

*Preface*

## The Rivet Poppers

As you walk from the terminal toward your airliner, you notice a man on a ladder busily prying rivets out of its wing. Somewhat concerned, you saunter over to the rivet popper and ask him just what the hell he's doing.

"I work for the airline—Growthmania Intercontinental," the man informs you, "and the airline has discovered that it can sell these rivets for two dollars apiece."

"But how do you know you won't fatally weaken the wing doing that?" you inquire.

"Don't worry," he assures you. "I'm certain the manufacturer made this plane much stronger than it needs to be, so no harm's done. Besides, I've taken lots of rivets from this wing and it hasn't fallen off yet. Growthmania Airlines needs the money; if we didn't pop the rivets, Growthmania wouldn't be able to continue expanding. And I need the commission they pay me—fifty cents a rivet!"

"You must be out of your mind!"

"I told you not to worry; I know what I'm doing. As a matter of fact, I'm going to fly on this flight also, so you can see there's absolutely nothing to be concerned about."

Any sane person would, of course, go back into the terminal, report the gibbering idiot and Growthmania Airlines to the FAA, and make reservations on another carrier. You never *have* to fly on an airliner. But unfortunately all of us are passengers on a very large spacecraft—one on which we have no option but to fly. And, frighteningly, it is swarming with rivet poppers behaving in ways analogous to that just described.

The rivet poppers on Spaceship Earth include such people as the President of the United States, the Chairman of the Soviet Communist Party, and most

other politicians and decision makers; many big businessmen and small businessmen; and, inadvertently, most other people on the planet, including you and us. Philip Handler, the president of the United States National Academy of Sciences, is an important rivet popper, and so are industrialist Daniel Ludwig (who is energetically chopping down the Amazon rainforest), Senator Howard Baker, enemy of the Snail Darter, and Vice President George Bush, friend of nuclear war. Others prominent on the rivet-popper roster include Japanese whalers and woodchippers, many utility executives, the auto moguls of Detroit, the folks who run the AMAX corporation, almost all economists, the Brazilian government, Secretary of the Interior James Watt, the editors of *Science*, *Scientific American*, and the *Wall Street Journal*, the bosses of the pesticide industry, some of the top bureaucrats of the U.S. Department of Agriculture and some of those in the Department of the Interior, the officers of the Entomological Society of America, the faculties of every engineering school in the world, the Army Corps of Engineers, and the hierarchy of the Roman Catholic Church.

Now all of these people (and especially you and we) are certainly not crazy or malign. Most of them are in fact simply uninformed—which is one reason for writing a book on the processes and consequences of rivet-popping.

Rivet-popping on Spaceship Earth consists of aiding and abetting the extermination of species and populations of nonhuman organisms. The European Lion, the Passenger Pigeon, the Carolina Parakeet, and the Sthenele Brown Butterfly are some of the numerous rivets that are now irretrievably gone; the Chimpanzee, Mountain Gorilla, Siberian Tiger, Right Whale, and California Condor are prominent among the many rivets that are already loosened. The rest of the perhaps ten million species and billions of distinct populations still more or less hold firm. Some of these species supply or could supply important direct benefits to humanity, and all of them are involved in providing free public services without which society could not persist.

The natural ecological systems of Earth, which supply these vital services, are analogous to the parts of an airplane that make it a suitable vehicle for human beings. But ecosystems are much more complex than wings or engines. Ecosystems, like well-made airplanes, tend to have redundant subsystems and other "design" features that permit them to continue functioning after absorbing a certain amount of abuse. A dozen rivets, or a dozen species, might never be missed. On the other hand, a thirteenth rivet popped from a wing flap, or the extinction of a key species involved in the cycling of nitrogen, could lead to a serious accident.

In most cases an ecologist can no more predict the consequences of the extinction of a given species than an airline passenger can assess the loss of a single rivet. But both can easily foresee the long-term results of continually forcing species to extinction or of removing rivet after rivet. No sensible airline passenger today would accept a continuous loss of rivets from jet transports. Before much more time has passed, attitudes must be changed so that no sane passenger on Spaceship Earth will accept a continuous loss of populations or species of nonhuman organisms.

Over most of the several billion years during which life has flourished on this planet, its ecological systems have been under what would be described by the airline industry as "progressive maintenance." Rivets have dropped out or gradually worn out, but they were continuously being replaced; in fact, over much

of the time our spacecraft was being strengthened by the insertion of more rivets than were being lost. Only since about ten thousand years ago has there been any sign that that process might be more or less permanently reversed. That was when a single species, *Homo sapiens*, began its meteoric rise to planetary dominance. And only in about the last half-century has it become clear that humanity has been forcing species and populations to extinction at a rate greatly exceeding that of natural attrition and far beyond the rate at which natural processes can replace them. In the last twenty-five years or so, the disparity between the rate of loss and the rate of replacement has become alarming; in the next twenty-five years, unless something is done, it promises to become catastrophic for humanity.

The form of the catastrophe is, unfortunately, difficult to predict. Perhaps the most likely event will be an end of civilization in T. S. Eliot's whimper. As nature is progressively impoverished, its ability to provide a moderate climate, cleanse air and water, recycle wastes, protect crop from pests, replenish soils and so on will be increasingly degraded. The human population will be growing as the capacity of Earth to support people is shrinking. Rising death rates and a failing quality of life will lead to a crumbling of post-industrial civilization. The end may come so gradually that the hour of its arrival may not be recognizable, but the familiar world of today will disappear within the life span of many people now alive.

Of course, the "bang" is always possible. For example, it is likely that destruction of the rich complex of species in the Amazon basin would trigger rapid changes in global climatic patterns. Agriculture remains heavily dependent on stable climate, and human beings remain heavily dependent on food. By the end of the century the extinction of perhaps a million species in the Amazon basin could have entrained famines in which a billion human beings perished. And if our species is very unlucky, the famines could lead to a thermonuclear war, which could extinguish civilization.

Fortunately, the accelerating rate of extinctions can be arrested. It will not be easy; it will require both the education of, and concerted action by, hundreds of millions of people. But no tasks are more important, because extinctions of other organisms must be stopped before the living structure of our spacecraft is so weakened that at a moment of stress it fails and civilization is destroyed.