

PLAYBOY INTERVIEW: **DR. PAUL EHRLICH***a candid conversation with the outspoken population biologist and prophet of environmental apocalypse*

In the three years since biologist Paul Ehrlich wrote "The Population Bomb"—a chilling scenario of the world's fate if people and their principal by-product, pollution, continue to multiply unchecked—the book has sold 1,250,000 copies and its author has become the chief spokesman for what promises to become the most important campaign of the Seventies: the crusade to save the environment. Ehrlich is very much in demand; clubs, colleges, magazines and networks find his message of ecological doom so compelling that he can't possibly answer every summons: "I get around two dozen requests a day and I'm booked solid for the next year."

Despite the scientific nature of what he has to say, Ehrlich has become controversial: one San Francisco columnist, Charles McCabe, called him "the Cassandra of contraception" and "in his own way . . . more dangerous than Hitler." Ehrlich endures this kind of irrational vituperation because he thinks the situation is desperate. "Some of my colleagues think it's too late, that we've already done too many irreparable things, given birth to too many people. They've given up. I think we may have some time, not much, but enough to turn things around and save ourselves, if we start now. That's why I'm doing all this traveling and speechmaking. Not because I like it but because I want my daughter to enjoy a full life, and I'd like to live another few years myself."

Ehrlich came naturally to biology. As a child in Philadelphia, he was fascinated

by butterflies (he wrote a book on the subject in 1961) and pursued his interest with a biology degree from the University of Pennsylvania in 1953 and an M. A. and a Ph. D. from the University of Kansas. After a short stint at the Chicago Academy of Sciences, he joined the faculty of Stanford University, where he served for three years as director of graduate study for the department of biological sciences. Currently a full professor of biology, Ehrlich considers himself a scientist and researcher by profession and a missionary for the ecology movement only by reluctant choice. A rare combination of natural eloquence and articulate expertise in population biology—the study of how species naturally control their growth and size—made him from the beginning of his teaching career one of those special professors who both trouble and inspire students. During one recent semester, he and associate Dr. Richard W. Holm taught an undergraduate course that drew over 700 interested students—an indication that Ehrlich has no trouble meeting the current student demand for relevance in the classroom. In fact, some of his pupils were the first to carry his message beyond the confines of academe. As a result, Ehrlich found himself making presentations and being interviewed frequently around the San Francisco Bay area.

On one of those occasions, he so impressed David Brower—then head of the most prestigious American conservation organization, the Sierra Club—that the

two made arrangements for a book by Ehrlich to be published by Ballantine as part of a Sierra Club series. Ehrlich worked every night for three weeks and produced "The Population Bomb," an effort that has been consuming almost all of his waking hours ever since. "One thing I didn't know about writing a book is how much people are willing to listen to you talk about it. In my case, that's a very helpful phenomenon. Through interviews, talk-show appearances and that sort of thing, I've been able to get through to thousands of people who will never read my book, nor any other, for that matter. I'm told that my two appearances on the Johnny Carson show generated some of the heaviest viewer response in the program's history. So I must be reaching people."

Ehrlich reaches people because, unlike many scientists, he feels no trepidation about leaving the laboratory and entering the political arena. He is president of a group called Zero Population Growth that is dedicated to stopping population growth and environmental deterioration in this country through political action. In every speech, he attacks the national leadership for its ecological ignorance and irresponsibility, sometimes calling the President and other Government officials, simply, "boobs." Because audiences, particularly the young, respond enthusiastically to this kind of blunt talk, Ehrlich is a coveted speaker at college and university programs aimed at mobilizing environmental activism.

Although Ehrlich takes seriously his



"The water in some rivers is becoming too polluted to purify, and evidence is accumulating that DDT in our fatty tissues has reached levels high enough to cause brain damage and cirrhosis of the liver."



"Our large population is responsible for air pollution that could lead to massive starvation in the United States within the next two decades—because air pollution changes the weather of the planet."



"No action has been taken to save the environment. And the things the Administration is talking about doing—emission standards for automobiles and so forth—are like giving aspirin to a cancer victim."

self-assigned role as propagandist, he regrets the damage it's done to his private life. He has had to defer work on two basic biology texts that emphasize ecological considerations—projects he has been laboring over for several years and feels strongly about. "Ecology has been largely ignored in biology teaching over the past few decades, but it's certainly the area of biology that should be emphasized today." He has also given up his most valued form of recreation—piloting his own small airplane. When he finds himself aloft now, it's generally in a commercial airliner, on his way to another talk alerting people to the perils facing the sky above and the earth below. But all this relentless crusading has cut most deeply into the time he can spend with his wife, Anne (who co-authored his recent effort, "Population, Resources and Environment"), and his only child, a 14-year-old daughter (he often makes the point that "population control starts at home" by telling audiences that he is married, has one child and has had a vasectomy—a form of sterilization for males).

His tight schedule was an obstacle even for PLAYBOY when we approached him with our request for an interview. Leisurely taping sessions with Ehrlich in his home or office simply weren't possible, so we had to intercept him on the road and squeeze in whatever questioning his time allowed. One such meeting occurred on April 23—the day after Earth Day, an event hailed by many commentators and Government officials as the signal of a new era of ecological awareness. With the unfortunate exception of a police-student clash in Boston, demonstrations had been peaceful; attendance in most cities was large; sponsors and supporters of the event—which found ecologists, including Ehrlich, speaking all over the country—were encouraged. By all accounts, every ecologist could have afforded to take the next day off. Ehrlich, however, was up early and off to the University of Toledo for another speech. Over coffee, he told us that it was part of a tour that would have him crisscrossing the continent, losing sleep and missing meals for the following three weeks.

We attended his speech at Toledo and watched Ehrlich establish rapport with the students as very few 37-year-old men can. He clearly enjoys the familiarity of academic surroundings and the irreverent wit of scholars, one of whom introduced him, saying, "Dr. Ehrlich has said that 20th Century man is engaged in a rape of mother nature; now, I don't have to tell you what, in the current parlance, that makes us." As Ehrlich began his speech, citing various horripilating statistics to buttress his theme of runaway world-wide overpopulation, he was repeatedly distracted by someone's

clapping. Looking up, he identified the culprit as an exuberant infant, pointed and said, "There's the problem." Alternating this way between grim statistics and gallows humor, he held his audience in rapt attention for almost an hour.

After a brief question-and-answer session, Ehrlich lingered long enough to talk with the students who crowded around him to ask questions or tell him of their efforts in behalf of Zero Population Growth and similar organizations. Then he returned to his hotel for a rushed meal and a hasty departure for the airport. His timing was off and he had almost an hour to wait before his plane departed. We took advantage of this unexpected interlude, found comfortable chairs next to a window overlooking the main runway and began taping. The seductive springtime afternoon made Ehrlich's vision seem remote, indeed, so we began the interview by asking him to explain his prophecy of apocalypse.

PLAYBOY: Why do you say the death of the world is imminent?

EHRlich: Because the human population of the planet is about five times too large, and we're managing to support all these people—at today's level of misery—only by spending our capital, burning our fossil fuels, dispersing our mineral resources and turning our fresh water into salt water. We have not only overpopulated but overstretched our environment. We are poisoning the ecological systems of the earth—systems upon which we are ultimately dependent for all of our food, for all of our oxygen and for all of our waste disposal. These very complex ecosystems are made up of many different kinds of organisms; we're killing off those organisms and simplifying the systems. The stability of ecosystems is dependent on their complexity; if they become simple, they become unstable. Suppose, by analogy, that our lives depended on the functioning of a very complex computer. If transistors were being removed from that computer at random, we would have reason to be concerned. In the same way, every time we turn over more land to one-crop farming, every time we eliminate a species, as we are doing with the California condor, the peregrine falcon and the brown pelican, we reduce the complexity of the systems upon which our very existence depends.

In a balanced ecological system, the effects of sudden fluctuations in the population of one species are canceled out by the actions of other species. Should one natural predator of a pest fall prey to a new disease, the complexity of the system ensures that other predators will keep the pest population in check while the diseased species builds new immuni-

ties. What man does is counter to this natural process and, in the long run, to his own best interests. When we use synthetic pesticides to increase crop yields, we reduce the population of the pests' natural enemies, because most of these chemicals are toxic to both the pests and their predators. Once we eliminate the natural controls, we have to use even more pesticides. The insects build up immunities and become resistant to the pesticides, while their predators may very well be wiped out. So by spraying miracle crops, we simplify the system to the point where we have not only miracle crops but miracle pests, and the only way we can keep on is to use more chemicals that slowly poison us.

If we do something to an ecological system in one place, the whole system is affected. We must learn to look at the whole world and the people in it as a single interlocked system. It's impossible to do something somewhere that has no effect anywhere else. There are a number of ecological rules it would be wise for people to remember. One of them is that there is no such thing as a free lunch. Another is that when we change something into something else, the new thing is usually more dangerous than what we had originally. We can't affect one part without affecting another. People must learn those laws of dependencies and interrelationships. One of the greatest defects of our Government is its failure to educate people about the interconnections among population, pollution, environmental deterioration, war and resource depletion.

PLAYBOY: Which of these is the most critical threat?

EHRlich: The basic problem is too many people, and nothing else can be solved unless we solve that problem. Though overpopulation is the fundamental threat to survival, the most immediate manifestations of the problem are poisonings of ecological systems and the threats of world-wide plague, weather change and thermonuclear war. Take your choice.

PLAYBOY: How does overpopulation increase the likelihood of nuclear war?

EHRlich: We have limited resources on the planet. At projected rates of consumption, we will exhaust many of the important ones before the year 2050. When resources are limited, the per-capita share will decrease as the population grows. There will be greater and greater competition for these resources, and competition for resources is one of the major causes of war. Friction among nations is also likely to increase as countries realize that other countries are destroying their environment. There are now arguments about environmental problems in one country caused by activities in another, by pollution from one country invading its neighbor. That's something that pushes

us toward war. And even without a thermonuclear war, other major disasters aren't out of the question.

PLAYBOY: Such as?

EHRlich: Our large polluting population is responsible for air pollution that could very easily lead to massive starvation in the United States within the next two decades, perhaps within the next five years, because air pollution changes the weather of the planet. A rapid change in our weather would result in drastically decreased food production, and we have less than a year's reserve of food at the moment for this country alone.

We're also dangerously ready for a world-wide plague, particularly since we have jet transports that can take diseased people rapidly from continent to continent. In 1967, we just missed a plague with the Marburgvirus, never before seen in mankind, which was transferred from monkeys to human beings in a laboratory in Marburg, Germany, and in a laboratory in Yugoslavia. Thirty people caught this extraordinarily contagious and lethal disease. Seven died, in spite of the fact that they were well fed and had excellent medical care. If that disease had spread through the world, we could have lost two billion people, because most people in the world are not well fed and don't have any kind of medical care. To show how close we came, the monkeys carrying the disease were at London's airport for two weeks before they went to Marburg. If the disease had been caught by human beings there, we might have exterminated most of our species.

Biological-warfare labs are another monstrous threat to the survival of man, because there is no such thing as an accident-free virus laboratory. There are accidents, lots of them. It's quite possible to build an organism that would run through mankind, killing virtually everyone, because of a lack of resistance in the human population. The medical profession, in its concern with the diseases of middle age, simply isn't prepared for the possibility—or perhaps I should say the eventual certainty—of such a world-wide plague. Many medical practitioners wrongly feel that vast epidemic diseases are no longer a problem, so the medical profession and the Government aren't prepared for that contingency.

PLAYBOY: Isn't the public becoming aware of these problems and aren't we beginning to move toward remedies?

EHRlich: We're hearing a lot of talk now, but that's one of the problems. Politicians are talking about ecology and most of them don't have the vaguest idea of what it's all about. Even many of those involved in ecology don't really have the facts. But the main hang-up at the moment isn't just that people are lacking a tremendous amount of talking about ecology; it's that no

action has been taken—no action whatsoever—on either the population or the environmental front. The things the Administration is talking about doing to help the environment—emission standards for automobiles and so forth—are like giving aspirin to a cancer victim.

PLAYBOY: But hasn't all the rhetoric begun to spur research into possible technological remedies that may make ecological disaster much less likely?

EHRlich: Man's technology hasn't eliminated all of the natural controls on his population, but it has artificially expanded, at least temporarily, the carrying capacity of the planet. Let me give you an analogy. Suppose we put gelatin nutrient, banana and a pair of fruit flies into a bottle. The fruit flies breed, their offspring breed and the population builds up. Eventually, the population becomes so large that the excreta of the flies fouls the medium and the food supply diminishes to a critical level. The fly population dies off or dies back to a lower level. By increasing the size of the bottle or putting more food into it, we haven't removed any natural controls; we have only temporarily increased the carrying capacity of the environment. Eventually, the flies will again overshoot the carrying capacity of the bottle and die. Man's technology has temporarily expanded the carrying capacity of the earth, but increasing that capacity without population control only guarantees that a larger number of people will die in misery than would have died if we hadn't increased the carrying capacity.

You have to understand the sheer numbers of the problem and the rate of acceleration of population growth. It took about 10,000 years for world population to grow from 5,000,000 to 500,000,000 in 1650 A.D., so population was doubling approximately every 1000 or 1500 years. World population reached one billion in 1850; the doubling time had been reduced to 200 years. Two billion was reached by 1930; that's a doubling in 80 years. We've almost completed the next doubling, only 40 years later. We're adding 70,000,000 people to the world every year. This means that we have a new United States—in population and all that implies in terms of environmental stresses—every three years. Let me put it another way. In all of the wars fought by the United States, we have suffered around 600,000 combat deaths. World population makes up that amount in about half a week. If current growth could continue, in 900 years there would be about 100 people per square yard of the earth's surface. Needless to say, population growth will come to a screeching and disastrous halt long before then.

PLAYBOY: What is the maximum population the world could support without environmental damage?

EHRlich: It's difficult to determine the

ideal population. There probably is no such static figure, but many scientists think the population of the United States should eventually be reduced to well under 50,000,000 and that of the world to an absolute maximum of 500,000,000.

PLAYBOY: Could family planning cut the birth rate and reduce population to this optimum level?

EHRlich: In general, around the world, the problem isn't unwanted babies but *wanted* babies. This doesn't mean we shouldn't have an all-out campaign to reduce the number of unwanted births, even if they aren't that important, on the whole. Some people estimate that in the United States, a third of the babies are unwanted and that if we can eliminate these births, we will go a long way toward solving our population problem. Perhaps, but it's very difficult to determine how many children people want. They say one thing and perform differently. Certainly, it's important that no woman be compelled to have a child she doesn't want; but as far as the world demographic situation is concerned, we have to change people's attitudes on how many children they *do* want. Despite the fact that family planning has existed in many countries for a long time and in the United States for well over 60 years, we still have rapid population growth. We've tried family planning and we know it doesn't work. That doesn't mean family planning isn't valuable, but more is needed to persuade people not to have too many children.

PLAYBOY: How many is too many?

EHRlich: Any more than two is too many. With a limit of two children per family, the average will move down to somewhere around 1.3 or 1.4, and that's what we need to bring rapid population growth in the United States to a halt before the end of the century.

PLAYBOY: Do you think Government regulations will be necessary to achieve this?

EHRlich: The first thing we should try is a Government propaganda campaign in which the President says, "Starting now, no patriotic American family should have more than two children." And we should start a TV campaign of spot commercials to keep reinforcing the idea that it's better for all concerned—especially the parents—to have families of two children or, if you want more, to adopt them; that it's stupid and irresponsible to have large families. We should also eliminate the notion that there is something strange or barren about a childless-couple.

PLAYBOY: What if simple reason doesn't work and people continue to reproduce at an excessive rate?

EHRlich: If we're going to attack this problem, the Government has to act intelligently, starting with the least coercive measures to remove the pressure, the conditioning, to reproduce. If propaganda doesn't work, the Government could

give *incentives* not to reproduce. If those fail, it could resort to disincentives—such as changes in the tax structure. The thing is that eventually, if we don't manage population control with voluntary means, the Government will have to step in and employ sanctions of some sort. Laws control the number of wives you can have now and, if necessary, they'll control the number of children you can have, too.

PLAYBOY: Wouldn't people resist Government interference with what most consider an inviolable individual freedom?

EHRlich: People aren't sufficiently aware that their freedoms are rapidly disappearing *because* there are more and more people. As population grows, we find that there are more and more restrictive laws on where we can drive, whether we can own a gun, whether we can fly an airplane, where we can throw our garbage, whether we can burn leaves. And as conditions become more crowded, even stricter and more comprehensive Government controls and regulations will be implemented.

PLAYBOY: We've already seen that massive, impersonal—and impersonalizing—Government machinery is required to maintain our large population centers. What are some of the other psychosocial effects of crowding?

EHRlich: I'm doing some research at the moment on the effects of crowding on human beings, and all I can say is that nobody knows what its over-all effects are. There are indications that crowding increases aggression, etc., but there is no way to correlate population density with events and conditions in various areas of the country and to be certain that crowding is the critical factor. In addition to too many people, crowded areas also have a different racial composition, educational level, and so on, from non-crowded areas. But it's interesting to note that per-capita cost of police protection, for example, goes up dramatically as cities grow larger. It costs a lot more to police one city of 1,000,000 than ten cities of 100,000. There are a number of indicators right there. I'm not saying that crowding in itself is causing riots, but nobody with any intelligence says that crowding is unlikely to *contribute* to riots.

PLAYBOY: Some social critics claim that activists such as you are exaggerating the urgency and importance of population problems and accuse you of minimizing and diverting attention from far more critical national problems. A recent *New Republic* article, "The Nonsense Explosion," implied that you are an alarmist and that what you call a population explosion is—in the U.S., at least—merely a population shift away from older rural communities into large urban complexes.

EHRlich: I *am* an alarmist, because I'm

very goddamned alarmed. I believe we're facing the *brink* because of population pressures. I'm certainly not exaggerating the staggering rate of population growth; it's right there in plain, round numbers. Whatever problems I'm diverting attention from will be academic if we don't face the population-environment crisis now. As far as the redistribution of population to the cities is concerned, it would be impossible even for a casual observer in this country to overlook the progressive concentration of people in large, sprawling population centers; it has been documented so thoroughly that it's almost cliché. The problem is that this urban population is still *growing*. But in his last State of the Union Address, the President didn't say we should cut down the size of the population; he said all we have to do is redistribute back from the cities to the towns. That's absolute idiocy. But let's make the simplistic assumption that we're going to redistribute, anyway; in other words, tell every fifth city dweller—in Los Angeles, say—to go somewhere else. Let's also assume they would go. Well, if people go back to their rural home towns, they'll be faced with the same problem that prompted them to leave there in the first place: They couldn't make a living there.

Others suggest that we redistribute to *new* towns. You get two choices if you're going to do that. You can locate these new towns in places where people can live—that is, where there's water, which allows you to have agriculture. But this would aggravate the already serious problem of loss of farmland. In California, for instance, the largest agricultural state in the Union, farmland is being paved so fast that by the year 2020, 50 percent of it will be concrete. And that's the *best* 50 percent, because most of the people settled originally on the prime agricultural land. Since this land is the best 50 percent, agricultural production will decrease during the next 50 years by more than half, and the people on this 50 percent are going to spew their pollutants out over the adjacent unpaved marginal land, thus reducing its already limited productivity. By settling on the best 50 percent of agricultural land and paving it, we are signaling doom for almost all California agriculture.

The other choice is to put people in Nevada or someplace like that. Why aren't more people living in Nevada now? Because there's nothing people can *do* in Nevada; they need water. So if people are going to move there, it will be necessary to desalt and then truck or pipe water in to them—an extremely expensive and ecologically unsound practice. To say that the problem is that we occupy only a certain percentage of America's land surface is to miss the essential point. Secretary of the Interior Hickel

made the observation that when you fly over the United States, you can see that most of it is underpopulated. This kind of nonsense is no more acceptable in the mouth of the Government official most concerned with environmental questions than it is in the pages of a supposedly learned journal. It's a matter of people and *resources*, not of people and square footage. There's plenty of uninhabited square footage on the *moon*.

PLAYBOY: Aren't some nations, such as Japan, with fewer resources and greater population densities than ours, attempting to increase population?

EHRlich: Japan's recent move to increase the birth rate may go down in history as one of the most idiotic moves ever made by a government, although there are many contenders for that honor. Japan already has to import around half of her food and she has to take from the sea roughly one and a half times the protein she is able to grow on land. She's involved in a race with other countries to get the last protein out of the sea. She is soon going to have very grave feeding problems and, with her present population-doubling rate of about 70 years, she will eventually have to turn aggressively toward the mainland. But even without military aggression, highly developed nations such as Japan, Russia and the United States are far more serious ecological threats than the underdeveloped nations in Asia or Latin America.

PLAYBOY: Even though the populations of countries such as India are growing much faster than those of the highly developed nations?

EHRlich: Absolutely. The average white, middle-class baby born in the United States has a future of consumption and pollution ahead of him that cannot be matched by 50 of his counterparts in Calcutta, who will probably not have enough food to survive as long as it will take the American kid to reach his peak consumption years. To keep that American baby in the style this country has decided is necessary, a large quantity of the natural resources of underdeveloped nations will have to be mined and made available to American industry. Most of the time, this exploitation doesn't require legions of occupying troops. We have the technology to extract the resources and use them; the underdeveloped nations don't. So we go in and build our plants or set up our mines, which employ a number of the natives who lived in absolute poverty before industry came along. In return for beefing up the local economy, we get the minerals, some of which may filter back into the economy of the nation that owned them. But as resources become scarcer, the populations of the developed countries grow larger and the governments of the poorer nations turn more nationalistic, competitions and frictions

will develop that may very well lead us to war. The earth is running out of some very critical natural resources; the demand isn't easing, it's increasing; and in many cases, no substitutes are readily available.

PLAYBOY: Are we close to running out of such essential resources as oil and coal?

EHRlich: Very close. It's hard to say exactly how much we have left, but some fairly accurate estimates have been made. We may be nearing the end of the world's oil reserves, if we continue to consume at present rates, within 100 years. Lead, zinc and tin will probably be exhausted by the end of the century. Coal will last between 300 and 400 more years. Copper, 100. Nickel, 200. All these figures are based on the premise that consumption rates won't increase—and there's little likelihood of that. The United States, which numbers around six percent of the world's population, already uses between 30 and 35 percent of the world's resources.

Unless we decide to level off at our present rate of resource consumption, unless other nations are willing to do the same and unless they accept the disparity between their portion of the wealth of the world and ours, we will run out of these critical nonrenewable resources even sooner than these estimates indicate. There may be some relief in the form of nuclear energy, but it can't entirely replace fossil fuels—coal, oil and natural gas—and it's very dangerous. We are facing a serious resource crisis and, as world population continues to grow, it will become more and more severe. Even if we don't go to war over scarce resources, we'll have the problem of how to run our societies when those resources are exhausted.

Incidentally, one nonrenewable resource I didn't mention is water. We may face a water crisis in this country as soon as 1980 because of the heavy demands of industry and agriculture for fresh water. And we seem to be doing our best to make vast amounts of water into something that's been called "too thick to drink and too thin to plow."

PLAYBOY: When you talk about the inability of the world to support the geometric growth of population and the likelihood that resource scarcity will cause war, etc., don't you open yourself to the same criticisms that were leveled at Thomas Malthus after he made the same prophecies 175 years ago? Haven't his predictions—none of which have come true—been discounted by most economists?

EHRlich: Robert Heilbroner, who is a noted economist, reviewed the book I recently co-authored with my wife, *Population/Resources/Environment*, in *The New York Review of Books*. In his review, he said that while Malthus overlooked the possibility of technological advances and was consequently off in his

predictions, we *haven't* discounted that factor at all. In fact, we know almost exactly what technological advances are possible. In the light of these possibilities, and making the most optimistic assumptions, disaster remains the most probable prospect. So Malthus was fundamentally right; he just got the timing wrong. One important difference between the situation in Malthus' time and ours is that self-restraint was the principal means of birth control then; he was justly pessimistic about the efficacy of this method. Though there's little likelihood that we'll make use of them, we have more hopeful alternatives now.

PLAYBOY: Aren't serious objections to some of them, such as the pill, beginning to arise?

EHRlich: The recent propaganda about the pill has caused an unnecessary scare about its side effects. Obviously, there are risks involved, just as there are with any drug; but those risks seem to have been exaggerated. People have panicked; many women have gone off the pill, and unwanted births will result. We could have a much safer pill if it weren't for the politicians who are fighting against abortion reform. With subsidized abortion throughout the country, we could have a pill containing a much smaller dose of hormones but carrying a small risk of pregnancy. Women would doubtless accept this risk if they knew they could go to a doctor's office and have an abortion. There are other risks with today's pill, but for most women, they are relatively small compared with the benefits. They are certainly small compared with the risks of pregnancy. Any woman using the pill, of course, should do so only under the supervision of a doctor.

PLAYBOY: How do you answer the moral and religious objections to abortion?

EHRlich: There *are* no legitimate moral objections to voluntary abortion. It's far less immoral to terminate a pregnancy than to bring an unwanted child into the world to live a life of misery and contribute to the mental problems of the mother. Compulsory birth is as immoral as compulsory abortion. The major group opposing abortion on religious grounds is the Catholic Church, but Saint Thomas Aquinas thought abortion was perfectly acceptable up to the fourth or fifth month, the time of quickening; unfortunately, the Church has since changed its view. The moral question results from confusion over what a human being is. A human being is the result of an interaction between a genetic code and a physical and cultural environment, particularly the cultural environment. A fetus isn't a human being, it's a *potential* human being. Religious objectors are confusing the blueprints for a building with the building itself. If people are concerned about those blueprints and the death of the cells containing them, then

they ought to stop brushing their teeth, because every time they do, they destroy cells that contain blueprints for human beings. Religious objections are based on ignorance, but I don't think we should force anyone who has religious objections to have an abortion. Women should be free either to have an abortion or to carry the child if they wish.

PLAYBOY: What changes do you feel should be made in our abortion laws?

EHRlich: Right now, any affluent woman can get an abortion and has been able to for some time. Restrictive abortion laws simply deny clean, safe abortions to poor people. These laws should be removed from the books and subsidized abortions should be made available to all women who desire them. A doctor must be required to give an abortion to any woman who requests it, or at least to refer the woman to a doctor who will, if his own morals are against it. Unless it's unsafe for them physically, women should be able to have an abortion any time they want it.

PLAYBOY: If abortions were freely available in the United States, would the number of births be substantially reduced?

EHRlich: There would be fewer births, but the extent of the reduction isn't clear, because we have such a very high level of illegal abortions. We aren't really sure how high it is, because there are no statistics on it. Organizations such as Zero Population Growth and abortion-law-reform groups will probably put enough pressure on politicians to get our abortion laws reformed in the next five years or so. That's one of the areas where I'm relatively optimistic.

PLAYBOY: Do you agree with those who feel that the women's liberation movement could be an effective force in campaigning to lower the birth rate?

EHRlich: A great deal can be said for improving the condition of women in this country and for opening opportunities to them as a way of helping control the population. Other countries might use similar programs to lower the number of births. We must give women better opportunities and set up health centers that include child care, so that women can be freed from taking care of their children to go out and work. In the United States, of course, the attitude persists that a woman's role is that of homemaker, shepherding a large number of children. Women are clearly denied equal rights in this country in many, many ways. We ought to encourage them to join the professions and to look on themselves as having many roles besides motherhood.

PLAYBOY: Do you think men should shoulder more of the responsibility for birth control?

EHRlich: I do, indeed. The medical profession, by almost banning women from its ranks, has had a man's-eye view of reproduction. The way some doctors

talk, you would think men had nothing whatsoever to do with reproduction. One way a man can take some responsibility is by having a vasectomy after he and his wife have had their children. Speaking from personal experience and the testimony of friends who have had vasectomies, I would highly recommend it. The effect on one's sex life is positive. It eliminates worries about contraception and has no physiological influence on sexual desire or performance. Anybody who understands the procedure and isn't being forced into it by his wife or girlfriend is likely to experience a positive psychological effect and improvement in his sex life.

PLAYBOY: If it became necessary for the Government to impose birth control, would there be any alternatives to this kind of surgery? Some authorities have talked about adding anti-fertility chemicals to water supplies.

EHRlich: I don't foresee any satisfactory technology for such indiscriminate mass-administered Government birth-control programs, at least not in time to help with the present crisis. Problems of side effects, uniform administration, avoiding those for whom such controls are not intended—children and the elderly, for example—are simply too severe for a rapid solution to the technological problems. And, of course, the problem of social acceptance would be even more difficult. On one hand, it might be viewed as mass involuntary medication, and some people consider that immoral. But, of course, it's also a public-health measure, because we're all doomed if we don't control population growth. There's plenty of precedent for mass administration of medicine in the name of public health—smallpox vaccination and fluoridation of water supplies, for example.

But I feel we already have more than enough bureaucratic intervention in our lives and I hope we can control our population by strictly voluntary means. If the Government inaugurates the proper programs of persuasion and the people respond strongly enough, it's possible that we'll be able to control our population. If we don't, compulsory Government control of births is a virtual certainty. Effective voluntary birth control, of course, will depend on dramatic changes in people's attitudes on the number of children they want. I don't think that very many people, particularly in the underdeveloped countries, will be persuaded to limit the size of their families for any reasons but matters of immediate self-interest, or what they think is self-interest. It has always been very difficult to get anybody to do anything for future generations. "What the hell did posterity ever do for me?" is the general attitude.

PLAYBOY: Some minority leaders have charged that birth control is simply an elaborate program of genocide to be imposed on their races. Is a birth-control

solution possible without the participation of blacks and other minorities?

EHRlich: Minority groups very wisely detect an element of genocide in the talk of many people who discuss population control. All too many people say, "There are too many black and chicano babies," which is nonsense. The most serious population growth is among affluent whites, because they are the heavy polluters and consumers. The blacks and the chicanos and the American Indians tend to be the victims of pollution rather than the cause of it; they have very little chance to consume. Anybody who worries about too many black, brown or red babies has a very simple device available to make the black, brown and red birth rates identical to the white birth rate. All that's necessary is for everyone in the country to have the same economic, social and educational opportunities. Then the reproductive performance of the various racial groups will be the same. Population control begins at home and whites will have to start cutting their own population growth—which is the most serious in the world—before they can say anything about what other people of other races, whom the whites are tromping on, ought to do. We're already hearing from black-power groups on this issue. The way to defuse it is to take pressure off the blacks by stopping people from calling it a black problem.

We must also avoid what many politicians are trying to do now, particularly in the Nixon Administration—deflecting public concern from racism and the war to the environmental crisis, as if they were separate problems. But the race problem and the war—which is incinerating a large chunk of the world—are inextricably tied in with the population-resource-environment issue.

PLAYBOY: Even if you could make the public understand the dimensions and implications of the population problem and persuade people to immediately reduce the birth rate to two children per family, wouldn't there be a dangerously long time lag before any noticeable effects took place?

EHRlich: If we had a miracle and everybody in the world decided today to have a maximum of two children, we would still have rapid population growth for at least the next 30 years. Thirty-seven percent of the world's people are under 15, and those young people are going to have children and grandchildren before they move from the 0-to-15 age group to the 50-to-65 age group and start dying of old age. Unless we have a massive increase in the death rate—which I think we will have—we will face a long period of population growth even with a drastic reduction of the birth rate. That's one reason biologists are so pessimistic about whether we can save ourselves.

PLAYBOY: Haven't there been radical ad-

vances in agriculture that will make it possible to meet the nutritional needs of this expanding population?

EHRlich: That's the famous "green revolution." The best way to evaluate the wildly optimistic claims of its proponents is to refer to *Time* magazine, November eighth, 1948, which reported that the agriculturalists expected in 12 years—by 1960—to be able to feed everybody in the world without any problem. Although some people thought there would be two and a quarter billion people by 1960, *Time* said other experts believed this was an overestimate. Well, in 1960, there were three billion people and the agricultural experts weren't feeding half of them. My reply to the prophets of agricultural utopia is: When you can adequately feed the 3.6 billion people we have now—including the 10,000,000 to 20,000,000 who are dying of starvation each year—come back and tell us how you'll feed the seven billion we'll have by the year 2000. Until you can do that, why don't you just shut up and get back to work?

PLAYBOY: Some economists have said that India and other underdeveloped nations, once they learn to master new agricultural techniques, will achieve economic self-sufficiency. Doesn't this contradict your dismissal of the green revolution?

EHRlich: Not a bit. Even if all the world's food were divided evenly, there would be a bare sufficiency of calories, but not of protein. *Everyone* would suffer malnutrition. The agriculturalists' solution is to plant more high-yield grains, the foundation of the green revolution. But there are a number of important things to remember about high-yield crops. In order to grow them and benefit from them, fertilizer has to be manufactured and transported, so there is a requirement for extensive new plants, trucks and roads. Tractors and other farm machines that burn petroleum fuels also have to be used. Water requirements for high-yield crops are very heavy, so irrigation also is mandatory, thus interfering with the ecology of water basins. And high-yield grains have often lost one very important characteristic in their development—pest resistance. They produce fragile crops that require large-scale treatment with pesticides that have very serious ecological effects and usually result in pesticide-resistant pests that do even more damage than unsprayed pests because the predators that ordinarily eat them have succumbed to the pesticides.

The green revolution wouldn't be ecologically sound even if it could meet the food needs of the world's population, which it can't. The points to remember are that you don't get something for nothing and that you never win totally. A perfect example is the Irish potato famine. That followed a green revolution. There were 2,000,000 Irishmen living in

misery in Ireland. Then they had a green revolution; the potato was introduced. The Irish planted a huge monoculture of potatoes, an ecologically stupid thing to do, since monocultures are simple and, therefore, vulnerable systems. Then, in the middle of the last century, along came the potato blight, which killed the potatoes. By that time, the Irish had bred up to 8,000,000 people on this huge supply of potatoes. When the blight hit, about 1,000,000 Irishmen starved and 2,000,000 emigrated. Had there been no place for them to go, 3,000,000 people would have starved because a green revolution was introduced to 2,000,000 people.

Today, of course, we don't have any place to go, and there are already new famines building. When the number of people starving annually is measured in the millions, that's famine. We have to stop looking around for some quixotic technological or agricultural panacea and face the problem: too damn many people. But even if there are fantastic successes with population control, even if everybody decides tomorrow that they're going to have small families and the average around the world drops instantly to 2.3 children—which would be a miracle—population growth and associated extreme environmental stresses will continue into the next century.

PLAYBOY: Why?

EHRlich: The world population is so young that even if not another baby were born, present food requirements would continue to increase over the next decade, because those now under 15 will make increased demands on the food supply and on the rest of the resources of the world as they grow older.

PLAYBOY: If the green revolution won't feed them, could we meet part of this need by farming the sea?

EHRlich: There is a great deal of—bullshit, I think, is the correct term—about the untapped resources of the sea and how we'll be able to farm them. Well, biologists have very carefully measured the resources of the sea, and the maximum annual yield we can get—if we do everything right—is between 100,000,000 and 150,000,000 metric tons. This means that if our population continues to grow at present rates and doubles in the next 30 years, as it's expected to, and if the 100,000,000-metric-ton yield is achieved, there will be less fish per person than there is now. And that's if we do everything right. At the moment, we're not doing anything right.

PLAYBOY: What about synthetic or manufactured food?

EHRlich: To produce food synthetically, in the sense of just taking carbon, oxygen, hydrogen, nitrogen and making the molecules, the energy demands would be colossal if we knew how to do it, which we don't.

PLAYBOY: Is there anything we can do to ease the food problem?

EHRlich: If the goal is more food for the people of the world, and the necessary money and effort are advanced toward it, there are all kinds of ecologically safe measures that could be employed and that would help. The most helpful step would probably be the use of our technology to cut into the very serious losses that occur between the harvest and the dinner table. There are tremendous losses to rats, insects, mold, mildew, and so on. A program aimed at cutting these losses would be much more sensible than trying to grow edible algae on sewage, which is one of the more appetizing solutions that have been suggested. The people who push such programs, of course, are never going to be the eaters; they'll shovel it out to the rest of us and say, "Bon appetit."

PLAYBOY: Many environmental experts say that even if we sensibly limit and adequately feed our population in the U.S., we'll still be headed for ecological disaster. Do you think your emphasis on population may be wrong for the U.S.? Aren't some of the consequences of pollution a more immediate threat?

EHRlich: I wrote a book called *The Population Bomb* because I thought too many people were emphasizing only pollution. I'm not in any way trying to minimize the problem of pollution. At the moment, it is at least as serious as, or possibly more serious in the United States than our population growth. It's perfectly clear that if we moved our population down to 50,000,000 and continued to use DDT as we are now, we could destroy the entire planet. But it's also perfectly clear that no matter how small we make our per-capita impact on the environment, everybody in a technological or agricultural society has a negative impact. If we take the problem from the pollution end and try to reduce the impact of each person, it's obviously going to be necessary to reduce it less drastically if there are fewer people. Los Angeles is a perfect example. It's had a continuous decrease in per-capita pollution for several years but a continuous increase in the number of people, so it hasn't made any progress. It's pointless to argue whether it's pollution or population; it's the interaction of the two, and the only intelligent approach is to attack both simultaneously.

PLAYBOY: Power consumption is one of the worst causes of pollution in this country. How serious a threat is it?

EHRlich: Very serious, because there is no ecologically "safe" method of producing and using power. Even if electricity generation weren't dependent on the burning of fossil fuels that emit deadly chemical and particulate pollution into the air, power plants would create dangerous thermal pollution. Any use of

power creates heat. Slam the brakes down on your car and you turn the kinetic energy of the car into heat energy; everything you do creates heat. The problem is that there is a very severe limit to the amount of power-generated heat that the earth can sustain. If the temperature of an organism's habitat—air or water—is raised above a certain level, that organism will die. Heated waste from nuclear power plants has already destroyed the fish populations of rivers where it has been dumped.

But power generation creates not just heat and air pollution but also other serious ecological problems. Daming rivers to produce hydroelectric power, for example, not only interferes with the ecology of the watersheds, it can even cause earthquakes. But despite all these grim facts, power use in the United States is doubling every decade. At this rate of growth, in 200 years, the entire surface of the United States will have to be nothing but power plants. There won't be room for anything else—including the people for whom the power is intended.

PLAYBOY: Nuclear power plants produce radioactive as well as thermal pollution. What is done with the radioactive waste?

EHRlich: A lot of it is buried deep in the earth, and this is something that people are justifiably worried about. A tremendous amount of all the red-hot waste that we plan to dump into salt mines could get out into the environment and cause an epidemic of radiation poisoning that would either kill immediately or lead to cancer, stillbirths and horrible genetic deformities. Remember that to be safe, we must contain these wastes for thousands of years. Another problem is that with the number of plants the Atomic Energy Commission is talking about, there'll be so many hot trucks and trains in transit to the salt mines that there'll be a tremendous danger of accident in the process of moving the waste. Even if that's done successfully, we can't build a 100 percent clean power-generation system, so there will be continuous low-level emission from the fission plants. The amounts will be small, but any release of radioactivity is biologically bad, and the total of these small emissions could be disastrous. Some physicists at the Lawrence Radiation Lab, which is fundamentally an AEC-backed facility at the University of California, have recently claimed that the AEC's permissible radiation standards are about ten times too high. Finally, with nuclear plants, there is always the possibility of an explosion—a small atom bomb, in effect. In 1966, there was an accident at the Fermi plant outside Detroit that just missed being such a disaster and killing millions with radiation.

My approach to the power problem is

not to build more and more nuclear power plants; it's to stop wasting so much of the power we produce now. Our aluminum industry, for example, is an extraordinarily large user of power. It consumes something like ten percent of the industrial power used in this country, and a fantastic amount of that is used to make cans—another environmental pollutant. For many excellent reasons, including this one, we might have to give up aluminum cans. Small loss. We might also have to turn off all advertising signs by law at midnight; that might be a blessing, too. We also have too many home appliances that are very inefficient, but the power companies send ads along with their bills urging us to buy another electric comb. Then the power-company officials say, "We're in a race for our lives to keep up with this power demand; to meet it, we'll have to flood farmland and build more nuclear power plants." It's a demand they have largely created. In western Europe, where people lead very pleasant lives, there is half the per-capita power consumption of the U.S.

PLAYBOY: The dangers from hydroelectric and nuclear power production aren't as visible—or as tangible—as those from fossil-fuel-burning plants that emit tons of pollutants directly into the air over our cities. What are some of the dangers of the air pollution such plants cause?

EHRlich: The danger is that it's lethal. Automobiles, various paper and pulp mills, chemical plants, refineries, other industries and trash incinerators spew millions of tons of deadly pollutants into the air annually. Carbon monoxide—about 70,000,000 tons a year—kills by suffocation when the level is high enough. In severe traffic jams, where a number of cars are idling for long periods of time, drivers begin to experience symptoms of carbon-monoxide poisoning: headache, loss of vision, nausea, abdominal pain. Death could occur in extreme cases. Sulphur oxides—about 14,000,000 tons annually—turns into sulphuric acid in the lungs. It is certainly one of the main causes of the increase in emphysema, bronchitis and other respiratory diseases among people exposed to severe air pollution. And hydrocarbons—about 15,000,000 tons annually—are almost certainly carcinogenic.

In most cases, air pollution kills slowly, by causing debilitating diseases that can't be directly traced to the pollution because of the diversity of pollutants, the existence of other factors and the varying degrees of exposure by the victims. But certain comparisons of respiratory-disease frequency in heavy-smog and smog-free areas indicate pretty clearly that air pollution is a killer. Sometimes, scientific study isn't even necessary. In the case of severe inversions—a layer of warm air overlying a layer of cool air,

thus trapping the pollution under it—people have died in huge numbers simply because of the smog. The worst such disaster occurred in London in 1952, when approximately 4000 people died as a result of a four-day smog. Similar disasters are likely to occur in cities such as Los Angeles if pollution isn't curtailed.

PLAYBOY: The most significant air pollutant is probably the automobile. What can we do to eliminate the ecological ill-effects of our transportation system?

EHRlich: Short of a mass switch from cars to bikes, we could do much better than we do with fewer and smaller cars, relatively low-pollution engines, more mass transit—which is ecologically and economically superior to private automobiles—and an efficient air-transport system. Anyone who flies much knows there are a lot of empty seats and duplicate flights. Obviously, in some places it will be a very difficult transition. Los Angeles was designed for the automobile. In fact, we've been designing the whole country not for people but for automobiles. So it's going to be a serious problem converting to mass transit, but it surely can be done and the simple first step is a law banning large cars and allocating tax funds to buy back old cars and recycle them. With smaller cars, we create more space for other cars, parking is easier, less smog is created and far less of our petroleum resources is consumed. If cars were made with aluminum instead of copper in the wiring, and so on, they could be very easily recycled. It's copper that makes melted-down automobiles undesirable scrap. So there are all kinds of things that could be done immediately to improve the transit system and reduce its impact on the environment.

PLAYBOY: Is there any validity to the argument that building smaller cars would mean simply that more people would be able to buy more cars?

EHRlich: Yes. Probably the way out would be to require that the maximum number of cars would be one four-seater per family. Until we can make people aware of their own contributions to the environmental crisis, such rationing may have to be imposed. But nobody will greatly suffer because he's limited to one automobile. That's not an unbearable sacrifice.

PLAYBOY: What about steam and electric cars? Are they feasible?

EHRlich: They would probably be very expensive; but there are many things that should be considered "feasible" even if cars cost five times as much as they do now, because there's nothing less "feasible" than dying. The thing to remember about electric cars, however, is that they, too, end up creating pollution. Somebody said it would take virtually the entire power capacity of the country to recharge the country's cars.

PLAYBOY: Do you see any plausibility in Henry Ford's promise of a pollution-free internal-combustion engine?

EHRlich: By definition, that's impossible. A cleaner one is unquestionably possible, though we may find that we can get rid of nitrogen oxides only by increasing hydrocarbons. But even if an automobile engine could burn a hydrocarbon completely, the end products would be carbon dioxide and water vapor, both of which are pollutants—not as serious pollutants as some of the others, but they have an effect on the climate of the planet that could be very dangerous.

PLAYBOY: Would it be possible—and helpful—for the oil companies to stop adding lead to gasoline?

EHRlich: Of course, and it would be a tremendous contribution. Lead is a pollutant not unlike DDT, which concentrates in food and is a deadly poison. There's some evidence that the decline of the Roman civilization was in no small part due to lead poisoning. Scientists have gone back and checked the lead content in bones of upper-class Romans, and it's enough to indicate that they had serious lead-poisoning problems. They drank their wine out of lead containers—ironically, to avoid the taste of copper. So it would be wise for the oil companies to stop adding lead to gasoline; we don't drink it, but we breathe the fumes, which are almost as deadly.

We must make sure, however, that the petroleum people don't substitute something even more deadly than lead, like nickel compounds. This is exactly what happened when soft pesticides were substituted for DDT. They break down fairly easily into harmless compounds, but they tend to be much more lethal than DDT before that process takes place. You could eat a teaspoonful of DDT, but if you put a single drop of parathion, a soft pesticide, on your skin, you're dead. It's from a family of pesticides that are derivatives of German nerve gases developed during World War Two. With these chemicals, the protection of farm workers becomes a severe problem. We must make sure that the oil companies don't substitute something equally dangerous for lead.

PLAYBOY: Unthinking use of chemicals seems to be commonplace today. Just how widespread and dangerous is it?

EHRlich: Unthinking use of chemicals is the rule today, and it's a dangerous rule. Farmers, for example, have been encouraged to increase production by relying heavily on inorganic nitrogen fertilizers. As is usually the case when such artificial factors are introduced into the environment, the results have been bad as well as good. The good effects of nitrates were immediately obvious. Long soil-building processes involving decay of organic matter, building of humus and nitrogen fixing by certain crops were short-cut in a single planting season as farmers used the inorganic fertilizers and reaped high yields. But, as always, it

wasn't quite that simple. When the normal soil-building processes were avoided, organic soil nitrogen was lost and the earth became so compacted that root systems had difficulty absorbing nutrients. This resulted in ever larger requirements for synthetic fertilizers; their use has increased 12 times in 25 years.

Dr. Barry Commoner has said that farmers are "hooked on nitrates like a junkie is hooked on heroin." One price of this addiction is increased water pollution, for a great deal of the fertilizer that's added to farmlands runs off the surface of the land and into lakes and rivers. In the absence of proper soil-building practices, farmlands in this country have lost around 50 percent of their original organic nitrogen. Commoner says that in 25 to 50 years, the fertility of the soil will be so low that the ultimate food crisis will occur unless inorganic nutrients are used to a degree that would cause an insoluble water-pollution problem.

Animal manure, on the other hand, is a soil builder. If we stopped treating the waste from animals as something to be disposed of—a pollutant—and used it, instead, as a fertilizer and soil builder, we'd be a long way toward solving one of our most critical pollution problems. Building soil in this way, of course, is a long, tedious process, and it may cost more than the present system of garbage disposal and chemical fertilization; but the country will save in the long run—in human as well as natural resources. It's always cheaper to clean it up now, at the source, than to let pollution continue to run wild and then scrape it out of our lungs ten years from now—if it hasn't killed us by then.

We'll want to continue, of course, to use those high-powered chemical fertilizers and pesticides in certain circumstances. But we're going to have to do it very cautiously, knowing what we're doing. Right now, pesticide use is encouraged whether bugs are present or not. Farmers are trained to spray on a frequent schedule. That's the kind of thing that has to stop. It will cost a lot and it will cause dislocation, but we have to do it. If we keep plundering the land until it's no longer capable of yielding food—and we're well on the way—there'll be no place left to go.

PLAYBOY: Some nonagricultural lands—such as the marshes along the New Jersey coast—have been allowed to become polluted because people seem to feel that the effects were merely unaesthetic. Should we be concerned about any ecological consequences of the pollution of such land?

EHRlich: The land you're talking about is ecologically as well as aesthetically valuable. An estimate has been made that somewhere around a quarter of all of our fisheries' production from the oceans is dependent on estuaries. And

the vast majority of oceanic fisheries' production comes from shallow waters close to shore. When we muck around with our marshes and estuaries, when the Army Corps of Engineers bulldozes them, when cities use them for garbage fills and nuclear power plants dump hot water into them and raise their temperature beyond the tolerance level of many organisms, there's a fantastically destructive effect on the shallow-water production of young fish. So that as we foul our shores—whether marshy or not—we simultaneously endanger the ocean, and we can't afford to do that. When explorer Thor Heyerdahl made his first attempt to cross the Atlantic by papyrus raft, he found extensive surface pollution most of the way across—so severe, in fact, that in some places, his crew couldn't even rinse their dishes and utensils in the sea water.

PLAYBOY: Dr. LaMont Cole of Cornell says we may already have destroyed the sea with the amount of DDT that has been used on land and will eventually run off into the oceans.

EHRlich: That may very well be. The situation with the oceans is very critical and very complicated. DDT doesn't break down easily. As it's sprayed on crops, runs off into watersheds and eventually makes its way into the oceans, it retains its toxicity. In fact, it's probably less than 50 percent broken down ten years after spraying. As we continue to spray the land, DDT continues to build up in the oceans, because what is already there isn't breaking down. But unless something in the nature of a catastrophic accident occurs—say an oil-tanker spill or deliberate poisoning—the oceans probably won't die overnight. Rather, their ecology will be slowly altered. As the level of DDT and other chlorinated hydrocarbons increases in the seas, certain critical organisms will either build up a resistance to these pesticides or be killed. The primary oceanic food source is phytoplankton, microscopic green plants that produce about 70 percent of the world's oxygen. If the phytoplankton are killed, marine photosynthesis will cease and all sea life will die.

But the effects of DDT on the oceans don't have to be this drastic to be devastating to the ecology of the planet. Pesticides may simply retard the growth of some species of phytoplankton and result in huge blooms of others. Some of the DDT-resistant strains may be unsatisfactory as food for oceanic herbivores. This would eliminate the food supplies of many oceanic species of fish. Certainly, as more and more DDT appears in the oceans, it will become concentrated in marine life and will more frequently reach levels that would be dangerous for human consumption. By the same process of concentration, DDT in mother's milk has reached levels that often exceed health standards for dairy milk.

Some radioactive wastes tend to be concentrated, too. The Atomic Energy Commission once dumped nuclear wastes into a river in the South, thinking that the amount wasn't serious and that it would be dispersed in the environment. When the AEC monitored the water downstream, it found radioactivity levels reassuringly low. But then someone pointed out that the oysters near the river's mouth were glowing in the dark. That's a pretty deadly form of water pollution. It's not only revolting but disturbing to consider that many smaller bodies of water—rivers, streams and lakes—in this country have been little more than cesspools for years. The Cuyahoga River, which flows into Lake Erie, was once a clear trout stream; today, it's so laden with pollutants that it periodically catches fire.

PLAYBOY: What does most of our water pollution consist of? Sewage? Fertilizer? Industrial waste?

EHRlich: A large amount of it is sewage, both animal and human. Fertilizer runoff, phosphates from detergents, animal manure, nitrates from inorganic fertilization, human waste and a tremendous variety of chemicals of one sort or another. Industrial chemicals. Pesticides. Mercury, which is extremely dangerous, was recently found in Lake Erie. There's lead, too, which takes the form of fallout from automobile engines. A lot of air pollution turns into water pollution; it comes down with the rain.

PLAYBOY: Can anything be done to save or revive a body of water as thoroughly polluted as Lake Erie?

EHRlich: It's difficult. This is a problem I have no particular expertise in, but the general estimates are that it will take one hell of a long time to purify a shallow lake like Erie. Even if we stop pouring wastes into it, there is such a build-up of crap on the lake bottom that it would take a thorough flushing over many years—perhaps hundreds of years—to restore it to its natural state. It's very easy to wreck these ecosystems, but it's hell to rebuild them again. And some of our lakes and rivers may be beyond salvation.

PLAYBOY: Several environmentalists have charged that President Nixon's program for control of water pollution will result simply in breaking down raw sewage into its inorganic components, which act as a fertilizer and result in the continued pollution of our waterways. Is that true?

EHRlich: Yes. At a teach-in at Northwestern University [reported last month in Assistant Editor Geoffrey Norman's *Project Survival*] just after Nixon's State of the Union Address, the first five speakers attacked his address vigorously, and several made precisely this point. Not one word of that, to my knowledge, got out over the network news. This wasn't long after Agnew's anti-press

speeches. Even though there was coverage of the event, that part wasn't picked up. Another point that was made that night is that Nixon is talking about spending ten billion dollars, only four billion of it Federal money, over the next five years to clean up water pollution. But we need much, much more. The best estimates are that it will require a Federal program of at least 50 billion a year, and similar amounts in other overdeveloped countries, over the next several decades, to give us a chance of surviving the population-resource-environment crisis.

But even if sufficient funds were appropriated, the kind of sewage-treatment plants Nixon is sponsoring wouldn't do anything to solve the fundamental problem. All that happens when processed inorganic nitrates and phosphates are dumped back into the water is that they're picked up by the algae as a nutrient and turned right back into organic compounds. As the algae die, their decomposition uses up oxygen and adds to the sludge at the lake's bottom. Finally, the lake is able to support only the algae; and when this happens, the lake is dead.

Even worse, some of the water that's used in municipal drinking supplies is so polluted that certain viruses seem to be impervious to the chlorine that's used to sterilize the water for drinking. Doctors in some areas have prescribed pure bottled water for infants; if air pollution doesn't get us first, we may live to see the day when that prescription is extended to adults. So water pollution is more than an aesthetic inconvenience and an injustice to fishermen; it's a dangerous health hazard. We need water; it's essential for life. We can't afford to continue poisoning it.

PLAYBOY: Oxygen, of course, is equally essential to life, and some of your colleagues have predicted an oxygen crisis. Is this a real threat?

EHRlich: There is little danger of an oxygen crisis per se. If photosynthesis were stopped—if the green plants that take in carbon dioxide and give off oxygen were all killed off by pollution—we'd eventually run out of oxygen. But there's a fairly large supply of oxygen already created. A rough calculation is that at the current rate of consumption, if the production of oxygen stopped, there would be about 1000 years' supply left. But we won't have to worry about our oxygen supply, because if photosynthesis is stopped, we'll all die of starvation long before the air runs out; all our food comes from green plants.

PLAYBOY: Apart from the oxygen problem, isn't there a carbon-dioxide problem? In addition to the surplus CO₂ created by the destruction of plants through pollution, paving and the like, doesn't the combustion of fossil fuels emit CO₂ into the atmosphere at an excessive rate?

EHRlich: Yes, it does, and this is a major problem. Increasingly, atmospheric CO₂

affects the weather, but we can't accurately predict the long-range effects of man's climatological influences. We can, however, describe what he is doing to change the weather. The 12 percent increase in atmospheric carbon dioxide since 1880, in the absence of any balancing factors, would tend—for rather complicated reasons—to warm the earth by a proportionate amount. But we've also added a number of other substances to the atmosphere—dust, particulate matter from incomplete combustion and the contrails of highflying jets—that have formed a substantial cover over the surface of the earth. This cover reflects solar energy before it can enter the atmosphere and warm the earth. Alone, it would cause a cooling of the earth. In combination with the CO₂, it may effect a kind of temporary balance—but an unstable and unpredictable one. Meteorologists now tend to feel that the cooling effect is overpowering the warming one.

PLAYBOY: What can we expect if these trends continue?

EHRlich: It's impossible to say what the long-range effects of our tampering with the weather will be. The flow of air is important, so local heating and cooling that can't be predicted are very important. But the northern area of the planet could warm enough to melt the floating arctic ice pack, which would cause a change in storm patterns and a drastic reduction in rainfall over certain areas of North America, Europe and Asia, turning them into deserts. The southern polar region, on the other hand, could become so cold that the icecap would become thicker, thus liquefying the bottom portions under the pressure and causing the mass of the icecap to slump into the sea, raising sea levels throughout the world as much as 100 feet and flooding low-lying areas such as those occupied by New York, London and Tokyo. If the ice fell into the sea and spread out, another result would be that much of the sunlight reaching the earth would be reflected and severe temperature drops would follow, perhaps bringing on a new ice age. It's all very difficult to predict. And very gloomy.

PLAYBOY: Is there any tangible evidence to support these cataclysmic scenarios?

EHRlich: Some scientists think that we're experiencing dramatic weather changes in the United States right now, and that they could hurt our agriculture a great deal. Here's a system on which our lives depend more and more as the population gets larger, and we're changing it in ways that we don't understand. There is a very great tendency among politicians and some technologists to take the point of view that if the immediate effects seem to be OK, go ahead. In this way, almost without knowing it, people have been conditioned to accept small, steady

increases in pollution. Los Angeles didn't become the smog capital of the world overnight. If it had been clear one night and choked with air pollution—as it is today—the next morning, people would have been alarmed and would have demanded action. But over the years, we have slowly acquired a psychological tolerance for pollution and the other environmental threats. We are also able to tolerate physiologically certain levels of pollution. At last, however, I think we may be reaching our limits of tolerance. The water in some rivers is becoming too polluted to purify by conventional means and evidence is accumulating that DDT in our fatty tissues has reached levels high enough to cause cancer, brain damage and cirrhosis of the liver. These are things that indicate we are approaching the physical limit.

PLAYBOY: Are we equally close to the psychological limit?

EHRlich: The psychological limit may be farther away. Conditioned by *Family Circle* and *Woman's Day*, women want their apples to look like the flawless red specimens in the magazines' advertisements, so grocers spray DDT on their produce to make sure no insects damage it in the store. Some people in England pay premium prices for insect-damaged fruit because they know it's safer than unblemished fruit. In the U.S., we have a media-inspired attitude toward all consumption and production. The media convince us that perfectly good cars ought to be turned in every year in order to get ones with a different array of chrome, and that somehow it's more swinging to drink beer from an aluminum can than from a glass bottle.

But the power of the media is double-edged. Now it's consumerism's cheerleader; in the future, it may encourage ecological awareness. On the *Today* show the other day, William F. Buckley's publisher, William Rusher, was saying that you can't blame industry for all of our air and water pollution—which is true. But Rusher said that industry contributes only around 17 percent of air pollution, compared with 60 percent by automobiles. The point he misses is that industry had some small role in producing those automobiles and, even more than that, in manufacturing the demand for them. That's the bad side of the media problem. The good side stems from the fact that the media can convince people that a bottle of deodorant will change their sex lives, that a car will turn them into superstars, that Richard Nixon is a statesman. If advertising can do that, it might even be able to convince people that big cars pollute too much and that fewer little consumers would be better for them as well as for the country.

PLAYBOY: Can the complexity of the eco-

logical problem be made clear to people through advertising? Wouldn't such a program be likely to suggest simplistic answers that might be counterproductive, in the long run?

EHRlich: There is a great danger of rampant know-nothingism from all sides in this area. The problems are so complex that you can be fairly sure that no single simplistic solution is right. But people have learned the word ecology, and now they're going to have to start learning what ecology is all about and how it relates not only to their welfare but to their survival. The essentials of the science of ecology won't be hard for this well-educated society to learn; the hard part will be learning to live differently than we do now—to conserve rather than to consume, to abstain rather than to indulge, to share rather than to hoard, to realize that the welfare of others is indistinguishable from our own.

PLAYBOY: Can people be persuaded to modify their high standards of living in order to save the environment?

EHRlich: The usual concept of a standard of living is really absurd. How do you measure a standard of living? By the number of four-slot electric toasters per capita? Or by the quality of education, recreational facilities, cultural events and physical health? But whether or not we decide to make sacrifices, the population-environment problem in the United States is going to cause a decline in any genuinely human standard of living. As I think everyone knows, we're falling farther and farther behind in the effort to keep our air and water clean, to provide adequate schooling for our children and to supply good transportation and decent housing for our citizens. Even without a major disaster, our lives seem doomed to become nastier, shorter and more brutish as a result of our unceasing pursuit of a "high standard of living," which is simply not a rational measure of what's desirable in life. I think people will begin to see that and move toward ecological sanity.

PLAYBOY: In describing that movement, you have often spoken and written about the necessity to evolve "from a cowboy economy to a spaceman economy." What do you mean?

EHRlich: It's the economist Kenneth Boulding's phrase. But what I mean by it is simply that we have to get away from the idea that we have unlimited resources and that as soon as we deplete or ruin one source of supply or foul our campground, we can push on west. We should conceive of everyone in the world as being on a single spaceship with a common life-support system.

PLAYBOY: On an ecologically sane "spaceship earth," which of the pleasures and privileges most Americans associate with the good life will we have to abandon?

EHRlich: We're going to have to limit our-

selves to the things that really improve the quality of our lives—and the lives of others. Instead of getting a new car every year, we're going to have to force automobile manufacturers to make them last for 30 years. They'll probably be damnably expensive, and we may have to pay for them over a period of 10 or 20 years, just as we do a house; but they won't cost any more per year than our present cars. They'll be safe, nonpolluting and well built, but they're not going to be designed to save your ego or to give you subliminal sexual kicks; you'll have to get your sexual kicks out of sex.

The fancy gadgetry that now goes into refrigerators and tends to make them obsolete after four or five years—things that automatically make ice cubes, cheap plastic inserts, and so on—will have to be replaced by quality workmanship that will enable them to last a lifetime. You may have to pay more for one, but it'll work forever and make minimal demands on the world's supply of renewable and nonrenewable resources. We'll also need to change our food-distribution system so people can get more fresh food—another improvement in the quality of life. And because we'll be eating more fresh food, we won't need such tremendous freezer-storage capacity.

What else? We should use smaller washing machines, thus conserving on the use of metal, water, electricity and detergents. While we're at it, of course, we'll have to change the attitudes of society so that people don't feel they have to own so many clothes. We should also use less air conditioning; the best way to accomplish this is by reducing the need for it. People lived quite happy and productive lives long before the world was air-conditioned; if we created a casual society in which very light or little clothing was required in hot weather, they could again.

It's all a matter of trade-offs. You may have a smaller income, but you're not going to have to travel so far for your vacation, and it's not going to be as expensive, and food's going to taste better, and the air's going to be cleaner, and life is going to be pleasant and relaxed. In essence, we need to turn the whole system down and start concentrating on what life's really about.

PLAYBOY: Can any of this be done by working within the present system? Do we make current technology more efficient, family planning more strict, appoint a few commissions of scientists, establish some Government enforcement agencies and hope for the best?

EHRlich: Well, there's no way we can go on the way we're going now. There's no way to make little technological modifications, put smog-control devices on cars, build more sewage plants and hope to beat the problem. That's treating a couple of the symptoms without tackling

the basic problem. This isn't to say that a hell of a lot can't be done with technology. Technologically, we could dodge a lot of the problems and make things easier. There are some immediately feasible stopgaps: recycling pollutants, eliminating nondegradable containers, more reforestation of cutover or barren land, and so on. I don't want to denigrate these efforts. And there are a number of things the Government could do, starting with a reorganization that will gear it to our needs in this area. The Federal Government isn't presently structured to handle the population-resource-environment crisis. The Department of Agriculture rather than the Department of Health, Education and Welfare handles the food program, so poor people get crud like lard and white flour rather than high-protein food. Interior tries to do one thing, Agriculture the opposite. Something like 11 agencies deal with the cities, and there's no coordination. We need an over-all Department of Population and Environment that would have the Census in it, large chunks of Interior, large chunks of USDA and of HEW. It would have to have the power that doesn't exist today to stop other Federal agencies from doing environmentally destructive things.

PLAYBOY: Would you say that the difference between what we have now and the ideal society would be the difference between the concepts of maximal and optimal?

EHRlich: I think so. I think Stewart Udall puts it very well when he says that bigger isn't necessarily better and more can be less. Some people say we should have the greatest good for the greatest number. Well, that's a double maximization; you can't do it; it's mathematically impossible. We have to determine the possible amount of good and then, within the limits of our ability, decide how many can share it. My idea of an optimum society would be one that offered the greatest amount of choice. An optimum population of the United States would be enough people to have big, active, interesting, swinging cities where those who really like city life could go and enjoy themselves instead of fighting traffic, choking on fumes, wading through garbage and ducking muggers. But it would also be small enough so that people who wanted quiet rural surroundings could find them without having to pay admission to see a live tree or a clean stream over the shoulders of hundreds of fellow refugees. I think it's important to maintain the diversity of mankind—not just different life styles but different cultures, because I don't see any evidence that our culture is so good that it ought to be the only one that exists. Man has to learn to live with and value different points of view, physical differences, cultural dif-

ferences. That's something an appreciation of the concept of ecology gives you and it's something that's being wiped out as the population gets larger and as our technology spreads over everything.

PLAYBOY: To some observers, resource preservation and anti-pollution as you've described them imply an anti-capitalist bias, but does that necessarily imply a pro-socialist bias?

EHRlich: Quite the opposite. I would say that the pollution-environmental-resource problems of socialist and capitalist societies are essentially identical. The Soviets and the Chinese are just as bad or worse in regard to their environment and resources as we are. In fact, Marxism is conceptually worse, because Marx, being an enemy of Malthus, found it unthinkable that an infinite number of people couldn't be supported if the Communist system were running the world. So, bad as our Government is, it would be worse if it were Marxist. It's not a matter of socialism or communism versus capitalism; it's a matter of the exploitive economy having to become a conserving, recycling economy.

PLAYBOY: How will this new economy enforce these new values?

EHRlich: The Government will have to place limits on consumption—until we learn to place them on ourselves. This is one of the problems with too large a population—more and different forms of Government regulation. But even with a smaller population, there will have to be limits. Everybody should have a right to a small car; but without a permit certifying special need, you shouldn't be able to get anything bigger. Everybody should have one refrigerator and that's it. Limit it that way and then make ownership requirements: that is, make it a crime to abandon an automobile on the street—not just a \$25-fine sort of thing but a serious crime. In the spaceman economy, some functions of Government such as this would undoubtedly increase, but others would eventually decrease. It wouldn't need a lot of pollution-control functions, because the place to control pollution and waste is at the source, and people—even manufacturers, who are also people, I'm told—are soon going to reach the point where they simply won't stand for any more of it.

PLAYBOY: You've become something of a celebrity because of your efforts to alert people to the dangers of population growth and environmental deterioration. Have you begun to see any results?

EHRlich: The main result has been the destruction of my personal peace and quiet. But I feel it's the job of every scientist and anybody else who's interested in this fight to do everything he can over the next couple of years to see that

we get some action. It's a self-solving personal problem for me, because if we don't get action by the 1972 election, it'll be too late; and if we *do* get it then, I won't be needed anymore, so I can go back to doing what I like. Everybody's got to do his own thing part of the time, and this racing around the country making speeches isn't my thing.

PLAYBOY: Apart from being aware of the problem, what can the average citizen do about the population explosion and the environmental crisis?

EHRlich: He can, first of all, limit his reproduction. He must do whatever he can personally to reduce his use of chlorinated hydrocarbons, polluting detergents, and so on. But the most important thing is to become involved in the political system. Too many Americans don't vote and too many Americans who do vote don't know what they're voting for and don't pay any attention to what is actually going on in Washington. These problems will take societal action to solve, because there is a limit to what we can do as individuals. But unless society shapes up, we've all had it.

People should write letters to their Senators and Congressmen in Washington and to their elected state and local representatives. Don't expect them to do their jobs without relentless prodding. Ask them to give their positions, to explain their votes. Keep after them—don't be fobbed off with those innocuous "Thank you for your views" form letters. And don't underestimate the power of your letters. Congressmen and Senators have staffs to keep track of the mail flow. It can be even more effective to write letters to newspapers and magazines, which tend to be responsive to mail.

Above all, join local anti-pollution groups that are dedicated to *doing* something and not just talking about it. And join Zero Population Growth [367 State Street, Los Altos, California 94022], which is working to elect candidates who will help solve our problems and to defeat those who don't understand or are under the control of special-interest groups. Z.P.G. also organizes picketing at hospitals with antique sterilization policies, works for abortion reform, smog control, and so on.

PLAYBOY: How do you feel about the tendency of many people to dismiss the ecology and pollution battles as a fad?

EHRlich: I think they *are* a fad. People's attention has been drawn and there's a tremendous amount of interest now. But there is a hard core of people who are determined to take advantage of this interest and mobilize it to get things done. We want to alert everybody to the problem and then recruit enough dedicated people to get the job accomplished.

Until we succeed in doing something substantial about the problem, the symptoms will get worse. So it's not going to be a fade-out fad like hula hoops.

PLAYBOY: What happens, though, if public interest does fade and the problems remain?

EHRlich: Well, most likely, we as a race will fade away, too. For good. I sometimes start my speeches by saying the environmental crisis began on January second, 8000 B.C. The levity escapes my audiences, more often than not, but the message is there. As soon as man began to farm the land, he began to significantly alter the ecology of the planet. Everything he has done since has made the situation worse. For most of man's life on the earth, however, his disruptions were small enough in scale to be handled by the biosphere—that thin layer of earth, air and water which supports and binds together all forms of life on earth. But with the Industrial Revolution, man tipped the scales; it became possible for him to overload the biosphere and destroy it piecemeal. He's been doing it, rather stubbornly, ever since.

When man mastered his own tools and intelligence enough to escape the earth and view it from space, however, he learned that what he has been given is not infinite. Those striking pictures of earth taken from the moon may be the greatest reward of the entire space program—an effort that certainly isn't ecologically sound in any other way. All anyone who doesn't believe in the severity of the crisis has to do to convince himself is look at those pictures of spaceship earth suspended in the black void. That's it—all we have, one little orb.

That orb and most of the other heavenly bodies are much older than man. Many of the creatures of the earth have seniority over us. They made it this far by remaining compatible with their environment, by adapting and adjusting to the natural circumstances of their existence. There are many species that have vanished because they could not adapt. It's not at all inconceivable that man will follow these creatures into extinction. If he continues to reproduce at the present soaring rate, continues to tamper with the biosphere, continues to toy around with apocalyptic weapons, he will probably share the fate of the dinosaur. If he learns to adapt to the finitude of the planet, to the changed character of his existence, he may survive. If not, nothing like him is likely to evolve ever again. The world will be inherited by a creature more adaptable and tenacious than he.

PLAYBOY: Is there such a creature?

EHRlich: Yes. The cockroach.