

Twin Studies as P.R. • Irrelevance of Heritability

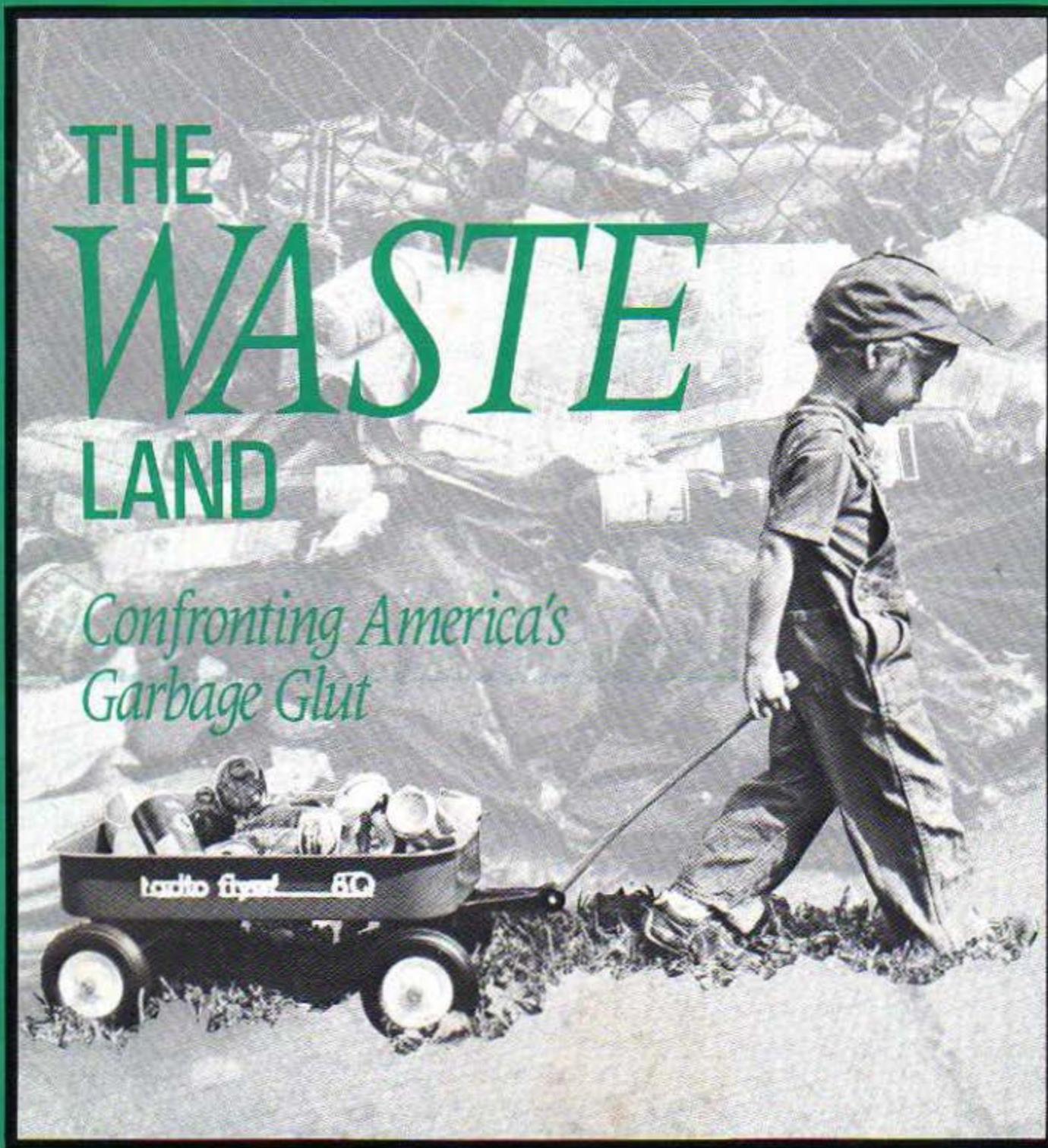
SCIENCE FOR THE PEOPLE

Vol. 19 No. 6

\$2.50

THE WASTE LAND

*Confronting America's
Garbage Glut*



Asbestos Pipe vs. Clean Water

Dear SftP:

As an engineer who has been involved with the problems of water supply and sanitation in the Third World for over thirteen years, I feel compelled to respond to the article "Asbestos-cement in Pakistan," by Susan A. Motley (May/June, Vol. 19, No. 3). I found the article incredibly simplistic in its presentation of the complex economic and public health issues facing water supply engineers in the Third World, and I find its implicit and explicit conclusions unsupported by the evidence. I do not claim that I know "the answers" to all of the questions involving the use of AC pipe, but I do believe that they need to be presented fairly.

First, the article displays a gross lack of perspective as to the public health issues faced by a nation such as Pakistan. In 1977, one in seven children born in Pakistan died before their first birthday. A substantial fraction—probably a majority—of these deaths are attributable to infant diarrhea, which in turn is viewed by public health experts as a product of inadequate water supply and sanitation. There is absolutely no comparison between the risks from the fecally polluted water supplies many people in the Third World must use, and the as yet unsubstantiated risks from ingesting water carried by asbestos-cement pipe.

I realize that the author is not directly proposing that the government of Pakistan abandon the supply of clean water to its people. However, when the provision of water to the urban poor in the Third World is limited by the availability of foreign exchange, small differences in cost between pipe materials can easily mean the difference between clean water or dirty water for thousands of people.

The author's observation that U.S. contractors find PVC pipe economically competitive because it saves on labor costs is absolutely irrelevant in a country such as Pakistan, where labor is cheap and the economic feasibility of water supply construction is dominated by foreign capital costs. My experience in Africa and the Middle East has been that PVC was not at all competitive with AC pipe in the larger sizes.

Finally, the condemnation of asbestos-cement pipe as a public health risk in the U.S. is hardly as conclusive as the author implies. In a curious turn of phrase, the article states that "the dangers of ingesting asbestos are not yet as definitive as those for inhalation," as if it were merely a matter of time before these risks became definitively established.

The debate in the U.S. water industry about the risks from AC pipe is a lively one, and the verdict is not yet in. I assure you that the EPA could only propose a ban on AC pipe because the most basic problems of water supply and sanitation have by and large been solved in the U.S., and we have the luxury to move on to less clearly defined tasks.

—Pete Kolsky
Pasadena, California



Diagnostic Truths

Dear SftP:

Loud and sustained applause from this reader for your splendid article "Diagnostic Dilemmas," by S.A. Spitz. Believe me, Dr. Spitz tells it like it is. I have been on a long diagnostic journey lasting approximately seven years and know that there are many people like myself out there trying to get a definitive diagnosis.

I present with dizziness and disequilibrium which, of course, are symptoms of many different illnesses. At any rate, I have a bulging file of letters from physicians identifying my illness, replete with copies of untold numbers of tests (costly indeed!).

One will generally find oneself in the hands of a psychiatrist, as Dr. Spitz indicates. One may or may not find relief there, but relaxing in that lounge chair and cursing the rest of the medical profession (anything goes, you know) is a great release!

—Grace Presser
Stamford, Connecticut

Editor

Leslie Fraser

Publisher

Gary Keenan

Designer

David Gerratt

Illustrator

John Klossner

Art and Photos

Mara Loft, MassPIRG
Paul Valery

Editorial Committee

Tracy Cohen, Leslie Fraser, Jeff Levy,
Gary Marchant, Stephanie Pollack, Joseph Regna,
Seth Shulman, Ellen Weinstock

Book Review Editor

Joseph Alper

Material Requests

Jim Barton

Distribution

Richard Aichelmann

Outreach Coordinator

Jon Beckwith

Fundraising Coordinator

Gerry Waneck

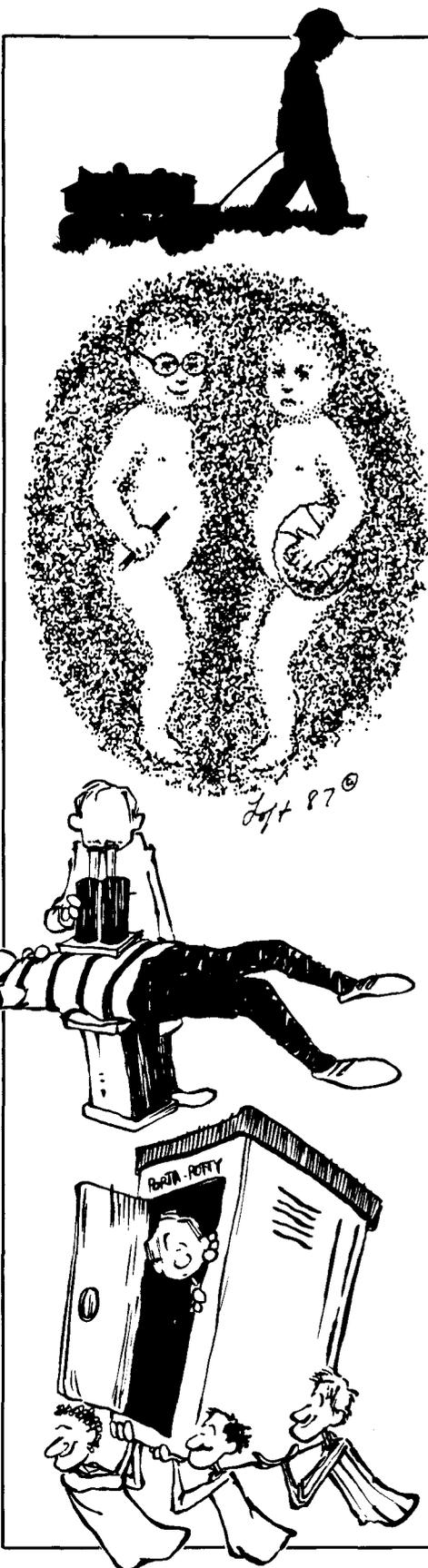
Editorial Advisory Board

Joseph Alper, Rita Arditti, Jon Beckwith,
Philip L. Bereano, Edith Brickman,
Stephen Chorover, Fran Conrad,
Eric Entemann, Roslyn Feldberg, Ross Feldberg,
Marilyn Frankenstein, Douglas Fuyama,
Ted Goldfarb, Rae Goodell,
Stephen Jay Gould, David Himmelstein,
Eric Holtzman, Ruth Hubbard, David Kahn,
Charles Koplik, Richard Levins, Richard Lewontin,
Karen Messing, Frank Mirer, David Noble,
Richard Novick, Connie Phillips,
Alvin F. Poussaint, Stephen Risch, Richard Rosen,
Virginia Schaefer, Scott Schneider, Miriam Struck,
Sue Taffler, Michael Tanzer, Scott Thacher,
John Vandermeer, Gerry Waneck,
Joseph Weizenbaum, Sandy Wiper,
Steffie Woolhandler

SUBSCRIPTIONS: U.S. one year/six issues: \$15. Foreign rate: \$21. U.S. libraries/institutions: \$24. Foreign libraries: \$30. Member subscriptions (includes the magazine, our newsletter and other communications): \$30. 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 in microform 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.

SCIENCE FOR THE PEOPLE (ISSN 0048-9662) is published bimonthly by the Science Resource Center, Inc., a nonprofit corporation at 897 Main St., Cambridge, MA 02139, telephone 617/547-0370. Edited and produced by the national organization of Science for the People. We offer a progressive view of science and technology. Articles, letters, reviews, newsnotes, photos, and art work are welcome. Please send double-spaced, typed manuscripts, on Wordstar IBM-compatible disks if possible. Unless otherwise noted, all material copyright 1987 by Science for the People.



4 THE WASTE LAND

by John M. Wasson and Stephanie Pollack

What are we doing about America's garbage glut? No other country in the world can match the U.S.'s output of garbage on a per-capita basis. Americans generate four to six pounds of garbage a day—double that produced by a Swiss, West German, Swedish, or Japanese citizen. And with leaking, overburdened landfills across the country, we've run out of room to bury our waste. How can we clean up our toxic dumps and implement safer methods for garbage disposal? What are the environmental impacts of waste-to-energy incinerators? And how can we reduce the amount of trash that we produce? Recycling is the best alternative—but will Americans go for it?

14 ELIMINATING THE INFERIOR

by Barry Mehler

The American and German eugenics movements were one in "the identification of human beings as valuable, worthless, or of inferior value in supposedly genetic terms." The Nazi sterilization law was mirrored after U.S. sterilization laws that had been enacted during the thirty years prior to Hitler's reign. According to Frederick Osborn, secretary of the American Eugenics Society, "a brief history of the origin and development of eugenic sterilization showed the originality of the United States, where all the first laws were initiated, and indicated a lack of thoroughness of our people in their failure to follow through."

19 BEWITCHING SCIENCE

by Val Dusek

For seven years, news about the Minnesota Twin Study has flooded the popular press. Striking coincidences, eerie anecdotes, and tales of strange behavior have been heralded as evidence of the heritability of personality. The Minnesota Twin Study's "latest bombshell" purports to show that traits such as shyness, political conservatism, dedication to hard work, orderliness, and intimacy are—to a great extent—genetic. Yet the scientific data and methods of investigation used in the twin study have not been published in a refereed scientific journal.

DEPARTMENTS

- 2 **Newsnotes:** Guilt by DNA, engineering animals, and more
- 23 **Opinion:** The Irrelevance of Heritability
- 24 **Opinion:** AIDS and Sexual Mutilation
- 25 **Report:** The Evolution of Nuclear Strategy
- 26 **Review:** Sarcophagus, by Vladimir Gubaryev
- 28 **Grassroots:** Lead Soil Cleanup
- 30 **In Brief:** Time's Arrow, Time's Cycle; Time Wars and more

U.S. DEFOLIATES GUATEMALAN RAIN FOREST

The setting: a lush tropical rain forest. The action: U.S. planes bathing a huge swath in deadly defoliants. If you thought the scene was Viet Nam, think again; it's Guatemala. Between April and June 1987, the U.S. Drug Enforcement Agency (DEA) sprayed hundreds of acres of Guatemalan rain forest with toxic chemicals, ostensibly to eliminate drug trafficking.

Beginning on April 21, DEA planes flown by civilian pilots dumped a chemical barrage that reportedly included glyphosphate, paraquat, malathion, and EDB on 200 acres in the northern Peten province. The spraying was done at the request of President Cerezo, although it did not have the approval of

the Guatemalan Congress. The operation was expanded in May, and by its conclusion on June 23, it had affected over one-third of Guatemalan territory.

Glyphosphate (U.S. trade name "Round Up") and paraquat are lethal defoliants. Malathion is a restricted-use pesticide that was used in the controversial Mediterranean fruit fly control program in California. EDB is a fumigant recently banned in the U.S. because of its carcinogenic potential.

The threats to human health and the environment posed by the spraying program are enormous. Shortly after spraying began, hundreds of cattle died from drinking contaminated water. By mid-June, fourteen people had died and hundreds of others showed signs of poisoning: nausea, diarrhea, vomiting, skin irritations, and respiratory problems. Defoliation will destroy countless rain forest plants and animals and contribute to erosion, as soil stripped of vegetation is washed away by tropical rains.

The DEA claims the spraying was intended to eradicate marijuana and poppy fields. (They also claimed to be fighting Mediterranean fruit flies.) Yet many of the regions targeted for spraying cannot even grow corn, much less marijuana or poppies.

More likely, the spraying is part of a U.S.-assisted counterinsurgency campaign being conducted by the Guatemalan military. The Peten rain forest and other regions targeted for defoliation are known areas of peasant guerilla activity. In fact, during the spraying period, the Guatemalan military asked for U.S. help in airlifting troops to one of the targeted regions.

In a possibly related incident, fires of unknown origin destroyed large areas of rain forest in the Peten. Some observers have suggested that napalm was sprayed along with the defoliants. The Guatemalan military is known to have used napalm in previous counterinsurgency operations.

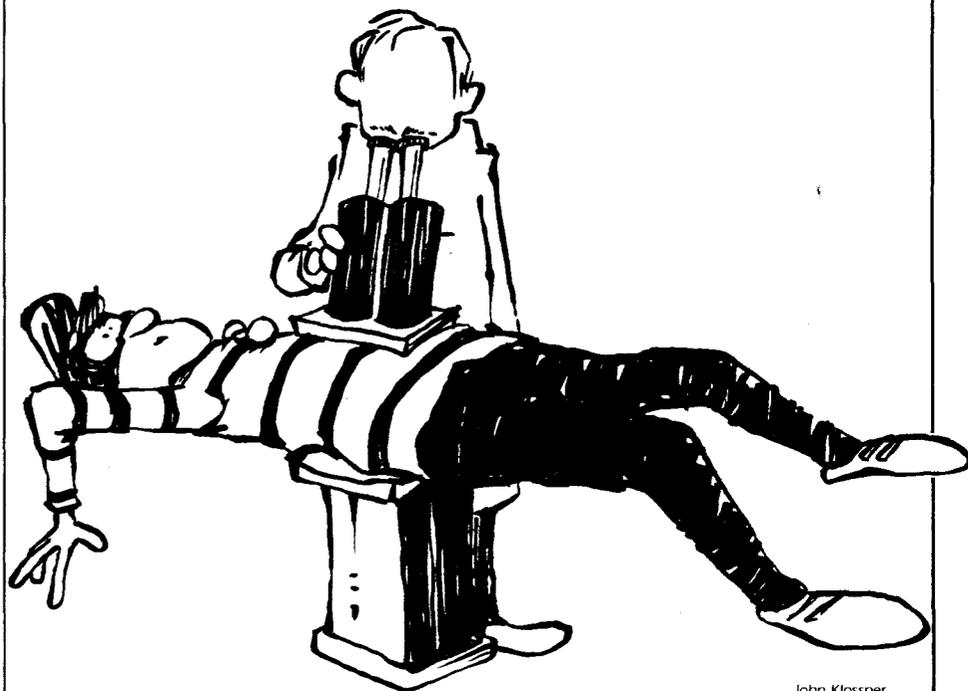
—Tracey Cohen

GUILT BY DNA

If you were at the scene of a crime and left some of yourself behind, your own DNA may be used to implicate you. Called DNA fingerprinting, a new technology is being used by police to analyze samples of blood, hair, or semen from suspected criminals. The person whose DNA is analyzed from these samples can be identified with "virtual certainty," according to company officials who are marketing the new technology.

Lifecodes Corporation, based in Westchester County, NY, and Cellmark Diagnostics, a British company, are two firms offering DNA analysis to U.S. law enforcement agencies. The companies claim that physical evidence can be linked to a single person using the technology, making identification possible in many criminal and paternity cases where fingerprinting is not feasible.

Civil liberties questions surround the new technology, however. While DNA analysis may save future rape and murder victims by identifying rapists and murderers, it can also be used to identify other "criminals"—political refugees, illegal aliens, and outspoken activists whom the government would like to keep under surveillance. James E. Starrs, a lawyer and forensic expert at George Washington University, claims that



John Klossner

police departments will maintain enormous DNA files, similar to fingerprint files now in existence.

"In rape cases*in which sperm can be recovered, there is just no way that could be analyzed until now," according to John K. Winkler, president of Lifecodes

Corp. "Now we can easily get a perfect match." But DNA analysis can also be used to clear suspects because, Winkler says, "there are no false positives. If it's not the guy, it just isn't. The DNA just won't match at all."

—information from the Washington Post



John Klossner

URINE THE BIG TIME

"Right now, you can feel the excitement in the air. We're on the verge of something very simple, very cheap, yet very, very big." That's the word from Dr. Thomas Prose, who sits on the board of Enzymes of America (EOA), a company in Michigan that's harvesting protein from outhouse urinals. Determined not to piss away their potential profits, EOA separates some of the 40,000 different proteins in urine and sells them to the pharmaceutical industry.

Owners of Porta-John, the largest portable-toilet company in the U.S., EOA processes urine only from men's urinals at outdoor concerts, festivals, and sports events. The bigger the event, the better the take. EOA hopes to improve its capital base in Washington, D.C., where demonstrations and the Fourth of July bring huge outdoor crowds in need of portable relief.

The company traps proteins using a special filter that's placed between the urinal and the holding tank. The filters are sent to a lab where the proteins are extracted. EOA can isolate about ten proteins, including human growth hormone, insulin, trypsin inhibitors, and

kallikrein. Extraction from urine is a low-tech alternative to biotechnology, since these proteins are now being produced through recombinant DNA techniques.

EOA's main protein product is urokinase, a blood-thinning enzyme. Last year, they earned \$150,000 from protein sales to pharmaceutical companies, though none have been used in pharmaceutical products yet. Medical schools and the National Cancer Institute are also interested in EOA's urine-derived proteins.

The scientific and medical applications were a byproduct of Porta-John's struggle to eliminate outhouse odors. Most of the stench comes from urine proteins, so company president Earl Braxton decided to extract the proteins as a nose-saving measure. "Urine produces the bulk of the odor in any waste system," according to Braxton. "If you take the protein away from waste matter, then the bacteria have nothing to feed on."

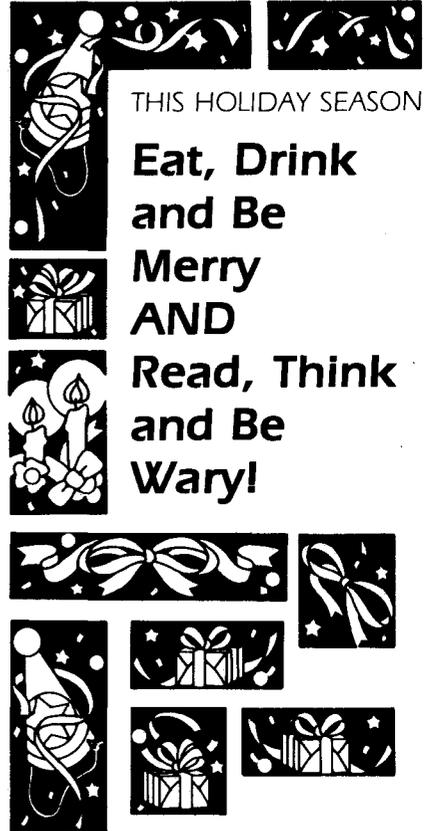
But rather than flush the extracted proteins away, Braxton recognized their potential value. "You and I aren't going to see a more cost-effective product in our lifetimes," he claims. "What you're looking at is a total protein transplant system." It's a recycler's dream.

—information from *City Paper*

CONTINUED ON PAGE 29

THIS HOLIDAY SEASON

**Eat, Drink
and Be
Merry
AND
Read, Think
and Be
Wary!**



Do you know someone who is looking for alternative work in science? Someone who opposes nuclear, chemical and biological warfare? Who's interested in the social and political implications of new technologies? Then you know someone who needs **SCIENCE FOR THE PEOPLE.**

Give them the facts, the thought-provoking analyses, and the voices of people creating a scientific community that works for human needs. Use the business reply card stapled in the front of this issue, and give them **SCIENCE FOR THE PEOPLE.**

**Use the reply card inside
the front cover to subscribe!**



First Gift: \$15
Second Gift: \$12

Third Gift: \$10
Fourth Gift: \$7.50
Fifth Gift: FREE!

THE MORE YOU GIVE,
THE MORE YOU SAVE!



THE WASTE LAND

Confronting America's Garbage Glut

BY JOHN M. WASSON AND
STEPHANIE POLLACK

The United States is the ultimate throw-away society. We use disposable flashlights and razor blades and wear paper clothing. We eat voraciously at fast-food restaurants that heavily package their products. We throw away biodegradable leaves tightly sealed in plastic bags, along with

disposable jars, bottles and cans, and mountains of paper.

No other country in the world can match the United States's output of garbage on a per-capita basis. Americans generate four to six pounds of garbage per day, about double that produced by the typical Japanese, Swiss, West German or Swedish citizen and almost three times that of the typical resident of Oslo, Norway. The total amount of trash generated in the



Photo/MassPIRG

United States each day—about 400,000 tons—boggles the mind. It's enough to fill about 40,000 garbage trucks or float an armada of 125 garbage barges like the "prodigal barge" that recently wandered the Atlantic Ocean carrying trash generated in Islip, Long Island.

Where does this country's trash go? Well, as a recent advertisement placed by the Steamfitting Industry Promotion Fund put it, "There are four ways to dispose of garbage: Burn it. Bury it. Recycle it. Or send it on a Caribbean cruise." Although the last alternative is used more widely than people think—another, less publicized barge full of toxic incinerator ash has been wandering the seas for over a year—the three basic alternatives are burying the garbage in landfills, burning it in incinerators or recycling it.

The vast majority of garbage—80 to 90 percent—is dumped in landfills. The remainder is split fairly evenly between recycling and incineration. This historical pattern is about to change drastically. Landfills are rapidly running out of space. A recent survey by the federal Environmental Protection Agency (EPA) found that one-half of all municipalities will run out of landfill space within ten years, one-third within five years. This space crunch will be compounded by the difficulty of finding new dumpsites and the closure of many dumps that are polluting ground or surface waters with a host of toxic materials.

With landfills filling up and closing down, communities across the country are grappling with the problem of what to do with their trash. Where will the mountain of garbage be moved in the coming decades?

THE LEAKING LEGACY OF LANDFILLS

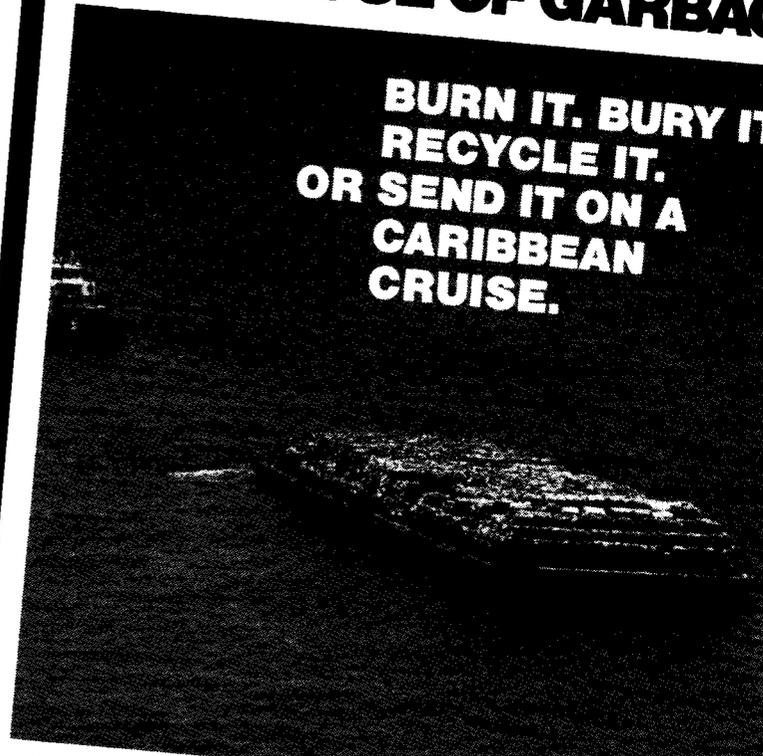
One approach to the garbage glut would be to build more landfills. But such a program would be difficult and expensive to implement. Land shortages, public opposition, and the costs of adequate environmental monitoring and controls will combine to limit the use of landfills in the future.

Landfills require large expanses of accessible space, preferably removed from residential areas. Such land is an increasingly rare and expensive commodity in many cities and towns. And landfills cannot be built on just any available land. The lesson that has been learned, the hard way, over the last few decades is that landfills must be sited in areas with appropriate soil conditions in order to prevent contamination

John M. Wasson works as a staff scientist for an environmental consulting firm. Stephanie Pollack is an environmental lawyer and member of Science for the People's editorial committee.

THERE ARE FOUR WAYS TO DISPOSE OF GARBAGE:

BURN IT. BURY IT. RECYCLE IT. OR SEND IT ON A CARIBBEAN CRUISE.



Under New York State law, all garbage disposal landfills must be phased out by 1990. Similar legislation has been enacted throughout the country, as dumping grounds in densely populated areas vanish rapidly.

If the humiliating odyssey of the Islip, L.I. barge and its unwanted garbage has accomplished nothing more, it has dramatized the critical waste management problem. Communities have outgrown technologies. There is an urgent need for new garbage disposal technologies.

Waste-to-Energy Incineration. Burning is the only practical, permissible method of waste disposal on a mass scale. Incinerator construction designed according to acceptable environmental standards will protect public health, while steam emitted by incinerator

smokestacks is usable to generate electric power.

Recycling. Solid waste disposal plants could reduce the city-wide garbage glut significantly, as has been demonstrated conclusively by voluntary recycling programs. Recycled paper, rubber, aluminum, glass and other materials produce marketable products for industry, substantially offsetting the cost of plant construction and protecting the environment.

Garbage. A burning question. Are communities going to be forced to ship their waste by truck and rail (or barge) to faraway places? Yes, unless they make use of the available technology for environmentally safe incineration and recycling.

Garbage is a dirty word. Intelligent waste management is the only way to clean it up.

PRESENTED AS A PUBLIC SERVICE BY:



THE STEAMFITTING INDUSTRY PROMOTION FUND
of New York and Long Island
230 Park Avenue, New York, N.Y. 10169 (212) 687-1513

of ground or surface waters.

Historically, municipal landfills—then known as town dumps—were placed on unwanted land, over old sand and gravel pits or in swamps or wetlands. But such locations were ultimately found to contain very permeable soil and reside above major groundwater aquifers. Rainwater percolating through the decomposing trash mixed with wastes such as paints, solvents, oils, pesticides, and fertilizers to form toxic leachate streams. This toxic soup traveled through the permeable soil into the groundwater below.

The results? Municipal dumps ended up polluting the groundwater below them with frightening regularity. A survey of New Hampshire landfills by the Conservation Law Foundation of New England found that two-thirds of the dumps that

had monitored nearby groundwater found evidence of contamination. According to a 1986 EPA survey, over twenty percent of the 850 sites then chosen or proposed for the Superfund cleanup list were municipal landfills. (See the accompanying sidebar.)

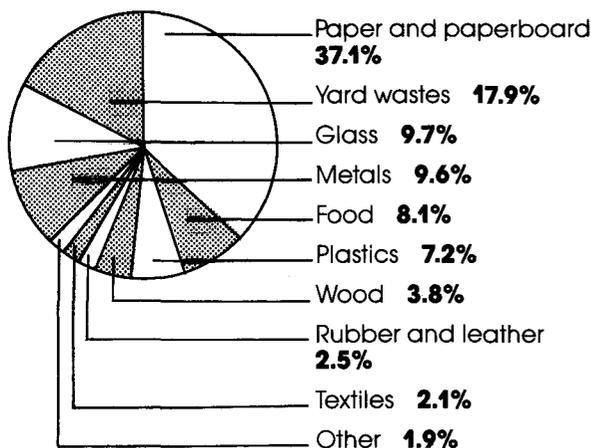
This enduring legacy of leaking landfills poses a serious roadblock to communities or private developers seeking to construct new landfills. Citizens simply do not want such facilities in their towns, let alone their backyards. Even if a developer can identify a suitable site for a new landfill, the plans usually meet with stiff local opposition.

Such opposition is hardly unexpected, given the current spate of dump closures and disclosures about drinking water contamination. Landfill developers counter

The Disposable Society: A Look at the Nation's Garbage

What We Throw Away

Percent of all materials thrown into municipal waste systems in 1984.



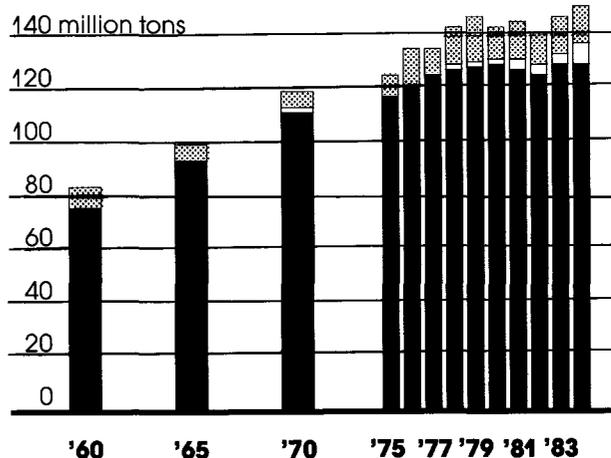
Source: Franklin Associates

Where It Goes

■ Recycled

 □ Incinerated for energy

 ■ Landfill



by explaining that landfills being constructed today bear little resemblance to their leaking predecessors. State-of-the-art landfills use a host of containment and treatment technologies to limit the spread of leachate. Synthetic and clay liners are placed beneath the landfill to capture the rainwater that percolates through the trash. Collection systems pump this leachate out of the landfill so it can be treated and disposed of properly. In addition, monitoring wells ring the site so that groundwater can be tested on a regular basis for contamination.

But this technology is largely untested: liners are unlikely to remain impermeable forever and leachate collection systems can fail. And even perfect technology cannot ensure that new landfills will not pollute the environment. Given the historically poor record of governmental regulators, landfill opponents can legitimately question who will oversee the operation and, eventually, closure of the new facilities.

A related problem is ensuring that landfill owners are held financially responsible for adequate upkeep and remedial measures if contamination occurs. Neighbors of proposed landfills must ask how state and local government officials and landfill developers will guarantee that state-of-the-art facilities will be constructed, operated, and financed. New landfills must minimize the possibility of ground- and surface-water contamination and provide for rapid and effective remedial actions if problems arise.

Further, technological fixes do not come cheaply. Constructing a state-of-the-art

landfill is expensive, often running tens of millions of dollars. Part of this high price tag is the result of decisions by landfill developers to construct as large a facility as possible. Since the time and money required to obtain necessary local and state permits is relatively independent of the size of the facility, developers have an incentive to obtain the regulatory approvals for one large facility, rather than to repeat the process for a number of smaller sites.

Accordingly, state-of-the-art landfills are often "regional facilities" that accept wastes from a number of surrounding

communities or even states. But the size of regional landfills only invigorates local opposition. Most residents simply do not want their community to become the dump for surrounding areas.

Given the lack of open space in most cities, the high cost of constructing and operating state-of-the-art landfills, the vigorous local opposition they engender, and the uncertainties about their technological and financial merits, it seems improbable that burial will be the primary means of garbage disposal in coming decades. Landfills will, of course, have a role to play because certain types of waste—such as incinerator ash—must go to such state-of-the-art facilities. But landfills will handle a far lower percentage of municipal wastes than they do today.

THE BURNING QUESTION OF INCINERATION

Government planners increasingly view waste-to-energy facilities as the solution to their garbage disposal needs. According to the EPA, there are 111 incinerators burning six million tons of municipal garbage now—but there could be 300 facilities burning up to 25 percent of the nation's garbage by the mid-1990s. Cities and counties in at least 40 states are in the process of planning, permitting or operating trashburners. Many states are planning on making this technology their preeminent trash disposal method; Connecticut, for example, plans to incinerate three-quarters of its garbage by 1990.

The reasons for the headlong rush are

**Many states
are planning
on making
incineration
their preeminent
trash disposal
method.
Connecticut
plans to burn
three-quarters
of its garbage.**

clear: incineration reduces the volume of garbage that must be landfilled by 70 to 90 percent, and in the process generates electricity that can be sold to utilities. But such benefits do not come without a price. Waste-to-energy facilities emit a host of air pollutants and leave behind toxic ash. And because of these environmental hazards, incinerators are beginning to face the same kind of local opposition as landfills.

Two of the most controversial classes of air pollutants emitted by municipal incinerators are dioxins and furans. Dioxin, a component of Agent Orange and the notorious culprit in the Times Beach, Missouri contamination, is one of the most potent carcinogens known. Incinerators emit dioxin, but in concentrations so low that it is often difficult to detect even at the top of the smokestack. Nonetheless, no one disputes the presence of dioxin in incinerator emissions. The controversy is over the magnitude of the health threat.

One of the most vocal opponents of incinerators is Dr. Barry Commoner, director of the New York-based Center for the Biology of Natural Systems. Commoner argues that the dioxin emitted by incinerators makes them "an inherently unacceptable technology." Another critic of trashburners, Ellen Silbergeld, chief toxicologist for the Environmental Defense Fund, stresses that dioxin is believed to be one of the longest-lived contaminants that accumulates in the human body. As a result, dioxin—even in the small amounts emitted by incinerators—can pose a significant health threat because of its tendency to remain in the human body over long periods.

Dioxin is hardly the only dangerous pollutant emitted by incinerators. Neil Seldman, director of the Institute for Local Self-Reliance in Washington, D.C., characterizes the dioxin controversy as a "sideshow"—not because dioxin emissions are safe, but because the disputes deflect attention from air emissions that are potentially more dangerous. Two pollutants of particular concern are metals and acid gases.

Seldman points out that, unlike dioxin, there is little controversy over the health threats posed by heavy metals emitted by incinerators. One example he cites is lead, a potent neurotoxin whose effects on blood formation and neurological development at even low levels are well documented. Allen Hershkowitz, of the New York-based environmental group INFORM, similarly argues that more attention should be focused on the 27 different metals that municipal incinerators may emit. Only three of the 27 are currently regulated.

Incinerators also emit significant levels of acid gases and acid rain precursors, such as hydrogen chloride and sulfur and nitrogen oxides. Besides contributing to acid rain, highly corrosive acid gases can

CLEANING UP THE LANDFILLS' LEGACY



In many cities and towns, landfills are not part of the solution to the solid waste crisis—they're part of the problem. Indeed, many town dumps pose a crisis all their own, because of the ground- and surface-water contamination they have wrought. Regulators and communities struggling to deal with the garbage crisis will, at the same time, have to devote regulatory attention and financial resources to closing down existing landfills and cleaning up their toxic legacy.

Because municipal landfills contain a variety of hazardous wastes mixed in with the household trash, they can produce leachate containing a variety of carcinogenic and toxic substances. The EPA's preliminary assessment of hazardous organic compounds in leachate from municipal landfills found 48 different substances, including benzene, methylene chloride, tetrachloroethylene, trichloroethylene, and toluene.

Most existing landfills are not designed to prevent this leachate from contaminating groundwater. In 1986, the federal Environmental Protection Agency completed the first phase of a Congressionally mandated study on regulation of nonhazardous solid waste disposal. The agency identified 16,416 municipal and private landfills, and found that few had taken adequate precautions to protect against groundwater contamination. Only eleven percent had either soil or synthetic liners, and only four percent had leachate collection and removal systems.

No one is certain how serious the problem of groundwater contamination is, however, because very little monitoring has been done. Only 19 percent of the landfills surveyed by the EPA performed any groundwater monitoring at all. One startling statistic from the EPA study provides an important clue about the scope of the problem: over 20 percent of the 850 sites then on or proposed for the Superfund cleanup list were municipal landfills. Another clue: a 1980 study by the Maine Department of Environmental

Protection found that every landfill located on a sand and gravel aquifer was contaminating the aquifer.

Federal and state regulation is finally catching up with these leaking landfills, and many will eventually have to be shut down and cleaned up. A Massachusetts court, for example, recently upheld the state's effort to close a leaking landfill in Quincy, calling the dump "an ecological disaster, discharging leachate into adjacent wetlands and quarries, and God knows where else."

The federal Resource Conservation and Recovery Act, as amended in 1984, provides that open dumps must be shut down or upgraded to meet minimum criteria established by the EPA to ensure the safety of sanitary landfills. Under the Act, states formulate solid waste management plans and receive federal funds to aid in their implementation. Landfills must obtain permits or shut down.

The EPA's solid waste management criteria are being revised currently. Congress mandated that new regulations be in place by March 31, 1988. The criteria are expected to require that landfills located in certain particularly fragile locations shut down, new and existing landfills install groundwater monitoring systems, and new and expanded landfills have liners and leachate collection systems.

Current and expected regulatory requirements will force many municipal landfills to close. Only half of the nation's 9,244 municipal landfills have valid operating permits. Many of the others won't qualify. New York's Environmental Conservation Commissioner has estimated that only 65 of the state's 340 landfills qualify for state operating permits. Some towns may be able to upgrade their dumps, but choose not to because of costs: Multinational Business Systems, Inc. has estimated that compliance with the EPA's revised criteria could cost municipal landfill operators anywhere from \$2 to \$25 billion.

THE ECONOMICS OF INCINERATION



At least until additional pollution controls are required, trash-burning will be a lucrative segment of the United States's \$15 billion solid waste disposal industry. But incinerators are more than a waste disposal technology: a 1,500-ton-per-day plant produces 40 megawatts of electricity. The economics of incineration can be understood only by viewing the plants as electricity generators as well as trashburners.

Incinerator operators make money at both ends: municipalities pay them tipping fees to take the garbage and utilities pay to buy the electricity produced by the plants. But much of the revenue comes from energy sales. Signal Environmental Systems in Saugus, Massachusetts gets a tipping fee of \$22 per ton plus a little over seven cents per kilowatt-hour for electricity from its 37-megawatt plant. Electricity sales produce over 60 percent of the plant's total revenue.

The profitability of incinerators is likely to be greatly reduced by regulatory developments in the next few years. Scrubbers and high-efficiency particulate removal systems—used to reduce emissions of metals, acid gases, and perhaps dioxin—are expensive. Allen Hershkowitz of INFORM estimates that air pollution controls would add \$5 to \$10 to current tipping fees of \$20 to \$35. In connection with its recent proposal to impose emission standards, the federal Environmental Protection Agency estimated that such controls would cost from \$4 to \$12 per ton, adding 10 to 15 percent to the consumer's cost for solid waste disposal.

Any requirement that ash be treated as a hazardous waste would further increase costs. California, which regulates incinerator ash as a hazardous waste, estimated in 1981 that disposal costs under its regulations would be \$50 per ton.

With or without pollution controls, the economics of incineration would be very different if incinerators were viewed as solid waste disposal facilities rather than energy production facilities. Treating garbage as a fuel for electric generation can have the unfortunate side effect of undermining source reduction and recycling efforts. Incinerator operators want a steady stream of fuel—garbage—

and contracts may even penalize municipalities who undertake recycling efforts that reduce their waste flows below a guaranteed minimum. Priorities should be reversed, critics contend, with all possible recycling conducted to minimize waste flows, and incineration used only for that garbage which cannot be recycled.

Recycling advocates argue that, at a minimum, incineration should occur in refuse-derived fuel facilities rather than mass-burn incinerators. Mass-burn plants incinerate a mixed stream of garbage with little or no pre-processing, while refuse-derived fuel facilities sort out metals and sometimes other materials prior to incineration. Neil Seldman of the Institute for Local Self-Reliance has estimated that pre-processing the waste stream to remove recyclable materials prior to incineration would lower the cost of a 2,500-ton-per-day incinerator from \$300-\$400 million to \$125 million.

Even a stricter recycling program than that used in refuse-derived fuel facilities would not necessarily prevent incinerators from serving as cost-effective electric generators. Studies have shown that a well-planned program of multi-material recycling can actually increase the BTU content of the garbage. And even if 60 percent of the paper is removed from a waste stream through recycling prior to incineration, the garbage's energy content is reduced by less than nine percent. Recycling advocates, such as the Natural Resources Council of Maine, thus conclude there is no conflict between recycling and incineration.

Still, even if incineration can be used to produce electricity in a manner that does not discourage recycling, environmentalists stress the importance of viewing the plants as waste disposal facilities rather than power plants. Allen Hershkowitz has studied incineration in Japan and concluded that one of the reasons that it is carried out so cleanly and successfully is that Japanese operators see their jobs as preventing pollution. To U.S. operators, what they burn is just solid fuel that happens to be garbage. Hershkowitz rejects "the erroneous assumption that a municipal incinerator is primarily involved in producing energy rather than disposing of waste."

adversely affect people's eyes and respiratory system. INFORM's Hershkowitz has written that refuse-burning plants in the United States emit 40 times as much hydrogen chloride as coal-burning facilities. Proliferating incinerators would thus exacerbate the acid rain problem.

Incinerator advocates, like landfill operators, argue that this pollution can be substantially reduced by mandating use of state-of-the-art controls. Control technologies such as acid gas scrubbers and high efficiency particulate removal systems—electrostatic precipitators and baghouses—can allegedly remove 99 percent of toxic particulates.

But the ability of such controls to limit emissions of the most controversial air pollutant—dioxin—is still uncertain. As importantly, such controls are lacking on most existing incinerators and will not be required on current or new plants for some time. Although state-of-the-art controls are standard features on Japanese incinerators, only two of the 70 high-volume incinerators operating in the U.S. as of 1986 had scrubbers.

The EPA has just announced plans to impose technology-based limits on emissions from new incinerators beginning in November 1989 and from existing incinerators beginning in 1993. Critics contend that these delays will allow too many trashburners to be built without adequate pollution controls. And they will not protect public health as strongly as standards under a different section of the Clean Air Act that was designed to deal with toxic air emissions. The Natural Resources Defense Council and two states have challenged the EPA's approach in court.

Toxic substances present in garbage or created by combustion also escape from incinerators in ash, which includes both the fly ash trapped in pollution control equipment as the gases flow out the stack and the bottom ash that falls to the bottom of the boiler after combustion. Ash is essentially the part of garbage that does not burn. Depending on the technology, from 65 to 90 percent of municipal solid waste is combustible, leaving 10 to 35 percent to be disposed of as ash. Based on the EPA's projections of incinerator capacity, 10,000 to 35,000 tons of ash will be generated daily by the mid-1990s.

This ash may contain high concentrations of heavy metals, dioxin, and organic chemicals. Nonetheless, except in a few states such as California and Washington, ash is not treated as a hazardous waste. Incinerator ash is usually disposed of in landfills. Fly ash and bottom ash are generally combined prior to disposal, although some environmentalists contend that the more toxic fly ash should be handled separately. Landfilled ash poses a threat to human health and the environment

through direct exposure—dust floating in the atmosphere, suspended particulates falling on surface water, or contaminants in the soil—and indirectly by the leaching of its toxic constituents into groundwater.

The most controversial issue surrounding incinerator ash is whether it should be regulated as a hazardous waste. Fly ash tested alone virtually always fails the EPA's leachability tests, as does combined bottom and fly ash in many cases. The Environmental Defense Fund has notified operators of current and planned incinerators of these test results, triggering a duty on the part of the facilities to conduct additional testing.

But the EPA does not regulate the disposal of incinerator ash because it is not convinced that the current test procedures adequately measure the toxicity of ash. Bills have been introduced in both the House and Senate that would order the EPA to set standards for testing and disposing of incinerator ash. Regulatory treatment of ash as a hazardous waste would have a profound effect on the economics of incineration, since disposing of ash would become much more expensive. (See the accompanying sidebar.)

Such arguments about environmental effects and safety, made in the face of a seeming juggernaut toward incineration, remind at least one critic of the early debates over another technological fix that eventually went awry. Neil Seldman of the Institute for Local Self-Reliance fears that incinerators could be the nuclear power plants of the 1990s. He has written that both technologies "have been plagued by a series of technological failures and plant cancellations. Both force a community to put all its eggs into one technological basket. And both have a powerful industry as their strongest advocate."

THE POTENTIAL FOR RECYCLING

If incinerators are the nuclear power

Recycling is
a flexible,
decentralized
approach to
solid-waste
disposal that
may, like
conservation,
prove to be
the cheapest
way to go.

plants of the solid waste industry, recycling is its conservation analogue. Rather than depending on large, centralized and largely untested technologies like landfills and incinerators, recycling efforts focus on changing the way garbage is generated and disposed of. Recycling is a flexible, decentralized approach to solid waste disposal that may, like conservation, prove to be the cheapest way to go.

Environmentalists and government officials are beginning to reach a consensus that recycling should be the number-one solid waste disposal option for the 1990s and beyond. But a recycling program that would involve 25 to 80 percent of the 150 million tons of garbage generated in the U.S. each year will look very different from today's scattered, often voluntary efforts to recycle perhaps five to ten percent of the waste stream.

Recycling advocates view garbage not as waste to be disposed of out as a

collection of "pre-consumed" raw materials available to be "mined." Many of the components of garbage—paper and newspaper, yard wastes, aluminum cans, glass—can be easily recovered from garbage and reused. (See the accompanying sidebar.) But even recycling advocates disagree about what percentage of the waste stream can be recycled in practice.

Effective recycling programs must first promote a high level of consumer participation. Neil Seldman advises municipalities and recycling companies to think of consumers as suppliers of raw materials. They can be induced to "supply" recyclable goods by mandating participation in recycling programs and by offering financial and other incentives.

The other key to widespread recycling involves the "demand" side of the equation: government at all levels must help develop stable markets for both "raw" recycled materials and finished products made with recycled materials. Without such markets, recyclers will have to charge more to accept garbage because they will not be able to make as much selling it. In the same way that incinerator operators make money from both tipping fees and electricity sales, recyclers will seek profits from both tipping fees and sales of recycled materials.

After evaluating the potential for promoting recycling, several cities and states have recently made their recycling goals far more ambitious. New Jersey and Massachusetts are aiming to recycle 25 percent of their waste stream, while Berkeley, California and Philadelphia have created a 50 percent recycling target.

Japan, which has one of the world's most successful recycling programs, recycles upwards of 65 percent of its garbage. (See the accompanying sidebar.) Others aim even higher. Barry Commoner believes that source reduction and recycling could eventually eliminate 70 percent of America's garbage; Neil Seldman cites



Photo/MassPIRC

figures as high as 80 percent. (Both would place the rest in landfills and bar incineration.)

Two different kinds of actions, usually grouped together as "recycling," are touted as means to reduce or redirect the solid waste stream: source reduction and various kinds of separation.

Source reduction entails shrinking the amount of material entering the waste stream, especially items that cannot be recycled or composted. Neil Seldman estimates that families who recycle reduce their waste output by 20 to 25 percent simply because they think more about what they buy. Most source reduction proposals focus on reducing excessive packaging, which generally accounts for 30 percent of the weight and 50 percent of the volume of household waste. Taxes and other penalties could be used to reduce the over 600 pounds of packaging material (paper, glass, metals, and plastic) disposed of annually by the average American.

Separation involves removing recyclable materials either before or after they enter the waste stream. Source separation takes place at home. Households are required to separate garbage into different categories (paper, glass, cans). Although many early recycling programs required separated materials to be brought to designated locations, most recycling advocates argue that curbside collection is necessary to ensure high rates of participation.

The most successful recycling programs supplement source separation with further sorting in materials-recovery facilities. Separation—generally using labor-intensive sorting—and sometimes processing of recyclables at these centrally located facilities results in high-quality and high-volume recycled goods, which helps to ensure markets for these materials.

The economics of recycling depends on a number of factors, including the cost of alternative disposal methods and the availability of markets for the recovered products. For a town with garbage to dispose of, however, the deciding factor will be the cost of recycling compared to tipping fees at landfills or incinerators.

As Cynthia Pollock's recent Worldwatch Institute report explains, "For years, recycling has been hampered by the belief that it should make money. But recycling is a cost-effective 'disposal' option so long as it requires fewer government subsidies than landfilling or incineration." According to Neil Seldman, most cities recycle to save the disposal costs (of up to \$100 per ton), rather than to gain the sale value of recycled goods (perhaps \$10 to \$45 per ton).

Recent estimates of disposal costs strongly favor recycling. Charles Papke of San Francisco's Resource Management Associates estimates that it costs \$20 to \$30 per ton to run a weekly curbside

trash collection and recycling program, far less than the \$40 to \$60 cost of landfilling or the \$70 to \$120 cost of incineration. A 1987 study of waste management costs in Minneapolis and St. Paul, Minnesota reached the same conclusion. Consultant John Madole estimated recycling costs at \$30 per ton, compared to landfill costs of \$90 to \$100 and incineration costs of \$90 to \$110.

In addition to saving on disposal costs, cities can try to make money from recycling by selling the recovered materials. Some even use recycled goods as raw materials in municipally owned manufacturing businesses, such as Fresno, California's plant for turning recycled newspaper into cellulose insulation. The Institute for Local Self-Reliance argues that recycling should be linked with local economic development and used to create jobs (six times as many as the use of virgin materials) and profitable new businesses.

But those who would profit from the sale of recycled products, whether cities or private companies, must overcome structural and attitudinal problems if stable markets for their wares are to be developed. Secondary materials markets are currently plagued by low and volatile prices. The marketplace is skewed against recycled products because of government policies favoring or subsidizing virgin materials, such as below-cost timber sales and water rates. Cynthia Pollock of the Worldwatch Institute has called for government action "to level the economic playing field so that used materials can compete with new substances."

Such levelling is likely to involve new subsidies for recycling, since existing subsidies for virgin materials will be difficult to rescind. But there are other actions that government at all levels can take to promote recycling.

Government agencies can use their purchasing power to create markets for recycled materials. Federal law requires the Environmental Protection Agency to establish guidelines that encourage federal and state government agencies to purchase products made of recycled goods. After prolonged delays, the Environmental Defense Fund recently sued the EPA to prompt the establishment of such regulations.

But state and local governments aren't waiting for federal action. Thirteen states have passed laws concerning the procurement of recycled goods. Vermont's precedent-setting statute, for example, requires the state's purchasing director to consider the costs of disposal in comparing the costs of virgin and recycled materials.

Governments also have an important role to play in matching providers of recycled materials with existing end-use markets for their products. Emily Bateson of the Boston-based Conservation Law Foundation notes that one of the best

WHAT'S IN A WASTE STREAM?

PAPER

Over one-third of the waste material disposed of by U.S. municipalities is paper and paperboard. At least one-quarter of this is newspaper. A recent Worldwatch Institute report notes that recovering the print run of the Sunday *New York Times* would leave 75,000 trees standing. Newspaper and cardboard—which usually contain recycled paper and can be recycled again—are probably the easiest and most lucrative materials for recycling programs to dispose of. A survey by the Natural Resources Council of Maine found that newspaper brings \$10 to \$32 per ton and cardboard \$22 to \$45 per ton, compared to \$12 to \$20 per ton for glass and practically nothing for scrap metal (which some recyclers pay to have hauled away).

YARD WASTES

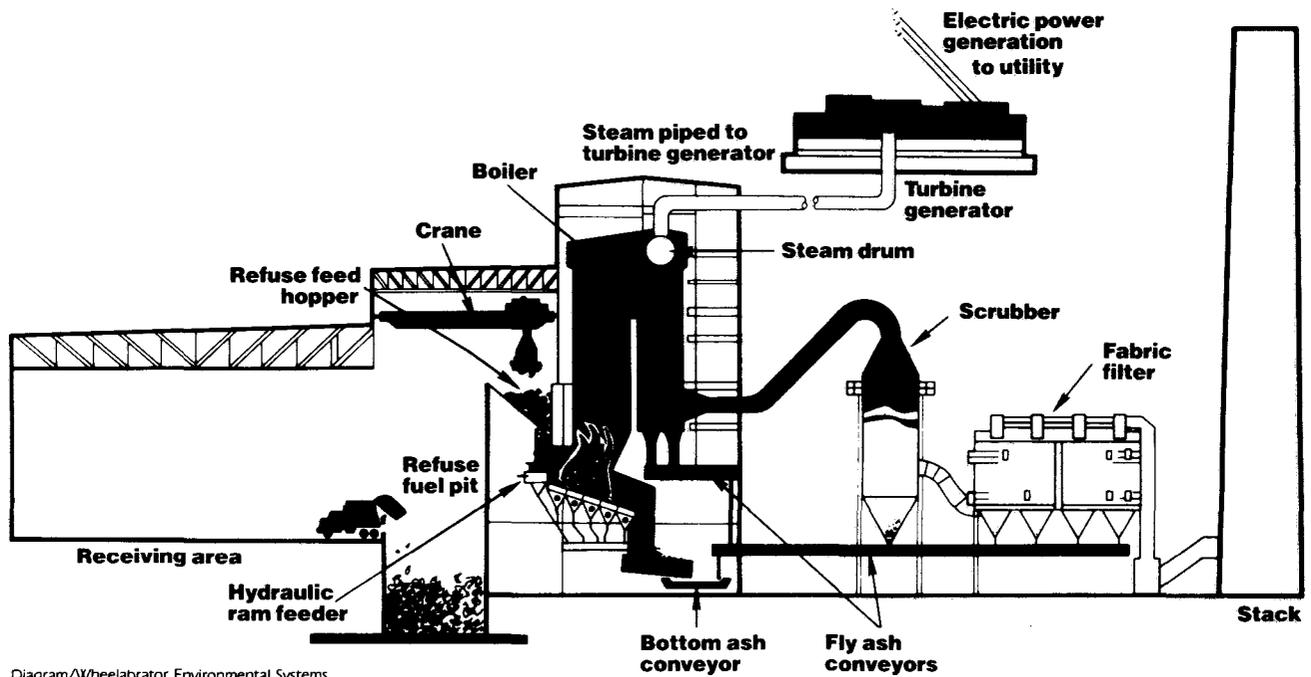
Yard wastes, which make up about 18 percent of the waste stream, can be recycled using composting, one of the oldest recycling techniques known. Currently, leaves and other yard wastes are trapped in nonbiodegradable plastic bags in dumps. If, instead, they are properly stacked and aerated and given the right amount of moisture, they will decompose into fertilizer.

GLASS

Glass makes up about ten percent of municipal wastes. After being sorted by color, it can be crushed into nickel-sized pieces called cullet. This recycled glass can be used to make new glass, insulation, and aggregate for asphalt in road paving. Glass producers' demand for cullet has increased with the adoption of stricter air pollution controls, because its use reduces emissions.

METALS

Another ten percent of the waste stream consists of metals. Some, such as tin and aluminum cans, can be easily recycled. Recycling aluminum cans can also conserve up to 95 percent of the large amounts of electricity needed to make aluminum from bauxite. Bottle bills and voluntary efforts have prompted large-scale recycling of aluminum cans: over half of all the aluminum cans sold in the U.S. are eventually returned for recycling.



Diagram/Wheelabrator Environmental Systems
Reproduced from Technology Review

Above: How a waste-to-energy plant works. Lime sprayed into the scrubber neutralizes acid gases that would otherwise contribute to acid rain. The scrubber also helps control dioxins and toxic metals emitted during burning. These pollutants are adsorbed onto

fly ash—the ash carried out of the furnace by exhaust gases. A fabric filter collects the fly ash, which must be dumped in secure landfills so that it does not contaminate groundwater. The bottom ash, another residue of the burning process, is not as dangerous.

examples of this type of governmental effort is the New Hampshire Resource Recycling Association. Towns inform the association about the materials for which they need markets; the association contacts businesses in the area, negotiates a price scale for the town, and arranges a pickup schedule once the town has enough volume.

Government must lead the way in creating and promoting markets for recycled materials to help compensate for Americans' suspicious attitude toward goods made from such products. Many people view recycled products as inferior to goods made from virgin resources. As Clifford P. Case of the National Recycling Coalition has noted, "our society is built on the idea that new is always better."

The biggest barrier to recycling is both structural and attitudinal: the treatment of recycling as an interesting hobby for hippies or as a fundraiser for scout troops, rather than an integral part of solid waste disposal policy. Like energy conservation, consumers must begin to see recycling as a necessary part of resource management, rather than a money-saving action to be taken by individuals.

Given the magnitude of the solid waste problem and the amount of recycling that

is needed to make a significant dent, individual actions are no longer enough. As Lester Brown of the Worldwatch Institute has noted, "It's one thing to save your aluminum cans or your waste paper

for recycling, but if there isn't a viable, stable, long-term, national market for these materials, then one day you'll find there's no place for your stack of papers to go."

Government must lead the way in creating and promoting markets for recycled materials to help compensate for Americans' suspicious attitudes toward recycled products.

TOWARD A RATIONAL SOLID WASTE POLICY

Burn it. Bury it. Recycle it. Or send it on a Caribbean cruise. That is the array of disposal options available to municipalities as they grapple with how to best dispose of their steady stream of trash. Treating the last option as a joke—although in the current state of affairs it has become an unfortunate reality—the question becomes what mix of recycling, incineration, and landfilling should cities use?

The answer does not involve a simple choice among these three technologies. For one thing, no single disposal method can handle the entire waste stream. The most avid recycling enthusiasts acknowledge that 20 to 30 percent of the waste stream cannot be recycled. Even if all waste were to be incinerated, the ash would have to be disposed of in landfills. And the potential use of landfills is limited by the difficulty of siting them given land shortages, environmental considerations, and public opposition.

Nor can the problem be viewed as a purely technological choice, because none of the technologies can be evaluated independent of its economic, environmental, and social context. A boiler is a boiler, but incineration looks very different when it is viewed as a method of pollution control (as is the case in Japan) as opposed to a means of producing electricity.

Similarly, recycling can be seen as just another solid waste disposal technology or as a method of mining urban wastes for raw materials that can become the basis of municipal industry and economic development. Cities and towns must decide not only which disposal technologies to use, but how they are to be used and regulated to promote economic and environmental goals.

The three major factors that states and cities should consider in deciding upon a regulatory policy for solid waste are environmental costs and benefits, economics, and implementation issues. The three are not independent. Disposal costs, for example, are strongly affected by what environmental controls are required for landfills and incinerators.

Recycling is the clear winner when environmental benefits and drawbacks are considered. It is environmentally benign, with few (if any) drawbacks and many benefits. Recycling substitutes the reuse of materials for the use of virgin materials and thereby reduces the number of trees that must be cut and the tonnage of metals that must be mined.

Recycling also reduces energy use: the Worldwatch Institute notes that recycling aluminum requires only five percent as much energy as producing it, so each recycled beverage can saves the energy equivalent of a half-can of gasoline. Mining raw materials from garbage slows consumption of the United States's limited natural resources and ensures that they are used wisely and frugally.

Landfills and incinerators, by contrast, pose many environmental threats. Incinerator emissions pollute the air, while incinerator ash and other wastes in landfills can contaminate groundwater with an array of toxics. While the adverse environmental impacts of these disposal methods may be mitigated through the use of control and containment technologies—like scrubbers, liners, and leachate collection systems—the controls' long-term effectiveness is uncertain.

Indeed, recycling may be one of the most effective means of reducing the environmental impacts of incineration and landfilling. Separating recyclable materials out of the waste stream removes the plastics that appear to be one of the major causes of dioxin formation in incinerators and the metals that might otherwise go up the stack of a trashburner or into the groundwater under a landfill. And, as

Recycling aluminum
requires only
five percent as
much energy as
producing it,
so each recycled
beverage can
saves the energy
equivalent of
a half-can
of gasoline.

Allen Hershkowitz of INFORM notes, by removing noncombustibles such as bottles and cans, recycling reduces the amount of ash produced by incinerators.

Economics also seems to favor recycling, especially when the environmental costs of incinerators and landfills are properly considered. Federal, state, and local governments must act to ensure that disposal costs for landfills and incinerators accurately reflect environmental costs by mandating measures such as state-of-the-art pollution controls and escrow accounts or bonds to ensure that a pool of money will be set aside to ensure adequate maintenance and to pay for unforeseen problems.

Figures cited above indicate that recycling costs may be only one-third to one-half of those for incineration or landfilling. Using straight economic principles, a town should recycle up to the point where the cost of promoting additional recycling will exceed the cost of alternative disposal methods. This analysis



Photo/MassPIRG

will, however, involve more than a comparison of tipping fees, because recycling entails other expenses such as implementing and enforcing a source separation ordinance.

The major strike against recycling is not environmental or economic, but political: it is difficult to implement. Many obstacles must be overcome for recycling to become the primary method of garbage disposal. Source separation will require a change in Americans' attitudes and habits that will have to be induced through some combination of public education and coercion. Many government and private actions will be needed to create stable prices and viable markets for recycled materials and products made with them.

But these obstacles are not insurmountable. The public can be taught about the need for recycling, perhaps with some emphasis on the need for source separation in order to keep landfills and incinerators out of their backyards. Procurement and other government policies can be used to develop and stabilize markets and offset existing subsidies that favor use of virgin materials.

Municipalities are also beginning to realize that massive incineration and landfill programs have implementation problems of their own. Public opposition must be fought, sometimes through landfill and incinerator corporations "buying off" towns with subsidies and incentives.

And state and local governments will also have to take on the task of ensuring that pollution controls are installed and operated properly. Here, too, public education will be needed to convince citizens that the benefits of these technologies outweigh their risks—a task that will be easier if public officials can explain that as much of the waste stream has been recycled as possible.

When all the factors have been weighed, the growing consensus is that recycling deserves to be the top priority. As a decentralized, low-impact, and low-technology approach to solid waste management, it is far more flexible and environmentally benign than large, centralized, high-technology landfills and incinerators with their attendant environmental problems and technological uncertainties.

There is also a consensus about what actions need to be taken to significantly increase the level of recycling. All levels of government should begin or upgrade efforts to promote source separation by consumers and create and stabilize markets for recycled materials and products made from them. Permits for new landfills and incinerators should be granted only upon a showing that the facility's size is based upon the assumption that all feasible measures will first be taken to reduce the waste stream using source reduction and recycling.

What should be done with that part of the waste stream which cannot be

CONTINUED ON PAGE 32

MAKING RECYCLING WORK

Successful Programs, Future Strategies



Some cities and towns have been working at recycling for a long time and have found ways to make it work. The experience of countries like Japan and U.S. cities like Berkeley, Hamburg, and Minneapolis has encouraged state and local officials to launch more ambitious programs. No assessment is yet possible of the three regulatory initiatives profiled here—each was enacted this year—but they mark the beginning of what promises to be a new wave of sophisticated and far-reaching recycling initiatives.

Programs That Work

JAPAN: This country is usually cited as having one of the best recycling programs in the world. The Japanese separate their garbage into seven categories, with different types collected on different days. Over 95 percent of newspapers, 70 percent of steel and aluminum cans, and 50 percent of glass bottles are recycled.

BERKELEY, CALIFORNIA: The city currently recycles 20 percent of the 145,000 tons of garbage it generates each year, using a combination of curbside collection, composting of yard brush collected at drop-off sites, and salvage at the landfill. The City Council recently voted to aim for a goal of 50 percent recycling by 1991 and impose a five-year moratorium on construction of incinerators.

HAMBURG, NEW YORK: This town of 10,500 recycles an estimated 34 percent of its trash through a mandatory recycling program. Garbage is not collected unless it is properly separated. Early on, the town found markets for selling the recycled materials and, in order to ensure stability, has stuck with them even when prices have gone down. Hamburg recycles 300 tons of glass, 440 tons of newspaper and cardboard, and 200 tons of cans annually.

MINNEAPOLIS, MINNESOTA: This city has implemented a forward-thinking

program called "shared savings." The city pays private sector and community recyclers approximately \$12 per ton to recycle newspapers. This results in both profits for recyclers and savings for the city, which would otherwise have to pay \$22 per ton to dump the newspapers at a transfer station.

New Regulatory Initiatives

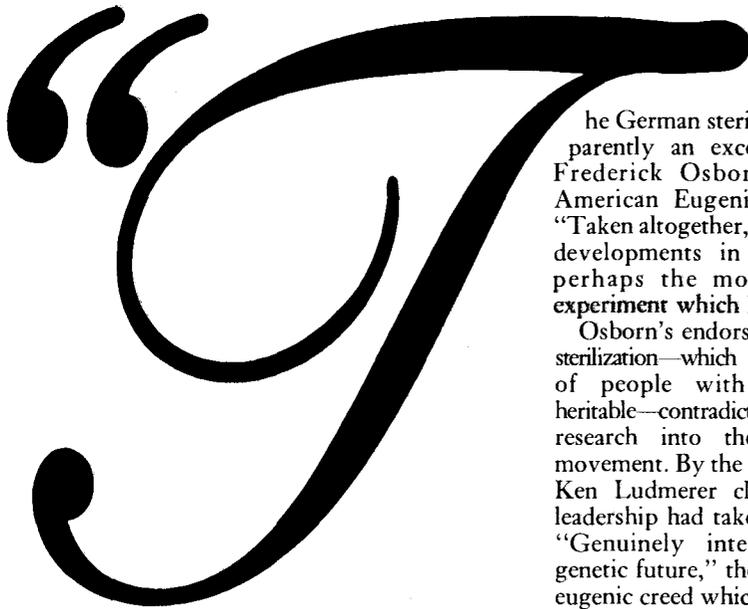
NEW JERSEY: Always a leader in recycling efforts, the state recently moved to mandatory recycling and source separation. Each county is designated as a solid waste planning district and must submit a District Recycling Plan to the state Department of Environmental Protection for approval. The plans must target reductions of at least 15 percent by the end of the first year and 25 percent by the end of the second year. Each municipality must appoint a Municipal Recycling Coordinator, adopt a source-separation ordinance, and provide a collection system for separated materials.

PHILADELPHIA, PENNSYLVANIA: After initial reluctance, Mayor Wilson Goode recently signed an ordinance with a goal of recycling 50 percent of the city's 2,000 tons per day of wastes by 1991. Within two years, all homes and businesses will have to separate their garbage into no more than four bundles. The city can cancel trash pickup from any resident who fails to comply.

MAINE: The state's new solid waste law is designed to reduce the volume of waste generation and increase the level of recycling. A new Office of Waste Recycling and Reduction will complete a state recycling plan by January 1, 1989. Most crucially, recycling is tied to other solid waste disposal methods. Under the law, a license can be issued for a waste disposal facility only after a licensing board finds that waste volume has been reduced to the maximum extent practicable by recycling and source reduction.

Eliminating the Inferior

By Barry Mehler



The German sterilization program is apparently an excellent one," remarked Frederick Osborn, secretary of the American Eugenics Society, in 1937. "Taken altogether," he continued, "recent developments in Germany constitute perhaps the most important social experiment which has ever been tried."¹

Osborn's endorsement of Nazi eugenic sterilization—which mandated the sterilization of people with disabilities deemed heritable—contradicts more recent historical research into the American eugenics movement. By the 1930s, Mark Haller and Ken Ludmerer claim, a new breed of leadership had taken over the movement. "Genuinely interested in mankind's genetic future," they "propounded a new eugenic creed which was scientifically and philosophically attuned to a changed America."²

The eugenicists of the 1930s included socialists, communists, and progressives who saw sterilization as a humane way to prevent crippling disabilities that they believed to be genetic. Attitudes towards Nazi totalitarianism varied widely between 1933 and 1939. Many eugenicists were emphatically opposed to Nazi totalitarianism, while others were quite supportive of the Hitler government.³

Whether the social and philosophical objectives of sterilization advocates diverged into democratic and totalitarian camps during the 1930s or not, with regard to eugenic sterilization, the United

States served as an example to the rest of the world. The first sterilization law was passed in Indiana in 1907. From that year until 1928, when the first European sterilization law was passed in the Swiss Canton de Vaud, Americans had enacted nearly thirty state sterilization laws.

Between 1928 and 1936, a number of European nations also passed sterilization laws, including Denmark (1929), Germany (1933), Sweden and Norway (1934), Finland and Danzig (1935), and Estonia (1936). All of these laws, according to Dr. Marie Kopp, who toured Germany studying the administration of Nazi eugenic sterilization laws for the American Eugenics Society in 1935, were modeled and inspired by American efforts.⁴

Furthermore, the American and German eugenicists were particularly close in ideology. Germans and Americans regularly translated each others' literature, and the German movement was closely followed in the American eugenics press.

In June of 1936, Heidelberg University planned a celebration in honor of its 550th anniversary. Harry Laughlin,⁵ the author of *Eugenical Sterilization in the United States*, was offered an honorary degree in recognition of his services to eugenics. Laughlin wrote that he would be glad to accept "not only as a personal honor, but as evidence of the common understanding of German and American scientists of the nature of eugenics as research in and the practical application of those fundamental

American and Nazi Sterilization Programs

biological and social principles which determine racial endowments and the racial health... of future generations."⁶

The American and German eugenics movements were one in "the identification of human beings as valuable, worthless, or of inferior value in supposedly hereditary terms." As one authority has noted, this "was the common denominator of all forms of Nazi racism." Eugenics was synonymous with "race hygiene," and its most fundamental program was to purify the "race" of "low grade" and "degenerate" groups. Thus, American and European eugenicists created a generic racism and sexism—the genetically inferior. Not surprisingly, the victims always turned out to be the traditional victims of racism—Jews, Blacks, women, and the poor.⁷

THE NAZI STERILIZATION LAW

The Nazi takeover enabled German eugenicists to achieve long-sought goals, but at least until the outbreak of the war did not substantially alter those goals.⁸ As Frederick Osborn remarked, "Germany's rapidity of change with respect to eugenics was possible only under a dictator." But the eugenic legislation enacted by the Nazis had "been on the docket for many years."⁹

The Nazi sterilization law was promulgated on July 14, 1933. Within two months, the *Eugenical News* printed a major evaluation of the law, including its complete text in translation. The Nazi government was praised for being the "first of the world's major nations to enact a modern sterilization law." The German law "reads almost like" Harry Laughlin's "American model sterilization law," and along with the American statutes was expected to "constitute a mile stone" (sic) in the movement to control human reproduction.

"The new law is clean-cut, direct and 'model.' Its standards are social and genetical," the *Eugenical News* article commented. "Its application is entrusted to specialized courts and procedure. From

Barry Mehler recently completed his Ph.D. in the history of science at the University of Illinois. He is currently working at the University of Illinois designing computer-assisted education programs for history students. His article, "The New Eugenics: Academic Racism in the U.S. Today," was published in the May/June 1983 issue of Science for the People.

a legal point of view nothing more could be desired."¹⁰

Paul Popenoe, director of the Human Betterment Foundation, a member of the Board of Directors of the American Eugenics Society¹¹, and an enthusiastic supporter of the Hitler government, published an alternate translation of the full text of the German sterilization law in the *Journal of Heredity* in July 1934.¹²

While the law itself was excellent, Popenoe commented, "the success of any such measure naturally depends on conservative, sympathetic and intelligent administration." The Nazi government was doing its best to prevent criticism by gathering "about it the recognized leaders of the eugenics movement," and depending "largely on their council in framing a policy which will direct the destinies of the German people, as Hitler remarks in *Mein Kampf*, for the next thousand years."¹³

Daniel Kevles, historian of science at the California Institute of Technology,



remarked that the German sterilization law "went far beyond American statutes" in that it applied to all persons "institutionalized or not, who suffered from allegedly hereditary disabilities." While it is true that the German law was not restricted to institutionalized persons, this difference should not be exaggerated.¹⁴

The Virginia eugenic sterilization law was challenged in the Supreme Court on the grounds that it violated the principle of equal protection since it applied only to institutionalized persons. Oliver Wendell Holmes spoke directly to this concern in *Buck v. Bell*. Holmes pointed out that the Virginia compulsory sterilization law sought to sterilize all persons with hereditary defects, not just those institutionalized. It did not violate the equal protection clause because "the law does all that is needed when it does all that it can." The

law, he said, clearly sought to bring all "similarly situated so far and so fast as its means allow" under its jurisdiction.¹⁵

The Commonwealth of Virginia aimed to sterilize only those who could "be safely discharged or paroled and become self-supporting with benefit to themselves and to society." Carrie Buck was institutionalized only after she became pregnant. She was released immediately after she was sterilized. Her sister, Doris Buck, was brought to the state colony specifically to be sterilized and was released immediately after her sterilization. It was clear that the provision in the law to sterilize institutionalized persons was not meant to restrict the population of those to be sterilized.¹⁶

AMERICAN SUPPORT FOR EUGENICS

The idea that, in the 1930s, American support for Nazi eugenics was limited to a fringe element discredited in the legitimate world of science is patently false.¹⁷ This does not mean that most American eugenicists supported the notion of Aryan supremacy or that American eugenicists supported Nazi extermination of Jews and others.¹⁸ American eugenicists supported the pre-war Nazi eugenics program, which included massive educational programs in all schools in Germany, an emphasis on the importance of biology to the state, marriage loans to help young Aryan couples begin families, and sterilization laws.

Charles R. Stockard, president of the board of the Rockefeller Institute for Medical Research (1935-1939) and a leading eugenicist, sounded the alarm for sterilization with as great an urgency as any Nazi. At a round-table discussion at the New York Academy of Medicine organized by the American Eugenics Society in 1937, Stockard said that the human race faced "ultimate extermination" unless propagation of "low grade and defective stocks" could be "absolutely prevented."¹⁹

Furthermore, support for Nazi eugenics was not confined to eugenic societies. A recent survey of high school biology texts from 1914 to 1949 reveals that over 90 percent included a discussion of eugenics.²⁰ In the mid-thirties, many of these texts commented explicitly and favorably on the German eugenics program.²¹

Eugenic ideology within the American

Eugenics Society was slowly hammered out in discussions and publications of the society over the years. The sterilization issue was discussed on numerous occasions and was the subject of many articles, papers, books, and conference round-table discussions. The integral role of eugenic sterilization in any thorough eugenics program was stressed in at least a dozen pamphlets that were published between 1923 and 1940. The most extensive exploration of the society's self-identity in these years, however, was Ellsworth Huntington's *Tomorrow's Children*, a 137-page catechism published in 1935, which was an effort to synthesize the various position papers of the past decade.²²

TOMORROW'S CHILDREN

Although Ellsworth Huntington was credited as the author "in conjunction with the Directors of the American Eugenics Society," *Tomorrow's Children* may be seen to represent the collective view of eugenics worked out by the board of directors and the advisory council of the American Eugenics Society over a period of more than a decade of debate and discussion.

"This book," Huntington wrote in the preface, "...is an outgrowth of the original report of the Committee on Program prepared under the direction of Professor Irving Fisher when the American Eugenics Society was founded." It was arranged as a catechism because it was written to replace *A Eugenics Catechism*, prepared by Leon Whitney in 1923. "The authorship of *Tomorrow's Children* is composite," Huntington proclaimed.

The final version of the manuscript went through seven drafts and the galley proofs were distributed to all the members of the advisory council, "so far as they could be reached." The final catechism represented the consensus of the group: "the author has done his best to represent the general sentiment of the group as a whole." To make this entirely clear, the verso of the copyright page lists the entire one hundred and ten members of the board and advisory council of the society.²³

What kind of numbers did the American eugenicists consider dysgenic? The Eugenics Society estimated that there were two million "feebleminded" persons in the United States in need of institutional care and 150,000 epileptics (90,000 were actually institutionalized). Another 320,000 persons were institutionalized for insanity.

Tomorrow's Children clearly recognized that such defects are sometimes "purely environmental in origin." Nevertheless, such people are always in danger of producing defective children. After all, "what kind of home influence can one expect where either parent is epileptic, feeble-minded, or insane?"

"Even if all
the criminals,
epileptics
and similar
people were
biologically
desirable, their
homes are rarely
desirable places
in which to
bring up children.
Even the
doubtful cases
should have
no children."



But no matter what the cause of such defects might be, "even if all the criminals, epileptics and similar people were biologically desirable, their homes are rarely desirable places in which to bring up children." Common prudence "makes it

advisable that even the doubtful cases should have no children."²⁴

Furthermore, *Tomorrow's Children* estimated that about five million adults and six million children were "subnormal in education" and suffered from "lack of innate ability." Another twenty million others failed to finish grammar school. Some of these, of course, could have finished with better health care or school programs designed to their needs. Nevertheless, there "seems no escape from the conclusion that many of them inherit such a poor mental endowment that even this moderate degree of success is beyond their ability."

But not all of these people should be sterilized, according to the American eugenicists. A thorough eugenics program would combine sterilization, segregation, and the vigorous promotion of birth control among the lower classes. Nevertheless, it is clear that the eugenicists advocated the sterilization of millions of Americans right up until 1940.²⁵

EUGENICISTS' SHARED GOALS

How does this compare with the goals of the Nazi eugenics program? In June 1933, Dr. Wilhelm Frick, Nazi minister of the interior who was hanged at Nuremberg for crimes against humanity, outlined the goals of the Nazi eugenics program. He estimated that there were about 500,000 carriers of "serious physical and mental hereditary diseases" who needed to be sterilized as quickly as possible. Then there was a much larger number whose "progeny is undesirable." He estimated this larger group at approximately twenty percent of the German population.²⁶

The Nazis actually sterilized 320,000 people between 1933 and 1939 (0.5 percent of the population) and perhaps two million by 1945. By the standards of the American Eugenics Society, this program was conservative. It is not at all surprising, then, that the American Eugenics Society praised the Nazi program in 1937.

After carefully studying its goals and operation, American eugenicists understood that the Nazi sterilization program reflected the goals and orientation of the American plan. That is precisely what Frederick Osborn meant when he said that "a brief history of the origin and development of eugenic sterilization showed the originality of the United States, where all the first laws were initiated, and indicated a lack of thoroughness of our people in their failure to follow through."²⁷

I don't think anyone who has written on the eugenics movement in the United States has made it clear that the American Eugenics Society, which represented the collective views of the mainstream of

American eugenicists and was composed of some of the most prestigious American academics and progressives, actually envisioned the sterilization of millions of Americans.

MEDICALIZED MURDER

In 1982, Yale psychiatrist Robert Jay Lifton published an important article, "Medicalized Killing in Auschwitz," in which he examined the imagery of killing as a medical procedure. Lifton was interested in just how German physicians were able to rationalize their participation in mass murder.²⁸ This led Lifton to focus on "the motivational principles around ideology, and the various psychological mechanisms that contributed to the killing."

Lifton emphasized the importance of the belief that killing was a therapeutic imperative. German physicians propounded an ethic which placed the doctor's loyalty to the nation as "cultivator of the genes" above his responsibility to the individual patient. As one Nazi SS doctor explained it, he participated in Auschwitz exterminations "out of respect for human life." Just as the physician "would remove a purulent appendix from a diseased body," so he was removing degenerates from the "body of Europe." The comparison of degenerate humans with cancer cells and disease is recurrent throughout European and American eugenic literature.

The American Eugenics Society's catechism of 1935 saw eugenics as "racial preventive medicine" and degenerates as "an insidious disease" affecting the body

"Crime and
dependency
keep on
increasing
because new
defectives are
born, just
as new
cancer cells
remorselessly
penetrate into
sound tissue."

of society in the same way that cancer affects the human body. "Just as opiates lessen the pain of cancer, so religion, philanthropy, and education, at great expense to society, restrain some of the hereditary weaklings from doing harm. Nevertheless, crime and dependency keep on increasing because new defectives are born, just as new cancer cells remorselessly penetrate into sound tissue."²⁹

In modern times, the catechism went on, "we treat cancer by means of the surgeon's knife." Our present methods of treating defectives leaves "great numbers of them to produce new offspring and create new cancers in the body politic." One might think of the American Eugenics Society as "a Society for the Control of Social Cancer," the catechism concluded. Sterilization, therefore, had to be seen as an integral part of preventive medicine. Since religion, philanthropy, and modern medicine would not permit the weak to die of hunger and pestilence, "sterilization seems to be the best protective."³⁰

Compare this view with that expressed by Konrad Lorenz, Nobel Laureate in Medicine:³¹ "There is a close analogy between a human body invaded by a cancer and a nation afflicted with subpopulations whose inborn defects cause them to become social liabilities. Just as in cancer the best treatment is to eradicate the parasitic growth as quickly as possible, the eugenic defense against the dysgenic social effects of afflicted subpopulations is of necessity limited to equally drastic measures... When these inferior elements are not effectively eliminated from a [healthy] population, then—just as when the cells of a malignant tumor are allowed to proliferate throughout a human body—they destroy the host body as well as themselves."³²

POST-WAR EUGENICS

With Paul Popenoe and Frederick Osborn as the editorial committee of the *Eugenical News* after 1945, it was not likely that American eugenicists would ever be informed of the intimate relationship between German eugenic leaders and the extermination of millions of innocent people. After the war, the revelations of the Holocaust made many American eugenic leaders defensive about their earlier positions. A successful effort was made to separate "humane socialist" eugenics from the "inhuman racist practices" of the Nazis.

In June 1946, the *Eugenical News* printed its only article on post-war German eugenics.³³ The article depicted eugenics as a casualty of the war. "With the collapse of Germany, all of the six scientific journals which were devoted to heredity and eugenics ceased publication." There followed short notes on what had become of individuals "who were particularly well known in the United States for their scientific work in connection with eugenics and human heredity." The list included many of those who took a leading role in the German sterilization, euthanasia, and extermination programs.

For example, among those listed was Otmar Freiherr von Verschuer. The

EXONERATING EUGENICS

The effort to exonerate eugenics of guilt for the Holocaust continues. In 1985, the University of Illinois hosted a prestigious conference entitled "Intelligence: Measurement, Theory and Public Policy." The conference was held to honor Lloyd G. Humphreys, retiring professor of psychology and education.³⁵ As the guest of honor, Humphreys gave the final talk, entitled "Intelligence and Public Policy."

Professor Humphreys ended the symposium with a call for a new eugenics program.³⁶ He expressed concern for the large numbers of children being born to parents of low intelligence and said that this situation "cannot be tolerated for long." Humphreys added, "Anger and horror at the practices of Nazi Germany are understandable and justified, but we should not allow those emotions to determine our own policies. A group of insane, evil men established practices that

were antithetical to every aspect of Galton's definition of eugenics."

During the question period, I commented that Galton had expressed the hope that eugenic education would "dispel the irrational sentiment against the gradual elimination of inferior races." I pointed out that the Nazi eugenics laws were not written by "insane, evil men," but by highly regarded academics, and that the Nazi laws were modeled after American laws. Professor Humphreys responded that Galton's definition had been misused by the Nazis. Galton himself was concerned basically with individuals, not groups.

What is the difference between a group approach and an individual approach? Doesn't this still leave us with superior individuals deciding the fate of inferior ones? And isn't the aim of eugenics still the elimination of the inferiors?

Eugenical News had carried a stream of articles on his work in the pre-war period. At the onset of the war he was head of the Department of Anthropology, Human Genetics, and Eugenics of the Kaiser-Wilhelm Institute in Berlin. From this important post he helped to set up a

laboratory for human experimentation at Auschwitz. His student, Josef Mengele, was put in charge of this research.

From Auschwitz, Mengele regularly selected "fresh research materials" which were "processed" for shipment directly from Auschwitz to Berlin. These "materials"

included the skeletons and organs of Jews and Gypsies selected by Mengele. No exploration of the gruesome fruits of European eugenics was ever published in any American eugenics journal. Instead, Osborn and Popenoe set out to combat the association of eugenics with racism.³⁴ 

NOTES

1. Frederick Osborn, "Summary of the Proceedings" of the Conference on Eugenics in Relation to Nursing, Feb. 24, 1937, American Eugenics Society Papers, BK 6.

2. Barry Mehler and Garland Allen, "Sources in the Study of Eugenics No. 1," *Mendel Newsletter*, vol. 14, June 1977, pp. 11-13; Mark H. Haller, *Eugenics: Hereditarian Attitudes in American Thought*. New Jersey: Rutgers, 1963, pp. 117, 174; Kenneth Ludmerer, *Genetics and American Society: A Historical Appraisal*. Baltimore, 1972, p. 174. Both Ludmerer and Haller based their notion of a "new eugenics" on conversations and correspondence with Frederick Osborn. Ludmerer distinguishes between eugenicists who favored the Nazi program and "American geneticists of standing" who criticized it. As will be seen from this article, such a distinction will not stand scrutiny.

3. Graham, "Science and Values: The Eugenics Movements in Germany and Russia," *AHR*, vol. 82, no. 5, 1977, pp. 1113-64 (1136-37). See also Paul Weindling, "Weimar Eugenics: The Kaiser Wilhelm Institute for Anthropology, Human Heredity and Eugenics in Social Context," *Annals of Science*, vol. 42, 1985, pages 303-318. Philip Reilly, in an otherwise excellent study of involuntary sterilization in America, also misinterprets Weimar eugenics. See Reilly, "Involuntary Sterilization of Institutionalized Persons in the United States: 1899-1942," Ph.D. Thesis. Yale: 1981, pp. 75-81. Carl Bajema, in the introduction to his benchmark collection, *Eugenics: Then and Now* (Stroudsburg, 1976) confronts the problem head on. "Does eugenics include brutal racist evolutionary practices such as those of Nazi Germany?" Bajema's answer is an emphatic no. He reminds us that Francis Galton employed two criteria for a true eugenics program. First, the policy must be humane, and second it must be effective. It was clear to Bajema that "the inhuman racist practices of Nazi Germany fail both criteria and cannot be called eugenic" (p. 5). The attempt to separate eugenics from the negative associations of the Nazi regime began in the mid-thirties.

4. Marie E. Kopp, "Eugenic Sterilization Laws in Europe," *American Journal of Obstetrics and Gynecology*, vol. 34, Sept. 1937, p. 499. The *Eugenical News* reported the full texts of a number of these foreign laws and published numerous reports on the progress of eugenics worldwide. The German law is much more comprehensive than all other similar laws and bills, and incorporates more safeguards than any other bill.

5. Harry Laughlin was Director of the Eugenics Record Office, which was affiliated with the Carnegie Institution's Department of Genetics at Cold Spring Harbor in New York.

6. Randy Bird and Garland Allen, "Archival Sources in the History of Eugenics," *Journal of the History of Biology*, vol. 14, no. 2, Fall 1981, p. 351. The most popular German eugenics text, *Menschliche Erblichkeitslehre*, was translated into English and widely read in the United States. Many American eugenics texts, including Madison Grant's classic, *The Passing of the Great Race*, were translated into German.

7. Giesela Bock, "Racism and Sexism in Nazi Germany," *Signs: Journal of Women in Culture and Society*, vol. 8, no. 3, Spring 1983. Reprinted in Renate Bridenthal et. al., *When Biology Became Destiny: Women in Weimar and Nazi Germany* (New York, 1984), p. 276.

8. Recent work on the German eugenics program supports this view. Giesela Bock writes that by the end of World War I, "sterilization was widely and passionately recommended as a solution to urgent

social problems" (G. Bock, op. cit., p. 274). Paul Weindling notes that the emphasis on negative eugenics "pre-dated the Third Reich." He quotes the geneticist Richard Goldschmidt, who complained that the Nazis "took over our entire plan of eugenic measures." The legislation which the Nazis promulgated in July 1933 had been developed and lobbied for during the Weimar years. Weindling concludes that "authoritarian politics provided favorable circumstances for eugenicists to exert influence on social policy in the planning of sterilization legislation." See Paul Weindling, "Race, Blood and Politics," *Time's Higher Education*, July 19, 1985; "Weimar Eugenics," *Annals of Science*, vol. 42, 1985, pp. 304, 318.

9. Marie E. Kopp, "A Eugenic Program in Operation," paper presented at the Conference on Eugenics in Relation to Nursing, Feb. 24, 1937, American Eugenics Society Papers, BK 6. There was a sterilization bill before the Prussian Legislature as early as 1903, and one before the Saxon Legislature in 1923. Bills were introduced to the Reichstag in 1907 and 1925. Quote is from Frederick Osborn, "Summary of the Proceedings," op. cit.

10. "Eugenic Sterilization in Germany," *Eugenical News*, vol. 18, no. 5, September/October 1933, pp. 89-95. Quote is from page 90.

11. Popenoe joined the American Eugenics Society in 1923. He was an active member of the society right up until the early sixties.

12. Popenoe, "The German Sterilization Law," *Journal of Heredity*, vol. 25, no. 7, July 1934, pp. 257-260. Popenoe not only praised the sterilization law, he also praised Hitler, who "bases his hopes of national regeneration solidly on the application of biological principles to human society." Popenoe also defended the Nazis privately. See Popenoe to L.C. Dunn, January 22, 1934, LCD Papers, quoted in Ludmerer, op. cit., p. 117.

13. Praise for the Nazi law can also be found in C.P. Blacker's *Voluntary Sterilization* (London 1934), pp. 90-94. See also, Leon Whitney, *The Case for Sterilization* (New York 1934); Gosney and Popenoe, *Sterilization for Human Betterment* (New York 1929); and J.H. Landman, *Human Sterilization* (New York 1932).

14. Daniel Kevles, *In The Name of Eugenics*, p. 116.

15. Buck v. Bell, Supreme Court Reporter 47, St. Paul, 1928, p. 585.

16. See "An Act to provide for the sexual sterilization of inmates of State institutions in certain cases," Acts of the General Assembly of the State of Virginia (Richmond, 1924), pp. 569-571. Carrie Buck had lived with the Dobbs family in Charlottesville, Virginia until she was seventeen years old. She had completed the sixth grade in school and had a congenial relationship with the family. The Dobbs sought her commitment on January 23, 1924, after they discovered that Carrie was pregnant. During the hearings to establish Carrie's eligibility for sterilization, Arthur Estabrook, the eugenics expert from the Eugenics Record Office sent to testify in the case, was asked if Carrie was incapable of self support. He was specifically asked, "Would she land in the poorhouse?" He answered, no, "she would probably land in the lower-class area in the neighborhood in which she lives." Estabrook went on to explain that she "is incapable of taking care of herself in the manner in which society expects her to." Quoted from Dudziak, "Oliver Wendell Holmes as a Eugenic Reformer," *Iowa Law Review*, vol. 71, no. 3, March 1980, p. 850.

17. Frederick Osborn, Conference on Eugenics in Relation to Nursing: Summary of the Proceedings.

American Eugenics Society Papers, Feb. 24, 1937. See also, *Eugenical News*, 18:5, September/October 1933; 19:2, March/April 1934; 19:4, July/August 1934; 19:6, November/December 1934; 20:1, January/February 1935; 21:6, November/December 1936; 21:4, July/August 1936; 22:4, July/August, 1937; 23:6, November/December 1938.

18. Although clearly some eugenicists, such as Madison Grant and Charles Goethe, did support such views.

19. Charles R. Stockard, remarks made during the general discussion at the "Round Table Conference on Eugenics in Relation to Medicine" at the New York Academy of Medicine, April 21, 1937. American Eugenics Society Papers, BK 6.

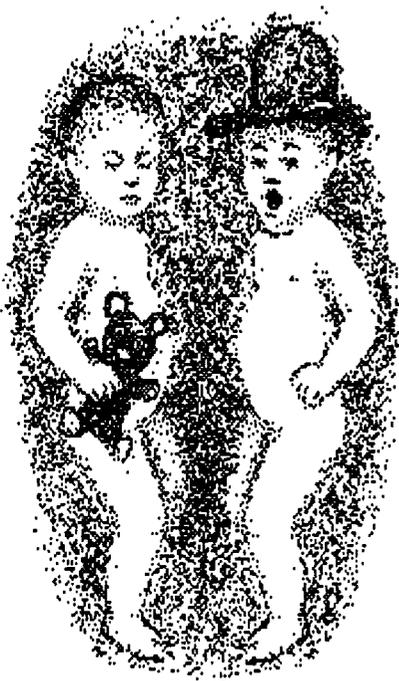
20. Steven Selden, "Confronting Tacit Social Values and Explicit Political Ideology in the Science Curriculum: The Response and Responsibility of Today's Educator," to be published in Alex Molnar (ed.), *The Social Responsibility of Educators*. Alexandria, VA: Association for the Supervision of Curriculum Development, in press. See also the author's review of college texts, "Education Policy and Biological Science: Genetics, Eugenics, and the College Textbook, c. 1908-1931," *Teachers College Record* (Teachers College, Columbia University), vol. 87, no. 1, Fall 1985, pp. 35-51.

21. As late as 1948, Michael Guyer's popular text, *Animal Biology*, was still advocating a vigorous program of positive and negative eugenics. "In many family strains," Guyer warns, "the seeds of derangement and disability have become so firmly established that they menace the remainder of the population."

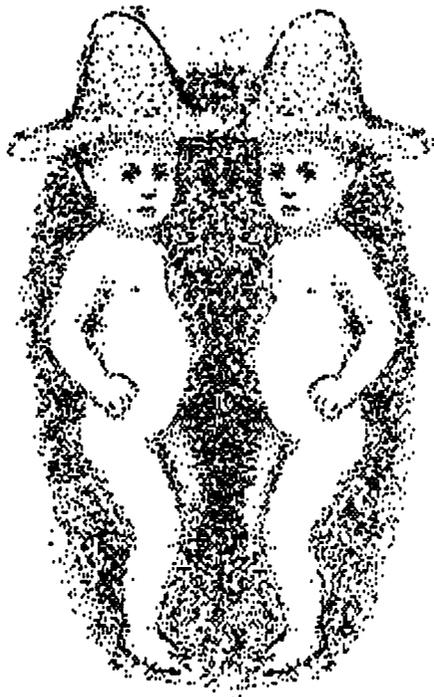
22. The first formal act of the society at its first annual meeting was the issuance of the President's Report, which re-examined and refined the "Eugenics Catechism" of 1923. The next year, the society published "The American Eugenics Society," a sixteen-page pamphlet which again examined the broad purpose of the society and its program. "Organized Eugenics" appeared a few years later, followed by "American Eugenics" in 1936, which represented a roundtable discussion of issues. In 1938, "Practical Eugenics" was published. "The Development of Eugenic Policies" was published in 1939, along with "A Eugenics Program for the United States." These are only examples of pamphlets produced by the society. Committees of the society also produced pamphlets, and all of the pamphlets were distributed to the advisory members for comment. See Ellsworth Huntington, *Tomorrow's Children: The Goal of Eugenics*. New York: John Wiley & Sons, 1935.

23. The Board consisted of Guy Irving Burch, Population Reference Bureau; Henry P. Fairchild, New York University; Irving Fisher, Yale University; Willystine Goodsell, Columbia University; C.C. Little, American Society for the Control of Cancer; Frederick Osborn, Secretary of the AES; H.F. Perkins, University of Vermont; Paul Popenoe, Human Betterment Foundation; and Milton Winternitz, Yale University. Among the advisory council were some of America's most liberal and highly respected religious, political, medical, and academic names. They included Robert L. Dickinson, probably the most highly respected geneticist in America at the time, the Reverend Harry Fosdick, whose Riverside Church in New York had over 3000 members, and his brother Raymond Fosdick, at the time the newly appointed president of the Rockefeller Foundation and the General Education Board. Among the biologists were E.M. East, William Wheeler, and Sewall Wright.

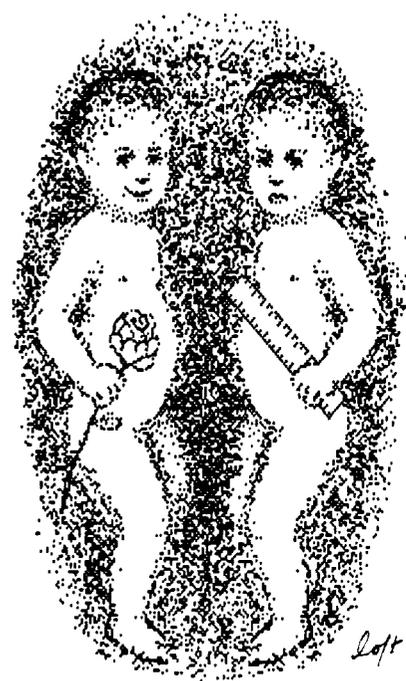
CONTINUED ON PAGE 32



NON-DATA



DATA



NON-DATA

Left 87©

Mara Loft

BEWITCHING SCIENCE

BY VAL DUSEK

For seven years, popular magazines have regaled us with tales of Oskar and Jack, a pair of twins, one raised in Nazi Germany, the other raised as a Jew in Trinidad, who both think it funny to sneeze in elevators and always flush a toilet before using it. We have also been told about Bridget and Dorothy, British twins who each wore seven rings.

These anecdotes issue from scientists undertaking a massive study of identical twins. The study, conducted by Thomas Bouchard and others at the University of Minnesota, is said to show that I.Q., personality traits, and virtually every other mental attribute or behavior is heritable, or capable of being inherited.

During the last year, lengthy articles have appeared in *U.S. News and World Report* (a cover story), *Discover*, and *Science*. Shorter pieces have appeared in

Val Dusek was a longstanding member of SftP's Sociobiology Study Group and has recently joined the Genetic Screening Group. His article on sociobiology and rape appeared in the January/February 1984 issue of Science for the People. He teaches philosophy at the University of New Hampshire.

Time, *U.S. News*, the *New York Times*, and other magazines and newspapers.¹

The Minnesota Twin Study's "latest bombshell" (as *U.S. News* calls it) purports to show that traits such as shyness, political conservatism, dedication to hard work, orderliness, and intimacy are to a great extent heritable, and that extraversion, conformity, creativity, optimism, and cautiousness are more determined by heredity than by environment.

Despite all the media coverage, the

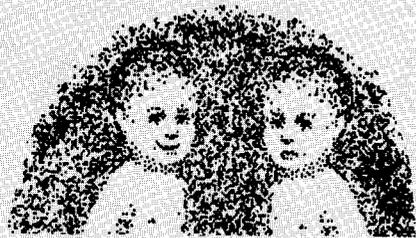
Twin
Studies
as
Public
Relations

scientific data and methods of analysis upon which these conclusions are based have not yet been published in a refereed scientific journal. A December 1986 article in the *New York Times* and one in the January 12, 1987 issue of *Time* referred to results "submitted" and "being reviewed" by professional journals. However, in the August 7, 1987 issue of *Science*, no reference is made to any article having been submitted; it is said only that "the group recently has produced a paper."

This seems like a minor anomaly until one realizes that for the last seven years, Bouchard has been releasing announcements to the media concerning the Minnesota Twin Study and its results. The news section of *Science* has several times enthusiastically quoted Bouchard. Also since 1980, articles have appeared in *Science* 80, *Newsweek*, the *New York Times*, the *New York Times Sunday Magazine*, *People*, the *New Orleans States-Item*, the *Washington Post*, and elsewhere.²

In these articles, traits from political conservatism to toilet flushing have been claimed to be heritable. Bouchard has declared his results "devastating" to feminists.³ Opponents have been termed "ideological."⁴ *U.S. News* stated, "Unable to hold back the swelling tide of evidence for the importance of genes, supporters of

BOUCHARD'S I.Q. STUDIES



A look at Bouchard's previous publications in psychology does not increase one's trust in the so-far-unpublished twin data. One paper published in *Science* by Bouchard and McGue reviews previous studies of correlations of I.Q. among relatives, omitting Burt's discredited studies.²³ This article is obviously meant to show that despite the loss of Burt's supposed data, there is a large body of work on which hereditarians can base their assertions.

The survey has many faults. One is that Bouchard and McGue do not mention or bother to deal with the faults already found in the early studies that they resurrect (dating back to the 1920s and largely from the 1930s and 1940s). Many of these studies were biased in their methodology and reported as "separated from birth" twins who actually lived next door, went to the same school, played together, and had frequent social interaction.

These studies are also vitiated by neglecting to correct for the age bias in I.Q. tests, a point that Leon Kamin has discussed in detail. Despite the fact that I.Q. is supposedly corrected for age, the I.Q. tests used in these studies show I.Q. rising with age. Thus part of the weaker correlation between nontwin siblings than between twins arises from the fact that twins are exactly the same age, while other siblings may differ in age.

Finally, Bouchard and McGue simply pooled the samples from very different tests and from tests which gave extraordinarily divergent results. For instance, one test of siblings gave an I.Q. correlation of 10 percent, while another test gave a correlation of 90 percent. Bouchard and McGue simply averaged the two to give a correlation of 50 percent. Given the radically opposite results of the two surveys, it is likely that they were performed with radically different biases and methodologies. They could not have been randomly sampling two subpopulations of the same homogeneous population of data—a basic requirement for drawing valid statistical inferences.

the nurture side try to fight back with words."⁵

This public trumpeting of "science" without data is perhaps the most extreme recent example of popular media releases without scientific publication. Given the popular interest in Bouchard's alleged results and their purported policy impact for child rearing, social welfare programs, the criminal justice system, and the schools, this situation raises questions of ethics and responsibility. These questions relate to not only Bouchard and the Minnesota Twin Study group in releasing these so-far unverifiable claims. They also relate to the journalists who uncritically convey the study's claims and the members of the relevant subdisciplines within the scientific community who have not raised critical notice concerning the twins study and its media coverage.

PERSECUTED GALILEOS?

Doctrines of hereditary I.Q., race differences in I.Q., sex differences in math ability, the sociobiology of aggression and sex roles, and other aspects of biological determinism have flooded the media. (See Dorothy Nelkin's article, "Selling Science," in the May/June 1987 issue of *SftP*.) In these media presentations, hereditarians play a double game. On the one hand, they claim to be "pure scientists," above the political battle. On the other hand, they are not shy in hyping their doctrines to the popular press, and have never, to my knowledge, criticized a favorable presentation of sociobiological doctrine, no matter how vulgar and distorted it may be.

The biological determinists often present themselves as persecuted Galileos of science. But they do not hesitate to make policy pronouncements on such topics as the inferiority of black intelligence, the inability of women to pursue careers in science and the law, the ineffectiveness of attempts to educate the disadvantaged, or the "naturalness" of female depression, rape, capitalism, and war.⁶

In the March 20, 1987 issue of *Science*, editor Daniel E. Koshland, Jr. wrote that the nature-nurture controversy is dead, with a victory for the nature side. (See Diane Paul's "The Nature-Nurture Controversy: Buried Alive," in the September/October 1987 issue of *SftP*.) As Paul points out, biological determinists tend to claim that their own views are purely scientific, while their opponents' views are purely ideological.

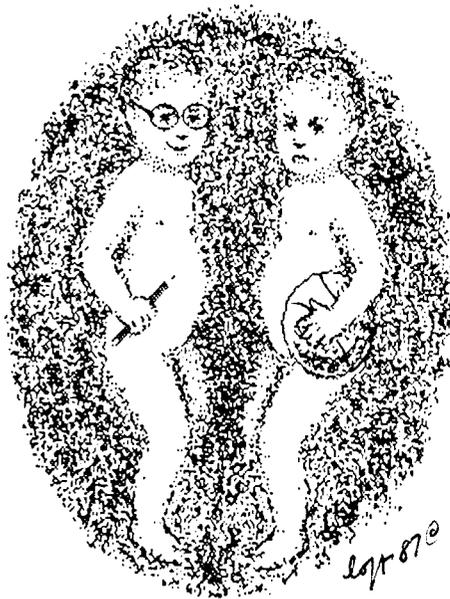
Bouchard, his coworkers, and supporters follow this pattern. According to *Science*, "Bouchard wants to keep his study free from politics." But in the same article, Bouchard is also quoted as saying that his German twins are "devastating to the feminist contention that children's personalities are shaped differently according to the sex of those who rear them, since Oskar was

raised by women and Jack by men."⁷ Thus, on a sample of one pair of twins, Bouchard is willing to draw conclusions concerning child rearing and sexual politics. David Rowe is even more expansive in his conclusions: "Parents should be blamed less for kids who have problems and take less credit for kids who turn out well."⁸

Many biological determinists portray themselves as liberals who were brought by the "harsh facts" of biology to hold conservative doctrines. Sociobiologist E.O. Wilson, psychologist of inherited criminality Sanford Mednick, and others have made this claim.

Bouchard is no exception. Despite his discipleship to the scientific racist Arthur Jensen at Berkeley, Bouchard claims to have been engaged in "political activism in the radical sixties."⁹ Bouchard also presents himself as having stumbled "almost casually" in 1979 into an interest in twins through reading about a pair of reunited twins.¹⁰

In fact, Bouchard had already published research and review articles years before on the heritability of I.Q. From this work and that of his mentor, Jensen, Bouchard must have realized the centrality of studies of twins reared apart for the I.Q. debate. This



importance greatly increased after Cyril Burt's data, a major basis for Jensen's claims concerning black/white I.Q. differences, was discredited as fraudulent.¹¹

INFERENCES FROM COINCIDENCES

Despite the claims concerning hard evidence, large samples, and the appeal to the biological sciences, what we find in statements by Bouchard and in material

released to the media from the Minnesota Twin Study are anecdotes and amazing stories. What is striking about the anecdotal material is its similarity to the sort of evidence often offered as proof for astrology or parapsychology such as extrasensory perception (E.S.P.).

Striking coincidences are reported as supposed grounds for belief in the phenomenon itself. In literature about astrology and E.S.P., cases where forecasts came true or where thought of a friend was immediately followed by a phone call from that friend are offered as evidence. The cases where forecasts failed or where a thought of someone is not followed by a phone call from that person are forgotten or left unmentioned.

Bouchard's coincidence anecdotes are of a similar nature: we are told about the similarities (seven rings on fingers, sneezing in elevators) but not about the differences. But some of the similarities are physical ones that are to be expected in identical twins. Other behavioral similarities are not all that amazing.

Two twins living east and west of the Mississippi turn out later to live on opposite sides of the river in Louisiana. Even if "the mighty Mississippi divided" the twins, the fact that they both wear cowboy hats and like hunting is not that unusual for two working-class men in the same region of Louisiana.¹²

Oskar and Jack, the Nazi and Jew—superficially the most spectacular case of twins reared apart—both had less isolation from each other and less different environments than the media stories reveal. They were raised by their own relatives in two German households. One of these households emigrated to Trinidad. Bouchard himself admits that their household environments were more similar than their Nazi-vs.-Jew image suggests. In fact, the two men met briefly during the 1950s in Germany, and their wives kept up correspondence since that meeting.¹³

Bouchard notes that one function of the media publicity about spectacular coincidences is to recruit more pairs of twins, but such pairs may wish to exaggerate similarities of behavior or wear identical dress to receive publicity and scientific approval for themselves. This sort of recruitment bias has occurred in some earlier twin studies.

Some of the coincidences recalled can have nothing to do with the twins' genetics, such as twins being adopted by families which had adoptive brothers with the same name or the twins themselves being given the same name by their adoptive families.¹⁴

Even the language of twin study reportage is similar to that concerning the occult. One of Bouchard's coworkers says that they were still "bewitched by the seven rings."¹⁵ *Discover* magazine's front

cover introduces us to "The Eerie World of Reunited Twins."

While admitting that "Genes do not cause fires," one popular book entitled *Twins: Nature's Amazing Mystery* moves easily between enthusiastic reports of Bouchard's coincidences and discussions of telepathic communication between twins and synchronous events such as fires in the lives of distant twins.¹⁶ The anecdotes that Bouchard relates would seem more at home in the pages of the *National Enquirer* than in those of *Science*.

It is ironic that Bouchard, in his reviews of the critics of twin studies, dismisses their work (like that of Leon Kamin) as ad hoc and unscientific.¹⁷ In reviewing Howard Gardner's criticism of I.Q. tests, Bouchard says, "The book is primarily an opinion piece, a collection of anecdotes.... Gardner's scheme is not, however, a theory in the rigorous (or even the non-rigorous) scientific sense."¹⁸ This remark is particularly ironic since all that Bouchard has so far released are anecdotes of strange coincidences that "struck" him.

Given that the largest study of identical twins reared apart prior to Bouchard's, that of Sir Cyril Burt, is now admitted to be fraudulent by even Burt's students and admirers, and that earlier studies of twins are replete with tester and surveyor bias,¹⁹ it would seem especially desirable that

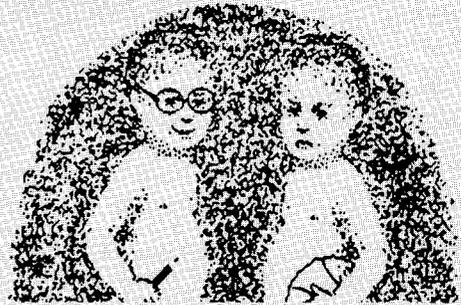
Bouchard and the Minnesota group open to public scientific scrutiny their data and experimental design. However, all we have in the popular reports are assertions of the heritable nature of various traits and anecdotes concerning a few of the twin pairs.

The only paper in a refereed journal which makes use of the Minnesota Twin Study data is a study of homosexuality in twins reared apart.²⁰ This study relies on the huge data base of six pairs of twins—four pairs of females and two pairs of males. Both members of one of the male pairs are gay. Only one member of the other male pair is gay. Of the four pairs of female twins, only one member each is lesbian or bisexual and one member each is heterosexual.

From these results, Bouchard and McGue conclude that male homosexuality has a strong heritable component, while lesbianism does not. That such a grand conclusion can be drawn from this sample of two gay male twins is even more mind-boggling than some of the coincidences that Bouchard relates.

The *Science* review of earlier I.Q. correlation studies (see the accompanying sidebar) and the study on the heritability of homosexuality are the only articles in peer-reviewed journals closely relevant to or based upon the twin study material.

FINANCING RACIST RESEARCH



The first *New York Times* report about the Minnesota Twin Study quoted Bouchard as saying, "I'm going to beg, borrow, and steal" to pursue the twins study.²⁴ In fact, Bouchard has solicited money from the Pioneer Fund, a foundation with racist and radical right-wing connections. The University of Minnesota has received grants from the fund for Bouchard's twin study. But the Pioneer Fund is best known for its support of research purporting the inferiority of blacks.

Once headed by directors such as the chairman of the House Committee on UnAmerican Activities, Representative Francis E. Walter, and Mississippi Senator James O. Eastland, the fund has long subsidized research and publication of the works of scientific racists, including William Shockley and Arthur Jensen. Jensen served on the scientific

advisory board of the German Neo-Nazi journal *Neue Anthropologie*. (See Barry Mehler's article, "The New Eugenics," in the May/June 1983 issue of *SftP*.)

The Pioneer Fund financed the work of Roger Pearson, author of *Eugenics and Race*. Pearson also helped organize the 1978 World Anti-Communist League meeting in Washington, D.C. The League has united old European Nazis with leaders of Third World death squads.

Bouchard, in his grant application to the Pioneer Fund, noted that the National Science Foundation has repeatedly refused funding for his study and has made numerous criticisms of his method. Bouchard has claimed that the National Science Foundation and the National Institutes for Health are packed with left liberals who deny him funds on ideological grounds.

PEER REVIEW & PUBLIC KNOWLEDGE

A central feature of science is its public and critical nature. Scientific data, unlike the lore and traditions of some religious cults or such esoteric practices as alchemy, are made publicly available in journals whose contents are reviewed, evaluated, and published by members of the scientific community. Peer review is meant to subject articles to critical scrutiny prior to being accepted as worthy of publication. Despite the fact that peer review does not always function to ideal effectiveness, it is better than outright cronyism or nepotism.

Once the scientific article has been deemed worthy of publication by a group of fellow scientists, the publicly available account of data and methods is available to the entire scientific community for further examination and criticism. Methods of data collection, sources of sample populations, statistical techniques, and the logic by which conclusions are drawn can be carefully analyzed and criticized by other scientists.

The failure of Bouchard and his colleagues in the Minnesota Twin Study to participate in the peer review process is an extreme example of circumventing the scientific process and using the media for public relations. But scientists in competitive fields such as high-energy physics, genetic engineering, and medicine have also announced their discoveries to the press before they are published in the organs of the scientific community.

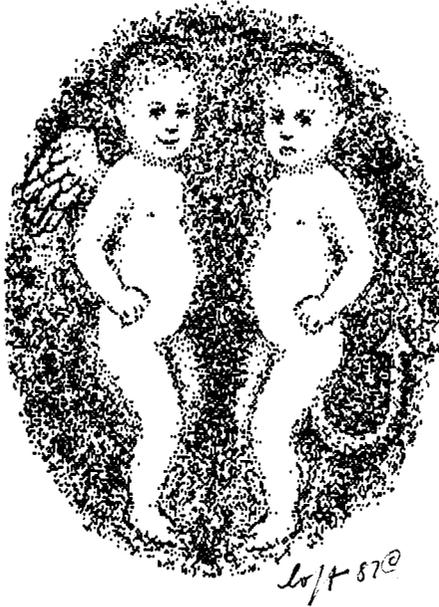
Editors of the *New England Journal of Medicine* and *Physical Review Letters* have complained about this practice.²¹ They've tried to discipline scientists who publish in the popular press before their work is refereed by other scientists through refusal of publication in their journals. However, their criticisms were concerned with delays of weeks or months in peer review—not the years lost to refereeing by the Minnesota Twin Study.

For seven years, Bouchard and the Minnesota group have been announcing their "conclusions" concerning the heritable nature of personality traits. They have been relating anecdotes of coincidences to convince the general public that subtle characteristics such as "beringedness" (wearing rings) have heritable predispositions and that complex behaviors, such as double toilet-flushing, sneezing in elevators, and naming one's dog Toy, are relatively independent of upbringing and environment.

Most recently, the Minnesota group has released a list of percentages on the heritability of eleven personality traits. The group's representatives have also expounded on such topics as the heritable nature of Chuck Yeager's bravery (although Yeager is not known to be a subject of their survey).²²

It is possible that Bouchard's survey is

exhaustive and his logic impeccable. But as long as the Minnesota Twin Study does not publish its data and the methodological basis for its conclusions in a peer review journal, we cannot tell. To investigate the background, upbringing, and circumstances of recruitment for the twins involved in Bouchard's research, a book-length study would first have to be released. The



Discover article promises such a book by 1989, but by the time critical evaluations are published by scientists, a decade of media coverage will have made its impression.

The media anecdotes about "eerie" and "freakish" coincidences that "struck" Bouchard must remain on a par with tales about astrology and E.S.P. And Bouchard's data and methods must remain in that limbo in which Cyril Burt's imaginary assistants and unverifiable data existed.

NOTES

1. Clare Mead Rosen, "The Eerie World of Reunited Twins," *Discover*, September 1987, pp. 36-46; Stanley N. Wellborn, "How Genes Shape Personality," *U.S. News and World Report*, April 13, 1987, pp. 58-62; Constance Holden, "The Genetics of Personality," *Science*, vol. 237, 1987, pp. 598-601; John Leo, "Exploring the Traits of Twins," *Time*, Jan. 12, 1987, p. 63; Julia Reed, "Genes: Little Things that Mean a Lot," *U.S. News and World Report*, Dec. 15, 1986, p. 8; Daniel Goleman, "Major Personality Study Finds that Traits Are Mostly Inherited," *New York Times*, Dec. 1, 1986, p. C1.

2. Constance Holden, "Twins Reunited," *Science* 80, November 1980, pp. 55-59; Constance Holden, "Identical Twins Reared Apart," *Science*, vol. 207, 1980, pp. 1323-1328; Sharon Begley and Martin Kastindort, "Twins, Nazi and Jew," *Newsweek*, Dec. 3, 1979; Edwin Chen, "Twins Reared Apart, A Living Lab," *New York Times Magazine*, Dec. 9, 1979; Rosemary Rawson, "Two Ohio Strangers Find They're Twins at 39—and a Boon to Psychologists," *People*, May 7, 1979; Kathy

Osborne, "The Twins," *States-Item* (New Orleans), Feb. 25, 27, 28, 29, 1980. See also Joann Rogers, "Me, Myself and Us: Twins," *Science Digest*, November/December 1980.

3. C. Holden, op. cit., *Science*, 1980, p. 1324.

4. Bouchard's coworker Lykken was quoted describing Kamin as one of the "psychologists who object to genetic research on ideological grounds" and "do not understand its true implications." *U.S. News*, Dec. 15, 1986, p. 8.

5. S.N. Wellborn, op. cit., *U.S. News*, April 13, 1987, p. 61.

6. For a sample of the history and criticism of biological determinist doctrines, see Ann Arbor Science for the People Editorial Collective, *Biology as a Social Weapon*. Minneapolis: Burgess Publishing, 1977; Stephen Jay Gould, *The Mismeasure of Man*. New York: Norton, 1981; R.C. Lewontin, Steven C. Rose, and Leon Kamin, *Not in Our Genes*. New York: Pantheon, 1984; Science for the People Sociobiology Study Group, *Biology as Destiny*. Cambridge, MA: Science Resource Center, 1984.

7. C. Holden, op. cit., *Science*, 1980, p. 1324.

8. *Time*, op. cit., Jan. 12, 1987, p. 63. See also Rowe's equally absurd quip, "Every parent of one child is an environmentalist, and every parent of more than one becomes a geneticist." *U.S. News*, April 13, 1987, p. 59.

9. C. Holden, op. cit., *Science* 80, November 1980, p. 55.

10. C.M. Rosen, op. cit., *Discover*, September 1987, p. 38.

11. L. S. Hearnshaw, *Cyril Burt, Psychologist*. London: Hodder and Staughton, 1979. Hearnshaw, eulogist at Burt's funeral and "official" biographer of Burt, was only reluctantly led to his conclusions that Burt invented both data and research assistants. Leon Kamin (*The Science and Politics of I.Q.*. Potomac: Earlbaum, 1974) had already raised doubts about Burt's data. Interestingly, the only person who by 1980 still seemed to have doubts that Burt's data were fraudulent was *Science* journalist Constance Holden, author of three articles in praise of Bouchard. See Holden, *Science* 80, November 1980, p. 58.

12. Kay Cassill, *Twins: Nature's Amazing Mystery*, New York: Atheneum, 1982, p. 183.

13. *Ibid.*, pp. 192-193.

14. *Ibid.*, p. 180; C.M. Rosen, op. cit., *Discover*, September 1987, p. 39.

15. C. Holden, op. cit., *Science*, 1980, p. 1323.

16. K. Cassill, op. cit., *Twins: Nature's Amazing Mystery*, pp. 134-135, 158-164 on E.S.P., p. 189 on synchronous events.

17. Thomas J. Bouchard, Review of Howard Gardner's *The Intelligence Controversy*, in *American Journal of Psychology*, vol. 95, 1982.

18. *Ibid.*

19. L. Kamin, op. cit., *The Science and Politics of I.Q.*, Chapters 3 and 5.

20. Elke E. Eckert, Thomas J. Bouchard, Joseph Bohlen, and Leonard Heston, "Homosexuality in Monozygotic Twins Reared Apart," *British Journal of Psychiatry*, vol. 148, 1986, pp. 421-425.

21. "Gene Cloning by Press Conference," *New England Journal of Medicine*, March 27, 1980, p. 743; *New York Times* article, Nov. 18, 1974, p. 2.

22. *U.S. News*, Dec. 15, 1986, p. 8; and *Time*, Jan. 12, 1987, p. 63. David Lykken is the source of the claim about Chuck Yeager.

23. Thomas J. Bouchard and Matthew McGue, "Familial Studies of Intelligence: A Review." *Science*, vol. 212, 1981, pp. 1055-1059.

THE IRRELEVANCE OF HERITABILITY

BY RICHARD C. LEWONTIN

Diane Paul has raised two points about the left critique of hereditarianism that need some further elaboration and comment. (See "The Nature-Nurture Controversy: Buried Alive," in the September/October 1987 issue of *SftP*.) The first is that left critics have been too much concerned with the technical assessment of heritability and with an attempt to show that the heritability of, say, I.Q., is really zero. As she quite correctly points out, this would be a mistaken tack, both because it accepts the basic, erroneous claim of hereditarians that the actual value of heritability is a critical issue for social policy, and because if the heritability of I.Q. should turn out, in fact, to be high, the left critics would have defeated themselves.

I am chagrined that we have so consistently given the impression that the value of heritability of I.Q. is important and that the critics of biological determinism believe that heritability is zero. Let me explicitly reject both those claims. I do not know how heritable I.Q. is in various populations. I doubt that it can be truly zero, and I reject the notion that the true value of heritability in any population is of the slightest importance to social action.

From the very beginning of the criticism of Jensen's claims about race and I.Q.¹, and consistently throughout the intervening twenty years², there has been a constant reiteration of the *irrelevance* of heritability estimates to the social questions at issue, because heritability does not mean fixity. I am disturbed that anyone reading the articles and books that have appeared on this subject in the last twenty years, especially those written for an audience of non-scientists, could fail to hear the message about the irrelevance of heritability studies. The critics have failed in an important way.

Richard C. Lewontin is a biologist, evolutionist, author, and professor at Harvard University. A veteran member of SftP's Sociobiology Study Group, he serves on our editorial advisory board.

Resisting the Hereditarian Agenda

It is certainly true that a parallel strain of methodological criticism has existed, both in technical journals³ and for a more general public.⁴ And some of that methodological critique has, indeed, been misdirected in the way that Paul discusses. But there is another purpose that the methodological critique has been meant to serve, one that is not noticed in Paul's essay.

The left critics have contrasted the methodological standards in human behavioral genetics with the standards demanded in other applications of quantitative genetics, in order to show that hereditarian ideology has compromised these standards. Over and over again, experimental designs and statistical claims have appeared in the literature of human behavioral genetics that would be rejected out of hand by the editors of, say, *Poultry Science*. Indeed, agricultural geneticists themselves will accept claims about human genetics that they would not allow in their own fields. Thus, the methodological critique has been designed in part to demonstrate the dominant role that ideology can play in scientists' thinking about nature, especially their thinking about human society.

This consideration leads to Paul's second criticism of the left critique, a criticism that is much more serious and, I think, entirely correct. While accusing hereditarians of ideological bias and motivation, the left critics have ignored the role of ideology in their own positions. Worse, by showing that they are conscious of the role of ideology and

then by ignoring it in their own case, they give the implicit message that they are free of ideological bias, that they are wholly "objective."

But in asking how ideology enters into the left critique, we should not adopt the position that there is symmetry between hereditarians and anti-hereditarians in this respect. While ideology permeates science, it is not true that no decision can be made in any case between what is correct and what is incorrect.

The statement that parent-offspring correlation confounds biological with social heredity, or that a trait can have 100 percent heritability and yet be changed easily by an environmental change, or that in an analysis of variance if there is any interaction, it is not possible to separate the main effects into separate causes, are correct statements within the rules of logic and mathematics used by all parties irrespective of social ideology. Two plus two do not make five and one-half under any social ideology, and we may justly criticize those who use such arithmetic without being ideologically self-conscious.

So where does ideology enter into the anti-hereditarian position? At the most basic level, it enters as an attitude about change. The right takes the view that things are pretty good as they are and ought not be changed much, unless it is to go back to the even better old days. In support of this view, the right constructs a picture of nature in which things *cannot* change much. It searches for, and capitalizes on, forms of evidence and argument that support the inevitability of things as they are.

For the left, on the other hand, things are not good and need to be made much better. We are led, then, to construct a view of the world that emphasizes changeability, flux, plasticity—in which human will can, collectively, make a very different world—and we seize on any evidence that this is possible. Ideologically committed to the belief that the world is plastic and changeable, we are suspicious of claimed evidence to the contrary, and we examine such claims with a very

CONTINUED ON PAGE 32

AIDS & SEXUAL MUTILATION

BY FRAN P. HOSKEN

Last November, an article appeared in the *New York Times* reporting that experts are unable to explain "the strikingly different epidemiological patterns of (AIDS) in Africa" as compared with the United States. Specifically, it is not known why in Africa women are affected by AIDS as much as men are, while elsewhere mostly men are afflicted.

As temporary advisor to the World Health Organization on female circumcision/genital mutilation, and as a member of the WHO secretariat at a seminar—"Traditional Practices Affecting the Health of Women and Children"—held in Khartoum in 1979, I have done extensive research and fieldwork all over Africa. After visiting hospital maternities and talking to midwives in more than eleven countries in East and West Africa, it is clear to me that traditional sexual practices by African men, as well as the widespread custom of genitally mutilating a large part of the female population, are responsible for the differences in patterns of AIDS transmission.

By my estimates, more than 84 million women and female children are genitally mutilated in present-day Africa (see country case studies and tabulation in "The Hosken Report—Genital and Sexual Mutilation of Females," 3rd ed., 1983, *Women's International Network News*). Most mutilations consist of infibulation, in which part or all of the clitoris and labia are excised. Infibulated women are left with only a small opening for the flow of menstrual blood and urine. Operations are generally performed on the ground with crude tools and without an anesthetic.

Excision often results in the formation of hard scar tissue that may be torn during intercourse. In the more extreme case of infibulation, a woman must be cut open before intercourse can take place. The procedure may be done by a midwife. Usually, it is done by the woman's husband through repeated attempts at penetration over several days or weeks, often with the aid of a sharp object. These practices result in lacerations and bleeding during intercourse, thus

Fran P. Hosken is editor of the Women's International Network News, 187 Grant St., Lexington, MA 02173.

Women's Health & African Traditions

providing a site of contact between AIDS-infected semen and a woman's bloodstream.

It is also reported in the medical literature, for example from Sudan, that anal intercourse is widely practiced among married couples. It is important to note that infibulation is widely practiced in the same regions, including Khartoum and other cities.

Other sexual practices can also be related to the high incidence of AIDS among heterosexual women in Africa. In many regions—for instance, northern Nigeria, Ethiopia, and Somalia—girls are married at a very young age to much older men, who can afford to pay the steep bride price. The physical disparities between a female child and a full-grown male often result in tearing and bleeding of the girl's genitals.

Hospital records also show that sex is often closely linked to physical violence. Violent rape is reported to be very frequent, often involving very young girls. Thus these practices also provide a means of infection through lacerations. The spread of the AIDS virus is further compounded by polygamy and prostitution. Moreover, children born to infected mothers are themselves frequently infected.

Genital mutilation in Africa is not limited to rural populations or remote areas. On the contrary, it can be found in the highest circles of African political and religious leadership, where arranged marriages are used to forge important alliances. Hence the male heads of each family see to it that daughters are suitably mutilated, as custom requires.

Many African officials, including United Nations delegates, have acknowledged that they have their daughters mutilated, as is documented in "The Hosken

Report" and in *Women's International Network News*, a quarterly journal on women and development that I edit.

It is not surprising, though, that male researchers have failed to observe a link between AIDS transmission and sexual mutilation practices. Male physicians from abroad seldom talk with midwives or visit the segregated maternities in African hospitals.

In Moslem Africa, and in many traditional regions, everything to do with pregnancy and childbirth is a strictly female concern. Men, least of all foreign ones, have no access to such information and have shown little interest in women's health or in making childbirth, which takes a terrible toll, safer. (The highest maternal and infant death rates in the world are registered in regions where female circumcision/genital mutilation is practiced.) Thus male physicians are unable to explain why women and children in Africa are as much affected by AIDS as men are.

According to published information, nowhere is AIDS as widespread as in the central belt of Africa. A report in the *Boston Globe* on June 22, 1986 stated that overall rates of AIDS cases in the central African region are 25 times higher than rates in the U.S. population as a whole. By comparing those areas experiencing a high incidence of AIDS with those areas in which female genital mutilation is practiced, one can see considerable regional overlap. Data from areas where mutilation is rare indicate that other sexual customs, and especially violent sexual practices by African men, are primarily responsible for the high rate of AIDS infection in women.

With no cure in sight, and with sexual practices the primary method of AIDS infection in Africa, it is certain that an increasing number of Africans will be infected with AIDS. Furthermore, many of the children born to infected women will carry the AIDS virus, which dooms the future of Africa.

African physicians and health officials have so far been unwilling to address the true nature of the problem. It is high time to state the real cause of why African women are infected in such large numbers, and thus their children—the future generation of Africa. Prevention is the only possible remedy at present—a remedy that requires dramatic changes in cultural and sexual practices and traditions. 



THE EVOLUTION OF NUCLEAR STRATEGY

More Garbage
from the White House

BY STEVE NADIS

Once upon a time, in a world far simpler than ours, there was The Bomb. That is, until a group of disgruntled grammarians disputed the choice of article, changing The Bomb to A-Bomb. Things remained pretty much the same for seven years. Then the experts decided that the A-Bomb wasn't big enough and replaced it with the H-Bomb ("H," of course, stands for "huge").

Well, we had our H-Bomb, and a year later, the Soviets had their H-Bomb. But Bombs aren't much good without a convenient way to use them. That's why we needed Bombers to drop them on suitable targets. And that's what made the Bomber Gap so scary. In fact, our

Steve Nadis spends many long, sleepless nights contemplating the human predicament. When he does sleep, he dreams about nuclear war. He claims to have found this nuclear tale in some outgoing garbage from Capitol Hill.

American boys in Moscow were so shook up by what they saw at the 1955 May Day parade, they couldn't even count straight. Anyway, we built our B-52s faster than hotcakes, and pretty soon there was a real Bomber Gap.

Then came Sputnik, and we had a new scare on our hands—the Missile Gap. The plain and simple truth was that our Bombers were just too darn slow. We needed something faster, with a catchy name like Intercontinental Ballistic Missiles—or ICBMs for short. So we had a Buildup, and it was good. And, for a while, there really was a Missile Gap. Then they had a Buildup, and there was no Missile Gap. That was good too.

Which brought us to the Balance of Terror. Each side would hold the other at bay with the threat of Mutual Assured Destruction. Sure it was MAD—any fool could see that—but it worked.

Enter *Dr. Strangelove*, which turned us upside-down with worries about the Mine Shaft Gap. You see, if they had more mine shafts than we did, they might

be able to save more people in the event of a Hypothetical Nuclear Incidence. All this thinking about defense inevitably led to the ABM Gap. Suddenly, MAD wasn't good enough. They wanted to protect themselves from a nuclear attack, which, in some ways, was even Madder than MAD.

Well, we found a way around that one: MIRVs, cute little warheads that could zap their defenses before they knew what hit them. They didn't get MIRVs until seven years later, and by that time we had already moved on to MARVs. When they got MARVs, we were working on Cruise. When they got Cruise, we turned to Particle Beams and Nuclear-Pumped Lasers. And so forth.

Just when we thought we'd seen the last of the gaps, along came the Launcher Gap and its next-of-kin, the Throw-Weight Gap. As if that weren't bad enough, there was also a Spending Gap. It seems they were spending more than us on Bombs, which simply would not do. So we spent and spent until we finally saw our way through the Spending Gap.

Next came the Gaps Gap—they were opening up gaps faster than we were. We opened the Supercomputer Gap and the Zap Gap, which closed the Gaps Gap, but opened the Window of Vulnerability instead. The problem was this: we had 1,000 ICBMs out there in the Great Plains, sitting around doing nothing. Sitting Ducks, you might say. The solution was obvious: replace those Sitting Ducks with Moving Ducks, just like at a shooting gallery.

To this end, we proposed a new mobile missile, the MX, equipped with ten highly accurate, independently-targetable warheads. There was a problem: the name MX did not convey the broader purpose of the missile, which was to rid the world of nuclear weapons. That's why we changed the name to Peacekeeper. And that's where we are today, still trying to build the blessed thing.

The sooner the better, because once we have the Peacekeeper, they'll see how serious we are about arms control. That, in turn, will pave the way to "meaningful arms reductions." But in the meantime, our Peacekeepers might get awfully lonesome out there in the prairie. So why not build some Midgetmen to keep them company? They're the cuddliest little things, just like Cabbage Patch Kids. Once we get some Midgetmen, they'll want some too. When that happens, we'll be well along the road to arms control.

Wait a minute, the skeptics said. Rather

CONTINUED ON PAGE 27

Sarcophagus

By Vladimir Gubaryev
Translated by
Michael Glenny
Penguin Books, 1987

REVIEWED BY LES LEVIDOW

"There is only one way of avoiding a repetition of Chernobyl: to tell the truth about what happened, to make the most painstaking analysis of the causes of the tragedy—and not to let the culprits get away with it."

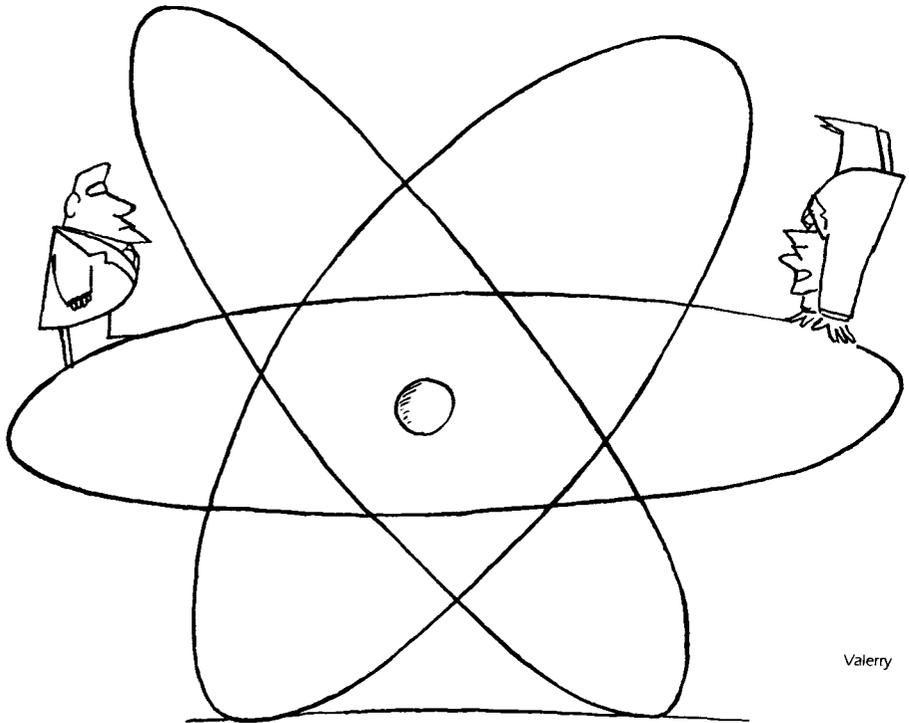
When three top officials of the Chernobyl plant were convicted and imprisoned in July 1987, the judge remarked, "There was an atmosphere of lack of control and lack of responsibility at the plant." Did this mean simply that staff were failing to observe and enforce the rules? Or were they perhaps following certain unwritten rules? How was it possible for no one to be responsible or in control?

Those questions are answered in a gripping drama called *Sarcophagus*, written by *Pravda's* science editor and completed just two months after the Chernobyl disaster. The play is based on interviews with many people who endured it, some of whom are recognizable in the play's characters. Through this dramatic form, Gubaryev makes credible a strange but true tale of how nuclear workers acted in complicity with a system that would soon doom them.

Although far more detail has emerged since then about technical aspects of the disaster, Gubaryev's play remains a unique inside view of the quandaries faced by nuclear workers. Here the characters reveal the hierarchy, division of labor, and competitive pressures that both caused the disaster and tended to deflect responsibility from particular individuals.

The play is set in the third-floor clinic for terminal patients at the Institute for Radiation Safety. Each of the highest-dose victims of the Chernobyl disaster is guided to one of ten cubicles designed to protect the medical workers from the radiation that their bodies are emitting.

Les Levidow is editor of the new journal Science as Culture, published by Free Association Books, 26 Freegrove Road, London N7. He teaches the politics of science at Middlesex Polytechnic.



Valery

Asking when they can leave, they are discreetly told, "You'll have to spend some time here." Although at first they feel normal, they will nearly all die within a few days. No medical effort can save them from hundreds of roentgens of exposure.

The prevalent sense of doom is relieved mainly by the jovial example of a pre-Chernobyl patient, the former nuclear worker Bessmertny. Having miraculously lived in the clinic for 487 days, he has endured 16 operations and the loss of his immune system from radiation exposure. Theoretically, he should have died long ago. His survival attests to the doctors' success, as well as symbolizing the playwright's own hopes and fears for scientific progress.

Bessmertny calls himself a series of nicknames: Mr. Immortal, Fred the Undead, a nuclear leper, a slave to science. Condemned to a "life" behind an ultraviolet curtain, he already inhabits a kind of coffin, which symbolizes the potential fate awaiting the rest of us. Bessmertny suggests a similar image for the Chernobyl plant itself when he compares the inevitable "sarcophagus around this reactor" to the Egyptian pyramids. "Nuclear pharaohs" have forced humanity to contain the radioactivity from the nuclear pyramids for a hundred thousand years. By analogy, he says, a nuclear war would mean a "collective, universal sarcophagus."

While the Chernobyl patients resist the idea of their inevitable deaths, they offer something like "deathbed confessions,"

revealing much about the nuclear plant's normal operation. The geiger counter operator claims it wasn't his fault that he gave the control room operator a misleadingly low radiation estimate, as the exposure "was so big, it was off the scale." And, besides, he had been using thirty-year-old geiger counters, despite repeated pleas for newer ones.

The control room operator, who had realized the danger anyway when he saw the glowing graphite, stayed on to restore the electric power essential for stopping the disaster. Now he complains about the powerless position of "nobody like us." The workers are refused new geiger counters, "yet we always do what the bosses ask us to do."

The fireman had been puzzled to see the reactor building burning, as there had been nothing to burn...or so he thought. As the chief fire officer admits, he had signed the approval of the plant construction, even though he knew the roof contained flammable materials that had already been banned. "There was a lot of it in stock," and by using it the builders had been able to hand over the new plant three months ahead of schedule. After all, the approval was "just a piece of paper...a formality." If he had not signed, then surely someone else would have done so. "Do you only sign anything when your conscience is totally clear?" he rhetorically asks.

The director admits that he too signed his approval for the Chernobyl plant. Moreover, he responded to the disaster by using his car to get his grandson out of

NUCLEAR STRATEGY

CONTINUED FROM PAGE 25

the area, without alerting the public. Why didn't he raise the alarm? He admits that he didn't think such a disaster *could* happen at his plant.

The physicist's calculations tell him that someone at the plant had turned off the plant's emergency safety system. But who? The director pleads, "I can't be held responsible for the actions of every lunatic." In other words, if the nuclear system fails, it can only be because of crazy people, or perhaps "sabotage." Bessmertny interjects, "The system switched off the safety system. The system that sees that nobody's to blame."

Although we now know that the Chernobyl disaster was to be at least a partial exception to traditional cover-ups, the director's self-consolation reveals an institutionalized complacency, based on a shared wrongdoing that leaves no particular person to take the blame.

We learn that the director's predecessor had been sacked, after four reprimands from the authorities, because they had "found him difficult to get on with;" he had opposed rushing the reactor into operation ahead of schedule. The present director, though he had not been an outstanding student, worked hard and won "efficiency awards." Who can blame him? After all, he was just doing his job. When the investigator departs, vowing to "find out who is to blame," we understand that pointing the finger at individuals would hardly identify the source of the problem.

During an argument over who was to blame, Bessmertny interjects, "It's not the age of the atom—it's the age of disaster." This play makes us wonder how we could ever feel safe in the hands of a system which ensures that nobody's to blame and that nobody's really in control, either.

The rules that truly matter—those of deference and expediency—tend to discourage nuclear workers from asserting real human control, be it individual or collective. Deprived of knowledge and control, and thus shunning responsibility, they collude in putting "the system" in control.

Although appearing like an impersonal force, "the system" is actually a kind of managerial authority. Exercised in the name of safety and efficiency, it economizes on money expenditure while squandering human resources. "Kopek-wise and ruble-foolish," its destructive logic transcends differences in reactor types and economic systems. Will we allow "the system" to bury us in a collective, universal sarcophagus?

than building our way to arms reductions, maybe we should stop building altogether—a Freeze, if you will. The problem with a Freeze is that it's just a temporary solution. One day, somewhere along the line, we'll have to Defrost, and everybody knows what a pain that is.

The time was ripe for a brilliant idea, and the Nuclear Build-Down was just the thing. How about retiring two nuclear weapons for every new one produced? The great thing about the Build-Down is that we can go merrily along making nuclear bombs until one day we plumb run out.

That sounds fine, at first hearing, until you start to think about it. But if we Build-Up too slowly, it will take us awhile to Build-Down. Meanwhile, there are all those nasty weapons to worry about. The Zero Option will take care of all the ones in Europe, but what about the ones at home? Even after Deep Cuts, we'll still have an awful lot of TTTs (Tempting Tactical Targets).

Enter SDI—the Strategic Defense Initiative—an all-purpose, all-weather, 60-40 umbrella to protect us and our allies from Nuclear Rain. Some people called it Star Wars, suggesting the system

could be used to destroy satellites, ignite cities, and be put to other mischief if it were to fall into the wrong hands. Others felt that the word "Initiative" sounded too aggressive. Perhaps Strategic Defense Response might be better....

But SDI stuck for one simple reason: it had an undeniable ring, a certain *je ne sais quoi* that the others were sorely lacking. Sure, SDI will end the threat of nuclear war, once and for all. But another fact, ultimately more important, often gets lost in the debate. Once we get our SDI wired up and fully tested, we'll give them one free of charge, except for a modest shipping and handling fee. They can keep it as long as they like, with no obligation to buy anything else. If they are not completely satisfied, they can send it back any time, C.O.D., no questions asked.

We're confident, of course, that they'll be delighted with their new SDI. If nothing else, it makes for a great conversation piece at cocktail parties. Then there's the fringe benefit: with defensive systems securely in place, both sides will be forced to concentrate on offense. When that happens, we'll be well along the road to arms control. 

PEACE & BREAD

WILLY
BRANDT



ARMS AND
HUNGER

Published by The MIT Press,
available at fine bookstores and at

The MIT Press Bookstore

Kendall Sq. • 292 Main St. • Cambridge MA 02142
617-253-5249 • Hours: M-F 9-7; Sat 10-6 • VISA/MC,
phone/mail orders welcome (add \$1.50 for shipping)

Food for thought from the MIT Press

Arms and Hunger

Willy Brandt

The arms race continues to turn resources and priorities away from international development. Diminishing aid programs, growing Third World debt, a population that may reach 10 billion people in the foreseeable future in spite of all efforts to control it, increasing division of the world into pro-US and pro-Soviet camps—these are the dangers Willy Brandt feels can lead not only to greater world poverty and famine but also to world conflict.

In this strongly worded book, Brandt goes beyond the diplomatic role he formerly played and describes major problems plaguing the globe today, as well as solutions for them. From personal observation and experience, Brandt demonstrates that the West has failed to meet today's challenges and delivers a frank criticism of the Reagan administration's policies—or lack of them. **\$7.95 paper**

Prospects for Peacemaking

A Citizen's Guide to Safer Nuclear Strategy

edited by Harlan Cleveland and

Lincoln P. Bloomfield

\$15.00 cloth

How Peace Came to the World

edited by Earl W. Foell and

Richard A. Nenneman

\$7.95 paper

LEAD SOIL CLEANUP

Boston's on the Superfund List



Somerville Free Press

BY RICHARD RABIN

Twenty-eight areas of Boston were targeted for Superfund cleanup this summer. But they are not abandoned dump sites or municipal landfills. They are neighborhoods—mostly two to five city blocks each—of severe lead contamination, in which large numbers of small children are continually being poisoned. The cleanup will involve the removal and replacement of lead-contaminated soil on residential properties. The project will be administered by the Office of Environmental Affairs (OEA) of the Boston Department of Health and Hospitals.

The expansion of Superfund to include the lead-in-soil pilot project marks an important turning point in the recognition, on a national level, of the need to address lead contamination (other than leaded gasoline) in urban environments. Since the early 1970s, numerous states and cities have had laws and programs to provide medical treatment and de-lead the properties of children who were already lead poisoned. But none has, to any significant extent, attacked the

Richard Rabin lives in Boston and is conducting research on the history of child lead poisoning. His article, "Lead Poisoning: The Silent Epidemic," appeared in the July/August 1985 issue of SftP.

problem with a preventive program. Lead poisoning programs have not, until now, identified areas of high lead-poisoning incidence and then systematically removed the major sources of lead.

In a report to the Environmental Protection Agency, OEA identified 28 areas in which children are being lead poisoned at a rate five to six times the city average. These areas, in the neighborhoods of Dorchester, Mattapan, Roxbury, and Jamaica Plain, have been designated "Emergency Lead Poisoning Areas" (ELPAs). Soil lead levels around the homes of lead-poisoned children in the ELPAs average 2,000 to 2,500 parts per million.

The designation of Boston's ELPAs as Superfund sites is the culmination of a major educational and lobbying effort by many environmental and grassroots organizations. About the same time that OEA requested a cleanup from the Environmental Protection Agency, Massachusetts Fair Share conducted a campaign in the Boston area to alert residents to the lead contamination problem and to demand a Superfund cleanup from the EPA.

As the original Superfund law was expiring in the fall of 1985, Senator Edward Kennedy introduced an amendment to the reauthorization bill that would require the EPA to conduct a soil

lead cleanup in several metropolitan areas. There was considerable opposition to this measure in Congress and from the Reagan administration. Some opponents interpreted the purpose of Superfund very narrowly, and wanted cleanup efforts restricted to abandoned waste dumps. Others simply did not view child lead poisoning as an environmental health problem.

Over the several months that it took to pass a new Superfund law, several organizations campaigned vigorously to overcome this opposition. Boston's Office of Environmental Affairs led the lobbying effort, with considerable support from the National Campaign Against Toxic Hazards, the Clean Water Action Project, and individual members of the Massachusetts Toxics Network. Curiously, although support for the soil lead amendment originated in Boston, neither the mayor nor the state's governor, Michael Dukakis—now running for president—gave it any public support.

The project, costing \$5-\$7 million, will have two main components. The key aspect, of course, is the actual removal and replacement of lead-contaminated soil in the emergency areas. (While lead paint is also a major source of lead poisoning, Superfund money cannot be used to clean it up.) In those areas selected for the cleanup, all properties with high levels of lead in soil will be abated. Cleanup in half the targeted ELPAs is scheduled to begin in the spring of 1988 or 1989; work in the second group should commence the following year.

The second component will document the effect of the soil abatement on blood levels. Project staff will test children's blood lead levels before and after soil removal. The blood levels of the children whose properties are abated first will be compared to the levels of the children whose properties are abated in the second year. All children under the age of six whose properties are to be cleaned up will be given periodic blood lead tests. Nursing teams will travel to the neighborhoods in vans equipped for lead screening. The nursing teams will also provide complete medical follow-up for those children with elevated blood lead levels.

For over 60 years in this country, lead poisoning has been acknowledged to be a serious childhood disease. And for many years we have said that it is a preventable illness. By removing this environmental contaminant—highly leaded soil—we are beginning to act on this knowledge.

MORE MILITARY MUCK

Pressure from Congress and neighbors of military bases has combined to begin to force the Pentagon to address problems caused by its history of irresponsible disposal of hazardous substances. (See "Pollution and the Pentagon" in the May/June 1987 issue.)

In a major legal victory, nine residents of Tacoma, Washington were awarded more than \$170,000 to compensate for groundwater contamination caused by the Air Force's improper disposal of trichlorethylene, a carcinogen, at a landfill near the McChord Air Force Base. The federal judge held that the Air Force had the same duty as a private person to follow state statutes and regulations concerning water pollution. And the court noted that if any of the residents later develop medical problems as a result of their exposure, they can sue the government for additional compensation.

McChord Air Force Base was one of 32 federal facilities—all but two run by the military—recently added to the National Priorities List of Superfund hazardous dump sites. Topping the list of federal facilities was McClellan Air Force Base in Sacramento, California, with at least 36 known hazardous areas. In 1986 amendments to the hazardous waste cleanup law, Congress had ordered the Environmental Protection Agency to add federal facilities to the Superfund list.

—Stephanie Pollack



HARVESTING THE UNBORN

Recently, West German doctors reported in the *New England Journal of Medicine* that they had successfully transplanted three kidneys from anencephalic fetuses into two children and one adult. (An anencephalic fetus has little or no brain development and cannot live more than a few weeks after birth.) In a related vein of research, blood-producing fetal liver cells were implanted into three

victims of the Chernobyl disaster to replace bone marrow destroyed by radiation. The three died from severe burns, however, before conclusive results from the transplant could be obtained.

Biomedical research, ever on the precarious interface of science, society, and ethics, appears poised to push back yet another boundary. The new frontier is fetal-tissue implantation, in which tissues and organs from aborted fetuses are used to treat nerve and other disorders.

For some, the research heralds a bright dawn of medical achievement in which millions of people will be cured of everything from Parkinson's disease to blindness. The promise of fetal tissues stems from their low probability of immunological rejection and their ability, demonstrated in laboratory animals, to reestablish damaged nerve connections and synthesize body chemicals.

For others, however, fetal research is the harbinger of a brave new world in which fetuses are generated as a supply of spare parts. Glimpses of such a world have already presented themselves. One woman wanted to be inseminated with her father's semen to produce a fetus whose kidneys could be used to treat the man's renal disease. Another woman wanted to conceive and abort the fetus to treat her own diabetes. Although doctors say the tissue matches would be almost perfect, such arrangements have so far been refused.

Scientists and industry analysts predict that the trade in fetal tissues and organs will greatly surpass the current organ transplant industry. One biotechnology firm—Hana Biologics of San Francisco—is already preparing to profit from the collection and sale of fetal tissues. (The Foundation on Economic Trends in Washington, D.C. has petitioned the Secretary of Health and Human Services to prevent the company from going ahead with this venture.)

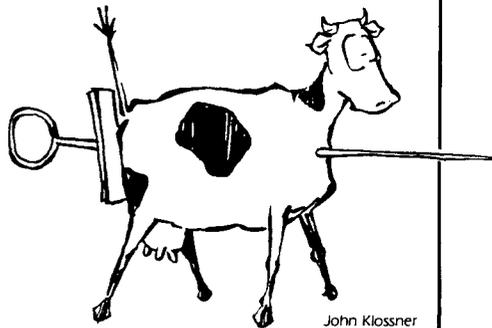
Federal legislation currently prohibits the sale of human organs taken from cadavers. Yet no such restrictions apply to organs and tissues taken from aborted fetuses. Federal and state laws require only that the fetus be certified as dead before any tissue can be taken.

Fetal-tissue implantation, like biotechnology, is gathering commercial momentum in the absence of clearly defined public policy objectives and ethical standards. Without such standards, powerful corporate interests are likely to determine the direction of the research, irrespective of the public interest.

—Tracey Cohen

ENGINEERING ANIMALS

The November issue of *Bio/Technology* reports that scientists from Integrated Genetics Inc., a company based in Framingham, MA, have genetically engineered mice into producing tissue plasminogen activator (TPA) in their milk. The trait is then genetically transmitted to their offspring. TPA was chosen for genetic engineering because it's expected to become an important drug for the treatment of heart attacks. According to the company's vice president and scientific director, Alan E. Smith, "You would only need tens, or at most, hundreds of cows to produce the world's supply" of certain drugs like TPA.



John Klossner

Researchers at the Institute of Animal Physiology and Genetics Research in Edinburgh have inserted genes for the production of two human proteins into sheep. These proteins, which could be used as drugs, are Factor IX (a treatment for hemophilia) and alpha-1 antitrypsin (a possible treatment for emphysema). A new company, Pharmaceutical Proteins, has been established to commercialize this research.

Commercialization of such transgenic animals has been termed "molecular farming." Using animals to produce human proteins is seen as cheaper than cell culture production. "What is your input?: grass and hay," states A. John Clark, principal scientific officer at the Edinburgh institute. Just breed more animals to produce more drugs.

But the high expectations for molecular farming are still premature. The Edinburgh researchers succeeded in genetically altering sheep in only five percent of their attempts. And proteins such as TPA and Factor IX, which are normally active in blood, might not be active if produced in animal milk.

—information from the *New York Times*

Time's Arrow, Time's Cycle Myth and Metaphor in the Discovery of Geological Time

by Stephen Jay Gould

Harvard University Press, 1987, \$15 cloth

It was so much fun reading Stephen Jay Gould's new book that it's hard to imagine having learned anything from it. In Walter Kaufmann's introduction to *Faust*, he remarks, "If one begins to read for enjoyment, the play will lead one, willy-nilly, to think." This characterization fits *Time's Arrow, Time's Cycle* as well. It provides plenty of action, heroes and villains, a large range of emotional tones, and reads like good theater.

The main characters are three geologists: Thomas Burnet, James Hutton, and Charles Lyell. The story is about the struggles they waged for their respective conceptions of time and the history of the Earth. Gould shows how these struggles were fought to establish the relative merits of thinking of time as moving in a directional manner, like an arrow, versus the conception of time moving in recurrent patterns, like a wheel moving in a cycle.

Burnet's *Sacred Theory of The Earth* appeared in the decade spanning the years 1680 to 1690, 100 years before Hutton's *Theory of The Earth*, and 150 years before Lyell came out with the first edition of *Principles of Geology*. Lyell, an attorney who would nowadays be accused of having too many professions, stood strongly against the notion of history as an arrow, and favored the conception that history is exclusively cyclic. Late in life, he allowed a little vectorality into his construction. Hutton, too, conceived of an Earth ruled by recurrence; the Earth is marvelous and complex, but there is nothing about it which "anchors us to a particular point in time."

Paradoxically, it was their predecessor, Burnet, who espoused the view which we would consider today to be the most modern sounding. To understand time, Burnet thought, we must consider it in some respects like a cycle, and in other respects like an arrow. There is an imminence to time which is exemplified by such laws of physics as caused an apple to fall on Newton. There are also particular events, such as the extinction of the dinosaurs, which are one-time happenings that occur in a particular chronological sequence. These examples are not Burnet's own, but they convey the diversity of experience his theories were meant to explain.

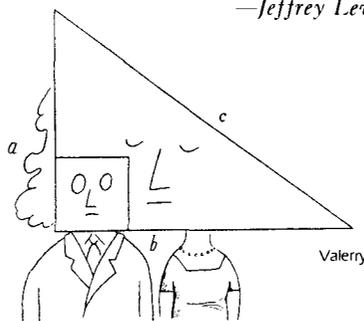
Our present state of enlightenment about geological time and history was not reached by scientists who chose the clearest path and kept to it. It is Lyell and Hutton who, traditionally, have been considered the ones to have unlocked the mysteries of time, while Burnet was regarded as a geological kook.

The march away from Burnet's more expansive theories of time wasn't even based on new empirical evidence. Gould is correct in saying that this example from the history of science represents "the debunking...of remaining cardboard myths about science as pure observation and applied logic, divorced from realities of human creativity and context."

A criticism of Gould's book is that there are too many parenthetical references, statements, and digressions which draw attention to themselves and away from the body of the text. Some beautiful sentences have been unnecessarily muddied by filling them too full of stuffing. The problem is easily solved by placing peripherals in footnotes.

Peter Medawar has remarked that people are shocked to hear him say that he cannot speak about the scientific method because there is no such thing as *the* scientific method. Facts emphatically do not speak for themselves. The story Gould tells represents both an explication of the high order of imagination required for getting to the truth underlying the tumult of worldly facts, and an example of that kind of imagination in action.

—Jeffrey Levy



Time Wars The Primary Conflict in Human History

by Jeremy Rifkin

Henry Holt & Co., New York, \$17.95 cloth

You don't throw out your junk mail because you think it's full of lies; you throw it out because it asks more of you than it probably will give, and it may say something you're not dying to know about. Jeremy's Rifkin's *Time Wars* is something like that. The main

point is well taken: we should not allow the quickened pace and new units of time made possible by computer technology to remove us from the rhythms of the natural world with which we have co-evolved. There's enough good material here for a powerful essay, but it's a bit stretched as a book.

Rifkin describes the transition of western paradigms about time and the universe. In the Middle Ages, time was conceived in terms of tasks, seasons, and cycles. When time became measured in order to manage human activity, scientists replaced belief in God as the craftsman of the universe with the notion of the universe as a clockwork mechanism that governs itself with natural laws. In the 1700s, clocks brought "temporal regimentation" to the home and workplace, disassociating time from human events.

In the late twentieth century, the mechanical image of time and the universe has evolved into the concept of the universe as a vast computer. Zoologist William Thorpe has called life itself "self-programmed activity." Time is now measured by computers' nanoseconds—one-billionth of a second—which supersede human experience. "This marks a radical turning point in the way human beings relate to time," says Rifkin. "Never before has time been organized at a speed beyond the realm of consciousness."

To illustrate the control that computer-time exerts over human consciousness, Rifkin examines the "computer nerd." This nerdly person, whom we are accustomed to laughing at, is really a pitiable example of how a personality can be gnawed to nothing by a technology gluttonous for attention. The computer nerd has become so much a part of the computer's simulated universe that he (nerds are equated with technology and are therefore "naturally" male) can no longer relate to the "real world." No wonder, then, that those whose empathies lie with silicon rather than living beings do not object to working on computerized systems designed for killing.

The quest for efficiency and superhuman speed that computers now control is exemplified by the machine tool factory near Mt. Fuji, Japan that is completely computer operated and runs 24 hours a day. "Here's a plant where nobody participates in the unfolding of their own future," says Rifkin.

Though Rifkin appears to accept the idea that time and space are inseparable, he shows no justification for not even considering the impact of space on human

In Brief

history. The notion that time has played the preeminent role in determining human activity—and its attendant conflicts—is the thesis of Rifkin's book, but it's far from being proven.

—Jeffrey Levy

Gender and Expertise

edited by Maureen McNeil

Radical Science Series, No. 19, Free Association Books, London, 1987

Distributed by Carrier Pigeon, 40 Plympton St., Boston, MA 02118

The essays in this book examine women and the things that they do—from Mary Seacole, a Jamaican Florence Nightingale, to women's involvement in London's "technology networks," which link community residents with technical resources to work on socially useful products. The collection's array of feminist opinions is broad, as is the range of "expertise" covered.

In "Being Reasonable Feminists," Maureen McNeil chronicles feminist analyses of science and rationality, criticizing both intellectual feminist praxis and involvement in women's health and peace movements for their inability to remove gender from definitions of rationality/science or intuition/nature. "In highlighting the differential composition and appeal of the women's peace movement," she writes, "my intention is not to discredit the movement, but to guard against glib presumptions that this cause is naturally or universally a feminist one."

Some of the essayists, in their urge to be "natural," endorse policies that may be dangerous. Judith Williamson, in "Intimate Imperialism," applauds Germaine Greer's suggestion to not encourage sterilization or chemical birth control in the Third World. "But who are we to sterilize parents who well know that few of their offspring may reach adulthood?" she writes. "Who are we to decide that because we don't want children, they shouldn't either?" She ignores the fact that death rates among these children do decrease when birth rates decrease, and that many Third World countries have already absorbed some life-prolonging innovations, such as oral rehydration therapy for diarrhea.

There's a wide range of book reviews, reports, and feminist theory in this collection. These essays are argument provoking and thoughtful—two good qualities for winter reading.

—Ellen Weinstock

Living Without Landfills Confronting the "Low-Level" Radioactive Waste Crisis

by Marvin Resnikoff

Published by the Radioactive Waste Campaign, 625 Broadway, 2nd Floor, New York, NY 10012, 1987

Written for environmental activists and state and local officials representing citizens living near nuclear sites or proposed low-level radioactive waste dumps, *Living Without Landfills* challenges the U.S. government's definition of low-level waste and its plans to dispose of nuclear waste.

"Citizens who live near potential 'low-level' waste facilities need to know that this is not a 100-year commitment, but a 100,000 year commitment," writes author Marvin Resnikoff. "The nuclear power industry is engaged in a disinformation campaign deliberately misleading the public on the hazards of 'low-level' waste."

Much of the waste that's now classified as low level will actually remain radioactive for 100,000 years or more. The report shows that—contrary to nuclear power industry claims that most radioactive waste derives from medical, research, and other industries—99 percent of low-level radioactive waste is produced by the nation's 115 nuclear power plants.

The report calls for alternatives to radioactive landfills. These include energy conservation and use of non-nuclear power to reduce the amount of radioactive waste produced, and use of monitored, retrievable above-ground storage systems for existing and future waste. Since almost all of the waste is now stored at nuclear power plants, the report proposes that those facilities become permanent waste sites, and that medical, institutional, and industrial producers transport their radioactive waste to those reactor sites.

The report also urges the U.S. government to reclassify much of the "low-level" waste to high-level status, including waste which remains radioactive for more than 10,000 years, decommissioned nuclear plants, and material from operating reactors. In fact, the Reagan administration is trying to weaken its already inadequate standards to move some high-level waste into low-level categories, in efforts to deregulate waste and industry accountability.

—Leslie Fraser

Science Teaching in Nicaragua

Teach science or math at the university level for one or two semesters. Must be able to teach in Spanish. Other projects include sending reference materials and technical journals to university libraries, participating in research projects, and teaching shorter seminars. Send curriculum vitae and description of teaching experience and courses you could teach to:

Science for the People

897 Main St., Cambridge, MA 02139
617/547-0370

INTERNSHIPS at SftP

Editorial, advertising, promotion, and office internships are available at Science for the People. Great experience! Call or write our office for more information.

SCIENCE FOR THE PEOPLE

897 Main St., Cambridge, MA 02139
617/547-0370

SUBSCRIBE

to Science for the People
six issues/\$15

FATE or FICTION

Biological Theories of Human Behavior



A 30-minute slide-tape presentation for college, high school, and community groups. Explores the link between genetics and behavior, exposing the use of science to rationalize social and political inequalities.

Teaching Guide now available.

Purchase: \$150 Rental: \$35

Send orders, with payment, to:

Science for the People
897 Main St., Cambridge, MA 02139

STERILIZATION

CONTINUED FROM PAGE 18

Among the psychologists were E.L. Thorndike, Lewis Terman, and Robert Yerkes. The list includes an all-star cast from other fields as well, the majority of whom were quite active in the society.

24. *Tomorrow's Children*, op. cit., pp. 41-42.

25. *Ibid.*, pp. 44, 56.

26. An Address by Dr. Frick, Reichminister for the Interior, before the First Meeting of the Expert Council for Population and Race-Politics, held in Berlin, June 28, 1933. *Eugenical News*, vol. 19, no. 2, March/April 1934, p. 34. This larger group was not necessarily to be sterilized. Various programs of education, segregation, marriage restrictions, and coercion could be used. This was the American view as well.

27. F. Osborn, Circular Letter, Feb. 24, 1937, Scrapbook, American Eugenics Society Papers, BK 6. For the German sterilization statistics, see G. Bock, "Racism and Sexism," in *When Biology Became Destiny*, op. cit., p. 279. Bock notes that in the U.S., only 11,000 persons were sterilized between 1907 and 1930. She also notes that 80 men and 400 women died as a result of the surgery. More detailed statistics can also be found in Hans Harmsen, "The German Sterilization Act of 1933," *Eugenics Review*, vol. 46, no. 4, 1955, pp. 227-232.

28. Robert J. Lifton, "Medicalized Killing in Auschwitz," *Psychiatry*, vol. 45, November 1982, pp. 282, 285. Also see Lifton's recent full-length study, *The Nazi Doctors: Medical Killing and the Psychology of Genocide*, (New York, 1986), pp. 23-45; "Doctors of Death," *Time*, June 25, 1979, p. 68. Leo Alexander, an investigator at the War Crimes Trials, wrote in "Medical Science Under Dictatorship," (*New England Journal of Medicine*, July 14, 1949, p. 42) that doctors served as executioners for the Third Reich in numerous capacities. "It all started," he argued, "with the acceptance of the attitude, basic in the euthanasia movement, that there is such a thing as life not worthy to be lived." For an extraordinary article on the contemporary use of these same psychological mechanisms, see Richard Goldstein and Patrick Breslin, "Technicians of Torture: How Physicians Become Agents of State Terror," in *The Sciences*, a publication of the New York Academy of Medicine, March/April 1986. The article examines torture in South and Central America in the 1980s.

29. *Tomorrow's Children*, op. cit., p. 45.

30. *Ibid.*, pp. 45, 46, 51.

31. Lorenz received the prize in 1973 for his work in ethology. His enthusiastic approval of Nazi eugenics has long been recognized. See Theodora J. Kalikow, "Konrad Lorenz's Ethological Theory: Explanation and Ideology, 1938-1943," *Journal of the History of Biology*, vol. 16, no. 1, Spring 1983, pp. 39-73.

32. Quoted from Chase, op. cit., p. 349.

33. "Eugenics in Germany in 1946," *Eugenical News*, vol. 21, no. 2, June 1946, p. 21.

34. For a complete description of Mengele's work at Auschwitz and his relationship to Verschuer, see R. Lifton, *The Nazi Doctors*, op. cit., pp. 22, 337-383; Benno Muller-Hill, *Todliche Wissenschaft: Die Aussonderung von Juden, Zigeunern und Geisteskranken, 1933-1945*, (Hamburg, 1985), pp. 71-85, 120-30, 157-64. A de-nazification tribunal later referred to Verschuer's activities under the Nazi regime as "misdemeanors," and fined him 600 Marks. He continued his illustrious career and retired as chairman on the Department of Genetics in 1974.

35. Humphreys was head of the Department of Psychology, editor of the *Psychological Bulletin* and the *American Journal of Psychology*, and the second-highest administrator in the National Science Foundation.

36. Lloyd Humphreys, "Intelligence and Public Policy." Paper presented at the symposium "Intelligence, Measurement and Public Policy," held in honor of Humphreys's retirement from the University of Illinois, April 30-May 2, 1985. The University of Illinois Press is publishing the proceedings of the conference.

WASTE LAND

CONTINUED FROM PAGE 13

recycled? Practically speaking, the amount that is incinerated will be determined in large part by the number of incinerators that have already been built or are currently under construction. If that is the



case, more garbage will be burned than people like Neil Seldman and Barry Commoner would like. The most important consideration for the nonrecyclable waste, whether it is landfilled or incinerated, is to ensure that the facilities are equipped with state-of-the-art pollution control technology and heavily monitored to ensure compliance.

A massive shift from landfills and incinerators to recycling will require an even more massive shift in the way individuals and communities think about garbage. The current attitude of most consumers is summed up by a woman in San Bernardino, California. When asked her view about a proposed solid waste policy, she replied, "Why do we need to change anything? I put my garbage out on the sidewalk and they take it away." As Cynthia Pollock of the Worldwatch Institute has written, "The fact that there is no real 'away' for throwaways has not yet hit home."

Thus, the most difficult part of developing a rational solid waste management policy will not be making the choice among disposal technologies, or even designing a regulatory system to implement that choice. The crux of the problem is convincing individuals—and government agencies—that they can no longer send their garbage out and forget about it. Perhaps solid waste policy should be based on a rule put forth by Neil Seldman and the Institute for Local Self-Reliance: no waste can be disposed of more than ten miles from where it is generated.

HERITABILITY

CONTINUED FROM PAGE 23

critical eye and demand tough standards of proof. Claims that things are changeable, however, seem self-evidently true to us, so we scrutinize them much less. We should not tolerate this double standard.

Hereditarians seem bent on amassing evidence of the fixity of our biological natures, while, for us, the research agenda is to determine how to go about changing things. Yet, again, the positions are not symmetrical. Hereditarians *claim* to have the same interest as anti-hereditarians, to determine how much change is possible so that we may act rationally in social programs.

But if that is really the hereditarian agenda, why do they keep studying heritability, which simple logic tells us cannot give the answer to the problem? Why do they not design studies to ask the questions about changeability directly? Because the answer would come out in the wrong direction.

It is here that the deep asymmetry of the ideological positions really lies. If human society really *cannot* be reorganized, then the political agenda of the left is irrelevant and those of us whose lives are devoted to bringing about such change are doomed to failure. That is, for the left a knowledge of the truth about these questions is absolutely essential. Only a mad person would donate his or her life to an activity known to be contrary to nature.

For the right, however, the truth of the matter is of no great moment. Even if society were as changeable as the left claims, the right could, with perfect coherence and with the assurance of considerable success, resist that change. To delude themselves and everyone else about the meaning of heritability is not practically and politically in contradiction with the social agenda of the right. With enough power, one can resist change almost indefinitely. Thus, the two ideologies have very different stakes in finding out the truth about human flexibility.

NOTES

1. R.C. Lewontin, "Race and Intelligence," *Bulletin of the Atomic Scientists*, vol. 26, no. 3, 1970, pp. 2-8.

2. R.C. Lewontin and M.W. Feldman, "The Heritability Hang-up," *Science*, no. 190, 1976, pp. 1163-1168.

3. "Genetic Aspects of Intelligence," *Annual Reviews of Genetics*, no. 9, 1967, pp. 387-405.

4. L.J. Kamin, *The Science and Politics of I.Q.* John Wiley and Sons, 1974.



CONTACTS

NATIONAL OFFICE: Science for the People, 897 Main St., Cambridge, MA 92139. (617) 547-0370

CALIFORNIA: Science for Nicaragua, c/o Robert Van Buskirk, 1627 Euclid St., Berkeley, CA 94709. (415) 549-1233. **Bay Area Chapter,** Dave Kadlecck, Box 390871, Mountain View, CA 94039. (415) 960-3639

DISTRICT OF COLUMBIA: Miriam Struck and Scott Schneider, 9311 Sudbury Road, Silver Spring, MD 20901. (301) 585-1513. Wanda Katz Fishman, 6617 Millwood Rd. Bethesda, MD 20817. (301) 320-4034.

FLORIDA: Bob Broedel, Progressive Technology, Box 20049, Tallahassee, FL 32316. (904) 576-4906

IOWA: Paul C. Nelson, 604 Hodge, Ames, IA 50010. (515) 232-2527

MARYLAND: Pat Loy, 3553 Chesterfield Ave., Baltimore, MD 21213

MASSACHUSETTS: Boston Chapter, 897 Main St., Cambridge, MA 02139. (617) 547-0370

MICHIGAN: Ann Arbor Chapter, 4318 Michigan Union, Ann Arbor, MI 48109. (313) 761-7960. Alan Maki, 1693 Leonard St. N.W., Grand Rapids, MI 49504

MISSOURI: Peter Downs, 4201 A Russell, St. Louis, MO 63110

NEW HAMPSHIRE: Val Dusek, Box 133, Durham, NH 03824. (603) 868-5153

NEW YORK: Red Schiller, 382 Third St., Apt. 3, Brooklyn, NY 11215. (212) 788-6996. **Story Brook Chapter,** Box 435, E. Setauket, NY 11733. (516) 246-5053

NORTH CAROLINA: Douglas Bell, 2402 Glendale Ave., Durham, NC 27704. (919) 471-9729

OREGON: Sheila Smith, 925 NW Merrie Dr., Corvallis, OR 97330

RHODE ISLAND: Carolyn Accola, 245 President Ave., Providence, RI 02906. (401) 272-6959

TEXAS: Ed Cervenka, 3506 Manchaca #211, Austin, TX 78704. (512) 447-9481

VERMONT: Steve Cavrak, Academic Computing Center, University of Vermont, Burlington, VT 05405. (802) 658-2387; 656-3190

WASHINGTON: Phil Bereano, 13B Loew Hall, FH-40, University of Washington, Seattle, WA 98195. (206) 543-9037

AUSTRALIA: Brian Martin, STS, Wollongong University, Wollongong NSW 2500, Australia. Telephone (042) 27076. Lesley Rogers, Physiology Dept., U. of New England, Armidale NSW 2351, Australia. Janna Thompson, Philosophy Dept., La Trobe University, Bundoora, Victoria, Australia. Tony Dolk, 17 Hampden St., Ashfield NSW, Australia.

BELGIUM: Gerard Valenduc, Cahiers Galilee, Place Galilee 6-7, B-1348 Louvain-la-Neuve, Belgium

BELIZE: Ing. Wilfredo Guerrero, Ministry of Public Works, Belmopan, Belize, Central America

CANADA: Ontario: Science for the People, Box 25, Station A, Scarborough, Ontario, Canada M1K 5B9. **Quebec:** Bob Cedegen, Dept. of Biochemistry, University of Montreal, Montreal 101, Quebec, Canada. **British Columbia:** Jim Fraser, 848 East 11th Ave., Vancouver, British Columbia V5T 2B6, Canada

DENMARK: Susse Georg and Jorgen Bansler, Stigardsvej 2, DK-2000, Copenhagen, Daneland 01-629945

EL SALVADOR: Ricardo A. Navarro, Centro Salvadoreno de Tecnologia Apropiada, Apdo 1892, San Salvador, El Salvador, Central America

ENGLAND: British Society for Social Responsibility in Science, 25 Horsell Rd., London N5 1XL, England. Tel. 01-607-9615

INDIA: M.P. Parameswaran, Parishad Bhavan, Trivandrum 695-001, Kerala, India

IRELAND: Hugh Dobbs, 28 Viewmont Park, Waterford, Eire. 051-75757

ISRAEL: Dr. Najwa Makhoul, Jerusalem Institute for the Study of Science, 6 Bnai Brith St., Jerusalem 95146, Israel

ITALY: Michelangelo DeMaria, Via Giannutri 2, 00141, Rome, Italy

JAPAN: Genda Gijutsu-Shi Kenkyo-Kai, 2-26 Kand-Jinbo Cho, Chiyoda-Ky, Tokyo 101, Japan

MEXICO: Salvador Jara-Guero, Privada Tepeyac-120-INT, Col. Ventura Puente, Morelia, Mexico

NICARAGUA: Science for Nicaragua, De los Ranchos, 6½ Cuadras al Sur, Managua, Nicaragua. Tel. 660502

SWITZERLAND: Bruno Vitale, 8 Rue Des Bugnons, CH-1217, Meyrin, Switzerland. Tel. (022) 82-50-18

WEST INDIES: Noel Thomas, Mt. Moritz, Grenada

WEST GERMANY: Forum fur Medizin Und Gesundheitpolitik, Gneisenaustr., 2 Mehnhof, 100 Berlin 61, West Germany. Wechsel Wirkung, Gneisenaustr., D-1000 Berlin 61, West Germany



No one gave Oliver North a gift subscription to Science for the People this year.

Don't let your friends say the same thing this holiday season.

Give the gift that arrives six times a year. Give Science for the People

THE MORE YOU GIVE, THE MORE YOU SAVE!

FIRST GIFT: \$15—six issues

SECOND GIFT: \$12—save 20%

THIRD GIFT: \$10—save 30%

FOURTH GIFT: \$7.50

FIFTH GIFT: FREE!

ORDER NOW FOR HOLIDAY GIFTS!

Prepaid orders may deduct an additional 5%.

Send your check and your friends' names to:

Science for the People
897 Main Street
Cambridge, MA 02139



Science Resource Center PUBLICATIONS

Decoding Biotechnology

An essential guide to the issues posed by new genetic engineering technologies. Questions concerning hazards and benefits, biological warfare, reproductive technologies, corporate influence over research and development, and the need for public involvement are given comprehensive treatment. Recommended for classroom use. \$4.00

Computing the Future

A unique collection of articles on computers and the high-tech industry, focusing on computers and the military, industry health and safety, and a special section on computer use in schools. An excellent educational resource. \$4.00

Biology as Destiny: Scientific Fact or Social Bias?

A provocative look at the controversies surrounding genetic theories of human behavior. A collection of eight articles produced by the Sociobiology Study Group. Recommended for personal or classroom reading, and as a resource for the Sociobiology Study Group's slide/tape show, "Fate or Fiction." \$4.00

Feed, Need, Greed

The classic high school curriculum guide on hunger, population, and food resources. \$5.50

Science for the People Magazine

For 18 years, the only national magazine devoted to the political significance of science and technology. Bimonthly, \$15/year

Also available from
SRC:

Fate or Fiction: Biological Theories of Human Behavior

A 30-minute slide/tape presentation for college, high school, and community groups. Explores the link between genetics and behavior, exposing the use of science to rationalize social and political inequalities. Purchase: \$150. Rental: \$35

Science and Journalism: Covering Controversy in Science

Addresses by scientists and science writers on the media's coverage of AIDS, Star Wars, sex role research, yellow rain, genetics and crime. Speakers include Stephen Jay Gould, Leon Kamin, Matthew Meselson, Jan Beckwith, Jerome Groopman, Kosta Tsipis, Vera Kislakowsky, Anke A. Ehrhardt. Complete Transcript: \$15
Audio Cassette Tapes: \$7.50 each
(Send for a list of available talks and speakers.)

ORDER NOW FOR HOLIDAY GIFTS!

Please add \$1 postage and handling for each title. Discounts available for bulk orders.

Send orders, with payment, to:

SCIENCE RESOURCE CENTER
897 Main Street
Cambridge, MA 02139
617/547-5560

