ARTICLE

Will tomorrow bring a silent spring or a brave new world? Six journalists seek answers to the earth's problems

SAVE THE PLANET

From the vantage point of Earth we look up to see the heavens. At night we gaze at the stars, new moon, full moon, or no moon at all; during the day the sun blasts or browns us, while nimbus or cirrus clouds ease on by. But if we're not careful, if we're not thoughtful, if we're not, yes, committed, we may lose our vantage point—this Earth—for millions of years home to us and our fellow species. It's time to stop gazing upward and to look around at the planet itself, to look at our fellow human beings, at some of their problems and their suffering.

The earth's in serious trouble. We've polluted the very water we drink and bathe in with human sewage and an endless amount of toxic chemicals. We've chopped down forests all over the world—we've even got a name for it, *deforestation*—without any sense of what we're losing. And worse, we're becoming nearly illiterate, unable to read technical manuals, high-school textbooks, or billboards on buses, to say nothing about *Don Quixote* or *A Midsummer Night's Dream*. Should we be alarmed by the number of people who can't read? Words strung together form sentences, paragraphs, and stories—inform us about how other people live, feed our dreams, introduce us to new concepts, soothe our wounds, unmask our prejudices. Without those basic tools we won't be able to understand and then solve the plethora of problems facing us as we move into the next century.

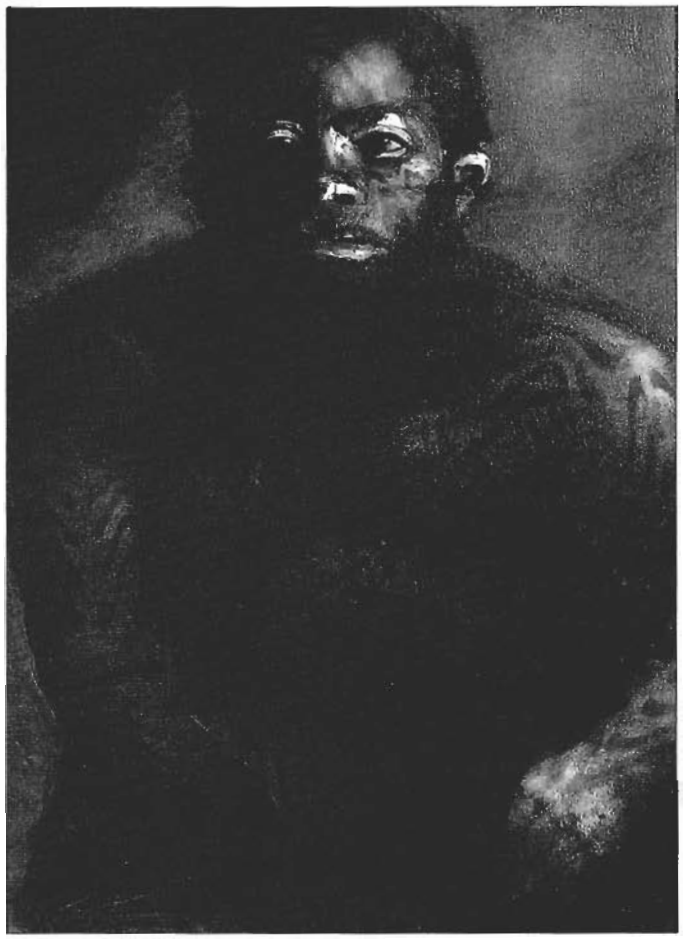
Health care, and its escalating cost, is just one of these problems. Some of us can't afford to get sick. We've got great medicines, grand machines, highly trained medical researchers and practitioners—for the benefit of some, not all. It's time to change that system, we say, so what's stopping us? Or consider the problem of war. In some countries the earth is mined with bombs awaiting an innocent man, woman, or child to set them off. In too many

PAINTINGS BY MARSHALL ARISMAN

"By the time kids reach tenth grade, four out of five high-school students show no interest in studying science or math."

places people wake up to the sounds of automatic rifles or artillery fire. What are we handing off to our children's children? Maybe the idea of a peaceful world is an illusion, a fantasy of people who just don't understand geopolitics. Perhaps these people read too much.

Lately science has been portrayed as the great villain, spawning death technologies, wreaking havoc with the atmosphere, precipitating ill health. It's partly true. Surely scientists now know that they will never again be able to enjoy the luxury of discovery or the thrill of invention without scrutinizing the consequences of what they've found. But the nonscientist cannot rest easy either, pointing the finger of blame at the community that has furnished us with aerosols, air conditioners, automobiles—with the goods, the life-style we wanted. Many of our ills are self-inflicted, the sins of selfishness, of greed. And that problem has a solution: We can curb our seemingly endless desire for things, or there may come a day when Earth will be no more.



That's not apocalyptic; it's not a scare tactic. That message—save the planet—is everywhere: flashing from the headlines of daily newspapers; on Glad garbage bags; UN studies; the latest reports from Washington, Paris, Tokyo, or Moscow; and blaring from evening news programs and rock concerts. Out of the myriad issues that confront us our journalists tackled six technological and human dilemmas: the inequity of our health care system, the state of our drinking water, the age-old horror of war, the alarming rates of deforestation and illiteracy, and drug abuse, whether it's on the stock exchange or New York's Lower East Side. Each issue is defined and dissected. Some politicians have their say about what legislation they're proposing to deal with, say, lead in our water. Scientists tell us, among other things, about Project 2061, a national program to eradicate illiteracy. And some kids talk about what they're thinking and what they're doing, whether it's helping their peers in remedial reading programs, attending classes after school to further their own education, or collecting rain from the playground to test it for acidity. Once upon a time, a prophet gave us a metaphor for what a world at peace would be like: Wolves and lambs, calves and lions would live together, and children would lead the strange menagerie. It could be time to take a child's hand and follow.—Murray Cox

TEACH YOUR CHILDREN

To keep this nation competitive as we move into the twenty-first century, we need scientific know-how, and we need it soon. The task: Find 450,000 scientists and engineers in fields as diverse as astrophysics, internal medicine, and biology, and find them over the next 20 years. Mindpower. We once had plenty of it, but now we're staring into a dry well.

The number of twenty-two-year-olds getting undergraduate degrees in science and engineering hasn't changed in 15 years—40 to 50 students out of every 1,000, according to a National Academy of Sciences (NAS) study. NAS predicts that figure will dip by 25 percent by the end of the Nineties. The number of science and engineering students seeking doctoral degrees has fallen 50 percent since the mid-Sixties.

The latest figures on high-school reading levels indicate that 61 percent of seventeen-year-olds can't comprehend their textbooks—whether they're history or biology texts. About half of these students cannot understand basic junior-high math, according to a National Assessment of Educational Progress report released this year. By the time they reach tenth grade, four out of five high-school students show no interest in studying science. And in an international survey financed by the National Science Foundation and the U.S. Department of Education, 24,000 thirteen-year-olds from South Korea, Spain, Ireland, England, Canada, and the United States competed in math and science tests. Korean students topped all the other competitors in math proficiency. Americans scored last in math and well below average in the sciences.

"West Germany, England, and Japan put their children through more rigorous courses in math and the basic sciences," says Dale W. Jorgenson, the director of Harvard University's Program on Technology and Economic Policy. "They take more science-related courses in secondary schools. There is less freedom of choice." In the late Sixties curricula in this country opened up, offering students a greater selection of elective courses. Today we are paying the price for such academic freedom.

To remedy the situation, officials of the American Federation of Teachers (AFT) propose that elementary school teachers take math and science courses to qualify for their licenses. But the proposal will not help immediately, says Albert Shan-

AFT's president, because new teachers lack adequate math and science credentials. Lewis Branscomb, director of Harvard's Science, Technology and Public Policy department, agrees. "We have too many teachers without any training in science, and the number of teachers trained in science is small," he says. "Scientific illiteracy feeds on itself. Unsure teachers with little or no training in science communicate their math and science phobia to students."

In order to stop the frightening trend toward illiteracy, private organizations, Congress, corporations, futurists such as Marvin Cetron, and schoolteachers are supporting the drive to achieve national scientific literacy. In 1985 the American Association for the Advancement of Science (AAAS) kicked off a long-term program called Project 2061. During Phase I they defined the scope of the problem. With Phase II now under way (projected completion time: four years) teams of educators and scientists are creating new curricula, revamping teacher education programs, and designing new testing and teaching materials. School systems in five states—Texas, California, Georgia, Wisconsin, and Pennsylvania—are participating in the project. Two private organizations, the Carnegie Corporation of New York and the Mellon Foundation, provided partial funding for the first phase. IBM has agreed to furnish computers and software for the second phase.

"We're putting the teams together now," says F. James Rutherford, AAAS's chief education officer. Twenty-five people will teach for the next two and a half years at each school. "We're not interested in rote facts but in stressing the importance of thinking and creating ideas," he says. "Students need to understand the basic functions of science and how they relate to society and their lives."

Congressman Douglas Walgren (D-Pennsylvania), head of the House Subcommittee on Science, Research, and Technology, called the AAAS project an "outstanding contribution in helping to close the gap in science education." Members of Congress, alarmed about the educational crisis, have proposed several bills to repair our nation's schools. Walgren supports legislation to create a national science scholarship program supervised by the National Science Foundation. Exceptional math, science, and engineering students would receive $5,000 a year for four years. Another bill, introduced by Congressman Sherwood Boehlert (R-New York), proposes to give federal scholarships to top science, math, and engineering majors who consent to teach two years in public schools for each year of funding received.

Scholars at the Educational Testing Service claim that academic performance can be improved if teachers and parents demand more from students and show more interest in science and math. Educator and columnist Thomas Sowell says Americans are intellectually lazy. He blasts schools for letting students graduate without understanding long division or such basic laws of the universe as relativity or the concept of matter.

In his forthcoming book, *American Renaissance,* Marvin Cetron suggests several ways to jump-start the sluggish American educational system, including increased school budgets, more teachers, longer school hours, greater use of computers in the classroom, and a standardized core curriculum.

IBM's involvement in Project 2061 is but one example of American corporations' support for the anti-illiteracy campaign. IBM, Citibank, and Pfizer also donate money to tutorial programs. General Electric executives tutor youngsters in Spanish Harlem to prepare them to enter top-notch universities such as MIT and Stanford. Polaroid Corporation pays up to ten of its workers each year to become math and science teachers. Those eligible for the company's Project Bridge receive full salary while attending a year-long teacher certification program at Harvard University or Lesley College in Cambridge, Massachusetts.

Students themselves are taking the initiative to improve their education by attending classes after school and on weekends. At the Science Skills Center in New York City, 2,000 kids between the ages of five and nineteen take classes ranging from biology, robotics, chemistry, and physical science to rocketry, geology, and oceanography. The ten-year-old center cooperates with the city's Board of Education and medical facilities such as Downstate Medical Center. Director Michael Johnson says all of the students in the center's early groups have gone on to college, with half of the graduates majoring in engineering or science. The majority of the students who attend the classes come from the city's financially depressed neighborhoods.

"The center teaches us how to use ou imagination and how to form new ideas says Dana Reid, a twelve-year-old six grader at P.S. 268 who plans to becon an engineer. "We learn to be committe I thought it was going to be difficult, b the experiments make it interesting." A other student, Aaliyah Barclift, a ten-ye old fifth grader at P.S. 307, recalls a f trip to the National Science Founda and George Washington University's in Washington, DC. "I was thrilled," the would-be surgeon. "We talked scientists and they told us abou crobes. They had a centrifuge in th It was all new for me. It was great."

The same enthusiasm resides public school, says Stanley Shap science and chemistry teacher a wood High School in Brooklyn teaches three chemistry and three

ence research classes daily. Many of the students who enroll in his demanding classes are accepted at prestigious universities after graduation, eventually becoming doctors, scientists, medical researchers, and chemists. "There is such poor public education in this country, especially in our science classes," Shapiro says. "In Japan, where I've lectured, science and scientists are respected. But in this country science has a bad reputation. A lot of teachers are afraid of the subject, and so our students are taught to be afraid and distrustful of science."

Children should be turned on to the mysteries of science and the universe in the early school grades, Shapiro says. The 12-year teaching veteran fosters intellectual curiosity by involving his students in challenging projects. Science and chemistry students at Midwood work with scientists and researchers in labs throughout the New York City area. Starting as observers, they take on manageable portions of research under the scrutiny of their mentors. "Once a kid gets in research, everything else seems boring," Shapiro says. Twenty Midwood students have won scholarships in the Westinghouse Science Talent Search, the nation's oldest and most prestigious high-school science competition. "The appetite for knowledge can't be totally developed in the classroom," Shapiro says. "You must stress independent work and study."

One sixteen-year-old Midwood High School science whiz won a $7,000 prize in the 1989 Westinghouse competition. For his project Andrew Gerber tested the strength of antipsychotic drugs by combining them with iodine. With both parents working as physicians in nearby hospitals, Gerber grew up in an environment filled with talk of the latest medical advances and scientific achievements. At six he caught the science bug when he received an electric bell and a battery. His father was not surprised when Andrew assembled a computer kit four years later. "My major influence was my parents," Gerber says. "A lot of kids grow up hostile to science. You only hear bad things about science: additives in foods, chemical spills, and nuclear accidents. You never hear the positive side of technological advances. There is a built-in bias against science and technology."

The way science is taught in American schools turns students off, Gerber claims. "The introduction to science and physics in high school has no practical application right away," he says. "Kids are impatient. They lose interest. People also distrust someone with an analytical mind—such a person is supposedly cold and has no feelings—but value poets, actors, and writers for their creativity. Scientists have to be creative as well as disciplined. If this country is going to remain powerful, it's going to need the best scientists and researchers."

Harvard's Branscomb knows the science education shortage is extremely serious. "In this modern, technical world our tools are getting smarter. When the tools get smarter, we must have people properly trained to master them. At this time we aren't doing that. And even if we solve the problem of scientific illiteracy, we will feel its effects for a long time to come."—Robert Fleming

LIVE AND LET DIE

"Our current system of health care is not fair; it's not just; and it's not the morally strong system this country deserves," Surgeon General C. Everett Koop admonished in a commencement address last May. On the eve of his retirement, Koop warned that public expectations of medical care are "fast outpacing our ability to pay for them."

The statistics underscore the chilling fact that the United States' health-care system is out of control. Rising at two and a half times the inflation rate, the nation's medical bill will total a staggering $650 billion this year. Yet, critics say, we're not getting much for our money.

"No other country in the world except South Africa tolerates a system in which the state of a family's health is deter-

mined by the size of the family's wealth," Senator Edward Kennedy (D-Massachusetts) told the Senate Subcommittee on Health for Families and the Uninsured last June. More than 37 million Americans have no health insurance. Another 15 million have inadequate coverage. One third of American women don't receive prenatal care during the first trimester of pregnancy. And some adults living in impoverished rural areas have never even seen a doctor.

There is little evidence, moreover, that many of the dazzling—and expensive—miracles of modern medicine actually prolong life. Americans have four times as many coronary bypass operations (at a cost of more than $7 billion annually) as Western Europeans. While 26 nations have better cardiovascular health rates than the United States, we rank a dismal fifteenth in life expectancy for males and twentieth in infant mortality. "A baby born in Spain or Greece has a greater chance of survival than one born in the United States," says Richard Lamm, whose views on health care issues ignited a fire storm of controversy during his three-term tenure as governor of Colorado.

"Health care is a fiscal black hole in which we pour an unjustifiable amount of resources," Lamm says.

Globally, the outlook is equally disturbing. Although medical care in some Third World countries, most notably China, has improved, practices remain 30 years behind the times. Generally, sanitation is horrendous and malnutrition is rampant. (The number one cause of infant death in developing countries is dehydration from diarrhea.) And whole populations have not received basic immunizations against such preventable diseases as measles, polio, and tuberculosis. Severe economic setbacks, compounded by the AIDS epidemic, have drained the meager resources of most African nations. "These governments simply do not have the money to provide everyone with the services they need," explains Michael Reich, associate professor of international health at Harvard's School of Public Health. "And the good facilities that do exist are often accessible only to the elite."

Even Great Britain's National Health Service, a system of socialized medicine once considered an enlightened model of egalitarian efficiency, is beset by crises: Waiting lists for cataract, joint replacement, and other nonemergency surgery are five years long. The lives of critically ill patients are often jeopardized because procedures are delayed repeatedly due to a shortage of nurses. (Nurses are so poorly paid they're quitting the profession at a rate of 30,000 a year.)

One of the few bright spots in this bleak picture is Canada's government-funded national health insurance system. The principal difference between the Canadian and the British systems is hospital ownership: In Great Britain hospitals are government owned, which means costs are lower than in Canada because the government controls everything, including doctors' and nurses' salaries. The Canadian government controls medical fees and the purchase of high-tech equipment, and each province negotiates its annual health-care budget with its medical and hospital associations, setting a ceiling on total expenditures.

According to the nonprofit, Washington-based Employee Benefit Research Institute, Canadians are healthier than Americans; they live longer; and their infant mortality rate is 25 percent lower than the United States'. But even Canadians, who believe their system is the best in the world, complain of bottlenecks. Indeed, delays were at least partly responsible for the deaths of six heart patients in 1988. And as more people take advantage of the insurance, costs are escalating, draining the national coffer. "We are beginning to move off the delivery of the highest standard, which was the premise of Canadian Medicare," Canadian Medical Association president John O'Brien-Bell recently said.

An endless number of economists, politicians, physicians, and health-care

policymakers have been stymied in their attempts to cut medical costs without sacrificing quality and accessibility. But we are headed for disaster, Koop and other experts warn, if fundamental changes aren't soon made in the practice of medicine.

Former Colorado governor Lamm believes there are plenty of solutions, but he also contends that dire circumstances call for stern, perhaps even Draconian, measures. "Medical expenditures are crippling the economy," he says. "We simply can't provide everyone with all the health care that medicine has developed. We need to set priorities in the allocation of resources." Lamm argues that it makes more sense, for example, to provide prenatal care to pregnant women than for pediatricians to fly sickly newborns to million-dollar neonatal care units. "The price of vaccinating children, providing prenatal care to all pregnant women, and giving everyone basic health care can be offset by reducing high technology medicine," he says. "The inadequacies in one part of the system can be funded by trimming other areas."

Director of the Center for Public Policy in Denver, Lamm proposes a radical restructuring of health care delivery along the lines Canada pioneered. He also advocates closing some hospitals, replacing them with hospices, and regionalizing such high-tech medicine as kidney dialysis, pacemaker implantation, and organ transplantation.

"We're engaged in a wasteful technology race. There are more CAT scanners, for example, in Colorado and Arizona than in all of England," Lamm says. "And high-tech care should be rationed based upon the chances of success rather than rationing care based on the ability to pay. We can no longer pour phenomenal resources into people for whom there will be no happy outcome."

According to pediatrician Barbara Starfield, head of the division of health policy at Johns Hopkins University School of Public Health, computerized data banks to monitor care are also necessary to eliminate administrative waste and the overuse of procedures. "First, there is more accountability with a centralized system," she says. "Second, keeping records on each patient means that we know exactly what treatments, tests, medications, and other care they've already received, so the procedures aren't duplicated, which is so often the case now. And by tracking treatments, we can determine which ones are most effective. This is an area in which we can begin to collaborate internationally and make cross-cultural comparisons."

Alex Romani, an eighteen-year-old senior at North High School in Torrance, California, agrees with the idea of a centralized data bank "so we can better understand disease. And with it linked to data banks in other countries," he says, "we can all learn from each other." He also looks forward to computerized tools to detect diseases in their very early stages. "If a computer spots chemical changes in our bodies, we can cure ourselves before we show physical signs of illness. And perhaps we will even have monitoring devices we can use at home."

Health care must be redirected toward preventive medicine. "Right now, the focus is on the management of disease rather than its prevention," Starfield says. "That *must* change because it is in the area of prevention that we can make the most dramatic inroads—with the least amount of money—in combating illness."

In Cuba, for example, the government has worked with nurses and doctors to develop programs that focus on prevention rather than high-tech care, providing such services as prenatal care and immunizations. Through Cuba's concept of one doctor for 125 families, ongoing community-based care is provided by a physician who knows the patients and their living conditions and takes personal responsibility for their health care.

"Hospitals, of course, don't prevent death. We should institute basic health services; raise the literacy rates of women, the primary caretakers of children; and teach nutrition to children in school."

And when Costa Rica abolished its military four decades ago, it freed up capital that went not only directly into health care, but also indirectly in the form of sanitation and housing.

Hospitals, of course, don't prevent death. Money diverted to building or improving hospitals and stockpiling high-tech equipment merely reduces the amount of aid that reaches the poor, points out Lawrence Bruce, president of the U.S. Committee for UNICEF (see First Word in *Omni*'s August 1989 issue). Instead, we should institute basic health services; raise the literacy rates of women, who are the primary caretakers of children; and teach nutrition and hygiene to children in schools.

"We also need to recruit people into medicine who are healers and get rid of those who are in it for the money," Alex Romani adds. "Right now, students need top grades to get into medical school, and if they're not rich, they end up deeply in debt by the time they're finished. But healing is a special skill, and the best doctors aren't necessarily the ones who got the best grades in school. We need to identify people who would be good doctors and subsidize their education."—Linda Marsa

GO ASK ALICE

You see it in the headlines.
You hear it every day.
They say they're gonna stop it,
but it doesn't go away. . . .
It's propping up the governments
in Colombia and Peru.
Ask any DEA man.
He says there's nothing we can do,
from the office of the President
*right down to me and you.**

When these words to the song "Smuggler's Blues" were written for television's *Miami Vice,* they were meant to convey the frustration of two undercover cops trying to interdict Colombian cocaine. But the words have nearly become an anthem for a frustrated nation pushing solutions that, for the most part, haven't worked yet never change—from cracking down on dealers and users and creating more educational programs to prevent or stop addiction, to bombing Bolivia, invading Colombia, and sealing the U.S.–Mexican border. Now George Bush wants to build more jail cells.

As drug enforcement agents plug the dikes the tide of drugs continues to rise. In 1987 the U.S. Coast Guard and the Customs Service confiscated approximately 30 tons of cocaine, an increase of more than 2,500 percent since 1981. And that amount, drug enforcement officials believe, is only 10 percent of what actually enters the country each year. Despite the so-called war on drugs, cocaine has become increasingly plentiful. Some drug kingpins are now showing up on *Fortune* magazine's list of the wealthiest people in the world. And drug-producing nations are earning roughly $2.5 billion to $3 billion annually—almost double their drug revenues in 1980.

Until recently cocaine was not a major problem in Europe, where heroin had been the drug of preference. But cocaine use has begun to rise in countries like Switzerland, Spain, Italy, and West Germany, either as a result of drug cartels tapping an undeveloped market or of Europeans following Americans' lead. New York Democratic congressman Charles Rangel, chairman of the House Select Committee on Narcotics Abuse and Control, hopes European governments will learn from our mistakes.

With only 5 percent of the world's population, the United States consumes 50 percent of the planet's drugs (some 600

* *Lyrics from "Smuggler's Blues" by Glenn Frey,*

tons), according to 1987 figures. This translates not only into deaths from overdoses but also more than 300 known drug-related murders in Los Angeles alone in 1988. Last winter a federal drug agent was executed as he sat in his car during a sting operation in New York City. And sixty-one-year-old taxi dispatcher Mildred Greene was slain after she agreed to testify in a New York drug case.

Senior economist Peter Reuter of the Rand Corporation, a California-based think tank, says his research and statistical studies show that the policy of interdiction has failed. He doesn't call for its abandonment, however, because recent studies by the National Institutes of Health indicate that high-school seniors have become more aware of the dangers of cocaine and other illegal substances. "Cocaine usage rose from 1978 through the early 1980's," Reuter says, "but the genuinely good news is that it has declined since 1985."

The bad news: Rand studies portend a continuing decline in the number of affluent cocaine users in the Nineties, leaving the drug's consumption increasingly concentrated among the poor and disadvantaged. While the overall number of users may decrease, the demand will remain constant. One reason is that crack, the highly toxic smokable form of cocaine, is less expensive, but greater quantities are needed to maintain the same high as cocaine that is sniffed or injected. "And if cocaine use becomes concentrated in the underclass," Reuter says, "the whole thing will increasingly feed on itself, with more cocaine-related crimes committed by those seeking the money to buy cocaine."

According to eighteen-year-old Linda Costello, adults are misguided in their belief that young people begin using drugs because of peer pressure. "I don't feel peer pressure and I don't think anyone else does," says Costello, who admits that she's been offered marijuana and other drugs on many occasions. When she simply turned them down, she says, no one tried to change her mind.

The Long Island, New York, teenager began seriously thinking and reading about drug addiction after a close friend "hit rock bottom" with his drug abuse. Eventually Costello became involved in fund-raising for a local drug prevention program. "Young people make a choice to use drugs," Costello says. "They often have to hit bottom before they ever make the decision to stop." And parents must precipitate such a crisis, she adds. "They have to clamp down. And if the children don't respond, parents must simply shut the door on them, though that is a hard thing to do."

While some parents must battle the drug problem at their own doorsteps, Congressman Rangel believes the war on drugs must be depoliticized. Attitudes stemming from the Cold War and four decades of confrontation and preoccupation with Communism have diverted attention from drugs, which claim more American lives than any conspiracy hatched in Moscow, he says.

Despite the glut of illegal drugs from abroad, Rangel points out angrily, "the State Department never mentions the subject, much less addresses it, because, in my opinion, we have been afraid of jeopardizing other supposedly more important purposes of foreign policy. In the official view of the United States, another country can do *anything,* including trafficking in drugs, as long as its government is anticommunist."

Western Hemisphere leaders, including Fidel Castro, must hold a summit meeting to map out a strategy for waging a real war on drugs, Rangel says. In fact, during a meeting with the Harlem congressman last December Castro pledged his cooperation in the battle against narcotics trafficking, but the State Department has been a stumbling block. In talks on drugs, it wants to bring up other, nonrelated issues, like Cuban armed forces in Nicaragua, that have nothing to do with drugs, Rangel says.

According to psychopharmacologist Ronald Siegel of the University of California at Los Angeles, however, the major obstacle to resolving the drug problem has been the belief that using drugs is unhealthy as well as immoral. Intoxication, Siegel asserts, is "the fourth drive," ranking right after hunger, thirst, and sex—sometimes overshadowing all three—and has been part of the human condition since at least the beginning of recorded history. "Trying to prevent drug use by outlawing it is like trying to treat AIDS by outlawing sex," says the author of *Intoxication: Life in Pursuit of Artificial Paradise* (E.P. Dutton). "Winning the war on drugs by eradicating nonmedical drug use is neither possible nor desirable."

The solution to the drug problem, Siegel believes, is to produce *safe* drugs. "The difference between a medicine and a poison is one of dosage," he says. The coca leaf, used by South American Indians as both a medicine and a stimulant, is extracted to produce the powdery cocaine residue, turning a medicine into a poison. If cigarettes were similarly processed, rather than using the whole tobacco leaf, the white nicotine alkaloid residue would be "instantaneously lethal" when ingested, Siegel says.

According to Siegel, the pharmaceutical industry already spends billions of dollars every year for the research and development of wonder drugs that maximize desired effects and benefits and minimize the risks and dangers. Indeed, he says, chemists have already designed drugs that enhance sensation. One example is 2C-B, which appears to enhance all the senses without distortion.

"I didn't have the heart to break them up!"

Future molecular architects, Siegel adds, may someday be able to mix and match the desirable properties to create a perfectly safe combination.

"This is not a moral surrender in the war on drugs," Siegel says. "The development of safe, man-made intoxicants is an affirmation of one of our most human drives and a challenge for our finest talents." He admits, however, that this is not likely to occur until drugs are depoliticized.—John Cummings

TROUBLED WATER

Picture a landscape dotted with streams and lakes so fetid that no species can survive a swim in them. Drinkable water pours only from plastic bottles. The surgeon general warns that bathing more than once a week in such fluids could be hazardous to your health.

Fifteen-year-old Waseem Ahktar's vision of American life in the year 2000 is pessimistic, which he readily admits. "Maybe these kinds of things will have to happen before people get really concerned about water pollution," the New Jersey high-school sophomore says. What's really frightening, though, is that Waseem's vision could become a reality.

When planet Earth was born, about a million cubic miles of usable fresh water existed—the same amount our world carries today. While fresh water coffers have remained at Year One levels, however, the earth's population, and thus its demand for H_2O, has skyrocketed. In this century alone, the number of people on our planet has increased fivefold, and our water consumption has risen in tandem. Scientists are predicting that the planet's population will triple again within 50 years, which is why we must uncover new freshwater sources to quench the world's growing thirst.

Making matters worse is the way we've taken to treating this most precious natural resource. It has become increasingly difficult to keep our fresh-water supplies free of dangerous contaminants. In developing nations the greatest fouler of fresh water is sewage. The waterborne diseases spawned by "biological" pollution cause a staggering 80 percent of all child deaths in the Third World. "The poorer the nation," says Mohamed El-Ashry, vice-president of the World Resources Institute in Washington, DC, "the more likely the water will be contaminated by human waste."

Most of us assume that it's rural folk in developing nations who live without benefit of water-treatment plants and sewage systems. But in many of these countries, city sanitation systems can't cope with soaring populations. Cairo's sewage floods the streets. The Jamuna River, which passes by New Delhi, India, picks up 50 million gallons of untreated wastewater every day and delivers this sludgy stuff to the unfortunates living downriver.

Because sanitation systems are more sophisticated in the West, water polluted by waste is less of a health issue. In the United States much has been done in the last two decades to protect us against biological pollution. Billions of dollars have been provided since the 1972 Clean Water Act to build better sewage-treatment plants and upgrade water-treatment facilities. In June 1989 the Environmental Protection Agency (EPA) required many of the nation's waterworks to either improve or install filtration systems to destroy the microbes known to cause such waterborne maladies as hepatitis A and Legionnaire's disease.

We have put an enormous amount of money into cleansing our water of biological impurities. At the same time, however, we have allowed much of our water supply to become tainted by a growing number of toxic chemicals. To date, more than 700 chemicals have been detected in U.S. drinking water, 129 of which the EPA calls dangerous. These include a hash of poisonous industrial solvents and metals spewed illegally into waterways and waste-treatment facilities by manufacturers. Consider the EPA's latest survey, which revealed that 627 industrial plants and 12 federal installations dumped toxic substances into the nation's waters this year. One was the Rocky Flats nuclear-weapons plant in Colorado (dubbed the most environmentally hazardous site in the nuclear weapons industry by the Department of Energy). Rocky Flats allegedly perpetrated a potentially lethal crime. It is accused of having discharged hazardous chemicals into creeks leading right to Denver's drinking-water supplies. Residents are outraged at the possibility that they might have drunk water containing radioactive contaminants.

"Trying to prevent drug use by outlawing it is like trying to treat AIDS by outlawing sex. One solution: Make safe drugs like 2C-B, which appears to enhance the senses without distortion."

And a 1987 survey showed that industry released 9.7 billion pounds of toxics into streams and rivers. In fact the EPA says there is chemically polluted surface water in 49 of our 50 states. And it gets worse. Our underground water reserves (known as groundwater), which provide 60 percent of the American population with drinking water, have become contaminated in recent years by seepage from underground chemical-storage tanks and toxic leakage from landfills.

Lest you think your local waterworks will simply filter out these hazardous chemicals, let us enlighten you: No all-purpose chemical cleanser is being employed today. The dirty truth is, our water-treatment plants simply aren't equipped to test and filter these toxics from our drinking water. "No one ever envisaged that our water-treatment plants would be required to clean these kinds of toxic chemicals out of our drinking water," says Ellen Silbergeld, a scientist for the Environmental Defense Fund in Washington, DC. "And the fact is, they don't." The result? All that arsenic, barium, cadmium, mercury, and a host of other pollutants are responsible for health problems ranging from stomach disorders and insomnia to liver and kidney dysfunction, cancer, and birth defects.

There's one more kind of water pollution—lead contamination—that may actually occur in the pipes stretching from water-treatment centers to our homes. Studies reveal that almost one in five Americans drinks water that's full of lead (50 parts per billion). According to the National Academy of Sciences (NAS), that much lead in the water is none too healthy for adults, but it's far more dangerous for children. The symptoms of lead poisoning in adults are pretty unpleasant: anemia, constipation, headaches. But for children nine or younger the effects of drinking lead-rich water can be devastating. The NAS claims that every year some 200,000 American children who drink heavily leaded water experience a loss of brain function equivalent to five IQ points. What's more, the NAS estimates that each year 640,000 fetuses suffer some neurological damage when pregnant women swallow leaded water. In spite of these figures no lead regulations have been set as yet by Congress.

Representative Henry Waxman (D-California) is currently preparing a bill to control the amount of lead in our drinking water. "Lead contamination of drinking water supplies is an extremely pervasive threat to the nation's health, affecting forty-two million Americans, according to the EPA," Waxman says. He and his staff hope to force the EPA to reduce lead levels in water to 10 parts per billion or less.

Environmentalists believe we must set toxic limits for every suspected pollutant and then test water regularly and carefully. Currently, the EPA has regulated only 40 of the hundreds of chemicals known to be contaminating our water.

All of this regulating takes time, which means we must continue to live in fear of what's pouring from our faucets—or switch to drinking bottled water. Silbergeld insists that we shouldn't condone the EPA's turtle-slow approach to regulation. Nor should we allow their "end-of-the-pipe

mentality," she says. "I don't think we should be investing more public money in designing sophisticated treatment plants to remove each of these chemicals. We've got to get rid of pollution at its source."

Senator David Durenberger (R-Minnesota), a leading member of the Senate Environment and Public Works Committee, agrees with Silbergeld, especially when it comes to groundwater pollution. "I think what we need is a national program to prevent the contamination of groundwater supplies," he says. "This law would focus on the principal activities that threaten groundwater quality, like pesticide applications, but also landfills and sewer impoundments and abandoned oil and gas wells. It would require that owners of these facilities take whatever measures are necessary to prevent groundwater contamination." El-Ashry believes the answer to water-pollution woes may be to make industrial waste recycling a more attractive alternative to dumping. "The key to pollution prevention is to recycle all that chemical waste and use it to create more energy. A few American companies—such as 3M Corporation—have already successfully employed a waste-recycling system. In such a closed-loop system, waste isn't simply dumped into a nearby stream or underground well. Instead, chemical waste water is separated and the different chemical compounds are returned to their original form. In this way the chemicals can be used to create new products.

"Designing these new technologies is the only solution for the future," El-Ashry adds. "People aren't going to want to alter their life-styles to reduce waste, so we must be more creative and innovative in the way we handle that waste."

At his most cynical, Waseem Ahktar agrees that it's tough for Americans to change their comfortable living habits. But he also believes that when we truly comprehend the depth of our water troubles, we will be eager to take part in the cleanup. "I know that my friends and I will try to use only environmentally safe products, like replacing cleansers, pesticides, and fertilizers so that we at least won't contribute to water pollution. After all, I don't want my kids to have to worry about this threat the way we have to today."—Ellen Kunes

BUNGLE IN THE JUNGLE

In a humid, densely forested region of the Amazon basin 80 miles north of Manaus, Brazil, scientists work to understand the intricate structure of the tropical rain forest. Cloaked in rain gear and weary from long and tedious hours, they document the changes occurring in the section of forest after the surrounding jungle has been cut and burned to clear the land for agriculture and cattle ranching. The vast expanse of forested Amazonia—approximately 6 million square kilometers—is in danger of extinction.

In Germany the Black Forest is disappearing, dying from the poisons of acid rain. In the United States the timber industry cuts irreplaceable stands of old-growth forest (trees at least 200 years old) from northern California to Washington State at an alarming rate. In some parts of Asia the earth has literally been stripped bare to supply firewood for booming populations. And in recent months dangerously high levels of ozone and acid rain have been discovered for the first time in Central Africa.

These dramatic and sudden losses are not going unnoticed, however. All over the world, government officials, scientists and concerned individuals are demanding change and implementing strategies to protect and replant forests. Due to lack of forest cover, massive flooding has occurred in India, prompting Prime Minister Rajiv Gandhi to declare reforestation a priority in his current development agenda. With the help of the U.S. Agency for International Development, 35 million trees were recently planted across the scorched and barren plains of Haiti. And in the United States environmental organizations purchase foreign debt in exchange for conservation programs—debt-for-nature swaps.

Congressman Bruce Vento (D-Minnesota), who chairs the House Subcommittee on National Parks and Public Lands, is trying to pass legislation to protect the remaining forests in Alaska and the Pacific Northwest as well as the tropical forests of Latin America and the Caribbean. "We need to find ways to protect the forest and, at the same time, support the economy of the region," Vento says.

A tropical rain forest receives 100 inches of rain each year (the eastern United States normally gets 60); light is scarce or diffused; humidity is high; temperatures are constant. If a rain forest is left undisturbed, every tree supports the next tree, every species depends on every other species. Trees depend on birds and animals to disperse their seeds. Otherwise trees do not reproduce and the forest eventually dies out. Such a highly sensitive balance makes the rain forest very vulnerable to even slight change. When a section of the forest is cut or burned, the remaining forest is exposed to elements from which it should be protected.

"A decade ago," says Thomas Lovejoy, assistant secretary for external affairs at the Smithsonian Institution, "no scientific data existed to determine how big a rain forest should be to preserve its health and natural balance." In 1979 Lovejoy decided to find out the minimum size a rain forest needed to sustain its trees, insects, birds, mammals, and plants. It has now been calculated that as much as 300,000 hectares, or almost three quar-

ters of a million acres, must be preserved to protect the entire ecosystem of a forest. In any section smaller than this, species begin to disappear.

Lovejoy also introduced debt-for-nature swaps. Third World countries bogged down with foreign debts—the total Third World debt is $3.2 trillion—usually slash money allocated for natural resources. Lovejoy proposed to buy the debts in exchange for conservation programs. "The World Wildlife Fund supplies technical assistance and grants to help protect undisturbed natural areas in these countries anyway," says Kathryn Fuller, president of the World Wildlife Fund and the Conservation Foundation. "Debt-for-nature swaps help make the conservation dollars go further."

Swaps ranging from $1 million to $75 million have been negotiated in Ecuador, Costa Rica, the Philippines, and Bolivia by the World Wildlife Fund, the Nature Conservancy, and Conservation International. Other debt exchanges are expected to occur in Africa, Eastern Europe, and Asia. Debt is bought for as little as ten cents on the dollar, or $1 million of debt for $100,000. In exchange a fund is set up to finance protection and management programs that support conservation. Debt-for-nature swaps are, however, still frowned upon by some nations. Brazil's president, José Sarney, believes the exchanges pave the way for the West to control policy in less fortunate countries. Even though Brazil's foreign debt is $120 billion, Sarney rejects the swaps. "It's a vocal minority," says Rob Bierregaard, a senior scientist for the World Wildlife Fund. "Most people in Brazil realize that these swaps are not an international plot to take over the Amazon."

What the United States demands of Latin American and other Third World countries—preservation of the rain forests—it does not demand of itself. Ironically, our own government is destroying the rain forest in Alaska. "We are saying, Do as we say, not as we do," says Congressman Vento. The Tongass National Forest, the only remaining rain forest in North America, stretches along the panhandle of southeastern Alaska. Extending over 16.8 million acres, the Tongass is a beautiful, pristine wilderness surrounded by spectacular mountain landscapes. Giant Sitka spruces and Western hemlocks stand proudly, as they have for many centuries. Home to Sitka blacktailed deer and the world's largest population of bald eagles and grizzlies (notably, the Alaskan brown bear), the Tongass is a unique natural wonder.

After World War II the U.S. Forest Service offered two companies, Ketchikan Pulp Company and Alaska Pulp Corporation, 50-year contracts and cheap lumber prices to harvest the Tongass. Japan bought the bulk of the trees' pulp product. Sixty percent of the pulp was used to make rayon and cellophane. In 1980 the Alaska National Interest Lands Conservation Act (ANILCA) was passed, making 4.5 billion board feet of timber available for cutting in the Tongass each decade. ANILCA also provided $40 million a year, "or whatever sums are necessary," to build roads and take other steps to make timber available.

Today the demand for Alaskan lumber has declined because rayon and cellophane are produced synthetically. Since 1981 the Forest Service has lost approximately $50 million a year, or 98 cents on each dollar. Given those losses the huge, old-growth trees—six to eight feet in diameter and 175 feet tall—are worth $2 apiece. Even though the demand for Alaskan timber has dropped, "the agency continues to build roads through pristine stands of forest to make timber accessible that nobody wants," says Vento. "We needlessly destroy irreplaceable forest." Many of the roads are never used. Advocates of the program, however, claim road building is essential to the economy: It creates jobs.

"Sixth, seventh, and eighth graders collect rainwater from the playground, test the precipitation for acidity, and call in the results to the Audubon Society's offices."

Both Republican senators from Alaska, Ted Stevens and Frank Murkowski, as well as Republican representative Don Young, support ANILCA. They insist the lumber industry in the Tongass supports the local economy. Cutting trees, however, doesn't support an economy based on fishing and recreation. And as the forest is logged, fishing and recreation are affected. The streams, no longer protected by vegetation, are contaminated by surface runoff. And recreational areas are being destroyed.

Some congressmen are out to kill the ANILCA subsidy. The Tongass Timber Reform Act, recently introduced in the House by Representative Bob Mrazek (D-New York), calls for termination of the 50-year contracts with the logging companies and proposes to set aside 23 areas in the Tongass as wilderness, as well as cancel the automatic $40 million funding. As of last April 22, 122 congressmen had cosigned the bill. The Tongass Timber Reform Act and a similar bill introduced in the Senate are slated to reach President Bush's desk later this year.

Congress also faces proposals to curb sulfur dioxide (SO_2) and nitrogen oxide (NO_x), sources of acid rain. In April a bill was introduced to the House calling for the reduction of sulfur dioxide emissions by 10 million tons per year and nitrogen oxide by 4 million tons per year by 1998. (President Bush recently proposed to reduce SO_2 by 10 million tons and NO_x by 2 million tons.) Emissions of these gases would be cut by one third. Sulfur dioxide emitted from coal-burning power plants and nitrogen oxide fumes from a variety of sources, including automobile exhaust, combine with water to form sulfuric and nitric acid in the atmosphere. Acid rain and snow damage forest cover, weakening trees' ability to sustain normal bouts of drought, insect infestation, or disease. Acid rain also disrupts the acidic balance of lakes and rivers and reduces fish populations.

Concerned about the effects of acid rain, the National Audubon Society set up the Acid Rain Monitoring Network in 1987. Three hundred monitoring stations measure acid precipitation throughout the nation. The network has centers in all 50 states. (The Environmental Protection Agency also monitors acidity in the rainfall nationwide. Because the agency does a complete chemical analysis, however, it takes two to three years before the results are known.)

Audubon, on the other hand, releases its data every month to Congress and local news organizations, keeping people aware of acid rain's continuing effects in their own backyard. Audubon Society members, families, and school groups run the acid rain test sites. At the Poughkeepsie Day School in New York, for instance, sixth, seventh, and eighth graders collect rainwater from the playground each month, test the precipitation for acidity with litmus paper, and call in the results to an answering machine at Audubon's headquarters in New York City.

Startled by a video on acid rain shown in class, Jason Berry, an eighth grader, said, "The trees were turning yellow and the needles were falling off the branches." Cami Townsend, another eighth grader, said she didn't know about acid rain before her school got involved in the network. "My parents didn't know any more than I did, but since my class started testing rain, my parents are more aware of it." And Nicky Rudikoff, a sixth grader at Poughkeepsie, said, "We need to improve education so the next generation learns how to handle acid rain better than people do today."—Cathy Spencer

WAR . . . HHUUUUH . . .
WHAT IS IT GOOD FOR?

With a world arsenal of more than 50,000 nuclear weapons holding the future hostage, nations continue to endorse war as a foreign-policy tool. They view the development and sale of weap-

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ons as healthy for the economy. They premise defense and national security programs on the idea that nuclear war can be fought and won.

When Soviet president Mikhail S. Gorbachev and former U.S. president Ronald Reagan signed the Intermediate Range Nuclear Forces (INF) Treaty in December of 1987, it signaled to the rest of the world an effort toward peaceful coexistence between the superpowers. Yet during the six months between the leaders' agreement and Congress's ratification of the treaty, both the United States and the Soviet Union built more nuclear weapons than will be destroyed in the three years stipulated in the document. Within the next decade, moreover, 60 countries—including Libya, India, Pakistan, and South Africa—will have the technological know-how to build nuclear weapons. And with the odds of nuclear war steadily increasing, the survival of humanity—indeed, the whole planet—is at stake.

If nuclear war broke out between the United States and the USSR, it would result in the immediate deaths of hundreds of millions of people. Radioactive fallout would eventually kill many more. Scientists predict the ozone layer would be completely destroyed, allowing the onslaught of the sun's deadly ultraviolet rays. In the worst-case scenario the sun's light would be blocked by radioactive clouds, creating a "nuclear winter" that would destroy *all* life on the planet.

But nuclear holocaust wouldn't necessarily begin with an actual declaration of war. An "error" could produce the same effect. In 1979, for example, a faulty computer chip in the North American early warning system "detected" a massive Soviet nuclear attack. In August of 1984 Soviet Pacific fleet headquarters flashed an alert to ships at sea, ordering them to prepare to engage U.S. forces in combat. Both were false alarms.

Missiles equipped with computer guidance systems that launch on warning can reach their destinations in minutes—intercontinental missiles in less than 30, submarine missiles in less than 10, according to Frank von Hippel, professor of public and international affairs at Princeton University and chairman of the research arm of the Federation of American Scientists. "The elimination of launch-on-warning systems is a first step in reducing the potential for nuclear war," Von Hippel says. "I would also eliminate nuclear weapons designed to attack each other, weapons that justify launch on warning. Such measures would remove the hair trigger on the doomsday machine and then we can shrink the arsenal by ninety percent."

The United States and the Soviet Union must agree to stop supplying weapons to the Third World, Von Hippel adds. "A more cooperative approach between them may be able to throttle back the tremendous flow of conventional weaponry to the Middle East, for example." In the long run, that would be in the interests of Middle Eastern countries as well as the rest of the world.

"Interestingly," says the University of Pittsburgh's Thomas Saaty, a professor of decision theory who worked in the U.S. Arms Control and Disarmament Agency, "ever since the beginning of civilization, prophecies have predicted that a major war would be sparked in that part of the world. And our destiny, at least for now, is tied to the Middle East. That is why we must concern ourselves with what is going on there. And we need to understand their religions in order to understand the way they think."

It seems obvious that a buildup of arms does little to ensure a strong defense when the motivations of entire nations remain unclear. The Pentagon, however, has seduced every president, with the exception of Eisenhower, into believing that national security and strength are based on the magnitude and character

of military hardware. Eisenhower, a career military man, launched the interstate highway system and initiated education programs with the idea that a country's infrastructure is vital to any total defense. "He believed that health, housing, and a strong economy are also fundamental to a strong national security program and that our arsenal, in and of itself, cannot compensate for our deficiencies in any of these other areas," says Oregon Republican senator Mark Hatfield. "Eisenhower once said that 'every ship launched and every missile fired is a theft from every child who is cold and not clothed, hungry and not fed.' That is where we have failed in our priorities today. America is more concerned about friendly political regimes—even if it means the destruction of a community or a whole country like Vietnam or El Salvador."

In El Salvador and other countries, even in the United States, the infrastructure is the very area that is suffering. "With teachers, health-care workers, farm people—the kind of army that builds and sustains life—the political, economical, and psychological attitudes would be transformed," says Hatfield, the father of the nuclear freeze movement and a cosponsor of the recently reintroduced Senate bill to prevent the development, testing, and deployment of all weapons in space. "Seeing the results, no one would continue investing in something that produces nothing. Instead of terrorism and war, international justice and stability would be enhanced."

Many peace activists, however, believe that to eliminate nuclear weapons, we must eliminate the institution of war. Moving toward a more global form of government would be a first step. But discussions of global reorganization have always been caught between two extremes: at one end, a kind of anarchy in which every country can do more or less what it wants, and at the other, some centralized, powerful world government.

Von Hippel argues for something in between: a specialized, cooperative organization similar, for example, to the International Atomic Energy Agency, which has gotten more than 100 countries to agree not to develop nuclear weapons. Another model of cooperation is the United Nations environmental program, which has been influential in organizing the international ozone convention, a forum where nations work out means of cutting back the production and release of freon and other chemicals that are depleting the stratosphere's ozone.

"During the INF treaty negotiations, Reagan told Gorbachev that it would be easy for us to agree if the Martians landed," Von Hippel says. "But the Martians are already here—not in the form of little green men from the red planet but in the state of the environment, the economy, education, and health issues. These moral equivalents of war can, in fact, substitute for war."

Indeed, in the words of thirteen-year-old actor Lukas Haas (*Witness, The Ryan White Story*), "If we keep on making these things that are destroying the world, if we keep on testing nuclear missiles and smogging up the place, we'll never be able to return the world to the way it was."

Active in the peace movement since his appearance in *Testament,* a 1983 film about post-nuclear-war life, Haas has addressed audiences at schools and other gatherings to voice his views on nuclear war. "I think about war all the time, and I think it's a pretty crazy idea," he says. "It's like my dad coming home and wrecking the place and then telling me to clean it up. I try to convince people that we are the ones who will have to deal with it. If countries keep trying, they can work things out. And if they can't, their presidents should get into a boxing match or something because we had nothing to do with it. We don't vote on whether we should go to war, and we haven't done anything to be blasted from the sky.

"I'm not scared for my own well-being," Haas continues. "I don't care if I die or not; I'm scared about humanity dying."

—A.J.S. Rayl