

PLAYBOY INTERVIEW:

BARRY COMMONER

a candid conversation with the crusading environmentalist

"OIL CRISIS ABATES," read the headline in The New York Times. In the adjacent column, a dispatch from Dallas reported news of a scientific gathering at which expert after expert had warned of some ecological doomsday to come. Said one: "I believe that unless we begin to match our technological power with a deeper understanding of the environment, we run the risk of destroying this planet as a suitable place for human habitation." It all sounds like a typical front page from the early months of 1974—but the date line was December 29, 1968; the oil crisis cited was caused by a truck drivers' strike rather than an Arab embargo; and its juxtaposition with the environmental story was fortuitous. Not many Americans in 1968 considered the possibility of either an energy crisis or an environmental crisis—let alone the fact that the two might be interrelated. One American who did was the scientist quoted above: Barry Commoner, director of the Center for the Biology of Natural Systems at Washington University in St. Louis.

In the years since then, Commoner has crisscrossed the country making speeches, appearing on dozens of talk shows, writing magazine articles and books—most recently his best-selling 1971 work, "The Closing Circle"—all sounding the same alarm. Air-pollution expert Lewis Green

once called Commoner "a Paul Revere waking the country to environmental dangers"; Time labeled him "the uncommon spokesman for the common man." Perhaps no other scientist today possesses so broad a grasp of the modern technological dilemma, with our insatiable demand for energy pitted against the inescapable necessity to reduce environmental pollution. So indefatigable is he in getting that message before the public that it's difficult to believe he's the same Barry Commoner who, as an adolescent, was sentenced to a corrective speech class—to overcome shyness.

Commoner, 57, was born and raised in Brooklyn, where his father, a tailor, had immigrated from Russia. The streets were his playground as a child, but he escaped as often as possible to Brooklyn's parks, where he roamed about collecting biological specimens. An honors graduate of Columbia University, he went on to receive M.A. and Ph.D. degrees from Harvard before getting caught up in World War Two, during which he served as a lieutenant in naval aviation. In 1947, he joined the faculty of Washington University in St. Louis, where he has remained since, developing an ever-broadening range of interests—and concomitant clout. He began as a biologist, and his work with the tobacco mosaic

virus and its relationship to genetics led eventually to the isolation of RNA (ribonucleic acid) and the discovery of free radicals (molecules with unpaired electrons), which play a vital role in cell metabolism and photosynthesis. This, in turn, pointed the way to new methods of detecting cancer.

No ivory-tower research specialist, Commoner has long believed in the scientist's need to see the whole picture—and his obligation to speak out about what he sees. Back when the word ecology was merely an obscure dictionary entry, Commoner was warning about technology's deleterious effects on the environment. In the Fifties, alarmed about officialdom's failure to alert the citizenry about the dangers of strontium 90, he helped found the St. Louis Committee for Nuclear Information (later to become the Committee for Environmental Information) and barnstormed the country. His efforts bore fruit in 1963 with the adoption of the nuclear-test-ban treaty, but he has gone on to speak out against other menaces; notably, the pollution of air, soil and water by the excessive use of detergents, insecticides, herbicides and other chemicals.

Commoner's St. Louis center, which he has directed since 1966, is an eclectic institution through which he and his



"The current energy crunch is simply the result of oil-industry policies that have used the legitimate idea of real shortages in the future as a smoke screen for creating phony ones today."



"Nixon appointed Dixy Lee Ray, head of the AEC, to lead the task force drawing up a plan for our energy future. That's like asking the chief fox to work out a research program in the chicken house."



HERB WEITMAN

"Failure to understand—and act upon—the ecological, economic and political imperatives that push us toward developing solar energy will end in disaster. It's as simple—and as crucial—as that."

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researchers can draw upon multiple disciplines to conduct basic studies on the complex relationships between man and his natural environment—and the ways in which the former has been poisoning the latter. To see if he has come up with any answers to the twin problems of energy and environment, PLAYBOY sent writer Larry DuBois to St. Louis to interview Commoner on his home ground. His report:

"I knew that Commoner was considered a moving force behind the environmental movement, but since I hadn't read or heard much about him in the press, it wasn't until I saw him on a Dick Cavett show last fall that I realized why. He's an impressive man: formidably intelligent and encyclopedically articulate, but in a way that communicates his wide-ranging knowledge as clearly and concisely to laymen as to his scientific colleagues. You'd never guess it, however, by looking at his office—a big old nondescript room cluttered with thousands of books on every imaginable subject and piled high with hand- and typewritten papers in seemingly chaotic disarray. But perhaps he's memorized them all, for he didn't need to consult any sources when his phone rang—as it did frequently during our taping sessions—with questions from associates working on projects ranging from utilization of agricultural chemicals to the study of carcinogens.

"I found Commoner to be not only amazingly well informed but a warm, engaging, high-spirited man who obviously enjoys his work as much as his weekend leisure time, which he likes to spend, when he can, with his psychologist wife, Gloria, on their farm in the Ozarks. Despite his congested schedule, he kept to our agreement of two or three hours in conversation every afternoon for most of a week. At the time, the energy crisis was just beginning to usurp headline attention and the public was disturbed, confused, annoyed—and slightly cynical about it. I figured that if anybody would have any answers, Commoner would. So that's how we started—with a skeptical question about the reality of the crisis."

PLAYBOY: Is there really an energy crisis?

COMMONER: There certainly is, but it isn't the one the oil companies would have us believe. They've spent millions of dollars in an advertising blitz aimed at persuading the public that because the U.S. is running out of its own fuel reserves, we've been forced into increasing dependence on foreign oil imports—especially from the Middle East—and that largely because of the Arab embargo, we suddenly got in trouble. They've portrayed their own role as that of blameless public servants, just doing the best they can in a bad situation that they played no selfish part in creating. In my mind, one of the bright sides of the last few months is how quickly people saw through the flimflam the oil companies

were putting out, asking us to believe that it's only an amazing coincidence that at precisely the time the public is being asked to make tremendous sacrifices, their companies are racking up the greatest multibillion-dollar profits in history. Well, it's no coincidence.

PLAYBOY: How do you know?

COMMONER: There are a lot of interrelated reasons that lead to the conclusion that it was the oil companies' drive for maximized profits that got us into the situation we're in. To begin with, there's absolutely no reason why, in 1974, the U.S. should be suffering from a shortage of the fossil fuels—oil, coal and natural gas—whether or not there had been an Arab embargo. There is enough recoverable oil under the ground in this country today—and I'm not counting the Alaskan fields that the companies are so anxious to exploit—to supply our needs, even at the rate at which we now use oil, for probably 20 to 25 years, and maybe even longer.

But let me put this very bluntly: The present dependence of all industrial societies on fossil fuels cannot go on indefinitely. There are limited amounts of such fuels on the earth, laid down once and once only over millions of years, and we are engaged in burning them up during a relatively short span of human history. We have based what we hope to be an ongoing civilization on the suicidal concept of supplying our energy needs by using nonrenewable resources that won't last, and it won't wash. It's as simple as that. The real energy crisis lies in our need to develop indefinitely lasting, ecologically sound sources of energy. The current crunch is simply the result of oil-industry policies that have used the legitimate idea of real shortages in the future as a smoke screen for creating phony ones today.

PLAYBOY: How did that happen?

COMMONER: The entire pattern of oil exploration during the last 17 years has shifted overseas. Most of the big U.S. oil firms' exploration is now taking place abroad, to the point where the amount of oil being found in the U.S. each year is insufficient to take care of our annual needs. As far as I'm concerned, our vulnerability to the Arab embargo was solely the consequence of the operating philosophy of the U.S. oil companies, who realized years ago they could get a higher rate of return on their investment by producing and refining oil abroad, and they simply walked away from exploration in the U.S. That's what made us dependent on foreign oil.

PLAYBOY: But aren't the oil companies conducting so much of their exploration overseas because, as they claim, it's too difficult to strike oil here anymore?

COMMONER: They can strike oil if they look for it. Since 1957, the number of exploratory wells drilled in the U.S., and the number of crew months worked by

geophysical exploration units in the field, has dropped by more than 50 percent. But the ratio of oil found per exploratory well drilled is constant. The conclusion one must draw from this is not that oil is becoming harder to find in the U.S. but that less effort is being put into finding it. The crews are being shipped overseas, particularly to Saudi Arabia.

PLAYBOY: Why Saudi Arabia?

COMMONER: You might well ask that, since there is also plenty of oil in Iran, which has a foreign policy much friendlier to the United States. But the U.S. oil companies chose to concentrate their exploration in the Saudi Arabian oil fields because they could get the oil out of the ground and into the tankers more cheaply from there than from the Iranian fields. So I think it's a hard fact that Saudi Arabia's ability to put the screws on us was virtually handed to King Faisal by the oil companies. The major company handling production of oil from Saudi Arabian fields is Aramco, the Arabian-American Oil Company, which is roughly 75 percent owned by four major U.S. companies; which means, as has been pointed out in the press, that the embargo against the United States was largely administered by U.S. firms. Another reason the oil companies are producing in Saudi Arabia rather than in the United States is that they've worked out sweetheart deals with both the U.S. Government and the Saudi Arabian government that allow them to escape paying income taxes in the U.S. at the same rate that other U.S. industries do. This was done under the cover of a foreign-policy decision, supposedly using oil investment as a means of supporting countries in the Middle East whose friendship the U.S. wished to court. But the main point is that it has yielded much bigger profits for the oil companies than their U.S. operations. According to testimony before Senator Church's subcommittee on multinational corporations, they paid no taxes on their overseas profits in 1972. They don't have that good a deal on the production of oil at home, so the economic incentive to produce abroad isn't hard to understand.

There is an enormous amount of hocus-pocus in the economics of how foreign oil is bought, paid for and sold by these U.S. companies, but the way the game works out, they make more of a profit by being tax collectors for Saudi Arabia than they would as energy-producing entities for the United States. Those taxes, by the way, are based upon an artificially inflated, mutually agreed upon price per barrel of oil. After the tax is collected, the oil is actually sold at a lower price.

There is another way that the Arab embargo proved a major boon to these U.S. companies. If you, as a part owner

of Aramco, own underground reserves of oil in Saudi Arabia and the Arabs double or triple the price at which they sell the oil, the value of your reserves has doubled or tripled, too. That's a quick way to make money.

PLAYBOY: Are you suggesting a conspiracy between the American companies and the Arab governments?

COMMONER: I think most people in this country are convinced that the oil companies have worked out some sort of deal—and so am I. It doesn't take much more than an elementary understanding of the basic economics of supply and demand for the Arabs to realize that the American companies wouldn't resist seeing their reserves doubling or tripling in value. So here we have the oil companies collecting taxes for Saudi Arabia, administering anti-American embargoes, trying to run our foreign policy in the Middle East—remember the oil executive who suggested, in the midst of the latest Arab-Israeli war, that we should look more favorably on the Arab side?—and developing energy supplies elsewhere in the world when we need more energy developed here at home. It's a ridiculous situation, or it would be if it weren't so serious.

PLAYBOY: And all of this has been building up over the past 17 years?

COMMONER: Yes, but it's been happening even faster since 1969. Overseas oil exploitation became even more attractive after our domestic oil-depletion allowance was reduced from 27 percent to 22 percent. Before that, we used to have gas wars. Remember them?

PLAYBOY: Sure, and fairly recently we still had gasoline trading stamps, contests, free glasses. You could even get your windshield wiped.

COMMONER: There was a service station on every corner and a battle just to keep pouring gasoline out of the pump, because the best opportunity for the oil companies to earn profits was simply by pumping the oil out of the ground. I'm told by people who know the business that there was a time in the Sixties when many of the big companies were making little or no profit on the sale of gasoline—but it paid them to get rid of it because they were making money from Uncle Sam, who handed them some of their taxes back every time they pumped a barrel of oil out of the ground. In a sense, the entire oil industry consisted of a kind of complicated pipeline that ended up in the motorist's gasoline tank solely for the purpose of sucking the oil out of the ground at the other end.

Well, when the depletion allowance was cut, they couldn't make so much at the oil-well end, so they had to look elsewhere. One solution, as I've just pointed out, was overseas exploitation. The other was to get more from the consumer—by raising prices. In order to do that, they have treated us to the spectacle of pro-

gramed shortages. We had them on a smaller scale, you'll remember, even in 1971 and 1972—long before there was any hint of an Arab oil embargo.

PLAYBOY: What kind of men are these oil-company executives? Are they some sort of buccaneers?

COMMONER: Well, they're certainly in business to make a buck, and they do a very good job of it. I know only one of them personally, and he's a bird watcher who gets involved in conservation and is widely regarded as a nice guy. I don't think he wants to hurt anybody. On the other hand, it's possible that he doesn't really understand what's happening. Some industry people maintain that they underestimated the demand for energy in the United States and therefore didn't build enough refineries to provide for the demand for oil products in the United States—or enough pipelines to move it around to where it was needed. They're saying they were caught by surprise. But it takes three to five years to build a refinery, and there must be hundreds of experts in the oil industry whose job it is to forecast such things.

PLAYBOY: And they didn't?

COMMONER: Well, it's an interesting thing, but Ken Jamieson, the head of Exxon, gave a speech to the Economic Club in Detroit on January 28, and he simply claimed the oil industry had made a mistake. They didn't expect domestic demand to match supply by 1973, he said. The same day, a former Shell Oil Company vice-president, in an interview in *The New York Times*, recalled having attended an energy-forecast meeting in 1968 at which it was predicted that the demand for petroleum products would exceed supply sometime between 1972 and 1974. I find it difficult to believe that Exxon was less competent than Shell to make that prediction, but that's what Jamieson in his Detroit speech would have us believe.

And there was something even more interesting in that interview with the former Shell executive, something we have also substantiated through the petroleum industry's own figures. Our center here at Washington University is now doing something that, amazingly, not even the Government has done before—compiling petroleum-industry data. In the interview I mentioned, the ex-Shell man pointed out that the refineries in this country are still not operating at full capacity, and they've been fluctuating. In 1972, the refineries east of the Rocky Mountains operated at 87.5 percent of their capacity. Last October, refinery utilization hit 95.4 percent, but last March it was down to 84.4.

PLAYBOY: Why would production go down when gas is needed so desperately?

COMMONER: Well, there are various reasons. One important reason is that an apparent shortage in supply is a good excuse for raising prices. At a recent Sen-

ate hearing, a memorandum from oil-company economists recommending that supplies be reduced in order to raise prices was read into the record. And, of course, that's just what has happened since last summer—a sharp increase in fuel prices, just on the basis of a scare about shortages. And sometimes it behooves the major refineries to withhold gasoline from independent merchants in order to drive them out of the market. A number of people have said the reason for the difficulties we had in 1972 and early 1973, when there were minor shortages—again, long before the Arab embargo—may well have been the result of efforts to squeeze independents out of the market; there have been some Congressional hearings about that.

Another reason is that the balance between gasoline and fuel-oil refining, or the diversion of crude oil into petrochemical manufacturing, is entirely in the hands of the oil companies. They can decide how much of a barrel of crude oil will be made into gasoline, or home heating oil, or the chemicals that make plastics. The big oil companies are called vertically integrated industries because they do everything from getting the oil out of the ground to refining it into different chemicals and in some cases even manufacturing end products such as plastics. They decide how much of the various products to make, and they manipulate the balance solely to suit themselves—with regard only to maximizing the profits of the oil industry.

As a result of all these manipulations, the auto industry is suffering; the public is paying exorbitant prices for a gallon of gasoline—until recently, after enduring long waits in line just to get it; the poor face rent increases because the landlords say they have to pay more for fuel oil; the truck drivers go on strike because they can't afford to absorb the increase in price of diesel fuel. We're in trouble, and because of that very trouble, the oil companies are making more money than they've ever made before. And we find ourselves stampeded into acts of environmental lunacy like Congressional approval for the Alaskan pipeline—although I think now that many Congressmen realize they've been had.

PLAYBOY: We haven't seen any evidence of that.

COMMONER: Well, they *should* feel had, because it's now clear that the shortages haven't been that severe and, in any case, there's lots of oil available that the oil companies have been unwilling to look for. It's been estimated that the oil on Alaska's North Slope may provide the U.S. with a two-or-three-year supply. So we've extended the country's oil resources from, say, 20 years to 23 years. For that, we may permanently wreck the ecosystem in Alaska. Is it worth it? I don't think so. Since the recent Congressional hearings, everyone knows that we

don't need to get into this dubious ecological risk in Alaska, that a relatively simple way to increase our oil supply would be to take more oil out of Texas and Oklahoma.

PLAYBOY: Why are the companies so anxious to build the pipeline in Alaska if they can get oil out of Texas and Oklahoma?

COMMONER: Because they're going to make a lot of money out of it; they got the Alaskan oil rights at bargain rates. I've seen figures on the earnings expected, and they're something in the neighborhood of 50 billion dollars.

PLAYBOY: Isn't the Alaska-pipeline controversy, during which the oil companies and President Nixon attempted to pin much of the blame for oil shortages on environmentalists, an example of the danger the energy crisis poses for environmental causes? Won't the environment, in the long run, be the big loser?

COMMONER: I think the public has better sense than that. Have environmentalists been the target of the outraged American taxicab driver? The answer is no. It's the oil-company executives who have been getting it in the neck. There's been a clear-cut test case in New Hampshire. Aristotle Onassis tried to pressure the state into allowing him to build a half-billion-dollar refinery on the seacoast. The governor supported him, and Mr. Simon, the energy czar, told the people of New Hampshire that if the refinery were built, they could be sure of plenty of cheap gasoline. But the people were unwilling to sacrifice environmental quality and they turned the proposition down. I think it's simply marvelous to see how capable people have become of dealing with these issues. I think, for one thing, they'll soon see through the phoniness of Nixon's proposals for solving the energy crisis.

PLAYBOY: In what way are they phony?

COMMONER: Take them one by one. First, the need to relax standards for the siting of nuclear plants is a total hoax, because no nuclear power plant now being planned is going to help the energy crisis for the next eight to ten years; but according to Nixon himself, there won't be an energy crisis by 1980. In fact, he says there isn't any crisis *now*—only a "problem." So that's simply a way of using hysteria over energy shortages to get that particular camel into the tent. Then take the business of relaxing air-pollution standards, allowing industry to use high-sulphur coal because of a shortage of fuel oil. We now know there is no country-wide shortage of fuel oil; it's simply a question of working out an effective way of getting oil from one part of the country to another, and if the Government can't organize that, they ought to turn in their buttons. And the business of relaxing automobile-emission standards is totally ridiculous, because the present exhaust devices are already

inadequate for controlling pollution.

PLAYBOY: How so?

COMMONER: All they do is hold back waste hydrocarbons, which react with nitrogen oxide to form smog. Since the introduction of emission devices, Los Angeles has less smog, but the concentration of poisonous nitrogen oxide in Los Angeles' air has shot up, because it has nothing to react with. The real answer is to force Detroit to build small, properly designed engines; that will simultaneously solve both the energy question and the environmental question. But Nixon's not asking for that.

PLAYBOY: What you say may be true—that the public won't buy Nixon's arguments or those of the oil companies. But isn't it also true that there is less public concern today about ecology than there was, say, two years ago? Hasn't the furor died down?

COMMONER: It's pretty clear that environmentalism hasn't suffered a real decline in public interest. Inflation and the price of fuel are obviously concerning more people at the moment; even I am more concerned about inflation at this point than I am about air pollution, because I think inflation is a sign of very serious failures in our economic system that make it impossible to solve any problem, including that of air pollution. But people have come to realize that the very things they'd heard praised over and over again on television—big cars, detergents, synthetic fibers, all these things that were being touted as the pinnacle of civilization—are the very things that have been wreaking havoc with the environment. Concern with environmental problems has become firmly embedded in the social and political processes. There's a tremendous increase in the frequency with which bond issues and similar referendums on environmental issues win. And notice how Congress votes. An awful lot of Congressmen have been turned into environmentalists by their constituents.

PLAYBOY: And you think they'll stay that way, despite the energy crisis?

COMMONER: Because of it. Energy problems are going to be the cutting edge for environmental problems. They are inextricably linked. Most of our environmental problems come from the use of energy. To me, the striking thing about the environmental crisis is that it was produced during my lifetime as a scientist; it happened right before our eyes through a transformation of our productive technology; and the most fundamental facet of that transformation was the displacement of natural products by synthetic ones. Let me put it this way: If we could bring the U.S. environment back to where it was at the end of World War Two, I think everybody would be happy. Things were pretty good then. I was in naval aviation in

those days, and when I flew across the country, I could see the countryside, not thick brown clouds. The skies were clear in 1946. But shortly thereafter, the amount of pollution emitted each year started jumping—by ten- and twentyfold.

PLAYBOY: Why?

COMMONER: Well, some of us wondered the same thing when we began back in the Fifties to track back the causes of these problems. At first we were interested in radioactive fallout, but other things kept turning up. The scientific research became as exciting as any mystery story. It was like facing a bunch of those Chinese boxes; you start opening them, always hoping to find the explanation, but there are always more boxes inside. What we discovered was that the basic cause of this increased pollution was a series of drastic changes in the technology of industry and agriculture. It's amazing how many changes took place. We accept these things now, hardly notice them, but in 1946 there were practically no plastics on the market. You didn't have all this Saran Wrap and all those plastic olive stabbers, and buttons were made of shell, not plastic. The clothes you wore were of cotton and wool, some silk. People and freight rode on trains, not planes and trucks. It takes five times as much fuel to move a ton-mile of freight by truck as it does by railroad. Yet trucking has taken over a great deal of freight hauling from railroads in the last 20 years. A returnable beer bottle in 1946 made an average of 40 round trips before it was discarded; but today every time you drink a bottle of beer, it's instant waste. Even counting the energy needed to wash and refill a returnable bottle, the cost of creating and discarding today's bottle, in terms of energy use and environmental impact, is much larger than it used to be.

You go down the line and you get the same kind of pattern. Take the automobile. Prewar cars caused no smog whatsoever, for a simple reason: Their engines ran at a temperature less than that required to produce the chemicals in exhaust that lead to smog. By raising the compression ratio, and therefore the temperature, in engines, for the sake of higher power, Detroit's engineers made smog generators—and gas guzzlers—out of the American automobile. Detergents are probably the classic case. Before World War Two, we washed with soap. Synthetic detergents now represent something like 80 percent of the cleaning agents sold, and they're made from petroleum and natural gas. So you're using fossil fuels instead of natural fats as a raw material; you're burning energy from fossil fuels to turn that raw material into detergent molecules; and your finished products, the detergents, are terrible polluters. Today, when you wash a shirt, 19 times more phosphate goes down the drain than did in 1946. So

you're expending more energy to create a given amount of cleaning substance, and you're taking a heavier toll on the environment.

The whole petrochemical industry that has sprung up since the war has had this kind of effect. I have one of their ads that shows a woman wearing all their products—nylons, vinyl boots, and so on. The whole argument of the ad is that if we stopped producing these synthetics, we'd have nothing to wear. Well, we used to wear cotton and wool, and they covered us quite well. It reminds me of the science official in Washington I once had dinner with. We were talking about the possibility of banning DDT, and he was very much opposed to it, because he said there'd be no way to cope with insects. I asked him how he thought we were able to grow food before World War Two, when DDT was introduced. This was a novel idea that he hadn't thought of before. If you go right down the line, you find that technological changes have brought into play environmentally and energetically more senseless means of production than the things they've displaced.

PLAYBOY: In a 1970 cover story on the environmental crisis, *Time* quoted you as saying: "Once you understand the problem, you find that it's worse than you ever expected." Do you still feel that's true?

COMMONER: Well, one of the things I meant was that new problems are always coming up, and they still are. Did you read about the workers in a number of polyvinyl-chloride plants who have developed a very unusual type of liver cancer, and that it's now generally admitted that the disease is the result of exposure to materials in the plants? There is evidence that the cancer-producing agent is vinyl chloride, the raw material that's used to make polyvinyl chloride, and it's possible that some of the vinyl chloride is left in the finished product and leaks out of it when it's first used. That's frightening, because polyvinyl chloride is everywhere. Most tile floors are made of it, automobile upholstery is made of it, wallpaper is made of it, clothing is made of it, and I wish we knew where the wastes are really going. We've galloped ahead to produce this stuff in enormous amounts without this problem's ever having been sensed. The environment of the workplace has been terribly neglected, and we are all paying the price with our health—the workers most of all.

PLAYBOY: Wasn't there something similar recently in reports about lung diseases among asbestos workers?

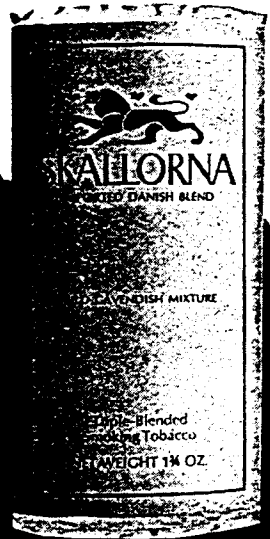
COMMONER: Yes, and not only in asbestos workers but also in people who had ever worked, even briefly, with insulating materials, or played as a child on a city dump where there was asbestos dust. And remember the women in a

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watch-dial factory in New Jersey who developed bone cancer from working with glow-in-the-dark watch dials? Many of these diseases don't show up until years later, and it becomes difficult to connect them with the occupational hazards that caused them.

PLAYBOY: If all you say is true, why have we, as a society, employed such foolish, wasteful and sometimes even dangerous means of production? Why were soap companies so eager to replace their relatively harmless product with detergents, which have polluted our waters and clogged our sewage systems? Why did Detroit build such big cars? Why did we substitute synthetics for cotton and wool? Why did trucks take over from railroads as the dominant freight haulers?

COMMONER: The answer lies in economics. Nearly all these changes in the character of production in the U.S. have come about because of corporate decisions. Corporations decided to set up truck lines instead of investing in railroads. Corporations decided to build those powerful auto engines and then spend hundreds of millions of dollars in advertising over the years to persuade the public that's what they needed.

A good test case involves soap and detergents, because the same companies that once made soap now make detergents. Imagine this scenario at a soap company making soap flakes. The engineer comes in from the research-and-development division and says, "Gentlemen, we have a new product; it's called a detergent. It'll wash very well and it's easy on the hands. It's made out of petroleum instead of palm oil. That means the price we pay for the raw material won't fluctuate with the agricultural market. Furthermore, we've done a cost accounting on the manufacture of soap and detergents and the profit margin is significantly bigger with detergents." I didn't sit in on any such discussion, but it has to be what happened. Corporate decisions are naturally based on the goal of increasing profit. That's what corporations have been expected to do, and they usually succeed—or go out of business. Synthetics have proved more profitable than cotton and wool, beer in pull-top cans more profitable than beer in returnable bottles, and so on.

PLAYBOY: Why are they more profitable?

COMMONER: The case of throwaway bottles and cans is a special, and rather interesting, one. Their use came about because of the efforts of large-scale bottlers to take over the industry from the small, independent operations we used to see in most towns. As the small-town bottlers were wiped out, the stuff had to be shipped longer and longer distances, and it obviously became uneconomical to ship empties all the way back to the big plants.

The fascinating thing is that the whole process has been reversed in Ore-

gon, where—as a result of legislative action—throwaways have been abolished. There have been two results: a large reduction in roadside litter and significant losses of revenue to out-of-state bottlers—with the slack being taken up in increased sales by local bottlers. The Oregon law has certainly hurt out-of-state bottlers, but it has benefited both the local environment and the local economy.

In most instances, synthetic products are more profitable because they substitute energy for human labor: in a café, for instance, serving coffee in a Styrofoam cup rather than hiring a dishwasher. Energy has been far cheaper than human labor, and it solves a lot of other problems. Those electrons come to work every Monday, they don't talk back, they don't go on strike, they don't complain about bad working conditions. But what nobody noticed until recently was that this was accompanied by a decrease in the efficiency of power utilization. For instance, those manufacturing sectors which are particularly inefficient in their use of electricity—chemicals, petroleum refining, paper and pulp, some primary metals—have grown more rapidly than the more efficient industrial sectors. It's significant that those industries at the bottom of the list, in terms of productive value and jobs created per unit of fuel consumed, recorded the highest gains in profits in 1973, as compared with 1972, of any sector of the economy.

PLAYBOY: But hasn't American industry switched to using more energy and less labor because wages are so high? Would you propose lowering wages in order to replace those electrons with human beings?

COMMONER: Of course not. Work is both an important aspect of human experience and the basic source of all wealth. But increasing the use of energy, especially through automation, often reduces work to meaningless, routine motion and, at the same time, takes work away from people. I think it's degrading to force people to compete with energy for either the experience of meaningful work or for its rewards. I would pretty much turn things around: The wealth created by the work that people do should be divided among them equitably, regardless of the cost of energy. In a number of new technologies, of course, energy has had the effect of reducing what we might term undesirable human labor. On construction jobs, for example, you don't see people getting bad backs pushing wheelbarrows full of concrete around anymore. What you see instead is a concrete mixer or truck come up and pump concrete where you want it. I don't think anyone would want to turn that particular part of the clock back.

On the other hand, there have been ways in which energy has displaced human labor that seem to make no sense

at all in terms of human values. An example of that would be the introduction of plastic packaging. Ten years ago, if you went to a hardware store to buy an electric plug, you would walk up to the counter and tell the guy behind it that you'd like to have a plug. And he would go to the wall, pull out a drawer, take out a plug, put it in a paper bag and off you'd go. If you want to buy that plug now, you have to find it yourself and you get it encased in plastic that you can't unwrap without a knife. I don't think that change has very much to do with increasing the dignity of human labor. People enjoyed the exchange with the clerk, and his wasn't a very onerous task: it wasn't hurting his health. So here is a case where plastic, which is energy-intensive, has been used not for humanistic reasons but because it reduces labor costs and enhances profitability—and because it was to the interest of some petrochemical company to push ever-increasing uses for new plastics.

PLAYBOY: Why has the petrochemical industry placed so great an emphasis on plastics?

COMMONER: It's a little bit like science fiction. You get the feeling that there is some self-duplicating plastic machine somewhere pushing all this stuff out—the little gadget you seal up your bread with, the rings around the six-pack of beer. I did an analysis of the petrochemical industry to find out why, and the reason is that by far the biggest cost in producing plastic or detergent or any other petrochemical product is that of raw material. Labor usually represents one percent or so of the manufacturing cost. If you can reduce the cost of making the raw material from its petroleum bases, you can increase your profit a great deal, and one way to do this is by utilizing the by-products created in the manufacturing process. The logic of this has led the industry to invent new products regardless of whether or not they're really needed by society—and then to create a market for these products.

Let's say that a committee of chemical engineers for a petrochemical company is designing a plant to produce ethylene, which they know can sell at a certain price. They know that one of the by-products of ethylene production is propylene, and one thing they can do with this propylene is pipe it back and burn it in a reactor, which will save them the cost of natural gas, and they figure out the economic gain involved in burning the propylene. Then along comes some up-and-coming engineer who describes a chemical reaction that has just been reported in which you can convert propylene to acrylonitrile and make acrylic fibers. They don't even need computers to tell them they can make much more money by converting that propylene into acrylic fibers than they can by burning it. And so, in order to make ethylene at

a high profit, they *create* a market for another petrochemical product, and the public has a new synthetic kind of rug that is advertised as progress.

PLAYBOY: And the petrochemical company is using still more fossil fuels, because now it's buying the natural gas it wouldn't have had to purchase if it had burned the propylene.

COMMONER: Yes. The petrochemical industry is a powerful parasite on the energy industry and the environment; it competes with farmers for fuels such as propane and drives that price up, which we finally pay for in higher food prices. The petrochemical people say they use only five percent of the energy in the country, but it's really more like ten percent, because they also use fuel as raw material. But it's very profitable. Let's face it: Production of synthetic products is more profitable than production of natural ones. And what all this means is that over the last 25 years, the economic system of the U. S. has traded long-term stability for enhanced short-term gains in profitability. And I think this raises some crucial political questions—most profoundly, the question of whether or not it makes sense to continue to govern the use of fossil fuels and other resources in this country the way we have in the past. Are we willing to allow the development and availability of a resource as absolutely essential as energy to be governed by decisions based on the profitability of a single company or a single industry?

PLAYBOY: What would your answer be?

COMMONER: This is a political question, and my role as a scientist is to provide the information we need to answer it. Political questions have to be decided by everyone. But knowing what I now know about (A) the importance of energy in our productive system, (B) the policy of energy development and use that has been generated as a result of private enterprise and (C) the problems that have arisen as a result, I think—speaking as just one voter—that we should govern the use of energy in the United States according to public welfare rather than private profit. What that means is that the energy industry needs to be owned and operated for and by the public.

PLAYBOY: Are you advocating nationalization of, say, the oil companies?

COMMONER: We have to face that alternative. Let me put it this way: For the last generation, we've allowed oil executives to make their decisions—thousands of separate decisions about looking for oil, what products to make, where and when to build refineries, and so on—based solely on the criterion of what was good for their stockholders. All these decisions have been made by a small handful of executives and industry committees. And they made some very smart decisions, given their criterion: profit. Exxon

made 2.4 billion dollars in profits last year. But it would have been a miracle if by accident all those decisions based on profitability had turned out to give the U. S. the kind of energy it needed, without polluting the environment, at a price people could afford to pay, where and when they wanted it. And the miracle didn't happen. On the contrary, what we're learning now is that there are very serious contradictions between those decisions and the well-being of the country. You could go so far as to say the American oil companies have put themselves in an antinational position.

PLAYBOY: Nationalization of an industry has always been a dreaded specter to American businessmen, politicians and most voters. Do you think that even something as dramatic as the energy crisis could change attitudes enough to make nationalization a realistic possibility?

COMMONER: I think that if we can keep our wits about us, and if Mr. Nixon and his janissaries don't succeed in orchestrating any new panics over the energy situation, we'll see at least some discussion of this in the next Presidential campaign. Several Senators have already advocated some type of Federal control over the energy industry and perhaps over the transportation system. I mean, our transportation system is sick, and it's causing a large part of our energy and environmental problems. Look at the airlines. Sixteen 747s have been in moth balls because they were too expensive to fuel. Imagine the enormous capital and human resources that went into building those 747s. And because there was no planning about energy, they were sitting idle in a country where many people are still hungry and poorly housed. What that says is that the organization of our transportation industry doesn't make sense.

And the biggest railroad in the country is bankrupt. So it's safe to say that private industry hasn't done a good job of organizing the railroad system. Do you realize that the U. S. railroads, and one in Canada, are the only major railroads in the world that are *not* nationalized? It's well known that nationalized railroads are unprofitable and, indeed, the railroads in Europe and Japan lose money; the reason is that they carry passengers, which is not profitable. In this country, we might not have any passenger service at all if it weren't for Amtrak, which is actually a subsidization rather than a nationalization of the railroads. But these countries have decided that they're willing to sacrifice the access of private industry to railroads in return for carrying passengers and freight in a way that is energetically more efficient and saves on environmental impact. I think that's a reasonable trade-off.

PLAYBOY: But would nationalization really help matters? Any opponent of yours would merely point to the U. S. Postal

Service as an example of the inefficiency of Government-controlled industry.

COMMONER: I do admit that at the present time we haven't got a shining example of a better alternative. I hear that accusation—that Government bureaucracy is inherently inefficient—every time I mention nationalization. A couple of years ago, when I first raised the issue of the inefficiency of trucks versus the efficiency of railroads and pointed out that we were letting our railroads go to the dogs, a Senator said to me, "But we don't know how to run railroads in this country." For a moment, you know, I sort of sat there stunned. Here I was in the New Senate Office Building, sitting in the august presence of a group of United States Senators, in the most powerful, technically advanced country in the history of man, and a Senator tells me that we can't run railroads. What I finally said to him was, "Isn't it time we learned?" But that's what it comes down to: it's impossible for me to believe that there is no way of setting up a social enterprise, let's say to run railroads, or to move mail, or to provide energy, that is both efficient and publicly owned and operated.

PLAYBOY: Aren't you really raising the larger question of whether profit-making enterprises under private ownership can operate in the public interest—whether, in the final analysis, capitalism can still hack it?

COMMONER: Yes, I am. But I think the time has passed when people are going to be frightened by the idea of examining the assumptions under which our productive system operates. You know, the design of the American economic system wasn't handed down on golden tablets. It's nowhere written into the Constitution, as far as I know. There is no religious reason that it should be protected from examination. Can we really meet our basic needs, protect the environment and use our energy efficiently under a capitalist organization of the economic system? It's time for us to examine that question without having any preconceived notions as to what the answer is going to be.

PLAYBOY: Without any preconceived notions, what do you think the answer is?

COMMONER: It seems to me that if everything I've been talking about is true, then what we have to conclude is that the capitalist system has caused chaos. What do you call the energy crisis, if not chaos in the whole mechanism of production? You've got hundreds of thousands of people thrown out of work because of the energy crisis and its phony shortages; you've got such high prices for gasoline and fertilizer that auto plants are closed down and farmers can't plan their planting. Householders are told to conserve electricity, and when they do, the power companies want to

raise their rates because they're selling less electricity. Then we're told that we have to stand for more air pollution from cars and power plants because low-sulphur oil has become too expensive. I read an article in *The New York Times* financial section the other day which said that the energy crisis may bring several countries to the point of bankruptcy. Now, *that's* chaos. I don't think anybody can escape the fact that the energy crisis is a child of capitalism.

PLAYBOY: But is there any less of an energy crisis, and environmental crisis, in socialistic countries such as those in Scandinavia, or in a Marxist society like Russia's?

COMMONER: Every time I lecture on campus, there is at least one student who asks whether we can solve the problem under capitalism and another who points out that the Soviet Union is having pollution problems, too. I think the answer is that there doesn't yet seem to be in existence a model of an economic, social and political organization that will do just what we're looking for. It seems to me that the Soviet Union has thus far fallen into the pollution trap in almost the same way that the United States has, because there you win the Order of Lenin by producing cars, not by keeping the water clean downstream from the factory.

At least that's the way it's been until now; but there are signs that this attitude may be changing. I think the basic solution is to organize society to produce goods in ways that benefit society as a whole. In theory, at least, that ought to be more in keeping with the design of a socialist system than a capitalist one. All I say is that we have to find a way to do that, and find it soon. Neither the capitalist firm of United States Steel nor its Russian equivalent can make steel unless there is enough oxygen in the air for the steelworkers to breathe and the fires to burn in the furnaces.

PLAYBOY: But isn't there an alternative to substituting public ownership for private enterprise? Couldn't the profit incentive be retained but altered in some way—for instance, by granting tax credits for developing ecologically sound products or environmentally sane manufacturing processes, so that it would be more profitable, as well as more socially desirable, to make good products? Or combine the carrot and stick approaches by imposition of criminal penalties on the executives of companies that pollute?

COMMONER: A number of economists are working hard to develop some techniques for dealing with environmental pollution and energy problems within the framework of the private-enterprise system. I think they aren't likely to succeed very easily, because all the solutions I know of only cause new problems. For example, a tax placed on polluters will only raise the price of their product, and

higher prices always place a heavier burden on the poor, widening economic inequalities. A subsidy for doing the right thing would be somewhat better, but the resulting over-all increase in taxes would also hurt the poor.

A basic thing to think about is this: In a private-enterprise system, no productive action is undertaken unless the expected return is greater than the bank interest rate. In the natural world, however, not all parts of the environmental system can produce at equal rates without breaking down. For example, an acre of Ozark pasture, kept in ecological balance, can produce much less food than an acre of good Illinois cornland—in fact, usually not enough to warrant investment. The result is that by not using such "marginal lands," we reduce the country's over-all capability to produce food. I think that an ecologically sound economic system would have to allow for the operation of different productive enterprises at very different rates of return. No one has explained how that could be done under a private-enterprise system, except by means of subsidies—which would require, in my opinion, parallel action to sharply reduce economic inequalities.

PLAYBOY: In dealing with all these problems, you stress the importance of the organization of the economic system. But many experts—perhaps most notably Paul Ehrlich, in the August 1970 *Playboy Interview* and in his best-selling book *The Population Bomb*—have stated the only solution to the problems of pollution and energy shortage lies in population control. You, however, have gone on record—both in speeches and in your book *The Closing Circle*—against this position. Why?

COMMONER: The argument between me and the populationists is partly one of political approach. Take the situation in the United States, which is quite different from the situation in the rest of the world. Clearly, if we could return to the density of population at the time the Indians had the country to themselves, I doubt that there would be any energy problems. All our productive activities are related to satisfying the needs of human beings; there really isn't anything that we produce to *not* use, except maybe nuclear bombs—I hope. It's entirely possible to take the position that one way to reduce the use of energy and the environmental impact is simply to have fewer people around. I just don't believe that's the simplest way or the best.

PLAYBOY: Why not?

COMMONER: Because we can maintain the population at the present level and change technology to reduce pollution and energy consumption. I made a series of computations, summarized in *The Closing Circle*, which run more or less along these lines: Suppose we had let the

population grow as it has since 1946—which would mean an increase of nearly 50 percent—but had improved the technology of production sufficiently to keep pollution levels down to where they were in 1946, instead of rising tenfold or so, as they have actually done.

PLAYBOY: And how would you have done that?

COMMONER: In some of the ways we've been talking about—for example, moving freight and passenger traffic back onto trains, away from cars and trucks and planes; getting rid of one-way pop bottles and ring-top cans; washing shirts in soap instead of detergents. At any rate, I calculated that to keep pollution at 1946 levels with a 50 percent increase in population, we would have to improve the efficiency of technology roughly 30 percent. By efficiency I mean a measure of the amount of goods produced per unit of pollution or per unit of energy consumed. That's an effort that could be made—a 30 percent improvement.

Now, if you approach it from the opposite direction—that we accept the technological changes that have actually occurred since 1946 but keep the pollution level down by cutting back the population—we would have had to reduce the population by 86 percent. Now we've come to the end of the science; from here on, it's a political choice. There is no scientific ground on which I can say it's better to undertake a 30 percent improvement in technology than an 86 percent reduction in population. My own political choice is the first route. Pollution has been created by the people who govern our productive enterprises, and I am unwilling to let them off the hook and saddle everyone in the country with the job of solving this problem by means of birth control.

PLAYBOY: But isn't the country overpopulated now?

COMMONER: I know one ecologist who has concluded that the country is overpopulated because every time he goes on his favorite trail in the Rockies, he sees somebody. On the other hand, I know people who live in New York who *enjoy* the density of the population. They would enjoy it a lot more if conditions were more congenial; but people enjoy themselves a great deal in countries that are much more densely populated than our own—Holland, for instance.

PLAYBOY: It's apparent, at any rate, that the population growth rate in this country is declining dramatically—that the population is beginning to stabilize. Even so, doesn't what you're suggesting in the way of technological improvements to conserve energy imply a need for some rather basic changes in the American lifestyle?

COMMONER: Oh, certainly. A friend of mine recently did a study on communes

and concluded that communal living reduced energy consumption—as a result of the members' desire to de-emphasize the materialistic aspects of life. For example, instead of each household's buying its own washer and drier, the commune members used laundromats. The laundromat doesn't save on the energy used to operate the equipment; a certain number of people's clothes will fill so many loads in a washer, wherever the machine is located. But it does save on the energy needed to produce that number of machines. Of course, there are always some superfastidious persons who don't want somebody else's dirty clothes in their washer. But how about lawn mowers?

PLAYBOY: How about lawn mowers?

COMMONER: It has always struck me as a sign not of affluence but of stupidity for us to organize our society in such a way that you have to have your own private lawn mower as you have your own private toothbrush. Why not a lawn-mower station in the neighborhood with, say, 25 lawn mowers available? It doesn't even have to be that formal; several families could simply go in together and buy a lawn mower. They'd save a lot of money, as well as the energy required to build all those mowers—production of which is going up something like 15 percent annually. Some families I know have done something like that with a station wagon. What you often need in a second car is something that will lug junk around, but you don't need it very often. So these people went together and bought a communal station wagon.

PLAYBOY: Which they could also use in a car pool for trips to the supermarket?

COMMONER: Sure. Shopping is a very important factor in energy use. When I was a kid in Brooklyn, you could buy any daily need—food, drinks, clothes, lollipops—within easy walking distance, five blocks or so. Nobody needed a car to take care of all of these things. Well, today, people live farther away from stores; you can have all the good will and mother-earthly attitude in the world, but if the nearest grocery is five miles away, you drive there. A great deal of gasoline is burned simply to enable people to get the food they need from day to day. One answer to that problem, incidentally, is another communal venture—the food cooperative. People usually set them up to save money rather than energy, but they conserve that, too. Once or twice a week, some member of the cooperative takes a station wagon or a truck and goes down to the wholesale markets to buy staples, fruits, vegetables and meats, and then returns them to a neighborhood distribution point. You just go in and pick up your order. You could adapt that system to other things, too.

PLAYBOY: What other things?

COMMONER: Well, for instance, one of the oldest dairies in St. Louis recently announced that in the interest of energy conservation, it was giving up its last milk-delivery routes. Milk delivery to private homes may be wasteful, but so is sending a truckload of milk to the supermarket and then having everybody get into his or her private car and drive to the supermarket to pick up one container of milk. A much better system would be to set up on every fourth or sixth corner a refrigerated vending machine to which a milk truck would deliver containers of milk every other day. All the people in the neighborhood could trot over there and pick up their milk. You'd have to figure out the exact density of distribution points, to minimize the trips for the delivery truck but at the same time make it possible for people to pick up the milk on foot.

PLAYBOY: Which, in the old urban neighborhoods, is what they used to do—at the corner store.

COMMONER: I think it may turn out that an important way to save energy would be, insofar as possible, to re-create neighborhoods, with the local store and the local laundromat and the local tavern.

PLAYBOY: Taverns save energy?

COMMONER: Certainly. You could get rid of the whole beer-can-and-bottle-production-and-disposal problem by having people drink at the corner tavern, as they do in Britain. I rather imagine their trash problem is less severe than ours, and I wouldn't argue that the British enjoy beer drinking less than we do. Another interesting side light is that one researcher has come out with a statement that one cause of alcohol problems in this country is the fact that people drink at cocktail parties or at home instead of in taverns, where there is a certain sense of community. But that's another problem. Just sticking to the energy part of it, there are many things people can do at home. Bathing Japanese style, for example, was apparently designed as a way to save the fuel required to warm water. The youngest and cleanest goes in the water first, and on up the line, using the same tub. People used to do that in this country, too, in the old days of the Saturday-night bath—before we had hot running water. When you had to heat the water on a wood stove, you were much more conscious of the energy required. But whatever means of conservation we adopt, we'll need some form of energy to heat that bath water—energy that someday we won't be able to get from petroleum or even coal, because they just won't be available anymore.

PLAYBOY: What's the solution, then? Is it further development of nuclear power, as the Atomic Energy Commission seems to be telling us?

COMMONER: The AEC people say that, but I think they're wrong. In the first

place, there isn't enough fuel to run the present types of reactors for more than 25 or 30 years, so their resource lifetime is no greater than that for petroleum. In fact, I think that petroleum, considered world-wide, would probably last longer than the uranium used to run nuclear plants. So the nuclear-power advocates say that we'll develop breeder reactors—in which there's a regeneration of fuel. That would stretch the resources very considerably; but there are serious problems with breeder reactors.

PLAYBOY: Such as?

COMMONER: The first such reactor in the United States, the Fermi reactor, was a dismal failure; it broke down and hasn't operated since. We are only now in the process of designing a prototype breeder reactor, and when you look at the track record of technical difficulties and down time compiled by the present reactors, the chance of a breeder reactor's becoming a reliable source of energy in the next 50 years is slim. And reliability, to my mind, is an absolutely essential attribute of any energy system.

Look at it this way: If your furnace at home breaks down because of some flaw, you can probably put on more sweaters or move into a motel until it gets fixed. But consider what the unreliability of fuel supply can do, for example, to corn production in the Midwest. The old-fashioned way of harvesting corn was to let it dry on the ear; the sun did the work, without using any artificial energy supply. Then it was picked and placed, still on the ear, where the air could get at each kernel, in an open-air crib to complete drying. One of the recent developments in corn production, though, has been the introduction of combines that pick, husk and strip the kernels from the ears in one operation. In other words, the combine produces a big bin of moist grain that you have to dry artificially if it isn't going to rot. So you put it in a hot-air drier fueled with propane gas, and the result is that corn production in the Midwest in recent years has become totally vulnerable to having a sufficient supply of propane gas available during the right week, in the right place and at a price the farmer can afford. If he's uncertain about being able to get it, or to pay for it—the price, remember, has tripled this past year—he just may decide this is the year to retire, or to take his land out of production for a while, or to plant some other crop. All because the supply of energy he requires is not reliable. If the future farmer is told to rely on electricity from a nuclear reactor to dry his corn, and that blacks out at the wrong time, there goes the crop.

PLAYBOY: What about the safety of nuclear power plants?

COMMONER: There are very serious environmental problems with present nuclear reactors, and those with breeder reactors

will be far worse. No one really knows what to do with high levels of radioactive waste, and the problems we have now would be many times multiplied if we got to the point where we were depending on nuclear reactors for power. I think that would be intolerable. More than that, breeder reactors involve the use of plutonium, which is the most dangerous radioactive pollutant there is; for various technical reasons, it raises horrifying problems of control.

PLAYBOY: Then why is the AEC pushing so hard for nuclear power?

COMMONER: You have to remember the origins of the AEC. Our entire atomic-energy program, on which billions of dollars have been spent, was developed not because of any real concern about energy but as a way of putting a peaceable cloak on the development of nuclear weapons. People have forgotten that the first power reactor in the United States was built as a prototype for a power plant to go into submarines. In fact, the Government was unable to convince private industry to build nuclear power plants until it horsed around with the subsidies enough, and until the price of other fuels rose enough, to make it economically worth while.

You know, one of the significant things in this field is that when the private power companies were being persuaded by the Government to build nuclear power plants, they naturally turned to their insurance companies for liability coverage in case of accident—and no group of private insurance companies was willing to underwrite the risk. As a result, the Price-Anderson Act—which in effect gave them the insurance free as a subsidy from the Government—was passed. The Government, so to speak, put the safety of its own citizens on the line and guaranteed that whatever happened, it would pay the bill. Nuclear power plants were an item the AEC wanted to sell, and it did everything it could in terms of Government subsidies, pressures and persuasion. The people who are pushing nuclear power, who say we're going to be able to rely on it, are walking blind into a cave full of tigers. No, that's the wrong image: They're leading us blind into a cave full of tigers, and I think it's totally irresponsible.

PLAYBOY: Well, then, what is the answer—or is there one?

COMMONER: Yes, there is. Any sensible examination of the facts about global energy supplies, and of the laws of biology and physics, tells us that the only logical way in which to develop our energy system in the United States is to make it nearly entirely dependent upon solar energy, in various ways. All the energy on the earth comes from the sun—most of it as visible light and some as ultraviolet and infrared radiation. There are

several natural means of trapping solar energy: in organic materials through photosynthesis, for example. We have used photosynthetic products, such as wood, as fuels for years, but that process can be made more efficient by, for example, producing charcoal from the wood and using it in powdered form to operate high-pressure boilers.

Wind is a form of solar energy, too—a hurricane has more energy in it than most atomic bombs—and windmills can be very useful. In many places, a windmill can produce enough energy to take care of a farm; a generation or so ago in this country, they did. You might say the windmill has become a victim of the overcentralization of our economy; for a time, it was simply impossible to buy one in the United States. Now, though, there are two or three companies either building or importing them. You can use a windmill to generate electricity and store it in batteries or to pump water uphill and then have it run downhill to produce electricity. Hydroelectric power comes from solar energy, too, you see. You get water power by using the force of falling water to turn a generator. In order to fall, the water has to be first lifted, and it's lifted naturally by being evaporated by the sun, condensed in clouds, and then raining down the mountainside. In other words, the sun raises the water, and when you lower it from the mountain, you run it over a dam and produce power.

PLAYBOY: But aren't most potential dam sites already in use? Isn't there a limit to the new hydroelectric power that can be produced?

COMMONER: There is a limit to sites that are suitable for large-scale, centralized operations. The power companies have simply built bigger and bigger power plants, looking for big rivers between high mountains that you could dam up to get a high water drop. You need that to produce large, commercially profitable amounts of electricity. But there is falling water all over the country; falling slightly, but enough to generate electricity. I haven't seen it, but I'm told that the West Germans have developed a generator that can be driven by the water moving in a swift stream and will produce enough electricity for a farmhouse without the need for a dam at all.

PLAYBOY: But all of this—windmills, charcoal burners, water wheels—sounds rather quaint, not the sort of thing one would think of in developing any technology on a wide enough scale to combat the energy crisis.

COMMONER: We all have this mind-set that technology requires some huge shiny apparatus presided over by a man in a white coat, because we've artificially equated technology with bigness and complexity. But you know, a lever is an example of technology; so is a knife. I

consider a windmill that pumps water up to a farm pond on a hill, connected to a pipe running down past a little generator to a lower pond, a perfectly decent piece of technology. It will do a job just as well as hooking into a power line with a nuclear reactor at the other end will, if the ponds are big enough to provide a reservoir to account for the intermittency of the wind.

The electrons that go into a washing machine don't know if they've come from a shiny nuclear-power reactor or some creaky old windmill; they're the same electrons. And that windmill is being fed by a natural energy pool, the wind, and isn't going to disturb the ecology one whit. Some of the energy in the wind will end up in your toaster, but then the heat from the toaster will go out into the air and eventually dissipate into space. All you're doing is interacting with the energy system that comprises the weather. Solar energy can be captured on this scale without any noticeable ecological disturbance.

PLAYBOY: Still, all the things you've mentioned are basically old forms of technology. Are there no new ways to utilize solar energy?

COMMONER: Yes, of course. One particularly interesting proposal has been made by Clarence Zener, a very good physicist, using the temperature differential in the tropical oceans. You can get power when you have a high temperature and a low temperature, through thermoelectric effect. Zener would float devices in tropical oceans, where the natural temperature differential is greatest, which would produce, he estimates, about 60 billion kilowatts—or about 30 times the energy consumed by the U. S. in 1970. Now, of course, there are things like airplanes that don't run on electricity. So Zener would use some of that electric power to electrolyze salt water, yielding hydrogen and oxygen. Hydrogen burned with pure oxygen is, of course, an ecologically perfect fuel, yielding only water on combustion. The ecological impact of all this, Zener thinks, would be to lower the temperature of the surrounding ocean by one degree centigrade. That might have some ecological effects, but they should be minor ones. At any rate, there'd be no fuss, no fumes.

There are also ways of *concentrating* solar energy. Normally, after all, the sun doesn't set fire to the earth. But remember your childhood experiments with magnifying glasses? If you can collect light through a glass and concentrate it down to a much smaller area, you get enough heat to burn a hole in a piece of wood. There's a big curved mirror up in the Pyrenees that takes advantage of that principle to achieve temperatures high enough to melt steel. And a number of years ago, the Russians built a steam engine in which steam was

generated simply by mounting a movable mirror that followed the sun's daily path and concentrated its rays on the boiler. There's a project being developed in Texas that does the same thing in a different way, and some scientists in Arizona are working on a project using solar energy to melt sodium and get high-pressure steam. Their proposal is to cover some number of square miles in Arizona with sodium-filled pipes that will generate enough electric power to take care of a good part of the country.

But we haven't talked about all the solar-energy devices for which the technology now exists, like the windmill. There are certain major uses of energy in this country that could be taken care of within three to five years with no technical hoo-haw at all. I'm referring to residential heat. Solar devices to heat houses have been on the market since the Twenties. Not long ago, I drove from Miami Beach to Miami International Airport, and along the road, every third house—they were older homes—had a solar hot-water heater mounted on the roof. They consisted of a glass panel, usually four by nine feet, connected to a water tank. They work by the greenhouse principle: the radiant energy is trapped by the glass and absorbed by black-painted metal pipes full of water, and the hot water is stored in the tank, and that's that. Devices of that sort could probably be built for a few thousand dollars to provide all—or let's say 90 percent—of the space heating and hot-water heating for a home, even as far north as Boston. If you had a snowstorm, of course, you'd be in trouble for a while; you'd have to use an auxiliary energy source.

PLAYBOY: What about maintenance?

COMMONER: Such a device, with no moving parts, might last the entire life of the house with only periodic cleaning. Incidentally, about a quarter of the energy used in this country is for residential consumption of this sort, so this could make an enormous contribution. My own very small contribution is that I've built a solar heater on our farm. It's a very simple idea—I'd read about it someplace, about a device built once in Argentina that not only produces the energy but stores it right in the solar device itself. It's a box filled with black wax that melts in the heat of the sun, so that all you do is run in cold water, circulate it through copper tubing laid in the wax and it comes out hot.

PLAYBOY: As a dramatic demonstration, would it be possible, say, to heat the White House with solar energy?

COMMONER: Yes, I think so. That would be a very interesting idea. But, come to think about it, considering the present occupant of the White House, if any solar device were put in there, he might begin to call himself the Sun King. You always have to look at the political se-

quelae of these technical developments. Perhaps we'd better wait on that one.

PLAYBOY: Some kind of dramatic demonstration may be needed, though. Why is it that the public hasn't heard about the possibilities of developing solar energy?

COMMONER: It's a scandal. Ralph Nader likes to make the crack that if we put a depletion allowance on the sun, then let somebody own it, solar energy would be developed. And there's something to that, although I'm not sure it's the whole answer. One factor, as I've already shown you, is that a very important way to use solar power is to do it on a small scale, and that flies in the face of our concept of technology. It's not highly profitable, either, because I rather doubt you would sell a homeowner a new model of solar heater every year. There's no planned obsolescence in it, so it won't become economically valuable except insofar as the cost of fuel becomes high. I'm sure that's why solar heaters went out of style in California and Florida: because fuel was so cheap.

PLAYBOY: But fuel isn't so cheap anymore.

COMMONER: True, but if we simply use the economic weapon to force a shift from fossil fuels to solar heaters, it's the poor who will get it in the neck. Because as long as you can't afford to buy the solar heater to warm your house, then you have to buy fuel—at ever higher prices. What I'm afraid of is that solar energy is going to be exploited insofar as it is profitable, and we'll be backing into it without developing a comprehensive program. That would be better than the situation we're in now, but a far cry from what needs to be done.

PLAYBOY: How can you be so sure that solar energy is the right path to pursue when many students of the problem seem to disagree with you? A five-year research program voted by our own House of Representatives, for example, has been attacked as unwarranted.

COMMONER: I don't see how anyone can conclude that solar energy isn't worth developing when every one of the techniques that can be used has already been demonstrated on a small scale. All that's needed is economic development. As for opposition, you have to notice who's doing the opposing: the home builders, the energy industry, the Nixon Administration and the Atomic Energy Commission. Don't forget that in plumping for solar energy we're bucking an enormously powerful, well-heeled atomic-energy machine. Don't forget that the oil companies now own not the sun but uranium supplies. Don't forget that when the energy crisis surfaced to the point where even Mr. Nixon noticed it, he appointed Dixy Lee Ray, head of the Atomic Energy Commission, to lead the task force drawing up a research plan for the energy future of the United States. That's like asking the chief fox to work out a

research program in the chicken house. The outcome, not surprisingly, was that the report proposed that the future of the United States lies in the development of nuclear energy. What is even more disturbing is that the AEC had in its hands the report of a subpanel on solar energy which concluded that solar power could easily compete with nuclear reactors as a source of electricity. When I tried to get a copy of that report, through the good offices of Senator James Abourezk of South Dakota, it turned out to be quite a job. Neither his staff nor Senator Jackson's staff nor Peter Flanagan, a Presidential assistant, could get the report from the AEC. It was finally produced when Senator Abourezk wrote the AEC a letter citing the Freedom of Information Act.

PLAYBOY: You mean the AEC tried to suppress the report?

COMMONER: Apparently. That sort of thing happens all the time. When the AEC or any other agency wants to do a report on anything complicated, it asks some of its staff or a group of outside experts to break down the project into different topics. Each of these subcommittees turns in a report, which then becomes the property of the AEC, or whatever agency we're talking about, and the agency can usually do with it what it wishes. Or the agency can turn over a complete report and the President can ignore it or suppress it himself.

PLAYBOY: As he did with the reports of the commissions on marijuana, pornography and population?

COMMONER: At least that information got out to the public. But in September of 1972, a Presidential commission established by Mr. Nixon to make recommendations about what should be done about the nation's number-one health problem—heart disease—turned in a long and detailed report outlining steps to be taken to improve research and treatment, and the President refused to issue that report.

PLAYBOY: Why?

COMMONER: Probably because it recommended a fairly expensive heart-disease-prevention program. But the Scientists' Institute for Public Information—I served as chairman of its board—wrote to the President and requested that the report be published. We just heard from the White House that, a year and a half later, the report is going to be published. That is one of the scientific community's main responsibilities to society—to pry information loose and see that it gets to the people who need it.

The whole thing gives me a sense of *déjà vu*. Way back during the fallout flap of the Fifties, when the Atomic Energy Commission was hatching a lot of crackpot schemes to get peaceful uses out of nuclear bombs, there was a thing called Project Chariot, a proposal to

blast a harbor on the Alaskan coast. Someone tapped the AEC on the shoulder and said, you know, there might be ecological problems; there might be Eskimos around there, caribou, and so forth. So the AEC arranged with the University of Alaska and a couple of other institutions for a series of investigations that were done by some very good ecologists. About a year later, we here in the St. Louis unit of the Scientists' Institute for Public Information became interested in the status of the thing and we wrote to the AEC for information. They answered that they had a report on it but they couldn't release it. So we said, well, tell us who worked on it, and they sent us the names and addresses of the ecologists. We wrote to them and asked for copies of their reports, which were literally being suppressed by the AEC. Well, the reports showed that there were completely unanticipated and very serious ecological effects involved in the carrying out of Project Chariot. So we summarized those reports in our magazine, *Environment*, and really spilled the beans on the AEC. To make a long story short, the whole project was killed. But today, they still seem to be doing it—still suppressing reports.

PLAYBOY: If Government agencies, even the President, are suppressing information, and private industry has no incentive to support the development of solar energy, do you think we'll ever see it fully exploited in this country?

COMMONER: Oh, yes. I'm optimistic. We *have* to develop it. And it's just the kind of experience I've had with the Atomic Energy Commission in the past that makes me hopeful. One way political power has been maintained in this country is by keeping things secret; that's the lesson of the Pentagon papers and of Watergate. And the way in which those of us in the scientific community have had an impact on public policy is by destroying that secrecy, by destroying that exclusivity of knowledge. That's exactly what happened with the test-ban treaty. The AEC, the people in the military, knew damn well that nuclear war was an impossible risk. Either that or they were unbelievably incompetent. But they were free to act as though building up nuclear weapons were possible because that secret was theirs exclusively. When those of us in the scientific community sniffed out the facts about strontium 90 and other forms of radioactive pollution, broke through the secrecy and got those facts through to the public, all that changed. It was an aroused public opinion that led to the test-ban treaty, and I think that will happen again with solar energy. The people of this country are able to see where problems originate, once they have enough information to understand them.

My mind always goes back to an experience I had during the fight against fall-

out, when I used to turn up every other night, it seemed, in some church lecturing about the dangers of strontium 90. Often enough, halfway through the talk, somebody would say, "You mean we're poisoning our neighbor's well?" Once the people understood that, there was no need for an injection of morality to spur them to action. The conscience was already there, the moral conviction that you do not poison your neighbor's well. It's the same thing now with the energy crisis. People don't believe it's fair for a few individuals or companies to make money while the whole country is suffering. You may be surprised in the future, as the facts become clear, to see what good people Americans are.

PLAYBOY: You don't, then, see us racing against some inevitable doom?

COMMONER: No, I don't. Obviously, you've got to be an optimist if you've had the experience, as many of us have, of taking on the AEC and winning. As long as you share what you learn in scientific investigation, there are millions of people who, given the truth, have the conscience and the conviction to take the necessary action. I consider myself enormously lucky to have been able to use my scientific and technical knowledge as a tool with which to inform the public. To me that has been a very rewarding experience, because, in fact, people *listen*. Twenty years ago, when I and a few others began talking about environmental problems, we were considered ridiculous kooks, modern Jeremiahs. But we kept at it, and now people understand.

PLAYBOY: How long do you think it will take us to get on the right energy track?

COMMONER: Let's say, just for the sake of argument, that in the next election we choose a President committed to a national effort to shift from fossil fuels to solar energy, so that in 1976 we're ready to launch this shift. I'm no expert on this, but I know a little bit about how these engineering things go, and it seems to me that in 20 to 25 years, we could be three quarters of the way there. In the meantime, we know we have enough fossil fuels to keep us going while we're building up this new energy system. We could easily supply all of our fuel needs for that period by taking oil from the continental United States and mining coal in reasonable ways. At the same time, we could be cutting back on the demand for energy by improving the efficiency with which we use it: shifting traffic from cars and trucks to railroads, using natural materials instead of synthetic ones wherever possible. In other words, part of the national program would be a planned use of fossil fuels to tide us over.

The most important thing, overall, is the need to re-examine all the assumptions that we've kept hidden about the

character of our productive and political systems. Isn't there some way of having both economic and political democracy in the same society? I'm not willing to accept the notion that it can't be done because it *hasn't* been done. With that attitude, we wouldn't have had the American Revolution. We're really in the same situation today, where we have to think openly about the ways in which we want to govern the resources we've got, so that there will be no need for crises, for shortages, for high prices—and for imposing heavier burdens on the poor.

PLAYBOY: Are you advocating a kind of fortress America in the energy sphere—a return to self-reliance on our own natural resources, with less emphasis on trade with the rest of the world?

COMMONER: By no means. I'm advocating that we be less dependent on Arab oil, because we absolutely must shift over to solar energy. But trade with other nations can be very useful both for them and for us. Take the implementation of solar energy, for example. There is no reason why the crash program to develop every aspect of it has to take place only in the United States; there's no reason why good solar heaters developed in Nigeria shouldn't be used here. As a matter of fact, one of the intriguing things about solar energy is, as I've said, that it can be exploited on a small scale. Therefore, it's highly applicable to developing countries. It's my hope that they will, in fact, lead the way, exert technological leadership. It's a great opportunity for nations that are behind in the race toward the wrong technological goals—countries whose economies are not dependent on energy-wasteful factories producing energy-wasteful products—to get ahead, to get on another track. I hope they move in that direction and show us the error of our ways. Somebody has to.

PLAYBOY: Isn't that what you're trying to do yourself?

COMMONER: Sure. That's why I'm doing this interview. It's absolutely imperative that the people of the United States—and the whole world—understand that the only rational way to assure future energy supplies and, at the same time, end our suicidal assault on the environment is to undertake a massive development of solar energy. Any other alternative would enormously worsen our environmental problems, create dangers such as plutonium radiation and potential nuclear-power-plant explosion, even risk wars over foreign oil supplies. In other words, failure to understand—and act upon—the ecological, economic and political imperatives that push us toward developing solar energy will end in disaster. It's as simple—and as crucial—as that.

