A Friends of the Earth / Ballantine Book
ORIGINAL $1.25
02125-8-125

HOW TO BE A SURVIVOR

A Plan to Save Spaceship Earth

DR. PAUL R. EHRLICH
author of
"THE POPULATION BOMB"
and
RICHARD L. HARRIMAN

HOW TO BE A SURVIVOR

Dr. Paul R. Ehrlich
and
Richard L. Harriman

Make the world such that we all can make it. [illegible]

BALLANTINE BOOKS • NEW YORK
An Intext Publisher

SBN 345-02125-8-125, Paperbound Edition
SBN 345-02-126-6-595, Hardbound Edition

First Printing: January, 1971

Printed in the United States of America

BALLANTINE BOOKS, INC.
101 Fifth Avenue, New York, N.Y. 10003

"We travel together, passengers on a little spaceship, dependent on its vulnerable reserves of air and soil; all committed for our safety to its security and peace; preserved from annihilation only by the care, the work, and, I will say, the love we give our fragile craft. We cannot maintain it half fortunate, half miserable, half confident, half despairing, half slave to the ancient enemies of man, half free in a liberation of resources undreamed of until this day. No craft, no crew can travel safely with such vast contradictions. On their resolution depends the survival of us all."

Adlai Stevenson

"One world—or none."

Wendell L. Willkie

Paul R. Ehrlich

Dr. Paul R. Ehrlich, Professor of Biology and Director of Graduate Studies at Stanford University, is a population biologist and ecologist whose studies convinced him some years ago that "if *Homo Sapiens* is to continue as the dominant species of life on Earth, modern man must come soon to a better understanding of the Earth and of what he has been doing to it." In his subsequent efforts to inform and convince others about the elements and dimensions of the overpopulation crisis, Professor Ehrlich has become probably the nation's most outspoken expert on the subject. He graduated from the University of Pennsylvania and received M.A. and Ph.D. degrees from the University of Kansas; he has lectured on more than 150 college campuses, has testified before congressional groups, and has written many scientific and popular articles and several books, including the best-selling paperback *The Population Bomb* (1968).

Richard L. Harriman

Mr. Richard L. Harriman is a graduate student in Political Science at Stanford University. Through his close association with Dr. Ehrlich, Mr. Harriman has worked extensively with the subject of the population crisis and its relationship with environmental deterioration. His interests are in New Politics, the political implications of the ecological movement and new life styles.

To

Loy Bilderback
Douglas Daetz
Thomas Harriman, Jr.
John Hessel
John Holdren
Richard Holm
John Montgomery
John Thomas

Authors' Note

Scientists in our society are often criticized for being too narrow, but when they step outside the narrow field of their training they are invariably told they should stick to their specialty We prefer to risk the latter criticism. In many areas of this book, we have gone beyond the boundaries of our formal training to try to seek solutions to human problems. We see no other course than for scientists in all fields to do the same—even at the risk of being wrong.

Paul R. Ehrlich
Richard L. Harriman

HOW TO BE A SURVIVOR

Contents

I

Spaceship in Trouble

IN APRIL 1970, an explosion occurred on board the spaceship Apollo 13, seriously affecting its life-support systems and threatening the lives of its three crewmen. Fortunately, careful planning for emergencies had been carried out in advance by NASA technicians, and rapid decisions about emergency action were possible. Such decisions were made, the astronauts performed with courage and ingenuity and were able to survive the mission.

That very same April a much larger spaceship was also in deep trouble. Its life-support systems were malfunctioning, it was running out of vital supplies, and half of its overcrowded passengers were hungry. But on this spaceship there had been no emergency planning; indeed, there was not even any crew. Most of the first-class passengers were under the impression that the ship existed only for their benefit, and spent their time squabbling with each other and maneuvering to insure themselves the lion's share of the dwindling stores. The tourist and steerage passengers lived and died mostly in misery, unable to get their fair share and unaware that even a fair share was by then inadequate. That spaceship was, and is, the Spaceship Earth.

By April 1970, a scattering of the passengers had perceived the danger to their vessel. Over the last few hundred years of the Ship's long voyage there h occasional warnings from individuals concer the functioning of the life-support systems, bu 1960's their words went unheeded. Then, in the years of that decade, signs of malfunctioning were ficiently obvious and frequent to attract wide atter On April 22, 1970—for the first time in history—a stantial number of the passengers of Spaceship Earth paused to consider the state of their vehicle. That day was, hopefully, the first step in organizing the passengers into a crew for the endangered Ship, and in taking the actions necessary for survival.

This book is designed to be a step toward the development of a survival manual for Spaceship Earth. It contains a brief description of the state of the Ship in mid-1970, and then gives suggestions for emergency procedures and long-term actions which we feel are essential for the successful continuation of our voyage. In some cases we will be very specific about solutions. In others, we will merely indicate the direction in which we feel solutions might lie. Finally, we are including a set of actions which may be taken immediately by individuals who have an interest in their own survival and quality of life, and that of their children and subsequent generations.

The State of the Ship: Today and Tomorrow[1]

Passengers. Approximately 3.6 billion human beings are aboard Spaceship Earth. Almost one half of these are "hungry"—that is, they are undernourished or malnourished. Between 10 and 20 million passengers, a

---

[1] Unless otherwise cited, details and supporting references for statements made in this book may be found in P. R. Ehrlich and A. H. Ehrlich, *Population, Resources, Environment: Issues in Human Ecology* (San Francisco: W. H. Freeman and Company, 1970.)

...many of them children, now starve to death an-[illegible]. The most serious nutritional problem is mal[illegible]ment which usually results from a lack of high [illegible] protein in the diet. Protein malnourishment, if [illegible] does not result in death, all too often produces mental [illegible]rdation. Without an adequate supply of protein, the [illegible]y is unable to manufacture enough brain tissue.

The quarters for most of the passengers are substandard or worse. As Professor Georg Borgstrom of Michigan State University recently put it: ". . . there are not many oases left in a vast, almost world-wide network of slums." [2] The scale of needed slum clearance is difficult to comprehend. For instance, if it were possible to construct 10,000 houses per day in Latin America for the next decade, about 100 million people there would still be ill-housed at the end of that period.

But crowded, hungry, and miserable as much of mankind is today, tomorrow seems destined to be much worse. The passenger list of our spaceship is growing by roughly *70 million persons annually*. Every three years, 210 million people—a population slightly larger than that of the United States—are added to the planet. The growth rate is so rapid and the numbers so large that it is difficult for us to grasp their meaning. Perhaps the most stunning way of driving home the rate of world population growth is to compare it with the horrifying statistics of war. In all the wars the United States has fought—the Revolution, the War of 1812, the Mexican War, the Civil War, the Spanish-American War, World Wars I and II, Korea, Vietnam, Laos and Cambodia—the United States has had some 600,000 men killed in battle. The size of the world population now increases by 600,000 people every three and a half days.

As population increases and as people are crowded more and more into urban areas, the probabilities of plague and conflict also grow. And each individual's chances for leading a fulfilling, happy life shrink.

---

[2] Georg Borgstrom, *Too Many: The Biological Limitations of Our Earth* (New York: Macmillan, 1970), p. xi.

Supplies. Economist Abba Lerner of the University of California summarized the resource situation of Spaceship Earth in a single sentence. "If you want to improve the standard of living of mankind, you basically have two choices: make the Earth larger or make the population smaller."[3] No matter how you slice it, the resources of the planet are finite, and many of them are non-renewable. Each giant molecule of petroleum is lost forever when we tear it asunder by burning to release the energy of sunlight stored in it millions of years ago. Concentrations of mineral wealth are being dispersed beyond recall, senselessly scattered far and wide to where we cannot afford the energy to reconcentrate them.[4] Precious stores of fresh ground water, accumulated over millennia, are being drained much more rapidly than natural processes can replenish them.

This profligate use of resources results in part from desperate attempts to provide bare subsistence for most of mankind. But it also derives from the exploitative economic systems of the overdeveloped nations, which persist in the pursuit of an "affluence" based on almost limitless wastage. Since the non-renewable resources consumed by these wastrels are resources which will not be available to their descendants, this behavior has been accurately described as grand larceny against the future. We are doing something that few businessmen would consider rational in conducting their own businesses. We are rapidly using up our capital in full knowledge that it will be impossible to get any more.

Life-Support Systems. If too many people in relation to

[3] Debate January 14, 1970 at the University of California, Berkeley, sponsored by the Northern California Committee for Environmental Information.

[4] Energy use always pollutes. Vast amounts of energy are used to mine concentrated ores. The amounts that would be necessary to attempt, say, to reclaim rusted iron scattered thinly over the Earth's surface by man would be incalculably higher. Even if the energy were available (it is not), the impact of its use on the ecology of the planet would be disastrous.

food and other resources were our only problem, Professor Lerner's alternatives would summarize the possible solutions. We could get out of our troubles either by increasing the amount of resources ("making the earth larger") or by reducing population size. Indeed, many people see the world situation in just these simple terms. But things are not that simple. Population growth itself greatly increases environmental deterioration.[5] Rapidly accelerating environmental deterioration adds enormous complexity and difficulty to the existing population-resource imbalance.

Most laymen tend to view environmental deterioration (which they think of as "pollution") as a problem combining esthetic decay and direct health hazards. It is quite true, of course, that we are turning the world into a vast slum and junkyard, and that pollutants are reducing our life expectancy. DDT alone may already have substantially reduced the statistical life expectancy of all of us, especially of children born since 1948.

More important than these obvious hazards though, are the subtle, indirect threats of environmental deterioration. These are threats to the integrity of the life-support systems of our spaceship—the ecological systems (ecosystems) of our planet. We must always remember two facts.

First, we are all completely dependent on the life-support systems of our planet for every bit of our food, for the oxygen in our atmosphere, for the purity of that atmosphere, and for the disposal of our wastes. Green plants supply our oxygen and our food. All animals eat either plants or other animals, which in turn eat plants or eat animals that eat animals, which in turn eat plants, and so forth. (In spite of what some Americans seem to think, food does not materialize miraculously overnight in supermarkets.) Without green plants we would all quickly starve to death. Even if we could live without food, we would eventually suffocate in the

[5] The relationship between population growth and environmental deterioration is detailed in Appendix II.

absence of green plants. We would slowly use up the store of oxygen which plants have created in the atmosphere over millions of years, and then there would be no more. In addition to green plants, a variety of microorganisms (tiny bacteria, protozoa, and fungi) work quietly in soil and water recycling the materials necessary for life, and in the process they too maintain the quality of the atmosphere.

The second important fact to remember is that the stability of ecological systems depends in large part on their complexity. Every time a population or species is driven into extinction, every time prairie is cleared and planted with a single crop, every time an area is paved, the complexity of the Earth's ecosystem is reduced, and the danger of large scale malfunctions of the life-support systems of the planet is increased. Suspicious signs of such malfunctioning are already apparent in our lakes, rivers, and even in the oceans.

Suppose our lives depended on the smooth functioning of a complex computer. We are aware of the general principles of the computer's design. For instance we know that it often has more than one transistor where one would suffice, providing the safety of redundancy. Now, suppose we see to our horror that people and machines are beginning to pull transistors from the computer at random. We cannot predict accurately when the computer will stop functioning, because we don't know exactly how "fail-safe" the various back-up systems make it. But we can be sure that if enough transistors are removed, the computer will stop or malfunction and we will die.

Similarly, ecologists cannot predict exactly when or how the world ecosystem—the life-support system of our spaceship—will break down. However, we can guarantee that, if our present course is continued, sooner or later *it will break down.* Preliminary signs make "sooner" seem more likely than "later."

In addition to ecosystem simplification, other subtle kinds of environmental deterioration also present grave threats. For example, air pollution is now changing the climate of the Earth. As more and more marginal land is farmed, large quantities of dust are picked up by the wind and carried long distances in the atmosphere, creating such meteorological phenomena as the Harmattan haze of Africa and a dust "blanket" over much of southern Asia. The overdeveloped countries pour huge amounts of poisonous gases and solid particles into the atmosphere, both from industry and from automobiles. As a result, the murkiness of the atmosphere over the central Pacific Ocean—far from major sources of contamination—has increased 30 per cent in the last decade. One consequence of this massive injection of particles into the atmosphere has been a cooling trend resulting from the decreased ability of sunlight to penetrate the atmosphere. An alternate trend is known as the "greenhouse" effect. Either could undoubtedly lead to weather changes which, in turn, would hurt world agriculture. Such changes could seriously damage American agriculture as early as the decade of the 70's. Since we have only about one year's reserve supply of food in the United States, famine could come to this nation, and it could come relatively soon. The blight in the corn belt in 1970, associated with too moist weather, may be a foretaste of things to come.

Perhaps the most threatening change in our environment is directly related to increased population size and the resulting food scarcity. The larger and denser our population becomes, the greater is the probability of a worldwide plague. Remember that there are more hunger-weakened people in the world today than there were people in 1875. This large, weak population is a perfect target for disease-causing organisms—especially for a lethal virus. A lethal epidemic might result from a mutation of a virus already present in the human population, such as the flu. The chance of such a mutation's occurring goes up as the number of people (and thus the number of human viruses) increases.

Alternatively, we might be struck down by a plague