# SURVIVORS FROM EARTH

Laurence B. Winn


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# FOREWORD

Some of my colleagues at Martin Marietta (now Lockheed Martin) once told me that they had hoped someday to work on the moon or Mars, but that politicians had stolen that opportunity from them. They said they wouldn't let it happen to their kids. I realized at that point that we had to stop talking to each other about space and seek a wider audience. I embarked on what turned out to be a 25-year study of the frontier theory of history as it applies to space colonization. One result is this book. It is not a book about how to get into space. There are plenty of those. This is a book about why we must.

There are no frontiers left on Earth. Virtually every spot on Earth is owned or claimed by a nation willing and able to defend it for economic or military reasons. Every point on Earth is within 20 minutes flight time by ballistic missile. Every point on Earth is connected to the same stressed ecosystem. Nowhere on Earth welcomes refugees anymore. There are no frontiers left on Earth.

Can we substitute other kinds of frontiers? No. Metaphysical realms are a poor bet. "God helps those who help themselves," said Benjamin Franklin. In a similar statement of faith, Heinricherson Faust, the scientist hero of Goethe's play *Faust*, frees himself from a pact with the Devil through practical, dirty-handed struggle. (At the end of Act V: "He who strives on and lives to strive/ Can earn redemption still".) Intelligent design is efficient design. We can expect no future miracle of salvation because that miracle has already occurred.

God has given us the tools to save ourselves: a mind and a spirit capable of conceiving the technologies to enter space.

Princeton physics professor Gerard K. O'Neill called space "The High Frontier" in his 1976 book by the same name. In it, he gave what he called an "existence proof" that humans could build and live comfortably on colonies in space, independently of the earth, but benefiting the home planet in many ways: clean solar power delivered to the earth in virtually unlimited quantities, new hope for an exciting and affluent future, new markets, inventions stemming from the needs of the new environment, and openings for technologies and political systems that would not be permitted to challenge the status quo on Earth.

The nation that does this gets far more, but, perhaps most significantly, it gets the military high ground, justifying the expense of it all (about $200 billion a year over 15 years). It's a pittance, really. The United States can find it by the simple expedient of diverting funds from its conventional and failing military efforts to space colonization and industrialization, with all that it implies. So what does it imply? See above.

For our trouble, we also get truly isolated facilities to handle any strains of microbial life we may find in space, high vacuum, low temperature, and zero gravity (all valuable industrial resources expensive or impossible to obtain on Earth, but free in space), plentiful energy and materials, exciting and profitable work, a reduction in social pressure for crime and terrorism on Earth, and, like Atlantis, Camelot, and America in their time, the next "Land of Wonders".

The obstacles:

Cost, but not so much. We could more than do this work for a fraction of the money squandered on the military and social futilities of the United States Government alone.

Technological barriers, but not so much. No breakthroughs in physics, materials science, propulsion, or structures are required. At least one (carbon nanotube wire for the cables of space elevators) would be useful. Closed-cycle life support might be a particularly instructive challenge. We will need solid engineering.

Cowardice. We will need to take some risks, including the risk of using nuclear propulsion. A sufficient number must understand and be willing to take these risks.

Communication/Education. This is the most difficult work of all, and the work left to what are typically the weakest minds. About 4% of the U.S. population already gets it, according to an admittedly old copy of the *Space Activist's Handbook*. We can start with that.

Legal/Political Barriers. The Outer Space Treaty, the Moon Agreement, and the Nuclear Test Ban Treaty are examples. Like the treaties themselves, this speed bump is worth mentioning only in a historical context.

Those contributions are most welcome that enable us best. Nothing is more enabling than an idea that provides a litany against fear. That is what *Survivors from Earth* seeks to do, because, for the first time in their history, Americans are afraid. They are the worst kind of afraid, with a cold, hopeless, debilitating fear rather than the hot sense of urgency which has driven them to vigorous action in the past. It is clear that we cannot continue as we have been. The situation has changed. Alternatively, our leaders ask for sacrifice and permanently reduced expectations. Too many of us believe we must not see what is forbidden by the gospel of sustainable development: that there is a third path that avoids both environmental mayhem and dreadful losses of sovereignty and prosperity. What we do not yet see in America is that the world needs an exit, and that the only way out is up. When we do, we will

begin to end the dark age that began when frontiers disappeared from Earth a hundred years ago and we embarked upon a desperate and futile attempt to address that loss with a specious philosophy of big government, counterfeit altruism, and all manner of the wrong stuff.

**Laurence B. Winn**

Tucson, Arizona
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# Chapter 1: First Principles

*"You know, in America in 1994 we really don't have any freedom of movement. All you can do is ride up and down the road. Everything's fenced in."... East Texas cowboy balladeer Bob Campbell.*

The headlines read like a global demonstration of Murphy's Law: Anything that can go wrong, will....

"Rhine may need 10 years to recover from spill"

"Greenhouse tragedy may be coming fast, hard"

"Wheat losses may soar as Russian aphid moves west"

"Experts fear spread in U.S. of dangerous mosquito"

"NY students pack drugs, guns"

"4 million may starve in Ethiopia, U.N. says"

"Spread of ballistic missiles troubles U.S."

"School cancels exams amid suicide pact fears"

Yet there is a pattern.

Human beings neither reproduce nor evolve quickly, so they have survived and prospered by a strategy which consists, at least in part, of avoiding one another. In modern Western history, when conditions became intolerable in Europe, colonists left for the New World. The process had been going on for generation after generation. It stopped only recently, when Earth's frontiers filled up late in the nineteenth century.

## Enclosure

Take a look around. Unless you are looking straight up, virtually everything you see is owned by a corporation. Do you really own your home? Do you get to live in it free? Not only do all the things you see belong to corporations, but social roles belong to them as well. It used to be, and not so long ago either, that a high school education was adequate to begin an apprenticeship in many careers. You could run for public office without owning a mint or selling your soul. The leading roles are not as solidly cast as they were in, for example, the Middle Ages in Europe, but a little time will certainly yield more progress in that direction if we get too comfortable with this thing called enclosure. That's the term we have adopted to describe the surrounding and walling off, literally or figuratively, of a resource. English law gave the term its meaning when, in the last century, that country concluded its

transition from agriculture based on tenant farming to the cultivation of huge, consolidated holdings with (many fewer) hired hands.

The phenomenon is not new. It has existed since there have been human beings, probably since there has been life. And in humans, at least, it always produces the same effect: a conviction that no one profits except at the expense of someone else. It's like an end game of Monopoly in which there is no "get out of jail free" card, hotels are everywhere, and the sum of the assets of all players is a fixed number. For you to get a buck, someone has to give up a buck. That is the concept which has produced the expression "zero-sum game" in reference to life.

In what is now among the most teeming and threadbare parts of the world, long before this expression existed, ancient Indian communities organized themselves around a core that included a "chief inhabitant", who was judge, cop and tax-gatherer; a bookkeeper who kept the accounts; a boundary man, who guarded the access to the village; the water overseer, managing the irrigation works; a Brahmin who conducted religious services; a smith, a carpenter, a potter, a barber, a schoolmaster, and a few others (perhaps a poet, for example). If the population increased, the surplus founded a new community on the pattern of the old one, on unoccupied land. A modern community is far more complex, consisting, as it were, of a fusion of many simple communities, with many cooperating individuals in the same occupation. When the cooperation turns to competition in a zero-sum environment, however, it is time for a new community. And in the absence of a frontier, the village model breaks down instead of duplicating itself. That's what we are seeing today, enclosure that may well be called terminal.

You can find examples of terminal enclosure everywhere in the world today, but the best are in undeveloped countries like Bangladesh, a bite out of India's northeastern arm between China and Burma. Its population density is 2,000 per square mile, third-highest in the world after Singapore and Hong Kong, but that's not the Bangladeshi problem. Their problem is that, while the land is fertile, 60 percent of the inhabitants don't own any of it.

The dispossessed do have a choice, and many of them take it. Seeking a better life, tens of thousands of settlers move their families to tiny silt islands in the Meghna River delta. Where the river empties into the Bay of Bengal, it deposits sand and silt washed from the Himalayan headwaters of the Ganges and the Brahmaputra, which water India. In contrast to their lives on the mainland, the settlers have rice and often fish to eat. They build huts thatched with palm leaves. They ferry fresh water from the larger islands. And they give their islands idyllic names. Sonaimuri means “Gold Cove” and Sonadeep is “Island of Gold”. Nijhumdeep means “Island of Silence.” Most of the islands are only a few feet above sea level.

Every few years a storm surge washes over the delta, sweeping away and drowning thousands. One cyclone in May of 1991 took 125,000 lives; 635,000 people died in the 21 years before that. They go anyway. It's not a death wish. Many of them know the danger, but still they migrate in the thousands. It's frontiersmanship under the terms of enclosure.

## The Secret of NIMH

These circumstances recall a chilling piece of research from the National Institutes of Mental Health (NIMH). Sometimes called "The Secret of NIMH”, it involved a community of

Norway rats confined in a space of fixed dimensions, wanting for nothing — plenty of food, plenty of water, plenty of places to live — a rodent utopia. The research began at Johns Hopkins University in 1946 and continued into the '60s, when John B. Calhoun, then a research psychologist at the National Institutes of Mental Health, published a report of the work in *Scientific American*. What fascinated the scientist about the rats was that, confined, they developed social pathologies similar to the behavior of humans in large cities. Among the males, the behavioral disturbances included sexual deviation and cannibalism. Even the most normal males in the group occasionally went berserk, attacking less dominant males, juveniles, and females. Failures of reproductive function in the females — the rat equivalents of neglect, abuse and endangerment — were so severe that the population was reduced to a few geriatric cases who subsequently died.

## Casmalia, California

Vandenberg Air Force Base is on California's Central Coast, just up the shoreline from Santa Barbara.

Every Air Force test facility has its own rustic watering hole that pretty much defines its character. Vandenberg's was a steak house in Casmalia that drew customers from the neighboring cities of Santa Maria and Lompoc as well as Vandenberg. Way out in the country, it had great eats, sawdust on the floor and about every rocket patch, sticker, and doodad known to Man.

The area, about 60 miles north of Santa Barbara, was oil country. Casmalia had been living with that fact for a long time. The industry had managed itself more or less to

everyone's satisfaction. It had been a decade since the Santa Barbara oil spill.

Perhaps that is why no one thought twice when Casmalia Resources located its Class I toxic waste landfill there. However, in November 1984, chemical fumes began to invade the town. Residents complained of nausea, runny noses, irritated eyes, and headaches. The restaurant business dried up. The principal of Casmalia's school sent his students home.

Casmalia Resources claimed the oil fields were the source of the chemical invasion. But by December and winter rains, local photographers were displaying shots of contaminated runoff flowing from the landfill.

An air monitoring program started. A public health nurse was assigned to the school, which reopened. There were door-to-door health surveys. Soil samples were taken for analysis.

Casmalia Resources continued its operations.

Why?

Because all the other Class I disposal sites in Southern California had closed first. Casmalia was the last, and closing it too would have resulted in an epidemic of illegal, uncontrolled dumping.

## Cleaning Up Is Not Enough

Back in 1984 hardly anyone had heard of the greenhouse effect, and people who spoke of it were considered crackpots. There was no ozone hole, although at least part of the chemistry that could attack the earth's ozone layer was known. Toxic plumes from landfills, temporary storage sites, and city-

owned gasoline storage tanks contaminated ground water. "Cancer clusters" were investigated. Housing developments and playgrounds were built over buried drums of poison that had begun to leak and spread to the surface. Foundations were discovered to contain radioactive tailings from uranium mines mixed in the concrete. Cancer-causing asbestos fibers and flakes of polyvinyl chloride floated through the air of residential communities. The air pollution report became a standard feature of television weather programs. The operative word was "cleanup."

Before long, it had become an article of environmentalist faith that cleaning up was not enough. We had to make fundamental changes in human behavior as well. The reasons we heard about were the sweeping transformations in the atmosphere's chemistry that, for the first time, could be attributed to human activity. In 1985, British scientists discovered a suspicious "hole" in Earth's ozone layer over the South Pole. That discovery, and its subsequent verification by satellite measurements, served to attract public attention to an ecological problem of global proportions. Human beings may have accidentally started a chemical process which will eventually strip away our planet's natural protection from the sun's ultraviolet rays. The forecast was for millions of cases of skin cancer, damage to the human immune system, and irreparable harm to plant and animal life.

How ironic that Freon, a product hailed in the thirties as the first environmentally safe refrigerant, should be the cause of this grief.

The rest of Earth's atmosphere was undergoing changes, too. Its methane content had doubled in the past 500 years, a result of intensive agriculture. Its carbon dioxide content had climbed 25 percent from 1880 to 1980, partly because of industrialization. These gases, in addition to nitrous oxide from

fertilizer, and chlorofluorocarbons (CFCs like Freon), even Freon's replacement, hydrogenated fluorocarbons (HFCs), contribute to the general warming trend dubbed by the press "the greenhouse effect". In addition to coastal flooding, the greenhouse effect promised shifts in rainfall patterns and ocean currents, and a new species of storm dwarfing what we have naively called "killer hurricanes" in the past.

## Saving Our Children

No place is safe from enclosure's deadly effects.

In 1993 alone, scores of Chicago-area children died at the hands of people they knew -- their mothers or fathers, friends or relatives. Their stories appeared in a *Chicago Tribune* piece called "Killing Our Children." The paper called the motives of the killers "unfathomable." They were nothing of the kind. All it takes to understand is an appropriate frame of reference.

Fortunately, we have such a frame of reference at hand in English history and literature. Charles Dickens' Ebenezer Scrooge (*A Christmas Carol*) was fond of the phrase "surplus population," which he used to describe his neighbors. The term became popular in 1834, when English manufacturers proposed to the Poor Law Commissioners that they send the surplus population of the agricultural districts to the north so that "the manufacturers would absorb and use it up." This strategy, arising from enclosure, resulted in the abuses that created communism. Karl Marx, the political economist who was communism's chief theorist, and Charles Dickens the author were contemporaries.

Marx observed that, although the Americans had invented a stone-breaking machine for clearing boulders from agricultural

land, the English did not make use of it because of the ready availability of cheap labor. "In England," Marx wrote, "women are still occasionally used instead of horses for hauling canal boats, because the labor required to produce horses and machines is an accurately known quantity, while that required to maintain the women of the surplus population is below all calculation."

Enclosure cheapens labor. It also cheapens life. When human beings are pressed to the breaking point, they make decisions based on a premise that resembles the military concept of triage. The word triage means to pick or to cull. It is the sorting of casualties into three groups: those who can be expected to survive without help, those who will die regardless of treatment, and those who will perish unless given immediate aid. When human beings, some of them at least, think themselves in the last category, they are apt to extinguish even their offspring to preserve their lives or their sanity.

"Within the logic of triage, there is nothing sacred about human life," writes Richard L. Rubenstein in *The Age of Triage: Fear and Hope in an Over-crowded World*. As we will see in chapter 13, mothers trapped by enclosure in England of the last century reacted very much as they do virtually everywhere today, by killing their children.

Remember the rats?

## A Conflict for the 21st Century

By 1863, the massive emigration of factory workers to the frontiers of America had become Britain's saving stroke of luck, at least for the workers. Some 6 million left those shores

in a span of 25 years. That was a quarter of England's population. Wages in the old country soared.

But on March 24, 1863, the *Times* of London published a letter which became known as "the manufacturers' manifesto." It argued that the emigration of labor power from England should not be encouraged and, perhaps, not allowed. At about the same time, H. Merivale, a professor of political economy at Oxford maintained in "Lectures on Colonization and Colonies" that the wealth of a country depends on its keeping at hand a certain amount of surplus labor to throw into production at that "prosperous moment when demand is brisk." According to Merivale, "It takes...the space of a generation to replace the loss of adult labor" to emigration. As we shall see in the remainder of this book, it is not the creation of wealth that a vigorously expanding frontier makes difficult, but its concentration in a limited number of hands.

Colonization prevents the formation of an industrial reserve army of the unemployed and the underemployed, reducing the dependence of workers on management. Colonization creates wealth, but it also diffuses it. And that is why, as we shall also see, established economic forces tend to resist the creation of frontiers.

It may be partly for this reason that a new breed of revisionist historian emphasizes the injustices of frontiersmanship and attempts to discredit western expansion as a positive influence on the American spirit. Indigenous Americans were slaughtered and driven off their land, but such behavior is not uniquely European.

In *Admiral of the Ocean Sea, A Life of Christopher Columbus*, Pulitzer-winning author and historian Samuel Eliot Morison reports that the people inhabiting San Salvador when Columbus discovered it, the Taino, were a fairly advanced civilization that had emigrated from South America, displacing

and enslaving a more primitive group called the Siboney. As a culture, the Taino are extinct today, made so by another civilization that knew, perhaps instinctively, what the historian Frederick Jackson Turner voiced just a century ago: that territorial expansion and cultural vitality are inextricably linked.

Turner was a history professor at the University of Wisconsin who, in 1893, first expressed this idea in an address before the American Historical Association. According to him, it was not legal tradition, not place of origin, not religious creed, not race that made Americans inquisitive, practical, inventive, restless, individualistic, and indomitably free.

"These are traits of the frontier," said Turner, "or traits called out elsewhere because of the existence of the frontier.

"What the Mediterranean Sea was to the Greeks, breaking the bonds of custom, offering new experiences, calling out new institutions and activities, that, and more, the ever retreating frontier has been to the United States directly, and to the nations of Europe more remotely. And now, four centuries from the discovery of America, at the end of a hundred years of life under the Constitution, the frontier has gone..."

The Turner thesis shot through the academic community like a bolt of lightning. It was until recently the basis for almost 90 percent of teaching about American history, and it provides penetrating insight into what America must become if it remains on its present course.

## Divide and Conquer -- Fearing Each Other

It has been almost universally accepted that human inventiveness is adaptability enough to cope with an

increasingly overburdened environment. Wishful thinking aside, it is now clear that such is not the case. Sometimes even our solutions have become problems, as with the "safe" refrigerant Freon or the "safe" disposal of toxic waste by burial.

To complete the cycle, the fear which all of this engenders could freeze us in an agony of social paralysis until all hope of recovery goes glimmering. Unlikely, you say? Our responses to fear alone have, in the recent past, cost citizens their civil rights. Consider the 110,000 Japanese Americans imprisoned in concentration camps during World War II. Consider McCarthyism, which savaged our freedoms of speech and association for nearly a decade. Now consider the possibilities when the fear is justified, for example, fear of AIDS.

The AIDS virus is a legitimate threat that invites scapegoatism targeted at homosexuals, drug users and prostitutes, whether real or suspected, especially those with minority backgrounds. The Fourth Amendment to the Constitution of the United States guarantees the "right of the people to be secure in their persons, houses, papers, and effects." Yet the need to locate AIDS victims or potential victims by means of tests, investigations, computerized files -- perhaps extending to wire tapping and miniaturized bugs -- may override the basic right to privacy.

The fear of disease in the insidious form of AIDS is only one of the fears we all face. Most of us hardly even count crime anymore, even the gratuitous violence which seems especially characteristic of drug-induced criminal insanity. It's just part of the background noise, the muted rumble of civilization crumbling. We have even come to enjoy seeing headlines that read "Crazed Mud-Truck Driver Runs Amok in Rush-Hour Traffic, Dozens Killed."

Such developments, about which people feel helpless, are enough to frighten a significant number of the weak-minded into a retreat from reason. When they cast about for the causes of their discomfort, they tend to find them on bookshelves. Authors are especially vulnerable to that kind of assault, and one would naturally expect them to take a hard line in favor of printing anything.

Ray Bradbury is America's poet laureate of science fiction. If you are a science fiction fan, and you weren't born yesterday, you probably know Bradbury's work. Now it happens that science fiction is an easy target for the censor's torch, because it tends to get into things that aren't necessarily biblical. It explores. It tests. It pushes the inside of the envelope. Still, when interviewed on the subject of censorship, Bradbury's comments took a surprising turn. He said,

"Two of my daughters have been raped. That doesn't make me feel very liberal about certain kinds of people in society, does it? A lot of the 'censorship' feeling is not so much about censorship at all, really, so much as it is a reaction to the failure of our judges and criminal system to provide some kind of fairness about victims and criminals."

Certain kinds of people in society occasionally go berserk, attacking less dominant individuals, females, and juveniles. Like rats.

An imagined decay of moral values has become the trivial explanation of everything from bad eating habits to mass homicide. Recently in Culver City, California, such fuzzy thinking allowed the assistant superintendent for instruction to remove *Little Red Riding Hood* from a first grade supplementary reading list. The book, an award-winning adaptation of Grimm's fairy tale which generations of American school children have read and enjoyed, cast wine in too favorable a light, she thought.

An aberration? Not at all. The gradual concentration of decision-making power in the hands of a few is a threat to freedom that is typical of enclosure.

There are always a few lunatics out there. When enclosure is present, they can ride the crest of public hysteria to popularity. In one instance the pastor of a non-denominational church in Dayton, Ohio circulated fliers inviting people to bring books by Moslems and Jehovah's witnesses to his book-burning event. Also to be burned: books on New Age religions, witchcraft, yoga, transcendental meditation, and Christian Science, in addition to horoscopes, playing cards and "secular albums, tapes, and bumper stickers."

"Our purpose is to rid our city — and throughout the years we'll continue to rid our city — of more satanic paraphernalia, and then we believe the Holy Spirit will have a greater freedom to flow," said the reverend, apparently oblivious to the irony of such intolerance in a "non-denominational" church.

Most people who promote censorship on moral or religious grounds are simply afraid, and not without reason. Their dread is real. The cause is sufficient. Yet the adversary of the censor is afraid, too -- afraid of opportunists and their quest for power, afraid of manipulators of fear, guilt and uncertainty, who are also real.

Each little fear, taken by itself, is in some way approachable. Diseases have telethons and promising medical research. There are eradication programs for insects. There are laws and prisons for criminals. We can collect canned goods and baskets of treats for the needy at Thanksgiving and Christmas, and we can get the feeling of having lit a candle in the darkness. But in the deepest recesses of our minds, where no amount of cheer can penetrate, reason waits to have its way. There are too many people. Some will starve. We make chemical waste faster than we can clean it up. Critical

resources are scarce enough to fall under the control of inimical interests in the few remaining areas where they are plentiful. For every cure there seem to be a dozen new diseases. The law will do nothing about crime because there is nothing it can do on a scale so vast. In our worst moments, we know that time will eventually prove that Thomas Malthus, who predicted this end in the nineteenth century, and the Club of Rome, which predicted it in the twentieth, were right.

Some of us give up, hide behind assault rifles in the deepest woods we can find, and wait for the end. Who wins then?

## Bigger IS Better

Can technology restore the earth? Almost certainly. But who will pay for it? We humans derive our wealth from Earth's resources. We can shift assets from place to place within our world. We can improve our use of some of them. But we cannot renew a single acre without using some wealth external to it.

Earth could restore a country, maybe a continent, but not without further impoverishing some other place on the earth. To benefit the entire planet will require resources from elsewhere, resources much larger than we currently possess. This statement is true even if all we demand from Earth is its natural state. That our current approach to the restoration and preservation of Earth is wrong, that our resources are insufficient for the task, should be manifest from the rate at which events are overtaking us.

# Chapter 2: Zero-Sum Economics

*"Civil society is thus driven to found colonies. Increase in population alone has this effect, but it is due in particular to the appearance of a number of people who cannot secure the satisfaction of their own needs by their own labor once production rises above the requirements of consumers."… G.F.W. Hegel,* Philosophy of Right

In 1798 Thomas Robert Malthus, an English political economist, published *An Essay on the Principle of Population*, in which he observed that "positive checks" (famine, pestilence, war) limit population growth unless "preventive checks" (like celibacy, abortion, and euthanasia) are brought to bear. The argument seems unassailable. Population grows exponentially, by the rules of compound interest, while the production of food and other goods is restricted by available resources. Under these conditions, most people remain poor, barely able to survive. Improve the standard of living even a

little, and birth rates go up. The gains are immediately consumed and the standard of living drops to a subsistence level again. The Malthusian cycle, it's called.

After a brief interval of acceptance lasting fifty years, new developments appeared to discredit the theory. But in the period 1800 to 1850, it seemed very likely that Malthusian economics would be applied to the situation in England, which had turned ugly. Malthus himself argued against public assistance to the poor in *Principle of Population*, advocating their "elimination" by natural means. His point was that support for the indigent would allow their increase until the expense of their upkeep overwhelmed the supporting society.

Charles Dickens observed the same scene and composed those emotionally loaded social commentaries, stories like *Oliver Twist* and *A Christmas Carol*, which seem more descriptive of our own situation with every passing Christmas. Karl Marx observed it and formulated Communism in response.

## Surplus Population

The industrial revolution, by amplifying production, usually gets credit for breaking the Malthusian cycle in Britain. That is amazing, because the Malthusian cycle was readily observable in the midst of the industrial revolution. Far from elevating the general standard of living, it created a "surplus population", a term popular in mid-nineteenth century conversation. It generated more and more wealth, but it also concentrated that wealth in the coffers of fewer and fewer individuals. It's what Marx was writing about. It's why Dickens invented Scrooge. Massive emigration to the United States in the nineteenth century saved England from the Malthusian

cycle, and a (probable) bloody revolution. Territorial expansion saved them. And that is all.

It may be an oversimplification from the historian's point of view, but it is nevertheless true that Earth's land frontiers had all but vanished by the beginning of the twentieth century. Philosophical speculation about the significance of this fact was trampled in the rush of events.

The world was awakened to the power of science, which seemed to promise miracles of technology. The air was filled with skyliner dirigibles. The Wrights demonstrated powered, heavier-than-air flight at Kitty Hawk. An unsinkable ocean liner, the *Titanic*, was under construction in Britain. That theoretical fellow, Albert Einstein, was making the universe jump through hoops.

In the literary world, novelists H.G. Wells and Jules Verne were spinning a new kind of yarn for the new age -- science fiction.

There followed a series of other amusements; World War I, accompanied by the Bolshevik Revolution, the Great Depression, World War II, the crumbling of the great European empires, Korea, Vietnam, the Cold War...the end of the Cold War. These were times sufficiently diverting to enable us to forget frontiers and their disappearance.

## The Service Economy

Meanwhile, the world had changed. Frontiers had not only been forgotten, but consigned irrevocably to the past. By the 1960s, the so-called "American dream" had become a nightmare of zero-sum gamesmanship. It conscripted the children of the poorest to sacrifice for the profits of the

"military-industrial complex." It turned inner cities into a no-man's-land filled with graffiti, the wreckage of past street riots, and disposable people. The rich were getting richer in part by pushing social services they had to know would make things worse, thereby creating a further need for social services. Five percent of the world's population consumed seventy percent of its resources. The per capita income of the richest 20 percent of nations was almost 60 times that of the poorest 20 percent. The ratio had doubled in 30 years, growing as fast as the populations of the poorest countries themselves.

No longer a frontier, the United States had become immersed in its own internal struggle for survival. The Vietnam conflict, before its ignominious end, became a case of every man for himself. It was inevitable that the attitude so evident in the jungles and rice paddies of Southeast Asia should manifest itself in the American economy as well.

During the early seventies, those who could do so adopted the strategy of concentrating wealth instead of creating it. A "service economy", was the euphemism John Naisbitt (author of *Megatrends*) applied to this vice. The illusion of unlimited abundance in America had become all too obviously an illusion. The phenomenon became international in scope with the formation of the Organization of Petroleum Exporting Countries (OPEC) being a prime example. OPEC's activities drove prices up, but created no new wealth. It became a model for business.

Pure business, the process of accumulating wealth, as opposed to entrepreneurship, the creation of wealth, is well represented in the activity of corporate raiding. According to the trade journal *Industry Week*, 239 companies, each valued at $100 million or more, were victims of hostile takeover attempts in the years 1985 to 1987 alone. The take-over targets were usually well-run businesses -- otherwise raiders would have

had a hard time raising the money to buy them. Robert E. Mercer, chairman and chief executive officer of Goodyear Tire and Rubber Company, itself nearly the victim of raiders, described the process this way:

"...after swapping paper back and forth in a frenzy, you sell out at the last minute and stash the money in a Swiss bank account. This perversion of financial instruments has no redeeming social value and certainly creates no new wealth. The fact is that corporate raiders are destroying wealth."

Corporate raiders were not alone in their rush to get something for themselves before it's all gone. Labor wanted its share, too. Victor Kamber, a union official turned consultant, declared in a 1986 meeting of the National Association of Manufacturers in Washington, D.C., that labor was prepared to apply force to "economic pressure points" to get what it wants, a bigger slice of the pie.

Labor's list of wants was reflected in the legislation introduced into Congress in 1985, just after the Democrats regained control of the U.S. Senate. Among the demands were an increased minimum wage, better health benefits, better pension plans, and earlier notification of layoffs and plant closings. Security in old age -- the cash to build a nest egg, protection against the financial ravages of illness, steady employment with a pension waiting at the end -- these are the ambitions of the wage-earner. Modest as they seem, there is real doubt that they are affordable. And labor did, in fact, continue to lose ground.

## The American Myth

In 1990, a study by the Economic Policy Institute, a labor-backed group, found that the real wages of the average American worker had declined 10% during the '80s.

The same study found that the incomes of the wealthiest 5% of Americans grew at 17.6% from 1979 to 1988.

At the very least, wages went nowhere. Figures from Bureau of Labor Statistics say the median weekly salary adjusted for inflation in 1980 was $190. In 1990, the figure was $195.

"The American myth about being able to pull yourself up by your bootstraps — it doesn't exist anymore," said Barbara Otto of the 9-to-5 National Association of Working Women, an advocacy group for secretarial and clerical workers.

Government unemployment figures, which tend to be optimistic for reasons of job security, do not give an accurate picture of developments. Even when unemployment figures are low, and at this writing they are not, economists say it is because laid-off workers have taken lower-paying or part-time jobs.

According to a Bureau of Labor study of displaced workers, a third of those who lost their jobs in the mid-to-late '80s took pay cuts of 20 percent or more when they returned to work.

The rise of part-time employment is not just part of the usual economic cycle, economists say, but a structural change caused by America's decaying position in the world economy. As one economist put it, "Americans can't have the

expectations they had in the 1950s for a better way of life. Things are definitely getting worse."

The zero-sum game is played with and by surplus people. All we require to test the zero-sum hypothesis is to check the news. Employment, the cornerstone of the American Dream (says Bob Herbert of *The New York Times*) should get harder to find if the zero-sum hypothesis is correct. For those who are employed, real wages (defined as wages after inflation) should fall.

A 1993 report by the Washington research group Economic Policy Institute found that, while the number of payroll jobs in the United States was falling, so were wages and the quality of existing jobs. As Lawrence Mishel, a co-author of the report told the *Times*, "The most depressing part about my research is that if you look at the (real) wages of just about every education group over the past 20 years among men — college graduates, two years of college, high school graduates, dropouts — the wages are down. The only reason the male wage just hasn't plummeted on average is that more people are educated. So education is almost like inoculating us against a just horrific decline. It's sort of like everybody is on a down escalator and we're busy getting more educated so as not to fall as fast."

We're still losing.

In 1991, the number of officially designated long-term unemployed (people who had been out of work for six months or longer) was 1.3 million. The number had climbed to 1.7 million by January 1994.

People who have given up looking for a job are called "discouraged workers". They are not counted among the unemployed. In January of 1994, there were 1.1 million of them. About 600,000 had not looked for more than a year.

Even college-educated men in their 40s and 50s are experiencing a sharp decline in wages. These are the people who followed the injunction of society to stay in school and work hard. It was supposed to confer on them a kind of immunity to economic misfortune. It doesn't.

The trend is reminiscent of the effects of industrialization and social policy in England during the 19th century. If that experience means anything, the trend toward cheap labor in twentieth-century America will continue, regardless of any well-meaning effort by presidents or legislators to control it with direct intervention (assuming, that is, that their efforts *are* well-meaning).

Richard Rubenstein, whose book *The Age of Triage: Fear and Hope in an Over-Crowded World* was published in 1983, gives us a grim synopsis of the zero-growth trend in language which foreshadows a Marxist end to things if a solution is not found. He writes,

"In an expanding economy, such as the United States enjoyed during much of the nineteenth century, the destructive aspect of the universal competitiveness of bourgeois society is not as evident as it is in a static or declining economy. The mutual hostility that is intrinsic to a system in which all the actors are compelled to maximize their gains at each other's expense becomes obvious in a zero-sum or declining economy."

Growth is a prerequisite for free enterprise for two reasons. Territorial expansion, accompanied by an increase in numbers of consumers, creates new markets. In addition, entrepreneurial opportunities for settlers abound in the exploitation of new resources and in meeting the needs of settlers for such things as news and entertainment. To work, free enterprise requires expanding markets and an expanding resource base. If the so-called "free world" does not ensure that such expansion occurs,

it will, inasmuch as free enterprise and other freedoms are inextricably linked, become unfree.

## Demographics Is Destiny

Enclosure, the consequence of attempting to create an equilibrium society which neither grows nor decays, creates both individual and group animosity. We now have the opportunity to examine at first hand conflict between generations and between races.

Members of the generation born between 1946 and 1964 are called "baby boomers." They belong to a demographic bulge that has been moving through American society like a meal through a python. When they were young, their shear numbers made everything they did significant, even when what they did was foolish to the point of embarrassment. The arts catered to them; politicians gave them whatever they wanted. After having lapped up concessions at every turn, after having gotten away with making excuses for everything from permissive parenting to greed, the boomers are in trouble.

The number of persons over 65 will double to 65 million by 2030. Younger workers, their ambitions thwarted by a surfeit of experienced labor, will demand that their elders retire. But it will be hard.

The preceding generation financed its retirement with corporate pensions and home equity. Most of the boomers are expected to have 10 employers before retirement. They won't spend enough time with any one of them to become vested. Houses are not likely to be paid for by retirement time. Mortgage rates are higher. The driving forces — restructurings,

plant shutdowns, and shifting markets — are all symptoms of enclosure.

But they'll still have Social Security.

Or will they?

The political clout of the nation's senior citizens makes Social Security virtually untouchable for budget-cutting. Even so, the government's universal retirement plan is an enormous financial drain.

In fiscal 1990, the government spent $246 billion on Social Security, a sum second only to the $297 billion defense budget. Social Security spending is expected to grow at 6% to 7% annually, making it one of the fastest-growing parts of the budget.

As the age distribution and demographics of the American population change, Social Security is likely to be perceived as the tyranny of an old, white middle class perpetrated against a young, predominantly poor workforce. Future events become even less certain if the workforce is also largely non-white. At that point, government may have to terminate Social Security payments in order to preserve public order. Either way, the zero-sum rules will produce a class of embittered losers seeking revenge. In the absence of a determined effort to change the rules by opening up routes to business and population growth, the outcome can only be ugly.

In addition to intergenerational warfare, enclosure is bringing us interracial warfare as Americans of European descent compete against African and Hispanic minorities for space in a shrinking economic pond.

In 1991, 24 million Americans (10 percent of the population) were getting government assistance to buy food.

Sixteen million were jobless or underemployed. Hourly wages, adjusted for inflation, were lower than in 1973.

A former Ku Klux Klan leader (David Duke) won a significant number of votes in Louisiana in November, 1991, in part by blaming middle class economic hardship on "the rising welfare underclass," code for Africans.

A curfew was imposed on parts of Washington D.C. in May after racial tension exploded into large scale rioting between blacks and Hispanics.

In August, a New York City traffic accident triggered violence between blacks and Jews.

A year later, racial violence erupted in Los Angeles.

These are zero-sum behaviors.

In the animal world, when a predator attacks another predator of the same species, it is not for food. Biologists call it "interference competition." Ideally, it drives one of the animals to increase its range in the search of a living. If that is not possible, at least one of the beasts dies, or they go on battering one another until, weakened by combat and hunger, they both perish. A big cat in the shrinking wilds of Africa has little choice in the matter. Humans are not so helpless.

## The Frontier Defined

Serious-minded people used to think of the sea when they considered options for territorial expansion. Two-thirds of Earth's surface is ocean. Furthermore, the sea is generally thought of as a rich source of protein that could be farmed. Wind, waves, ocean currents, and changes in water temperature

with depth are all potential sources of energy. Desalinization can provide fresh water, as it does on ocean vessels and in some parts of the Middle East. Mineral resources lie both on the ocean floor and in the water itself, as dissolved salts.

For all that, the ocean is a tough place in which to build. The violence of even the usual storms requires expensive protection of surface facilities and their moorings. Below the surface, extreme pressure requires an architecture of small compartments more suitable for trained submarine crews than for family life. Corrosion and fouling of equipment are yet other difficulties facing the engineering side of ocean habitation.

While one can imagine solutions for any engineering problem, nothing but distance provides the isolation required of a frontier. Ownership of resources found within 200 miles of the nearest coastline would face immediate armed challenge based on national sovereignty. At least three days of travel time are required to provide a barrier against armed incursion by nations trying to enforce established customs, laws, and forms of government or religion, and that is for even a well-armed colony with plenty of time and resources to devote to defense. No place on Earth is more than half an hour away by ballistic missile. The cops are too close.

So is the past. Anonymity, the chance for paupers or princes to appear out of the blue and be judged for their character and abilities as demonstrated, not as presumed by birth, station, or political machinery, is impossible within the controlling web of established society. A population protected by dossiers and resumes from the mainland may feel more secure, but is also constrained by convention, and it is no frontier.

Food is not particularly plentiful, either. Plankton, the unicellular plant life that forms the bottom link of the ocean

food chain, are concentrated in coastal waters, where they dine on nutrients which rivers wash into the sea. Coastal areas are already heavily harvested. For this reason, ocean settlements would have to grow their food using the same techniques required in space.

Except for the Herculean task of getting there in the first place, the vacuum of space is a more benign and flexible environment in which to build than the deep ocean. Even if it were not, there remains a final, overriding reason why the oceans cannot serve as our next frontier.

The oceans are a toxic waste dump.

## Reefs and Shipwrecks

When a ship bearing a toxic load sinks, it carries to the bottom with it its fuel and its cargo. Often, neither is retrieved. Right now off the Pacific Northwest coast, shipwrecks more than 30 years old lie on the ocean floor leaking poisons. They will stay there and continue to leak. The unknown structural integrity of an old wreck makes it more risky to recover the cargo than to leave it alone.

Garbage goes into the ocean, too. In New York and New Jersey, medical waste, including dirty hypodermic syringes and empty medical vials, turn up on public beaches almost routinely. The Texas government has appealed to citizens to help clean up the state's beaches by picking up garbage from the Gulf. Volunteers have found five-gallon plastic buckets containing toxic liquids that have washed ashore on Padre Island and near Corpus Christi.

In late December, 1991, scientists gathered for a meeting of the American Society of Zoologists in Atlanta learned that the

continent's only living barrier reef off the Florida Keys is probably dying as a result of water pollution. The reef, running 200 miles from Biscayne Bay to the Dry Tortugas, is the backbone of a $500 million tourism and commercial fishing industry. It became the nation's largest national marine sanctuary in 1990.

Nutrients in the form of human sewage and agricultural runoff stimulate algae growth, which scientists say is overwhelming parts of the reef. In addition, sedimentation caused by erosion that follows shoreline deforestation smothers the coral animals. An unexplained plague has virtually wiped out the black spiny sea urchins that usually clean the reef.

The reef, like other structures of its kind, is the central element of a complex system of marine life that includes sharks, angelfish, sea cucumbers, and starfish living in the reef's rocklike core. Much of the Florida reef died and started breaking up around 2000. And that, marine biologists agree, is something that's happening not just off Florida, but around the world.

## Add Sewage

Sewage is supposed to flow through 9-foot diameter pipelines that deposit the partially-treated, often toxic goo miles from land. Sometimes the lines break, as one 29-year-old outfall tunnel off San Diego did in February of 1992. California declared a state of emergency after the break caused 180 million gallons of partially-treated sewage to flow into the ocean three-quarters of a mile off shore. San Diego's border neighbor, Tijuana, can't prevent a flow of up to 12 million gallons of raw sewage a day from reaching the ocean. High concentrations of fecal coliform bacteria have kept closed a

2.5-mile stretch of beach north of the Tijuana River on the U.S. side of the border since 1987. In the United States, there are of course federal standards governing what can be done with sewage. But one hundred and thirty public sewage systems across the country are out of compliance with those standards. And the standards do not keep untreated effluent from going directly into Boston Harbor or the Great Lakes. In most of the world population growth has so far outpaced infrastructure that the situation appears hopeless.

The sea is a part of the island of life we are already stressing to its limits. Species of sea life are nearly as threatened by over-killing and pollution as are their cousins on the land. As environmentalists will be quick to point out, the oceans are as fragile as the forests, perhaps more so. We are already exploiting them for their nutritional and mineral wealth as much as we dare. To do much more would be to risk creating ecological unbalance or even changes in climate which we cannot foresee and could not reverse.

The future path of any earth-bound economy is clearly posted "dead end." To our everlasting discredit, we forge blindly ahead on the wrong road.

# Chapter 3: Turf Wars — Zero-Sum Politics

*For the first time in their history, Americans are afraid. They are the worst kind of afraid, with a cold, hopeless, debilitating fear rather than the hot sense of urgency which has driven them to vigorous action in the past.*

We can accept what used to be called an "era of limits" and make increasingly more difficult adaptations with smaller and smaller expectations. We can hope for an unending series of miracles from science, encore after encore of engineering feats produced with ever-diminishing resources. If that sounds rational to you, welcome to politics, the other way of grabbing a share of the wealth while there's something to grab.

After money, it is said, comes power. But it is often hard to tell whether the indigenous bureaucrats believe it that way, or the other way around. In government, as elsewhere, the struggle for power takes the form of rivalries that become more bitter as enclosure deepens.

In Washington D.C., where the official secret is the ultimate status symbol and the power pyramid has more levels than a Babylonian ziggurat, bureaucrats battle over crumbs of influence. Civilian imaging spacecraft are perceived as a threat because their use breaks an existing government monopoly on the information they provide. Washington watchers have seen the U.S. Commerce, State, and Defense Departments locked in acrimonious turf wars over what exports should be controlled and by whom. Chapter 6 deals with these aspects of zero-sum politics in detail, showing how they gut freedom of choice in America. Here we will examine what may be the most visible and damaging conflict of all, that which exists between civil and military space enterprises.

NASA, the National Aeronautics and Space Administration, was the chief architect of the U.S. space program at its best. As recently as 1986, it enjoyed a kind of technological supremacy, unchallenged in its dominion over matters extraterrestrial. In fact, mostly behind the scenes, the Air Force and NASA were entrenched in mortal combat to determine which organization would be preeminent in space, and NASA was losing. Since the early seventies, the post-Apollo moon project years, NASA has been the victim of Defense Department manipulation of Congress to the detriment of capability, cost effectiveness, and safety in spaceflight.

## Who's Shuttle?

America's most expensive technological project during the '70s, and NASA's reason for being, was the space shuttle. Congress, however, was reluctant to fund it. So the Air Force, wanting access to space, worked out a deal with NASA. The Air Force would intervene in Congress on NASA's behalf. In return the civilian space agency would increase the shuttle's payload to 65,000 pounds, provide a larger cargo bay to accommodate military payloads and design in a longer cross-range capability -- the ability to glide to a landing at points distant from the orbiter's ground track. The Air Force wanted enough added cross-range, 1500 miles, to make possible shuttle operations from Vandenberg Air Force Base in California. The requirement that all of this be done, at essentially no additional cost, resulted in the shuttle's present partially-recoverable configuration, with strap-on solid rocket boosters and a throw-away external fuel tank. The weakness of the shuttle's politically-driven design became obvious with the loss of the *Challenger* in January 1986.

By 1987, the Air Force role in space had become conspicuous. Its space budget had become larger than NASA's entire budget, even excluding the "Star Wars" research to develop a high-technology space-borne defense against missile attack. It was proposing to develop its own heavy-lift booster, independent of NASA, to serve its own needs. In addition, then Secretary of Defense Caspar Weinberger was attempting to usurp control of the U.S./International space station for military operations of an unspecified nature.

Symbolic of NASA's new black sheep status was a botched launch attempt in March of 1987 which the aerospace trade journal *Aviation Week and Space Technology* immediately dubbed "Atlas Launch Follies." The unmanned Atlas rocket

was destroyed after being struck by lightning from a storm in the launch area. According to the account, a NASA team had warned before the launch that the Air Force Weather Service recommendation to proceed might be unreliable. The NASA team noted that the meteorological support provided by the Weather Service was barely adequate and that there was poor coordination between weather forecasters and NASA's launch controllers.

Although it was clear that the Air Force had made a questionable call in recommending a launch, it is frightening that NASA was either unwilling or unable to challenge that call. According to *Aviation Week,* an untrained observer could see how bad the weather was. Sensors around the launch pad showed extremely high electrical potential. Besides, NASA had data on lightning hazards dating back to Apollo 12, which was struck several times during liftoff, and extensive testing at Cape Canaveral had shown that even a small rocket can trigger multiple lightning strikes. NASA's crisis of confidence had gone beyond dangerous. Only years later, after the collapse of the Soviet threat and the partial loss of the military leverage in Congress, would civilian space enterprises recover control of their own operations.

These two federal bureaucracies, NASA and the Air Force, are players in the most clearly perceived zero-sum game in town, the U.S. federal budget process. The situation is zero-sum because the national resources which support the budget are in a state of atrophy or near-atrophy which varies according to whether the current administration is patting itself on the back for achieving "healthy growth" or blaming a recession on someone else. Without a frontier to create new markets for an expanding economy, the budget itself stays the same, or grows at the expense of increased debt or increased taxes, or both.

In government, as in big business, the object of the zero-sum game is to get what you can, while you can get it. To ensure protection against press snoops, its business is conducted behind closed doors. It involves not only the redistribution of wealth, enforced through taxation, but also the management of commerce by the extending or withholding of federal contracts, loans, and other assistance. What we show here is that zero-sum gamesmanship is a natural and inevitable consequence of life in an elderly, static, and overpopulated world.

## Fog and Mirrors

The idea of government evolves. We have seen it develop from loose confederations of hunter-gatherers to fabulously complex empires built on the need to support large populations by agriculture and trade. Americans like to think of their unique republican form of government as an advanced and spectacularly successful experiment in self rule. But it is only the product of a frontier, now gone. Communists like to think of their plan for organized behavior as a triumph of reason over greed. But it is only a reaction to the perceived injustices of a zero-sum society created by enclosure.

Cold war notwithstanding, the two systems started to merge almost immediately after World War II. Ironically, it was the Russian triumphs in space, first the launching of Sputnik and then live animals, and finally a man, Yuri Gagarin, that drove the so-called "free world" in the direction of the centralized command economy, with its inflated budgets and bloated bureaucracies.

Historian Walter A. McDougall, author of *The Heavens and the Earth: A Political History of the Space Age*, attributes

the growth of federal budgets in the U.S. to the need to fight the Cold War and the pursuit of social justice. After the Second World War, he says, the United States did not fully demobilize, but continued to maintain a large peacetime military establishment with ongoing research in advanced weapons. The United States thereby sacrificed autonomous universities, autonomous corporations, balanced budgets, and the idea of self-reliance in return for a government-driven technological machine. McDougall calls it a "technocracy", by which he means "the funding, direction, planning and control by government of initial research and development, and ultimately all kinds of social change."

McDougall comes down heavily on government funding for research and development for reasons which sound pretty sane: it corrupts the private sector, it costs too much, it brings to bear on previously self-regulating institutions all kinds of government rules about secrecy, cost, safety and personnel policies.

Yet others argue that government-sponsored research is crucial to the continued well-being of the American economy, not to mention national defense. So what happened to the America that was proudly self-reliant, productive, and secure within its borders?

Simply that it ceased to be a frontier, so that the evil necessity of bureaucratic dominance (or technocratic dominance, if you prefer) evolved in a natural fashion. The traits we claim as Americans -- including self-reliance, resourcefulness and an aptitude for hard, honest labor are not uniquely American at all, but are, as the controversial 19th century historian Frederick Jackson Turner observed, characteristic of frontiers.

America, in the sense of traditional American values, is not a place; it is the leading edge of civilization wherever it occurs.

It is an echo of the Arthurian legend of Camelot, the home of perfect justice and white magic, existing briefly on the edge of the known lands. As recently as the turn of the century, civilization's leading edge was located in the American West. Europe's frontier was America.

## Why One Big Government Can't Work

Frontiers offer many things in addition to a unique set of values, among them free land, abundant resources, and fresh opportunities. The urge to pioneer is driven at least as much by the chance for riches as by a sense of adventure. New needs fuel new technologies for growing markets.

The American frontier's transportation needs stimulated the growth of steam power for water-borne and rail-borne commerce. Europe's pursuit of its frontier across the sea required the development of accurate navigational techniques for sailing vessels, including better clocks as a means of determining longitude. The space frontier required the creation of compact, light-weight tools for computation. Microelectronics, a new industry, answered that need and after it came a new software industry based on computer programs like NASTRAN (for NAsa STRuctural ANalysis) which helped make America preeminent in aeronautics as well.

A Chase Econometric Associates study of the economic impact of the space investment from 1960 to 1972 showed that the $1 billion per year Americans spent on pioneering space during those twelve years yielded a $144 billion return, a twelve-to-one profit ratio. Since that study, the value of the spin-off return from Project Apollo has been quoted by various sources as not less than six dollars for every dollar invested (and the low figure is the one given by former NASA

administrator James Fletcher, the man responsible for dismantling Project Apollo). Even six-to-one over 12 years is not bad. It's an annual return of 16%. That's better than you can get at the bank.

Space still awaits recognition as a real frontier, a place of human habitation. After the initial flush of victory at beating the Russians to the moon, we turned to other business and placed the national destiny in the hands of accountants. We are only beginning to realize the losses of that venture in the form of a flagging economy and a crippling burden of debt.

If America continues on this path, we have more than adequate reason to fear the outcome. When England found itself in nearly identical straits in the early 19th century, its social systems were unable to cope with only a few of the problems we face today.

Charles Dickens published his poignant novels about poverty and meanness in England while the policy called "enclosure" was completing the conversion of individual land holdings to large-scale agriculture. The industrial cities could not absorb the surplus population. It fell to a system of poor relief, at first administered by the church and then by government itself, to provide for the jobless and their families. The motive was not charity. Rather, the earliest motive for poor relief in England was, as it is in the United States today, the preservation of public order. What will happen when this support is terminated, either as the result of an economizing government or because of a depressed economy, is the question England never had to answer. But the answer is clear. Dealing with the underclass will become a police matter. If the underclass consists primarily of one or more racially distinct minorities, the situation will become grim.

Mass destitution, with the formation of a permanent underclass, is more-or-less sustainable as long as poor relief on

an adequate scale is painless. Largess requires a large economy. In an economic crisis, mass unemployment and poverty will admit only two solutions: the elimination of excess people or the redistribution of wealth.

## The Race to the Moon

In the past, most governments have shown a marked preference for the former, as demonstrated by the virtual elimination of the Armenians from Turkey in World War I, the Jews from Europe in World War II and the ethnic Chinese from Indochina after the Vietnam campaigns. Nineteenth century England escaped being the first in the roll call of modern genocide because in its hour of need there existed an open frontier in America.

Writes Rubenstein in *The Age of Triage*, "Had it not been for the safety valve of emigration, in all likelihood the history of Great Britain would have been far bloodier than it was."

But enclosure is catching up with all of us. For the first time in their history, Americans are afraid. They are the worst kind of afraid, with a cold, hopeless, debilitating fear rather than the hot sense of urgency which has driven them to vigorous action in the past. Ironically, they are afraid of everything but the most clear and present danger: there is no place to run. We must live with the knowledge that any misstep may be fatal. That we have already committed a frightening array of errors is obvious from a casual reading of the morning newspaper, but the most fundamental and damaging error we have made, and still make, is to act in fear with fear alone as our motive.

The nation's prosecution of its space program is a case in point. The race to the Moon was motivated almost entirely by fear of another Soviet first after an agonizing (to us) string of firsts, including the first launching of an artificial satellite, the first biological research in space and the first manned orbital flight. In the rush to land men on the Moon before the Russians could score again, the United States missed opportunities for more lasting and valuable achievements. Project Apollo left no legacy, not even a plan for the future.

## Making the Gods Perform

The Strategic Defense Initiative (SDI), the so-called "Star Wars" plan, was sold as an alternative to the frightening doctrine of Mutually Assured Destruction (MAD). Actually, MAD was not a plan at all. It was just the way things worked out. The former Soviet and American arsenals had escalated in destructive power until either could deliver a death blow to an attacker, even after a fatal first strike.

Star Wars was not a plan either. It was a gut reaction. Its supporters readily admitted that SDI could not defend civilian population centers in an all-out attack. It could be designed with sufficient capacity to defend only military targets, making it, in fact, another element of MAD. Even assuming an SDI-like system would work on ballistic missiles, it would add nothing to our defense against the delivery of nuclear weapons by ground-hugging cruise missiles or, surreptitiously, in the holds of airliners or ships, or even by private airplanes piloted by fanatical martyrs for some cause.

The expense of deployment and maintenance of a simple system for the protection of hardened missile sites would have increased defense spending by 70%, according to some

sources. All for the faint hope of relief from just one of the fears that haunt a small planet.

Those fears are justified, too. Children, who are the primary victims, are indulging in self-destructive behavior, including early pregnancy, drug abuse, and crime to support a drug habit, at a rate which surpasses anything in American history. There is an alarming rise in gratuitous crime: assault, murder, and rape for the fun of it. These developments, about which people feel helpless, force some into a retreat from reason. A surge of religious fundamentalism which began in the early eighties, perhaps even before, has been the result. It is making matters worse by stimulating additional fear reactions in other segments of society.

In particular, scientists, whose principle tool and asset is reason, feel threatened by the regressive reaction of religious fundamentalists to their work. They seek refuge in the scientific mainstream, and they fear to venture far outside it because to do so might jeopardize their careers. It is a retreat from reason made necessary, or at least made worse, by society's image of the scientist as a master of mysteries, not unlike a priest. To maintain his credibility (and therefore his funding) the scientist must make the gods perform.

This image of the scientist as a high priest of technology is wholly inaccurate. Worse, it places science in direct competition with religion for the faith of the masses. Astronomer Bradford Smith's discovery of a new solar system is rejected by born-again Christians because it challenges their belief that Earth harbors the only life in the universe. Novelist Jean Auel's books about the tribes of prehistory are attacked because they make fundamental assumptions about the idea of evolution. What all this makes clear is that the human animal, when deprived of a reason for hope, seeks hope in unreason. Such trends pose grave dangers to a free society. They are the

fruit of struggles for power to decide the fate of men by players who see One Big Government as the only possible stage of action, and who want that government to make law in their favor.

# Chapter 4: In God's Name

*People want magic because they're babies. They won't accept the fact that there most probably are no gods, no demons, no Santa Claus. People who devoutly believe that God will help them are in denial. — Albert Ellis*

Hard times drive the most desperately frightened of us to seek comfort in mystery, authority, faith and the supernatural. As long as the phenomenon is limited to pockets of poverty and ignorance, it is a problem that education and time may solve. When it shows signs of pervading a society, it is a mark of social stress which time will worsen unless the cause is removed. And that is the situation here and now. Those who struggle against reason are not Appalachian dirt farmers, but members of the urban middle class, some of them technically trained. Fear drives them.

## Why We Fear

And if Americans are afraid, the causes are sufficient.

Chicago's Gangster Disciples, a gang — you know: drugs, murder, mayhem, that sort of thing — is run from the Vienna State Prison in Chester, Illinois, by Larry Hoover, an inmate serving life for murder. He told ABC News recently that he's got himself a political action committee. Calls it 21st Century VOTE. It's just like any other political action committee, registering voters, gathering money, supporting candidates.

Said Hoover on national TV, "See, it's 40 percent African vote in Chicago, and that vote is our folks. That's the folks in the projects, the poor people. You got them dope fiends and wineys; we can get that vote out. We can — we got the army. We got what nobody else got out there."

There are some obvious advantages to going main stream. The Disciples could free Larry Hoover. They could use their new identity as a political group to avoid police scrutiny. And it's not just Chicago we're talking about. Perhaps the largest criminal organization in the United States, the Gangster Disciples has chapters and affiliates in over 150 cities.

Consider that.

Consider teenagers eager to kill for their next fix, or for no reason at all.

Consider the inability of established institutions to do anything about it; also consider economic uncertainty and political mayhem involving weapons of terrifying power.

Human nature being what it is, we must expect a sizable, dedicated minority to throw reason away in favor of blind, albeit comfortable, faith.

## Why We Pray

Take the miracles. Theologians say that the profusion of signs — a Mary-shaped blood stain in a Chicago shoe repair shop, an image of Christ on a Wichita billboard for Pizza Hut , "holy apparitions" in cloud shapes captured on Polaroid in Lubbock, Texas — are a reflection of an overwhelming anxiety about the future and a distrust of leadership. It's a new wave of conservative piety that's in step with general political and social trends. Whatever we've been doing, however we've been doing it, it's not working.

America became more religious as the world grappled with enclosure and all of its social, political, and military implications, including imminent annihilation. Guided by a Catholic priest, a study by the National Opinion Research Center based in Chicago sought, in the early '90s, to find out how many of us pray. It could hardly avoid some bias on the side of devotion. Even so, the results are what one would expect given an understanding of the social impact of enclosure.

Most of us — 99% in fact — pray to a deity. As to the reasons, the keenest insight probably comes from Albert Ellis, a guru of the cognitive-behavior school of therapy and a popular author, who says, simply, that "People want magic because they're babies. They won't accept the fact that there most probably are no gods, no demons, no Santa Claus. People who devoutly believe that God will help them are in denial."

It may be more accurate to say that people are looking outside of themselves for the resources that they used to believe God expected them to provide for themselves. But it is precisely at this point that we cross into a dark realm of anti-logic in which the first and only argument is that reason doesn't count.

## Flashback

Christian fundamentalism started in Victorian England as a reaction to the theories of Charles Darwin, Sir Charles Lyell, and Thomas Malthus. Before Darwin, the accepted explanation of natural forms, geological and biological, rested on a succession of catastrophes, the last of which was Noah's flood. Darwin applied the principals of Sir Charles Lyell in geology and those of the economist Thomas Robert Malthus to the animal world. He proposed that species changed gradually under the influence of natural forces, rather than by special creation (the biblical point of view). Darwin announced his theory in 1858 and published evolution's seminal work, *On the Origin of Species*, in 1859. *Origin* sold out on the first day and went through six printings. It was a philosophical breakthrough that accompanied a territorial breakout. And the two were related.

By 1860, demand for labor in English factories had to contend with the depopulation of Ireland and the emigration of vast numbers of farm workers from the agricultural districts of England and Scotland. Wages were exceptionally high. Ordinary people had acquired the time and the confidence to think for themselves — all because a mass migration to America that had been going on since the 1840s had relieved enclosure in those islands, and so weakened the

hold of religious doctrine there that rational explanations of nature became acceptable.

There were still plenty of adherents to Christian dogma, and they hated rational explanations, especially the theory of evolution. They had had two objections to the theory. First, it denied the special creation of human kind. Perhaps worse, it placed humanity in the same class as other animals. But hardly anyone heard their voices above the din of the American continent's industry and new enthusiasm for life. By the time mystery and authority became dominant forces again, it was the early 20th century, and enclosure had reasserted its hold. The American frontier was gone.

In 1909, a group of orthodox Christians began publication of a periodical called *The Fundamentals*. Although it only lasted two years, its effect was profound, defining the points on which fundamentalists could never compromise. They included unconditional acceptance of the virgin birth, the physical resurrection of Christ, Christ's sacrificial atonement for sin, the second coming of Christ and, most importantly, the inerrancy of scripture. The last item has been a fundamental sticking point among Christian sects through many episodes of enclosure, as we shall see. A new episode had in fact started with the end of the American frontier.

Fundamentalist opposition to the teaching of evolutionary theory in public schools reached a peak with the Scopes trial of 1925. It declined during the Great Depression of the '30s, at least in part because most biology textbooks published during that period avoided the subject. The controversy, and fundamentalism itself, all but disappeared during World War II. However, the social upheaval of the '60s — the Vietnam war, the civil rights movement, changes in public education and television — reanimated fundamentalism, and continuing social turmoil, fear and doubt have sustained it.

One of the products of the Cold War was the introduction of certain government-sponsored enhancements to public education. I call them enhancements, but that is not necessarily a shared value. The Feds sought to boost the number of qualified technical workers in the United States in order to meet the perceived Soviet threat. What appeared to be about preeminence in space exploration was really about big rockets to deliver nuclear weapons.

One of the elements of that new education was a government-developed social science curriculum called "Man: A Course of Study", launched in 1963. It was a political mistake. Swiftly banned in Phoenix, Arizona, it met with opposition across the country because it portrayed ethical values as patterns of behavior which evolve in response to environmental pressures, rather than as God-given absolutes. The course used the example of the Netsilik Eskimos, whose behavioral repertoire was said to include infanticide and senilicide, the killing of the very young and very old, in order to survive in an environment of limited food and other resources. The protest continues even now, with many of the faithful pointing to the scourges of child abuse, abortion, and euthanasia as consequences of <u>that</u> kind of teaching in public schools. What is true, and what the politics of self-interest should never have allowed to become so plain, is just this: If the Netsilik committed (to them) socially acceptable murder, they did so because they could not imagine a larger world, with room for more things and kinds of people in it. On some gut level, the Fundamentalists knew that that isn't normal, but the product of something hateful, even if they didn't know exactly what it was.

## A Destructive Turn

Signs of the resulting struggle show up in the legislative record. A 1973 Tennessee law required public school teachers to give equal time to biblical creationism. Declared unconstitutional and repealed in 1975, the law was back again by 1982. In October 1986, Federal Judge Thomas G. Hull ruled that public schools in Hawkins County, Tennessee, must excuse fundamentalist Christian children from reading classes so that they might avoid ideas that violate their parents' beliefs.

And what ideas are those? The theory of evolution is a peripheral issue. What Christian fundamentalists object to in the larger society is "secular humanism," the sacred articles of which are said to include evolution, rationalism, the scientific method, and criticism of government. The "big bang" theory of the origin of the universe probably belongs in that group, too, along with any other product of reason which is not in literal accord with the teachings of the prophets.

All of those separately enumerated taboos of the religious zealot have in common a single idea — that reason based on observation of nature leads eventually to the truth. In fact, religious fundamentalism is defined by its rejection of reason in favor of authority as an organizing principle. That makes it anti-science.

Science is logic applied to the natural world. Science bends in the stream of new information. It seeks change. It is non-dogmatic. Of the various theories of the origin of species, some will survive and some will not, depending only on their merits as predictive models of nature. Theories concerning the origin of the universe will stand only as long as the evidence supports them.

Religious fundamentalism, on the other hand, already has the answers. It is rigid. Certain conclusions are inadmissible. It abhors change. Logic is unavailing in the environment of fear and suspicion it creates. It is completely typical of enclosure.

Without the underlying logic of science, new knowledge and understanding are not accessible, even though the old results still work. The teaching of results without the logic is the kind of "education" that makes people vulnerable to demagogues preaching a politics of scapegoating and simple solutions. The ultimate irony occurs when the debate is framed as a contest between the dogma of religious fundamentalism on one hand and "scientific" dogma on the other.

The likelihood is that neither side will win. Even though some of their ideas are truly toxic, the fundamentalists cannot be muzzled without harming the basis of First Amendment rights for everyone. The results of science, on the other hand, have an economic value too great to be abandoned. The probable outcome is that public school curricula will be "dumbed down" to appease everyone. Those who can afford it will opt for private education. The result: a state-sponsored system of indoctrination for a majority which views technology as magic and blindly accepts whatever doctrine is current, with an educated upper class in control.

This outcome is not difficult to predict because it is already happening. Today's university students are the product of a system of education which is teaching accepted scientific doctrine, not science. Students of anthropology at the University of Massachusetts at Amherst, for example, were easily snowed a few years ago when their instructor, anthropologist Laurie Godfrey, presented anti-evolutionary arguments in class. According to her, "They'd say, 'I know

this is wrong because it's not what I've been taught all along, but I don't know why it's wrong.'"

As with the undergraduates from Amherst, the evidence is that students are memorizing "facts", trusting the source. The maturity to employ logic to confirm and extend the evidence of one's senses comes to most late, or not at all. A clever manipulator can use that lack of understanding to discredit not only the conclusions of the rational process, but the process itself.

Having done that, the next step is an easy one. It is to implant the belief that obedience and sacrifice will remove the causes of overpopulation, the breakdown of the traditional family, drug abuse, and all the rest.

## Faith, Understanding, and History

Noted science fiction author Harlan Ellison says of this, "I am convinced we won't have a nuclear war -- but we can never survive these people who seek to drive us back into the Dark Ages...We have to stop fighting them politely...Their aim is power."

As Ellison's heated response suggests, the resurgence of fanatical religious faith, not only in the United States, but elsewhere as well, has the potential to create deeply-felt and dangerous polarization between the best educated and the less educated.

"The best way, I think," says science fiction author Arthur C. Clarke, "is not to censor ideas but to expose them to ridicule. In the long run, I believe that education is the only answer. I realize that is taking a wildly idealistic view."

Indeed, the assumption that destructive ideas can be left to die a natural death is the philosophical basis of the First Amendment to the U.S. Constitution. Whether such frontier notions as freedom of speech and of the press will long survive the passing of frontiers is what is being tested now.

It doesn't look good. From financially distressed parents to centralized, indifferent school systems, circumstances do not favor the success of public education as an answer to anything. Clarke is right. In our current circumstances, without a frontier, his solution is wildly idealistic.

The spirit of free inquiry, of willingness to follow wherever the evidence leads, is giving way to memorization and rote learning because the world is no longer big enough to grant isolation to religious minorities, no matter how much they desire it. The holders of renegade beliefs can no longer vanish into the wilderness as our Calvinist forbearers did, or as the Mormons did while there was still an American frontier.

In a situation filled with irony, here is another — those most likely to lead a wave of migration, as John Winthrop's Puritans did in 1630, are also those most likely to savage the freedoms of others, given the upper hand in an enclosed environment. In short, they are dangerous.

Religious strife is a hallmark of enclosure. In the history of Western Europe, religious persecution has accompanied at least three major episodes of it, each with some form of inquisition.

## The Medieval Enclosure

During the Middle Ages, the so-called Albigensian heresies in the south of France provoked the first of a series of Catholic inquisitions. A monk representing the Church of Rome would arrive in the neighborhood and announce that the local heretics had a month to recant. Those who did received a light penance. More stubborn heretics were brought to trial with the presumption of guilt. Sometimes torture facilitated the process of obtaining a confession, and unrecanted heresy was punishable by fine, imprisonment and, occasionally, burning at the stake. The process continued for a hundred years, from 1200 to the beginning of the fourteenth century. In addition to solidifying the power of Rome in those precincts, it facilitated oppression, political intrigue and acts of undisguised hatred perpetrated against nonconformists of every stripe. They were dark, nasty, brutish times, completely typical of full enclosure.

Europe found no frontier in the next century, so nature found an alternative. The Black Death took 30 million lives by the end of the 1300s. That was half of Europe, a third of the civilized world. Thus pestilence, one of the Malthusian population checks (famine, plague, war) created the functional equivalent of a frontier...resources without proprietors...by killing off the proprietors, and the enclosure of the Middle Ages was broken. A half dozen generations passed before Europe again felt the pinch of enclosure, and, again, religion played a pivotal role.

# The Columbian Breakout

In the prologue of his biography of Christopher Columbus, *Admiral of the Ocean Sea*, Samuel Morison describes conditions in Europe in 1492. They seem much like our own times, characterized by social decay and a preoccupation with the past. It was the height of the Spanish Inquisition: political correctness with thumbscrews.

Ferdinand II, King of Aragon, and Isabella, Queen of Castile, had recently prevailed against Granada, the last of the Moslem enclaves in what is now Spain. Ordering all of the Jews and Moslems expelled, except for those who converted to the true faith, the monarchs pressured Pope Sixtus IV into naming an Inquisitor General to investigate the legitimacy of Jewish and Moslem conversions. As in the earlier inquisition, secular interests overran pious principles. With his notoriously ingenious tortures, Thomàs de Torquemada, an early inquisitor, made a name for himself as a master of terror. In the pursuit of power, he applied the death penalty freely; even church leaders were not safe.

Murdering Moslems and exporting Jews was good for business, and so, in furtherance of half of that goal, the Catholic monarchs ordered the Jews that had been gathered at the ocean's edge — poor Jews crowded aboard ships chartered by richer Jews — out of port on August 2, 1492. The ships of the Great Migration dropped down the Rio Saltès the next day, on the same tide as the Columbian fleet — the exiled in the company of the Genoese navigator who would discover a New World to give that persecuted race new life.

But the admiral did not sail for the Jews, any more than he sailed for the Puritans of the Massachusetts Bay Colony.

He sailed for the glory of Christ, believing that he was destined to bear his cherished faith to the peoples of the Orient, and truly believing that the earth is far smaller than we now know it to be, so that he could reach the East Indies before his supplies ran out. It was a horrendous risk, and he was dead wrong in his beliefs, just as his enemies said he was. But, as Morison points out, "Their issue with the commander was the eternal one between imagination and doubt...oftentimes the doubters are right...It is at times of crisis, when unpredictable forces are dissolving society, that the do-nothings are tragically wrong. There are tides in the affairs of men, and this was one of them."

Spain may have financed Columbus's voyages to the New World, but it was England that learned to use his discovery to break the grip of enclosure on Europe. The Spanish explorers were less interested in settling the new lands than in finding gold and returning to Castile to spend it. The operational definition of a frontier — resources without proprietors — did not exactly fit the situation, but it was close enough to secure for Spain a temporary infusion of wealth by the judicious application of steel and shot. In spite of this strictly limited achievement, their successful navigation of the ocean sea opened the door and, a little more than a hundred years later, a group of English Protestants stepped through it.

During the intervening century, the cultural and philosophical environment in Europe changed from one of feudal authority dominated by the Catholic Church to one of humanism, with a new emphasis on personal judgment. This transition period, which history has come to identify as the Reformation, begins virtually on the stroke of 1500, matching the Columbian voyages exactly, and ends with the beginning of the European migration to America a century later. So precise is the timing that it is difficult to see it as coincidence. So well does it fit the model of a precursor to American

individualism that it gives credence to the concept of frontiers as shapers of human character.

There can be little doubt that Columbus' discoveries had a powerful effect on the Europeans of the time, because what he reported seemed like nothing less than a terrestrial paradise — the warm climate, plentiful food, and the innocent state of the natives recalled legends. The idea that such a place existed, that it was possible, however difficult, to go there and live in freedom cannot have failed to shape the thoughts of young men and women contemplating nothing better than a roof, four walls, obedience to the church and a dull existence doing whatever their parents had done, and their parents before them.

The Puritans who peopled the Massachusetts Bay Colony in the New World were religious dissenters, advocates of a more Protestant theology than that of their mother church, the Church of England. Their leader, John Winthrop, born in England, educated in the law at Cambridge, served as an attorney in England's court of wards and liveries (an important position) until he lost that post due to his Puritan beliefs. He sailed to New England in 1630 with 1800 colonists and settled the Shawmut Peninsula, later renamed Boston.

## The Heresy of Galileo Galilei

As Winthrop was leading his protestant pioneers to the New World, the Catholic Church was consolidating its hold on the population of the southern Europe. It did so, as in previous inquisitions, by the prosecution of heretics. In Italy, Galileo Galilei was inventing what we now recognize as the scientific method, a philosophy that would do much to break

the hold of enclosure on Europe by making a virtue of exploration. And the churchmen were demonstrating, once again, what happens to society in the absence of frontiers.

Galileo's troubles with the church began with his advocacy of the so-called Copernican, or heliocentric, theory of cosmology, which differed from the accepted Ptolemaic view in that it held that the earth moved. It was not just the Copernican system that irritated the theologians, but Galileo's assertion that it represented more than a hypothetical model on which to base a calendar. Galileo had stated the Copernican model as truth, that the earth really moved about the sun, as did the other planets. In the words of Cardinal Bonifacio Caetani, whose opinion would guide the Holy Congregation of the Index, this made Galileo's assertion more than one of those "false suppositions which the study of astronomy was accustomed to use as its special right."

If the astronomer were correct, his conclusions would erode the concept of the literal truth of the Holy Writ. The Bible would then require reinterpretation, and issues of interpretation were at the heart of the church's struggle against the Protestants. In the view of the church, natural philosophy had to be consistent with scripture, such as Psalm 104, which reads "O Lord my God...who laid the foundations of the earth, that it should not be removed for ever."

No matter what the evidence, that the earth moves was not an admissible conclusion.

But Galileo would not relent, and so, in 1633, he was placed under house arrest at his home in Arcetri, outside Florence, and forbidden to write further on the mobility of the earth. The center of creative science moved north, into a climate more suitable for exploration.

So there you have it: enclosure is repressive, and religious fervor is its signpost. Furthermore, if you've got zealots, you've got political trouble, too. Of the four cornerstones of religious fundamentalism, at least three also belong to political tyranny. They are mystery, faith, and authority. When enclosure freezes societies into a fixed system or pre-defined roles, life becomes filled with taboos. And the most sacred of those is the taboo against escape.

# Chapter 5: Taboos

*"Fear is the mind-killer. Fear is the little-death that brings total obliteration." — Character Paul Atreides in* Dune*, by Frank Herbert*

During the 1980s, McDonnell Douglas Corporation produced a television commercial about breakthroughs that have occurred because of the Soviet Union's (now the former Soviet Union's) permanently manned space station Mir. The ad was called "Shouldn't We Be There, Too?"

If you never saw that ad, there is a good reason.

The ad would have violated a modern taboo — a proscription devised by the powerful for their own protection. Under the influence of vague, non-specific threats, what is intended as a ban becomes an inhibition, just a precaution, to avoid trouble. Nobody really made you do, or not do, anything.

You're just being cautious. For the creator of a taboo, it is a certain way to preserve the status quo without appearing to do so. It works well in an enclosed society because there is nowhere to hide. If you make a mistake and incur the wrath of the gods, or the IRS, FCC, FBI, DoD, CIA ... well ... it's just better not to.

## Conscience and Controversy

The ABC and CBS networks refused to air the McDonnell ad because it was too controversial. Not libelous, not offensive, not false or misleading. Not even in bad taste. Too controversial. In the recent past, network television had dealt with every aspect of human sexuality, drug abuse, smoking, religion, suicide, insanity, euthanasia, sedition, and nuclear war. Why was space, except in the context of science fiction, a taboo subject?

The answer is ... simple cowardice, the engine of the taboo. After all, in a zero-sum world, if you lose, you lose big. There's no place to start over.

So, to cite another example, when the Reverend Donald Wildmon of the American Family Association in Tupelo, Mississippi said that Mighty Mouse was sniffing cocaine on the air, the three-second scene from an 11-minute *Mighty Mouse* cartoon had to go. Animator Ralph Bakshi said of the scene, in which the fearless rodent picks up a flower and inhales deeply on his way to rescue a flower girl in distress, that the superhero was just enjoying the flower's scent. CBS may have caved, but Bakshi didn't. He planned to get even by spoofing religious zealots in a future episode. No word on whether the network let him get away with it.

To be fair, the leaders of television networks are not the only cowards on the block. Computer database bosses are afflicted the same way, particularly with regard to information that, in the depths of the Cold War, had come to be known as "sensitive."

## NSDD145

In January of 1987, *Dun's Business Month* reported that the Pentagon was pushing for electronic database controls to prevent the leakage of technical information to the Soviet Union. The report was prompted, in part, by a Defense Department announcement that it would restrict the sale of unclassified data, invoking the National Security Decision Directive 145 (NSDD145). Not long afterward, Mead Data (operator of the Lexis and Nexis database services) got a visit from federal agents who asked for the names of subscribers. The company responded by dropping the National Technical Information System from its database as a self-censorship move to avoid trouble. Information Industry Association vice president Kenneth Allen, referring to that and similar FBI and CIA activity, commented "What they fail to achieve by statute and due process, they will try to achieve by intimidation and coercion." Might the construction of a space station, unpopular among some members of Congress, have been the basis of similar coercion directed at television networks through the Federal Communications Commission?

Before he was dismissed for his part in the Iran arms deal, national security advisor to the Reagan administration John Poindexter laid the foundation for restricting the flow of technical information in America by granting federal agency heads the authority to label otherwise unclassified documents "sensitive". This new category of information allowed

government agencies to restrict access to knowledge, but was easier to justify than classification. The legal mechanism by which unclassified documents might be withheld from the public was NSDD145, the brainchild of then assistant defense secretary Donald C. Letham.

Among the restricted data were the medical records of the National Cancer Institute and the Veterans Administration, IRS corporate and personal taxpayer files and agricultural statistics, anything that could conceivably be used by a foreign power against the United States. It is a convenient coincidence that such information might also be used by citizens of the United States against their government to prove, for example, that exposure to certain chemicals during military service caused illness, or that patterns of IRS auditing are biased for purposes of harassment, or that food reserves are in a state of crisis. Even more conveniently, the sweeping nature of the restrictions makes information purveyors nervous.

NSDD145 is only one of the more recent measures imposed by federal agencies with motives which are often suspect, in effect generating a taboo. As part of a 1984 authorization bill, the Department of Defense got the power to withhold from the public any technical information with military or space application. That covers nearly everything. The list of "munitions of war" is a directory hundreds of pages long which includes virtually every modern technology. If you're a bureaucrat faced with the decision to allow disclosure, or not, what do you do? ... You scan this impressive list and realize you could easily miss something on it. Rather than risk trouble, you find an arguable relationship with some proscribed entry on the list and you make the safe choice. You stamp it "Restricted".

In 1990 with the fall of the Soviet Union, President Bush began quietly dismantling the restrictions on computerized

information instituted by the Reagan administration. The damage had already been done, however, the precedent set. Subtle intimidation directed at chokepoints in the information stream would do what the law could not. The new directive from Bush disbanding the National Computer Security Center, issued in July, 1990, is itself classified.

## Secret War

The United States no longer enjoys the safety of isolation. Until the coming of the rocket and long-range aircraft, the United States was separated by days of travel from any potential attacker. Travel time, rather than mere distance, is what made a direct attack on American soil difficult. This barrier of time, always providing ample warning, does not require a strategy, but our current circumstances do.

The current strategy is to rely on a technological lead. There is little historical experience with that kind of defense strategy, and what experience there is suggests that technological superiority is a decisive advantage in war only when the lead is enormous and a total surprise to the enemy. It is in fact possible to compose a long list of technologically advanced losers, among them Germany in World War II, the United States in Vietnam and the Soviet Union in Afghanistan. Nevertheless, we have chosen technological leadership as our defense strategy. We now find that our choice requires secrecy.

There is little doubt that this approach is damaging economically and politically. The National Security Agency is keeping information out of American databases that American engineers use when looking for answers to technical problems. The net result is that American taxpayers and consumers pay again and again for repeated "discoveries" of the same

solutions. Engineers have an expression which describes the situation neatly. They call it "reinventing the wheel."

## NOFORN

Nor can the United States afford to make enemies of its allies. At the same time that the Soviet Union was offering European scientists opportunities for research in their space station, the United States, which was supposed to be cooperating with Europe to build an international space station, was excluding its European allies from technical gatherings When a foreign national attended a symposium in the United States or was present in an American lab, certain papers could not be discussed. The United States called the policy NOFORN. Soon there were stories of Europeans considering a NOAMER policy that would bar Americans from technical meetings in Europe.

Any such move would be a loss for the United States, which no longer possesses an overwhelming lead in aerospace technology. The Europeans are well ahead of the U.S. in space materials processing and in more mundane areas as well. For example, in 1987 Martin Marietta Aerospace Corporation began evaluating its space booster production requirements with an eye to doing business with Europeans rather than Americans. One of the requirements was for a strong, lightweight payload shroud to protect and streamline their new Titan's cargo during launch. Only the European firms had a strong base in advanced, lightweight composite materials.

In 1964, long before the benefits of civilian space research became apparent, a young researcher at the Institute of War and Peace Studies of Columbia University, Amitai Etzioni, wrote that "Half the research reports processed by the

Department of Defense are classified and hence, with a few exceptions, are not available to civilian industry. Among the matters classified ...are several basic laws of nature."

More than a quarter of a century later, the advice of the then associate researcher still applies: "Americans must...curb the urge to classify everything from the spelling of Apollo to the location of Venus."

That didn't stop the federal government from creating 6.8 million new secrets in 1989 alone.

If, in another 25 years, we still look upon an America of fixed assets and frozen aspirations, the absurdity of our secret-making defense bureaucracy will be undiminished, while our ability to do something about it may be altogether gone.

## Politically Correct

If freedom of speech on technical issues were the only limitation which enclosure placed on Americans, perhaps the exigencies of the Cold War would have excused it. If the religious demagoguery of fundamentalists were met with the withering ridicule of enlightened minds, then Americans' First Amendment rights might be as inalienable as the Constitution's authors intended. However, the most urgent lesson taught on American college campuses of the twenty-first century is that one needs to watch one's mouth.

We suppose enlightened minds to come from universities. Instead we learn at school, unless we are confused by specious concepts of justice, that zero-sum gamesmanship and the politics of enclosure have created protected minorities to whom the rest of us owe deference. The enforcement of political correctness (PC for short) on a college campus is, of course,

execrable behavior. It is also predictable in a zero-sum society whose members are, by definition, in a struggle for power.

Columnist R. Emmett Tyrrell observed at the outset (in 1990) that the politically correct agenda, shared by minority students, feminists and homosexuals, is the program of the campus radicals of the '60s, a subculture "whose intellectual achievements over two decades are comparable to those of the intelligentsia of Bulgaria. Their illuminati have not created one book admired anywhere by anyone but them."

The motivations for such bile on the subject of PC were adequate. Tulane University administrators had posted in each department something they called an "enrichment-liaison person", which readers of George Orwell's *1984* would recognize immediately as thought police. At Smith College, the code of conduct identified 10 kinds of oppression to be avoided, including "ageism", "heterosexism" and "lookism", by which to stigmatize anyone who expressed an opinion regarding age, sexual orientation or personal appearance (among other things) not in accord with the party line.

# Chapter 6: Land of the Free

*"The hidden agenda of some environmentalists is to expand the dominion of some people's political will over others," – George F. Will,* The Washington Post

Ominously, not only American industrial activity, but American voting attracts the scrutiny of the military. In 1985, using NSDD145, the National Security Agency made a detailed investigation of a computer program used to count votes in local and federal elections. The reason for the investigation was, presumably, to determine the program's vulnerability to manipulation. In order to do that, however, the investigators had to learn how to manipulate the program themselves.

That our right to choose, the right we call "freedom", might be directly affected by a government plot to control elections is

a chilling prospect. Yet it is only one of the lesser threats to freedom imposed by enclosure. The major threat is environmental.

## Sustainable Man

"The Baltic Sea is dying from sewage and other pollution. Every year 25 billion tons of topsoil are lost. In places like Mexico City and Eastern Europe, millions breathe toxic air. China soon will have cut all its harvestable forests. The ozone is thinning, the globe may be warming, and more devastation lies in store," lamented a 1992 issue of *Business Week* in describing the new geopolitical fashion called "sustainable development". More a vision than a strategy, the concept of sustainable development calls upon the industrialized nations to consume less while directing billions in aid to developing nations in return for their promise to cut birth rates. Its fundamental premise is that the only way to avoid ecological disaster is to redistribute wealth.

Requirements for this "sustainable development" include:

1. Implementation of global family planning procedures by any means;

2. Massive aid and debt relief from the industrialized countries to provide replacements for existing air conditioners, refrigerators, furnaces, and lighting fixtures, not to mention solar power and biotechnology to replace pesticides, herbicides and associated polluting technologies;

3. Falling standards of living in the industrial countries.

There can be no guarantee that "sustainable development" is possible. Indeed, there are no models for sustainability in the context of civilization. (We could call such a thing an "equilibrium civilization" because of its emphasis on perfect recycling with zero losses). One is reminded of the second law of thermodynamics. No one has ever offered a proof of the second law, which is the basis of the rejection by science of the perpetual motion machine, an imaginary device which operates indefinitely without the expenditure of external energy. Science accepts the law because no exception has ever been observed. There is no model for a perpetual motion machine, just as there is no model for a "sustainable" civilization, which may well be the same thing.

As it stands, sustainable development must be equated with zero growth. And, as anyone who has ever lived on a farm knows, things grow, or things die. Much the same can be said of civilizations. The "sustainable" equilibrium option simply makes no sense, or does it?

Is someone trying to create, "Sustainable Man," much the way the Communists tried to create the New Soviet Man, with power as the motive?

## Karl's Got a Manifesto for Ya

Lester Brown, president of the Worldwatch Institute, an environmentalist organization, says he believes the world has until 2030 to achieve sustainability, or economic collapse will foreclose on the opportunity to do so. The threat of economic collapse some 20 years hence is a credible one. But it's a demagogue's trick to imply there is only one option when, in fact, there are others. Even more suspicious is his suggestion that fundamental human behaviors need to change.

In a widely-distributed 1990 "Earth Day" op-ed piece, Brown described the need for "a collective deepening of our sense of responsibility to the earth", "a transformation of individual priorities and values", "shifts in social, economic and moral character" and states that "materialism cannot survive", and "the idea of waging war will become an anachronism". (Tell that to Sadaam Hussein.) He also says his transformation will require a redistribution of land so that "people have plots large enough to sustain their families without abusing the land."

"The hidden agenda of some environmentalists is to expand the dominion of some people's political will over others," wrote *The Washington Post's* George F. Will in 1990. It is true that there is no more direct route to the regulation of the masses than restrictions on consumption, especially consumption of energy and transportation. Thus the slogan of some European conservatives: "The green tree has red roots."

In fact, the Manifesto of the Communist Party, penned in 1848 by Karl Marx and Friedrich Engels, reads like a blueprint for current U.S. policy.

Take government control of private land, including rent control and the Environmental Protection Agency's wetlands policy, as examples. So too are a "heavy progressive income tax" (quoted from the Manifesto) and the "centralization of credit in the hands of the state by means of a national bank..." like the Federal Reserve Bank. Marx's call for centralization of the means of communication and transportation is answered by government bureaucracies like the Federal Communications Commission and the Interstate Commerce Commission.

There's more, of course, but you get the idea. Most of what Marx had to say makes sense in the context of a zero-growth economic system. It promises what Rome promised: bread and circuses, and, like state welfare in England in Marx's day, it

preserves public order. As usual in political history, you have a choice. If you've got the guts to build a frontier, you can have free trade and the prosperity that goes with it. If you want a free ride, Karl's got a manifesto for ya. It will do exactly what it was intended to do, which is not at all the same thing it promises.

## Arrested Development

Citizens of the United States still enjoy freedoms envied by most of the world, but those liberties are under siege.

The Tenth Amendment guarantees that "Powers not delegated to the United States by the Constitution nor prohibited by it to the States are reserved to the States respectively, or to the people." How, then, can the federal government, under the Constitution, mandate speed limits and control public schools, among other things?

Under the Fifth Amendment, a person cannot be "compelled in any criminal case to be a witness against himself." Yet the information entered on Internal Revenue Service tax forms is compulsory in the only meaningful sense. It can't be refused except on pain of financial loss and harassment by audit. But the law insists you do have a choice, in the same sense that you have a choice of whether to run or stand your ground when confronted by a thug with a gun. You wind up providing the information "voluntarily." So it *can* be used against you in criminal proceedings.

The Second Amendment secures "the right of the people to keep and bear arms." This is not a deer-hunting provision. It makes certain that we, the people, retain some means of

keeping the back door of freedom propped open. Otherwise, the government has all the guns.

Every one of the above points is arguable, of course. "Circumstances" compel modification of the Constitution. These circumstances include runaway crime rates, strained medical infrastructure, educational inequity, you name it. But mostly, wanna-be tyrants and their minions force these changes on the rest of us because, in the absence of a frontier, they can.

Take the manipulation of vote-counting software. If it is arguable that such precautions are necessary to ensure that election results are not influenced by foreign agents, then such arguments must be based on the premise that centralization and uniformity have created a society in which elections pivot on one version of a single all-important computer program. That centralization is the product of arrested development. A society which expands faster than bureaucracy can catch up is a healthy one. A society in which expansion has been stopped, a society which has decided to live within its existing means by any sacrifice, will find it must make every sacrifice.

## Barriers of Secrecy

A trend toward limiting freedom of speech or toward the dominance of military considerations in the day-to-day affairs of a nation at peace cannot be viewed kindly by history. When arguments in their favor seem reasonable, it is time to ask whether more serious problems underlie the surface flow of events.

Information is the stuff which binds a community together. It consists of personal communications, news, and technical data of all kinds. We have already seen how stasis in real

growth has provided government with an excuse to cap the flow of technical information by classifying it. The military has also taken steps to control the flow of information generally.

In 1981, the Pentagon tried to force the passage of an amendment to the Communications Act of 1934 which would give the president the authority to take over communications systems in peacetime, without declaring a state of emergency. The effort failed because its purpose is offensive to the principle of free speech. However, there are overriding concerns.

Because it is economical, versatile and, in the main, reliable to do so, military communications are sent over the same channels as civilian communications, and civil data travels by satellite. What we have done with the communications system makes sense in every respect except one. We have moved our major communications assets into geosynchronous orbit, twenty-three thousand miles away from home, without being able to go there ourselves for repair, modification, replacement, or defense. By our absence from the space near them, these assets are made vulnerable to a hostile takeover. A foreign power can literally usurp the command links of a satellite and turn it off, or turn it to their own use.

So, acting under NSDD145 again, then Secretary of Defense Caspar Weinberger ordered, in 1985, that all communications satellites carrying routine government data be equipped with protection equipment. The requirement, which is effective on satellites launched after 1990, is not voluntary.

The move was probably ill-conceived from a security standpoint. You could as easily threaten to destroy a satellite with a laser beam or high-power signals as hold it for ransom by taking over its command links. The industry said then that the cost of security provisions ($3 million for a $100 million satellite plus a million dollars a year in operating expenses)

would make it less competitive. Really, there is only one reason for the Defense Department action that stands close scrutiny. It is power. Those concerned with constitutional guarantees fear that the new arrangement gives the Pentagon all the information on private satellites it needs to take over any of them, as indeed the Pentagon is prepared to do.

The physical facilities for implementing a total takeover are located in the National Coordinating Center (NCC) in Washington, D.C. It opened in 1984, partially as the government's response to the divestiture of Ma Bell from AT&T. The Center is manned around the clock by representatives of satellite communications companies. It would be their job to run the nation's communications system in an "emergency".

The pivotal question is, of course, exactly what kind of "emergency" are we talking about? The Department of Defense explains the NCC's mission as one of coordinating communications during a nuclear conflict. However, the facility, located in an ordinary building in Washington, is itself a vulnerable target, and there is no backup. Here we have the spectacle of the United States, which styles itself the leader of the "Free World", seeking to control the flow of information within its own borders. Such leadership requires, among other things, civilian participation and an overarching freedom of information. Increasingly, information must be global in scope and nearly instantaneous in transmission, because the events that shape our lives have those qualities. In our society, television provides the immediacy and the print media — newspapers, magazines and books — provide the detail. Often, the journalists representing these media have been able to break through government barriers of secrecy. At Chernobyl, they discovered a new tool.

# Mediasats Where Are You?

At 1:24 a.m. on April 26, 1986, explosions ruptured the graphite core of the Chernobyl nuclear power plant 80 miles north of Kiev in the Soviet Union. News of the disaster, which cost at least 31 lives in the short term and $3 billion in immediate economic losses, was delayed until unusual readings began showing up on radiation monitors outside the Soviet Union. Even after the Kremlin made available the first sketchy accounts, the site was closed to Western reporters.

However, the site could not be closed to orbiting Earth observation satellites, which provided photographic evidence of the damage and the still-burning fire. The publication of these photographs marked the first use of a satellite to record the progress of a major news event.

A similar "first" occurred in July of 1987, when the French "Spot" Earth resources satellite photographed a Soviet Navy submarine base in the northern U.S.S.R. from an altitude of 517 miles. The photographs — civilian, not military — of the Gremikha Naval Base were processed by Spot Image, Earth Satellite Corporation and General Electric and sold to the publishers of, among other periodicals, *Aviation Week & Space Technology*.

Much to the discomfort of governments everywhere, these events spot-lit the potential of dedicated news-gathering satellites financed by the news media themselves. Hughes Aircraft, a builder of Earth observation satellites, has estimated that a "mediasat" with significant news-gathering capabilities would cost about $300 million and could include such instruments as cameras, computer and telephone listening devices and infrared sensors to detect rocket launches.

Satellites with cameras able to show much more detail (that is, with higher "resolution", measured in meters or feet) than the Spot satellite could be made available at a cost of $470 million, with operating costs of $10 million to $15 million over a lifetime of five years. These satellites would be able to "see" objects as small as five feet in diameter, good enough to distinguish small vehicles. By comparison, the French Spot satellite that photographed Chernobyl had a resolution of 20 meters (60 feet), and the American Landsat can resolve details to 30 meters (almost 100 feet).

With mediasats in operation, Americans could confirm for themselves, without reliance on government, the observance of treaties and the movements of arms and troops. The new ability could reduce the risk of surprise attack, not only against the United States, but anywhere in the world. Commercial images could free intelligence analysts to discuss what they know without revealing classified sources. Moreover, it is unlikely that a mediasat could reveal anything unknown to militarily significant governments like the U.S.. Military spy satellites have resolutions measured in inches.

## KH-11

However, on July 10, 1987, the U.S. Commerce Department issued rules that allow the federal government to seize certain materials that do not comply with the standards set by the Defense and Commerce Departments. The secretaries of State and Defense now have the power to suspend the operations of U.S. commercial remote sensing organizations on national security or foreign policy grounds. Spot, owned by CNES, the French space agency, was found by Commerce to be a "public system," and therefore not subject to the license requirements. However, the processing or

marketing of satellite data in the U.S. are among the criteria that would make a foreign operator subject to the U.S. law.

That means the United States government, although it cannot prevent the sale of satellite pictures by French or Soviet sources, or their use in foreign publications, can and does prevent Americans from seeing at least some of them. That Americans protest so little and that their government acts so freely to protect its secrets speaks volumes about our ability to preserve our frontier heritage in a world without frontiers.

It is worthy of passing notice that the shear force of the federal bureaucracy's determination to protect itself was enough to drive at least one congressman from his post. Representative George Brown (D. Calif.) resigned at the end of 1987 from the House Permanent Select Intelligence Committee to protest what he considered excessive government restriction of public access to high-resolution satellite images.

Brown had been criticized by the intelligence community for citing published reports about the KH-11 satellite. The KH-11 is a spy satellite, but it was hardly a secret. The Kremlin had owned a KH-11 operator's manual for more than 10 years. It had been sold to them by a former CIA official.

# Chapter 7: Invasions of Privacy

*In our search for an alternative to frontiersmanship, we are binding ourselves with an iron rule of law so tightly that we will one day forget why we call ourselves free.*

There's another side to the mediasat coin, a dark side. Even if government were less inclined to guard itself from the governed, the advent of mediasats — and they are coming , regardless of federal machinations — will give the mantle of our frontierless civilization an uncomfortably close fit. If the price tag of Earth observation satellites is within the means of news media, it will also fit into the budgets of private investigative groups and non-media corporations, including consortia of collection agencies, and organized crime. The world that is becoming too small to support frontier rights is becoming too small to support even a little privacy.

## Comfort for the Traveler

The same motivation that causes government to cloak itself in secrecy, the perception of finite resources and diminishing opportunities, also causes it to seek greater control of individuals. Control means power, after all, whether it's the power of the absolute monarch or that of the bureaucrat who understands "the system", and power is one of the ways of assuring oneself a piece of the shrinking resource pie. To the victims (that would be the rest of us) the controls are often acceptable, even welcome, because interdependence is another perception that goes with "mass" everything, especially mass transportation.

So, when Transportation Secretary (in the Reagan Administration) Elizabeth Dole conceived of a program of periodic drug testing for employees in the transportation industry, the prospect drew only a mild public response. After all, drug use by airline pilots, bus drivers, mechanics, and others with safety responsibilities is not something to comfort the traveler.

## Who's Rights?

Some boards of directors and their bureaucracies, which are largely indistinguishable from governments in their motivations, soon implemented testing policies of their own. In fact, 40% of the nation's largest employers had adopted drug-testing policies when the trade journal *Industry Week* devoted the cover of its February 1988 issue to a story called "Smoking and Drug Policies: Whose Rights?".

The rub in the business world seems to be that a significant number of employees of such firms as GE, IBM, GM, Kodak, DuPont and Union Carbide believe that their Constitutional rights have been revoked.

That is not the case. What is true is that environmental pressures are making some of those rights meaningless.

Smoking restrictions, and the resentment they engender, are particularly difficult to explain unless one recognizes that both the need to smoke and the need to make others stop smoking stem from the individual's need to control his or her environment. In a world that is otherwise racing out of control, tobacco smoke is something about which we can take decisive action. Legislators on the lookout for a cause they can safely adopt see anti-smoking legislation as a godsend.

## Brave New World

Dateline New York City, 1990: Murders are up 10 percent, and they are cruising toward at year-end total of 2,000 homicides at the rate of 40 a week. New York has become a shooting gallery for muggers and addicts, who roam the city at will. New Yorkers face random drive-by shootings, street crime and gang wars (not to mention crumbling urban infrastructure, failing services and a case of perpetual near-bankruptcy). So the mayor decides to ban smoking in public places.

This is not a coincidence. Politicians know, perhaps instinctively, that diversion is a substitute for action when the high-priority items on the social agenda are clearly unassailable. Call it a smoke screen, a red herring, political camouflage, whatever. Politicians understand that when they

can't solve an existing problem, no matter how crucial, this ploy works: create a new problem that's easy to solve, solve it, and give the solution plenty of publicity. It makes it look like you're doing something.

It's a popular scam, too. Why not? Nobody's for pollution and smokers are a guilt-ridden minority.

By 1988, the politicians of 13 states and 300 communities had enacted legislation to restrict smoking in the workplace. Symbolic to some, petty to others, and landmark legislation to the petty, the new rules mean that, on the average, 25 percent of employees have to change their behavior at work. Welcome to a brave new world.

## Small Indignities

Drug testing reaches further. According to one (San Francisco) attorney for the American Civil Liberties Union (ACLU), "Because drug tests don't measure impairment, they go beyond what a person is doing on the job and open up a chemical window to an employee's life style off the job." Said another (ACLU attorney from Washington), "My concern is that this...will not stop with drug testing and smoking. Once a company has your urine (from a drug test), it can test for other things — prescription medicines you may be taking, mental illness, or even genetic defects."

Broad-spectrum drug tests are the cheapest and therefore the most widely used. However, they can give false readings. Users of codeine can test positive for opium, morphine or heroine. The analgesic Ibuprofen (in Advil and Nuprin) triggers the same test result as marijuana. Contac and Sudafed cold medicines show up as amphetamine abuse. There are ways

to defeat he tests, too. "Clean" urine samples sell on the street for less than $50.

In the beginning, people were unnerved by the indignity of urine drug tests and the precautions that went with them to prevent substitution of urine samples.

"What's next? A strip search? Where's it going to lead?" asked a Tempe, Arizona woman interviewed by a local paper in 1991.

Now, of course, the indignity, another small loss of freedom, is routine.

## Significant Risks

Drug tests got a big boost in corporate American in 1986, when then-President Reagan signed an executive order requiring them for federal employees with sensitive jobs. A program of compulsory drug testing began in December 1989 for airline pilots and mechanics, railroad employees and truck drivers — those, generally speaking, in "safety sensitive" jobs with federally regulated transportation employers. The idea, of course, was to discover and rout out drug abusers in positions of trust.

But testing has not uncovered widespread abuse. Federal agencies screened 29,000 workers in 1990 and found 153 abusers, at a cost of $77,000 each.

Accuracy is less of a problem now than it was earlier due to the use of a two-step process which checks a positive result of urinalysis with more expensive techniques, like gas chromatography and mass spectrometry. However, guarding against such false positives requires job applicants to reveal

any medications they may be taking. Armed with this information, employers may be able to exclude some applicants solely on the basis of medical risk, making less-than-perfect people, de facto, unemployable. With others, the information may simply undermine a prospective employee's bargaining position, as when an employer uncovers evidence of an allergy that would force an applicant to accept a lower wage who otherwise might have negotiated a pay incentive — or cause a tested employee to loose a raise because it has become obvious he cannot seek employment elsewhere.

Urine drug tests can even endanger your life. In 1991, a northern California flight attendant made the papers when she suffered from water intoxication after drinking about three quarts of water in a fruitless attempt to fill one of those little cups for a urine drug test.

To that point, there had been only seven other recorded cases of water intoxication, which is caused by a buildup of water in the brain cells and a dilution of minerals in body fluids. One victim died.

An estimated 30 percent of men and 25 percent of women exhibit a condition known as "paruresis", an inability to void in crowded, noisy or tense situations. This prompted doctors to warn of the possibility of an increasing frequency of water intoxication as the use of urine drug tests becomes more common.

## An Iron Rule of Law

Not just drug use, but any bad health habit can be fatal to your job. At least 6,000 companies in the United States, most of them small businesses, do not hire smokers. Cable News

Network (CNN) is an example. In one extreme case, an employee of an Indiana company was fired after nicotine was detected in her urine.

Other behavioral minorities are also becoming targets of discrimination. There are signs of discrimination against people with high cholesterol, people who drink alcohol, even people who ride motorcycles, according to the American Civil Liberties Union.

Employers are reacting to escalating health care costs, which have risen at double the rate of inflation in the past decade. That's what a captive market will do for you. On a frontier, the kind of zero-sum behavior in which a profession demands “your money or your life” vanishes because the bureaucratic infrastructure to support it is absent. Governments and self-appointed watchdog groups, like the American Medical Association, lack sufficient authority on a frontier to erect barriers to entry in the professions, so supply rises to meet demand. The quality of service is, arguably, poorer in such circumstances, but you get to keep your choices.

Choice, the right to choose, freedom, is vanishing even in the most trivial details of life because we, as a people, refuse to pick up our stuff and move on. For example, the state of Arizona adopted a new mandatory seat belt law in 1992.

According to a 1991 study used to justify the law, $33, 235, 000 in claims against the Arizona Health Care Cost Containment System came about because victims covered by the government-paid health insurance did not wear seat belts. The state's solution: everyone wears a seat belt, or they pay a fine.

Should you wear a seat belt when you drive? Arizonans lost their right to choose by the usual progression: first you accept the humanitarian aid of the state, and then the state makes new

rules to reduce expenses by protecting people from themselves. This happens to involve a loss of choice.

Forced drug testing and the persecution of selected behavioral minorities and government intervention in the details of our lives endanger our right to chose. All seem to be reasonable responses to intractable problems. The fact that their side effects should be intolerable in a free society suggests rather strongly that we are prepared to give up some of our freedoms in return for imagined safety. In our search for an alternative to frontiersmanship, we are binding ourselves with an iron rule of law so tightly that we will one day forget why we call ourselves free.

# Chapter 8: The Progress Paradox

*When we see our best efforts at creating an equilibrium society fail, some by aggravating existing problems, others by their ineffectiveness and still others by threatening to bankrupt us, it is time to ask whether we are looking for answers in all the wrong places. We proceed from a false assumption when we look to the limited resources of our home planet to feed, clothe, and house doubling and redoubling populations.*

In the final decade of the twentieth century, the world shifted its focus from cold war tensions to the fulminations of environmentalists against progress. The idea of freedom, of one's right to choose, became, shall we say, obsolete. Forgetting that freedom and growth are the same thing, we set off in quest of an ideal called "sustainable development", which would replace both.

## Conflicts Within

Today, persuaded by the teaching of a generation that growth, particularly population growth, will undo us, environmentalists urge restraint. Resources are limited, they say. We must conserve. They point to an abundance of evidence that Earth's biosphere is feeling our presence, perhaps even failing because of it. Famine, war, epidemics, and impending climate change make it clear that the status quo will bring us to a bad end.

The opposing view is emboldened by the collapse of the communist systems, which it interprets as a victory for the capitalist approach. Industrialists favor rapid expansion. Their model for the world is the United States of the mid twentieth century. They argue, convincingly, that wealth can come only from growth and that general prosperity, peace, and freedom are inextricably linked.

We have already seen that the capitalists are right. Now we shall see that the environmentalists are right, too.

When Richard Nixon declared war on cancer (in 1970), and boosted spending accordingly, cancer was the number two killer of Americans, right behind heart disease. It still is the number two killer. But, while the number of heart attacks dropped 43 percent between 1970 and 1987, cancer deaths increased.

The overall cancer incidence rose sharply, by 15%, from 1973 to 1987. For some types of cancer, the increase was astronomical. Melanoma, caused by exposure to ultraviolet radiation from the sun, rose 83%.

The chief suspect in most cancers is environmental pollution, from old mine tailings in the back yard to solvents in drinking water. Instead of isolating ourselves from our wastes, something we were once able to do, we're moving in with them.

Between 1971 and 1988, more than 86,000 Americans became ill as a result of drinking contaminated ground water, water which has percolated down from the surface into natural underground formations called aquifers. We pump water from aquifers through wells for drinking and irrigation. Into this water go herbicides, pesticides, and fertilizers from irrigated farmland. Into it also goes every kind of industrial waste and undetected leakage from underground storage tanks. Earth is a closed system, so the discharge of sewers is recycled in nature to become drinking water. The discharge from sewage treatment plants, which are only designed to treat organic wastes, includes heavy metals, pesticides, and degreasing agents. That's why arsenic, barium, chromium, copper, mercury, and zinc, all toxic, are common in water supplies.

Given a big enough world, it is reasonable to expect that we could dispose of these toxic byproducts of technology safely. Once, we thought the planet was big enough. Once, it was.

The Environmental Protection Agency has identified seventy-four thousand toxic waste dumps in this country alone. About a third of them are currently considered hazardous. Yet the Agency can only clean up seven or eight of them a year. Government can, in fact, do little. Sometimes it even refuses to acknowledge the problem.

During the late seventies in upstate New York, the Love Canal Home Owners Association had to fight to close a school built on top of an old and leaking toxic waste dump, then to evacuate the entire community. Love Canal was declared a disaster area.

It was a case of having populated a former waste dump, a recurring theme whenever space is limited. In the 1940s and 1950s Hooker Chemical Co. deposited toxic wastes, including PCBs and dioxin, in Love Canal. Doubtless the offenders thought it was safe enough; no one would ever live there.

The 70 acres nearest to the canal, where once there were 240 homes and an elementary school, are now populated by monitoring stations and warning signs. An additional 270 homes east of the canal have been, or will be, demolished.

## The Poisoning

Love Canal became an infamous first, the engine of a toxic waste cleanup campaign in the United States. Unfortunately, the case is so far from unique that the campaign has served only to emphasize the magnitude of the problem.

Incidents:

1980, Pompano beach, Florida -- A citizens' investigation discovers a connection between the white dust permeating the community's air and a variety of health problems, finding ten times the expected rate of headaches, seven times the expected rate of kidney problems and a high incidence of eye irritations, liver diseases, cardiovascular disease and cancer. The white particles are polyvinyl chloride dust from a nearby pipe factory. The state calls the group's findings "inconclusive."

1980, Globe, Arizona -- More than 100 residents are moved out of the Mountain View Mobile Home Estates after it is found to have been built on top of an old asbestos pile at an abandoned asbestos mine. Note: The state Department of Health Services had the site capped with fresh dirt. Weathering exposed the asbestos again, and residents were moved out for

good in 1983 under the Superfund program. In 1985, the federal government bulldozed the park — homes, furniture, and all — into a deep trench, where it remains buried. As Superfund cleanups go, that was fast. The average wait for the start of a cleanup after a site has been designated as a Superfund candidate is eight years. Completion is usually expected to take 13 years. The 1980 Superfund law, enacted after Love Canal, was supposed to provide speedy cleanup of over 1,000 high-priority hazardous waste sites. In 1992, 84 were complete after 12 years and $11 billion. Estimates of the final tab run to $750 billion. A 1991 report by the National Research Council found that cleanup of some sites would "create more of a hazard than would be caused by leaving such material undisturbed."

1981, Lowell, Massachusetts -- The state finishes cleaning up 30,000 barrels of toxic and carcinogenic chemicals at Silresim, a solvent recovery operation that declared bankruptcy in 1977. Some underground tanks and contaminated buildings remain. Meanwhile, lay epidemiologists turn up an alarming number of respiratory and skin problems, along with a high rate of miscarriages and birth defects, in the low-income neighborhood adjoining Silresim.

1986, Phoenix, Arizona -- A City of Phoenix storage tank leaks 200,000 gallons of unleaded gasoline into the ground before the damage is discovered. Phoenix, like the rest of Arizona, is dependent upon wells for much of its water supply. Afterward, traces of benzene and toluene, both ingredients of unleaded gas, are detected in the city's well water. Benzene is a known carcinogen.

In many respects, Phoenix is a unique colonizing problem. It is built on terrain of desolate beauty, but it is far from virgin soil. Back in the '50s and '60s, when giant industries like Nucor, Corning, and United Industrial were discarding solvents

into cesspools in the desert, it may well have been clear to the perpetrators that no one was ever going to live out there.

Then the people came.

In the Maryvale section of west Phoenix, leukemia struck forty-nine children between 1965 and 1986, twice the expected rate. Studies confirmed the existence of a cluster that seemed to be centered on St. Vincent de Paul Catholic School.

A likely cause was not hard to spot. Groundwater contamination with industrial degreasers (such as TCE — trichloroethylene), used in semiconductor manufacturing, has closed four drinking water wells in the area. It's not going to be an easy cleanup, either. One of the sites sprawls over 25 square miles, including a tank farm, and investigators have uncovered so many contaminants that they haven't been able to chart all the plumes. By one estimate, it will take 20 years to make the local groundwater clean enough to drink.

And the poisoning continues.

Over a period of three years ending in 1990, the Phoenix-area utility Salt River Project shut down 25 contaminated wells. Of 248 wells the utility uses to supply drinking water to the area, 126 are contaminated with nitrates, which reduce the blood's ability to carry oxygen. (The nitrates come from fertilizers used in the region's agricultural production.) While the nitrate level in those wells exceeds federal standards, the Project is forced to use the contaminated wells, because, "If we didn't use any of the wells with nitrate contamination, there wouldn't be enough water", according to a spokesman. In Phoenix, water from the contaminated wells is pumped into canals, where it mixes with surface runoff and the production of uncontaminated wells.

Even if the nitrates are ignored, there is serious groundwater contamination in Phoenix. Three of the wells closed in 1989 had excessive levels of chromium, which is toxic. And chromium (probably from a herbicide) was only one of 14 chemicals found in the water, including 13 volatile organic compounds, mostly industrial solvents, and one herbicide. The water pumped from one well contained 250 times the permissible level of tetrachloroethylene (an industrial solvent). That and trichloroethylene (used in dry cleaning) were the two most abundant contaminants of Phoenix's drinking water. Both are suspected of causing cancer.

The only good news is that the water in Phoenix meets federal standards when water from contaminated wells is diluted with the remaining safe water supply. For now.

## “American Democracy no longer works”

If our experience elsewhere is any guide, the groundwater situation is not likely to improve. Researchers at Oak Ridge National Laboratory reported in a 1990 issue of the publication *Environment, Science and Technology* that the EPA's "Superfund" cleanup strategy of pumping water from contaminated aquifers, cleaning it, and pumping it back into the ground doesn't work.

Said Curtis Travis, one of the authors: "We looked at 17 sites where pumping took place for from two to 13 years. None of those showed that it would ever reach drinking water standards."

In one typical case, groundwater was contaminated with about 400 gallons of a mixture of toxic organic compounds from an IBM plant in Dayton, New Jersey. Pumping seemed to

lower the concentration of the chemicals to an acceptable 100 parts per billion (ppb) over a period of six years, from 1978 to 1984. But when the groundwater was tested again in 1988, the concentration of pollutants had risen to 12,558 ppb. The researchers concluded that pockets of concentrated pollutants, many of which do not dissolve in water, remain out of reach of the pumps, sinking to the bottom of the aquifer, floating to the top, or clinging to the soil itself. Pumping may reduce the concentration of chemicals in the water, only to have those contaminants replaced over time from hidden sources. The implication is that groundwater contamination is permanent.

When we see our best efforts at creating an equilibrium society fail, some by aggravating existing problems, others by their ineffectiveness and still others by threatening to bankrupt us, it is time to ask whether we are looking for answers in all the wrong places. We proceed from a false assumption when we look to the limited resources of our home planet to feed, clothe, and house doubling and redoubling populations.

In fact, our world has maneuvered itself into a position which requires the same kind of competition to avoid poisoning that economic survival requires. There is no place on this planet to safely stash the volume of toxins that we produce. Never mind what should be. This is what is: someone has to live on poisoned ground.

The only short-term alternative to passive toleration of toxic waste is activism, an early and determined resistance to placing any kind of toxin-producing or toxin-storing facility near one's own community. To succeed, we will have to devote more and more time to this kind of defense. Others will also put up a fight, but the waste has to go somewhere. Those least able to defend themselves will just give up, give in, and die.

I will cite a few modest examples.

The far West Texas town of Sierra Blanca, 85 miles southeast of El Paso, is a dump. Literally. A 28,000-acre site near the town is the dumping ground for up to 500 tons of New York City sewer sludge per acre per year. The sludge smells like what it is, especially when it rains.

The deal between Merco Joint Ventures, a consortium of companies from Oklahoma and New York, and the Texas Natural Resource Commission was cemented in secrecy. By the time the people of Sierra Blanca heard about it, it was too late to stop the trainloads of sludge, which began arriving in 1993.

Merco and the state say Sierra Blanca is an ideal location for the dump because its climate allows year-round work. Residents say it was selected for its political impotence.

The town's reaction was exactly what is required of survivors in an enclosed world. It decided to combat not only the renewal of the contract for the sludge operation, but also a plan to bury low-level radioactive waste from nuclear power plants, hospitals and laboratories on a 16,000-acre ranch purchased for that purpose by the state.

Of course, there is a significant minority — well-heeled, prominent in social, economic, and political circles, and insulated — who feel that this struggle to survive is unseemly.

“American democracy no longer works,” lamented a columnist for *The New York Times* in May of 1991, because Massachusetts state politicians were not able to decide who to poison in order to clear the raw sewage from Boston Harbor. In this case, technology backfires by changing sewage into toxic waste and burying it next to innocents. The discharge of sewage into the harbor is a violation of the federal Clean Water Act. (Note: ... a piece of legislation which provides kudos for federal legislators while it imposes the costs on local

governments. It is a further example of political zero-sum gamesmanship.)

In 1983, a group calling itself the Conservation Law Foundation sued to stop the flow of sewage into the Harbor. Soon the Environmental Protection Agency joined the action. A federal judge, A. David Mazzone, mediated a solution involving the phased construction of a new sewage treatment plant. The thing about sewage is that you never really get rid of it. You can dilute it (by dumping it into a large body of water, for example) or you can concentrate it. Sewage treatment involves the latter. When you are finished concentrating sewage, you have toxic sludge, containing, among other things, heavy metals like lead and mercury. You need someplace to stash it. As in Sierra Blanca, someone else's backyard is ideal. Massachusetts officials found a site after an extensive search, but the locals in the town of Walpole managed to defend themselves by deadlocking legislation needed to situate the (euphemistically called) "landfill" in their neighborhood.

Noting the apparent stalemate, Judge Mazzone acted to break it by forbidding the state to hook up any new sewage lines which would empty into Boston Harbor. The effect on construction was immediate, as was the effect on the state politicians the construction interests controlled.

What the *Times* columnist meant to convey was that the American implementation of democracy, which has its roots in local control, had failed. Under these conditions, central authority had to prevail upon local leaders to act in the common interest. What he has really succeeded in demonstrating is that democracy cannot work in a zero-sum environment because, when all interests are equal, virtually any action can be blocked by the injured party. And every action will injure someone. The answer — do away with democracy

and, in a paternal gesture, impose a solution from above — is what is not American.

## Not a Drop to Drink

What is true in the Unites States is true globally as well. Third World nations have discovered a need to defend themselves against a stream of toxic waste from the industrialized world.

The government of Nigeria, in western Africa, has made it especially clear that it will not accept our poison goo without a fight. When, in 1988, the Nigerians discovered that an Italian company had secretly begun dumping toxic waste on their country, the government seized an Italian toxic waste ship in Lagos Harbor and ordered it to haul its cargo back to Italy.

While such action may be satisfying in the dramatic sense, it is not certain to prove effective. There is a reason why wastes from the United States, the Netherlands, Belgium, West Germany, and Italy have turned up in at least six African countries. African government officials are every bit as corrupt as ours, but a dollar goes further in Africa than in Europe or the United States. A free press and an educated electorate also may be absent. And so there was nothing to prevent some government officials in the Congo from forming a company to covertly receive toxic waste in exchange for $4.2 million a year. They were arrested eventually, but they had to be discovered first.

Civilization has come to mean a social organization based on the use of technology in a climate of limited resources. Not only living room, but room for error has been sacrificed in creating what amounts to a global civilization. A toxic spill

killed half-a-million fish and contaminated water supplies along the Rhine River in 1986. The spill was the result of a warehouse fire in Basel, Switzerland. A leak from another Swiss plant the day before the fire spilled six tons of herbicide into the river. Ecologists believed the Rhine might return to normal in six to ten years. Of course, this is an optimistic viewpoint. It assumes that there are no further accidents in the meantime.

And accidents happen in the best of families. Spills which threaten drinking water supplies have become routine.

In April, 1990, a landslide cracked a 10-inch pipeline, releasing almost 80,000 gallons of gasoline, kerosene and other fuels into Knapp Run Creek, northeast of Pittsburgh, Pennsylvania. The spill flowed into the Allegheny River, forming a 30-mile-long slick and interrupting water service to about 15,000 people who live in towns which depend on the Allegheny for their water supplies.

A 36-inch pipeline carrying diesel and heating fuel under Little Durbin Creek in northwestern South Carolina ruptured December 21, 1991, spilling 420,000 gallons into drinking water supplies. Cause unknown.

The town of Clinton, 25 miles downstream, switched to an alternate drinking water source. The town of Whitmire, 45 miles downstream, did not have an alternate source. A cleanup effort failed to stop the spread of the oil.

At 10 p.m. one Sunday night in July of 1991, a Southern Pacific train derailed while crossing the upper Sacramento River between Dunsmuir and Shasta Lake in northern California. Six tank cars plunged into the river. Five of them were empty. One contained 20,000 gallons of metam-sodium, a soil sterilizer usually used for keeping weeds out of parking lots and railroad rights-of-way. Fumes that smelled like rotten

eggs forced closing of Interstate 5. The water turned a color that witnesses called "fluorescent green".

Over the course of days, the spill spread out over 13 miles of river, killing thousands of fish and sickening scores of people. It reached Shasta Lake that Wednesday, having killed nearly everything along 45 miles of riverbed. Then it condensed into a dead zone 200 yards wide and half a mile long at the northern end of the lake.

Shasta Lake provides water for drinking and irrigation to districts throughout California.

## Regional Conflict, Global Results

In comparison to minor incidents like these which, individually, hardly make the papers at all, the results of the Persian Gulf War stand as an ecological disaster worthy of giant headlines. This kind of disaster usually doesn't get giant headlines because it has to compete for space with wars in progress. Even before the United Nations military response to the Iraqi incursion into Kuwait, while Iraq and Iran slugged it out in a war of attrition, tens of oil tankers were sunk and hundreds damaged. Oil platforms were razed and left pouring plumes of crude into the Gulf. Observers reported beaches paved with oil baking in the Middle Eastern sun. Reefs died, and fishermen's catches dwindled to insignificance. In some places, the environment became so toxic that not even algae would grow.

This problem is not going away in 20 years. If you made an effort to choose the worst body of salt water in the world in which to dump toxic pollutants, the Persian Gulf might well be your choice. This is relatively stagnant, unmixed water. For

comparison, the waters of Prince William Sound in Alaska, site of the Exxon Valdez spill, are recycled every 28 days. It takes 200 years for nature to flush the Gulf.

Not that the rest of the world gets off scot-free. The amount of sunlight reflected by the earth, called the planet's "albedo", may also have been affected, subtly changing the distribution of rain and the occurrence of storms.

Deep concern describes the state of mind of the world's environmental scientists even before Iraq's political leadership demonstrated, again, that human beings tend to let those who are demonstrably bonkers lead them into wars. All's fair in war, as the aphorism has it, and on January 22, 1991 Iraq opened the valves at Kuwait's Sea Island terminal in an apparent effort to head off a U.S. amphibious landing.

Iraq said the spill was the result of the U.S. bombing of two Iraqi tankers moored at the terminal. Saudi officials said the Iraqis themselves opened the valves and also emptied five tankers, each holding as much as several hundred thousand barrels of oil (Note: There are 42 gallons per barrel).

Also on January 22, oil wells and storage tanks were ignited at the Al-Wafrah oil field in southern Kuwait near the Saudi border and the Shueiba industrial complex just south of Al-Ahmadi.

Three days after oil was spotted flowing from the Kuwaiti Sea Island terminal January 23, several million gallons of crude had formed a slick stretching southward along the coast for 10 miles. The spill was still small compared to the Exxon Valdez spill, which put nearly 11 million gallons of oil into Prince William Sound, Alaska, in March 1989. But this slick was growing, and it would put fresh water supplies of the region in jeopardy.

The immediate threat was to the Al Khubar desalination plant in Saudi Arabia. The plant had been closed once before, in 1983, because an oil spill from the Iranian side of the Gulf.

On the fourth day after oil began to flow into the Persian Gulf, the slick was 70 miles long and on fire near its source.

Saudi Arabians took measures to protect the desalination plant at Jubail. That which could not be protected — birds, fish, dolphins, turtles, crabs, and mangrove trees — died.

Allied air strikes on oil installations at Ahmadi, 12 miles south of Kuwait City, in late January produced a black rain which covered cars and clothes with a dark film. Black water briefly flowed from taps after the raid. U.S. spokesmen said the oil pumps were bombed to stop the flow of oil into the Persian Gulf. They said Iraqi troops intentionally released the oil in order to frustrate a feared naval attack. Kuwaiti refugees said they did not believe the Iraqis deliberately pumped oil into the Gulf. Whoever was more at fault, the combined action of Iraqi sabotage and allied air strikes dumped 1.5 million barrels — 63 million gallons — of crude oil into the Persian Gulf by the end of February. Now the slick was a lot bigger than the Exxon Valdez benchmark, which dumped only 11 million gallons of crude into an environment which was much more easily cleaned.

In late February, as their military adventure in Kuwait lost ground, Iraqi troops made good on Saddam Hussein's threat to destroy the oil fields if the U.S.-led allies attempted a rescue of Kuwait by force. The world was treated to the spectacle of allied fighter aircraft streaking over a darkened landscape toward a horizon blazing with the orange light of burning oil wells. The smoke did not rise in pillars. Instead it flattened under an inversion layer into a plume that stretched two hundred miles downwind. Observing from the ground, a

Reuters reporter compared it to a storm that gathers but never breaks. Black rain fell.

Some news media started calling the damage in the Persian Gulf the result of "the world's first environmental war". Newspaper columnists, a little less naive and excitable than the headline writers, compared the devastation in Kuwait after the war to Verdun, a World War I battlefield which was still lifeless in patches after 80 years. The smoke from the burning oil was high in sulfur dioxide, the precursor gas to sulfuric acid. The pollution cocktail resulting from the oil well fires also included nitrous oxide (from which you get nitric acid), carcinogenic hydrocarbons, and ammonia. You could gas troops with it.

In 550 burning Kuwaiti oil wells, each day 6 million barrels (10% of the world's daily consumption), weighing roughly a million tons, were converted to 50,000 tons of sulfur dioxide, 100,000 tons of soot and perhaps 800,000 tons of carbon dioxide.

Daytime temperatures beneath the soot cloud were far below normal. Hospitals were jammed with respiratory patients. Black rain damaged crops and polluted water supplies.

Had the fires continued for a full year (they didn't), the effect of just 1% of the soot generated by the Kuwaiti oil well fires had the potential to lower temperatures in the northern hemisphere by two degrees Celsius (almost four degrees Fahrenheit).

In addition to smoke from hundreds of oil well fires and billions of barrels oil spilled into the desert and the waters of the Persian Gulf, spent antitank missiles containing depleted uranium littered the landscape at the end of the conflict. Eighty sunken ships continued to leak pollutants into the Gulf. Cancer-causing polychlorinated biphenyls (PCBs) and other industrial

waste contaminated populated areas, left there by Iraqi vandals, who also scattered sewage from shut-down sanitary systems. Unexploded ordnance, including mines, remains in a desert scared by tank tracks and pocked by bomb craters and military bunkers.

Scientists called the ecological damage "unprecedented". Eighty million barrels of oil had gushed from sabotaged wells. It fouled the Gulf. It fell as aerosol from the black plumes. Oil paved 400 miles of Saudi Arabian coastline, and the shores of Iran and Qatar. Tens of thousands of birds were left dead or dying. In Iran, 10,000 tons of fish had to be discarded as oil invaded spawning and feeding areas. Black rain fell in the Himalayas, 2,000 miles to the east.

## Anchor to Windward

Contemplating this mess, a reasonable human being can come to only one conclusion: that the world is too small to sustain the kind of damage modern war brings. War will not become obsolete, however. Freedom will become obsolete. We will cede our right to choose, little by little, to petty tyrants in the hope of avoiding ecological mayhem. And then those madmen, their minds ravaged by hatred, disease, and a lust for power, will war against one another. Without frontiers, they will put an end to the human adventure.

Arguably, the superpowers could have stopped the fighting in the Gulf earlier, by direct intervention before Iraq's military dictator got out of hand. However, the superpowers -- now the former superpowers, since the Soviet Union has fragmented -- have not been the most conscientious custodians of the biosphere themselves. There are currently 150 million tons of radioactive material circling the world in the stratosphere, most

of it put there by the United States and the former Soviet Union. All of it will eventually come down.

The gut reaction, at least in the America of the recent past, has been to pour money into a direct solution. We can't afford not to, the argument goes. But what if the resources just aren't there?

Wealth like that of the United States is not a guarantee of environmental responsibility, but it is a prerequisite. Such organizations as the Wilderness Society and the Sierra Club raise the alarm when, for example, the U.S. Interior Department announces plans to lease a new stretch of Alaskan wilderness for oil exploration. If the alarm is not heard, thousands of workers will arrive to mine gravel for drill pads, to build roads and, finally, to pump millions of gallons of toxic drilling mud into fragile holding ponds, the oil industry's equivalent of toxic waste dumps. But organizations that concern themselves with the environment run on surplus wealth.

When we are flush with oil, the messages of caution will be heard, and we will exercise restraint. Not so when a hard winter arrives and an Arab cartel tightens its grip on imported crude. Then children will shiver in unheated tenement buildings, and politicians will do the expedient thing. Oil is wealth, as are timber, clean water, and clean air.

'Wilderness is an anchor to windward," said Senator Clinton P. Anderson half a century ago. "Knowing that it is there, we can also know that we are still a rich nation, tending our resources as we should — not a people in despair, searching every last nook and cranny of our land for a board of timber, a barrel of oil, a blade of grass, or a tank of water."

Fifty years later, those words have lost their shock value. The nation's wealth is in doubt; we are net importers of both

raw materials and manufactured goods, and the search is on. Our new choices are to look downward in despair or upward in anticipation.

While economic growth under the terms of enclosure exhausts land, energy, and material resources, its aim, to promote general prosperity and to forestall bondage, is irresistible to humans. This is the progress paradox:

That growth can beget ruin.

That clean, abundant atomic power applied inappropriately produces toxic side effects and a fear reaction that delivers less power, not more.

That intensive agriculture can lead to deforestation, flooding, topsoil loss, and, ultimately, famine.

That indoor climate control expands our range into deserts and arctic wastes, but depletes ozone in the stratosphere with fugitive CFCs and warms the planet with HFC emissions, thereby threatening our existence everywhere on Earth.

That global commerce spreads, not wealth, but destructive organisms, crop failure, famine and pestilence.

These are the effects of enclosure. To resolve the paradox, remove the boundaries, as we shall see.

# Chapter 9: Last, Best Hopes

*We will be attempting the engineering of a global system which we do not understand, with stakes so high that we must neither fail nor permit delay.*

Technology used as a tool to create a balanced-ecology, zero-net-growth, small-is-beautiful world has been, and will continue to be, a failure. The reason is fundamental. Every process creates either toxic byproducts or heat. Both, usually. In a world where every resource is in use, every nook and cranny is filled, and hardly any natural process is understood in detail, it's impossible to find a safe place to stash waste of any kind. Under these rules of enclosure, technologies which should provide solutions are killing us instead. Nuclear power, once touted as the ultimate cheap energy choice, has presented us with more problems than solutions. And the so-called "green revolution," a global agricultural initiative intended to

eliminate hunger, has produced a harvest of human and environmental disaster. None of this is technology's fault. The fact that our solutions lead to worse problems should tell us that our approach is wrong, not that out tools are faulty.

## A Deadly Cocktail

Consider the process of cleaning up air pollution at the source. It's easy to forget here that you can't get anything clean without getting something else dirty. The scrubbers installed at a Hayden, Arizona copper smelter offer an excellent example of the principle.

The way the system is supposed to work, the scrubbers remove hazardous chemicals from the exhaust by trapping them in a spray of water. The contaminated water is stored in a rubber-lined pond until the solids settle and the water evaporates. Now you have dry hazardous waste concentrated on a rubber sheet. What happens to it next?. At Hayden, nature provided the answer quickly enough.

When heavy rains fell in December of 1990, the waste pond threatened to overflow. To prevent damage to the pond, water was pumped into a second holding pond which was not lined. No choice. Perfectly reasonable. You can't foresee everything. So the operators dumped a deadly cocktail of heavy metals (arsenic, cadmium, mercury, and selenium) removed from the smelter exhaust into the groundwater underlying their waste pond. Moral: sooner or later toxic materials are going to find their way into way the environment by accident.

# Warning for ET

In the case of nuclear reactors, the accidental escape of fission products and the handling of spent fuel have been among the greatest threats to the environment. The safe storage of nuclear waste for the life of the threat is probably not even a realistic expectation.

First, the material must be contained for a span of time exceeding the life expectancies of most container materials. Then the sites must be marked to prevent their accidental disruption by future generations of construction crews. This is roughly the equivalent of putting out "no trespassing" signs for extraterrestrials. The message must be universal, since there can be no assurance that our language and other symbolic conventions will be intelligible to the discoverers 10,000 years hence. An interdisciplinary group of scientists calling itself the Human Interface Task Force declared, in 1989, that it would take on the job anyway. The challenge: to create nuclear waste site warning signs for the next 300 generations. Brave noise. Predictably, nothing happened.

In 1992, a group of experts actually did gather at Sandia National Laboratory in Albuquerque, New Mexico to devise warning symbols to keep adolescents 3,000 years into the future from ripping open nuclear waste repositories with their ray guns. The symbols, pictographs etched on granite monoliths, were to be tried out at the Waste Isolation Pilot Plant near Carlsbad, New Mexico. It was not clear how they were to be tried out, however, there being no one in America today who is as completely ignorant of twentieth-century symbolic conventions as those blaster-wielding teenagers of the future are likely to be.

But that's the easy part ... easy, that is, compared to getting the waste to the dump in the first place. Among other insurmountables, the need to pollute is built into our defense establishment. It's pollute, or stop making nukes.

## Radioisotope Games

Rocky Flats nuclear weapons facility, 15 miles northwest of Denver, Colorado, once made plutonium triggers for hydrogen bombs. In November of 1989, investigators discovered that the plant's ventilation system was heavily contaminated with plutonium, the toxic and radioactive metal which fuels The Bomb. Sixty pounds of fugitive plutonium (enough to make several nuclear weapons) had been deposited on the duct walls as a result of minor leaks over decades. The government shut the plant down the following month because of that and other serious safety problems, including a faulty air-exchange system that could allow contaminated air to flood laboratories and offices in the event of accident, the possibility of chemical explosion in one of the buildings, and a questionable ability to detect radioactive leaks and fires.

This was no surprise to the people who worked at the plant. Some even tried to do something about it, and two of them attracted national attention. Plutonium operators Jacqueline M. Brever and Karen A. Pitts say they were forced to quit their jobs by threats from their employer (EG&G, the operator, and Rockwell, which operated the plant until Jan. 1, 1990). Fellow employees didn't help. Union officials also refused to help because they were afraid an investigation would lead to lost jobs. Brever said she was warned by a union steward about another employee who was "well-known for purposely getting people hot (radioactive), but they could never prove it." Shots

were fired at Pitts' home. Someone set fire to the Pitts' garage. The steering tie rods on Brever's truck loosened mysteriously.

Finally, Brever was deliberately contaminated with radioactive ash which had been stored since a 1969 fire at Rocky Flats. It was a simple thing. The ash flew through a pinhole in her rubber glove while she worked with the material in a sealed glove box. A fellow employee told her, "That's what you get for making waves."

Jacqueline Brever kept a journal from the day she started work at Rocky Flats in 1984. In it, she reported that the plutonium processing areas were so contaminated with plutonium wastes that "it's on the floor heaped in piles." According to her journal, employees turned off radiation alarms to avoid having to respond, threw radiation-contaminated rags at each other, poured cleaning solution on the floor so people would slip and fall.

Her reason for working at the plant: "We can never make this wage on the outside."

The women resigned in April. Plant operators admitted in August that both former employees of Rocky Flats had been "harassed".

Jacqueline Brever and Karen Pitts filed suit in Boulder District Court on October 9, 1991 against Rockwell, EG&G and 19 individuals.

But of course, you gasp, Rocky Flats must be an aberration, an exception to the rule, a criminal violation. Nah.

The plutonium production plant in Hanford, Washington, besides contaminating the air, leaked radioactive materials into the soil and ground water. Almost a quarter of a million persons in Washington, Oregon and Idaho have been exposed

to radioactive iodine, strontium-89, cesium-137, and other radioisotopes. Children living downwind of the plant received estimated doses high enough to cause hypothyroidism and thyroid cancer. Technetium-99 and iodine-129 found in soil samples will still be there in 160 million years. Civilian exposure to radiation also occurred at or near sites in Nevada, Idaho, Colorado, Georgia, and Ohio.

According to the Department of Energy (which has a vested interest in underestimating such things, since the mess occurred on its watch), the cost of cleaning up each U.S. nuclear weapons site, including those at Oak Ridge, Tennessee; Richland, Washington and Savannah River, South Carolina, could exceed $25 billion.

Another investigation, this one by the Congressional Office of Technology Assessment, agreed with the cost, in an order-of-magnitude sense, but added a chilling dimension. It determined that a cleanup of radioactive contamination at nuclear weapons factories and national laboratories around the country would take much more than 30 years. The report did not say how much longer. And the eventual cost of the cleanup will exceed $200 billion.

When the federal government terminated operations at Rocky Flats, the facility was within 90 days of reaching its on-site storage limit, with no place to dump its garbage.

For the sake of argument, let’s say you can contain nuclear waste and get it safely to the dump.

What dump?

Exactly.

## Whom to Trust

In 1982, Congress assigned the Department of Energy to create a high-level nuclear waste disposal system that would be guaranteed to cause fewer than 1,000 deaths from radiation exposure in 10,000 years. (Nice.)

In 1987, Congress designated Yucca Mountain in Nevada as the prime site for study.

In July 1990, the National Research Council released a study which said that the Congress was demanding a level of safety science simply cannot provide.

"Engineers are unable to anticipate all of the potential problems that might arise in trying to site, build and operate a repository." the report said. "Nor can science prove that a repository will be absolutely safe."

This is no surprise. The crime here is that people with limited knowledge, but unlimited zeal for pretending otherwise, have attempted (again) to intimidate their subordinate bureaucrats into promising to deliver that which is clearly impossible. In the process they have obscured the fact that nuclear power, once thought to be the ultimate answer to human kind's energy needs, is really, under the conditions of enclosure, just another "solution" that has become a problem.

Meanwhile, the Department started an experiment at another desert site.

The Waste Isolation Pilot Plant (WIPP) at Carlsbad, New Mexico was intended to be an $800-million, seven-year experiment in the disposal of radioactive waste by burial. Deep in a salt deposit, it is 2,150 feet underground. Radioactive waste, including plutonium-contaminated clothing and tools,

would be contained there for 10,000 years, if WIPP were a real disposal site. But that's the rub, really. New Mexicans simply refuse to believe the experiment is temporary. You'd think they didn't trust their government.

WIPP was first scheduled for opening in 1985, but it has seen a succession of delays while New Mexicans combat its presence in their state.

They are mindful of past experience elsewhere. Waste from Rocky Flats used to be shipped to the Idaho National Engineering Laboratory for temporary storage — until 1988. Idaho's governor (Cecil Adams) stopped further shipments after two million cubic feet of radioactive waste had accumulated there. WIPP would take contaminated garbage from 10 Department of Energy weapons plants, including Rocky Flats.

It can, indeed, be argued that the site has deficiencies.

Acetone and alcohols used in the processes that produced some of the low-level radioactive waste might cause an explosion if buried at the site, say those opposed to the opening. Mining experts told Congress in June of 1991 that the ceiling of a salt dome would probably collapse within three years, long before the experiment was planned to end.

The director of Concerned Citizens for Nuclear Safety criticized the Department of Energy plan to retrieve radioactive waste should the experiment fail. The plan failed to specify how waste would be stored once it was removed.

"How likely are they going to be to admit the tests have failed if they don't know where they are going to put it?" asked the director, Michele Merola.

## Under the Sea

So the question naturally arises, where did they put it before? And the answer is — you're not going to like it — in the worst possible place, but (and this is why) also the least conspicuous place.

Between 1946 and 1970, the United States government dumped 47,500 fifty-five-gallon drums of radioactive waste from atomic labs into the Gulf of the Farallones off San Francisco.

Those drums have now corroded, burst, and are leaking plutonium and cesium. The deep sea cameras of expeditions to map the ocean floor near the Farallon Islands off San Francisco have revealed fish swimming and feeding among corroded and burst drums.

The site is within the boundaries of the Farallones National Marine Sanctuary. It supports the largest population of sea birds south of Alaska and it is a commercial fishery for Pacific herring, Dover sole and Dungeness crab.

The U.S. Geological Survey team which performed the mapping also spotted what might be the aircraft carrier USS Independence, scuttled in the area by the Navy after it was deemed too expensive to decontaminate. The vessel was used as a target in the 1946 Bikini Atoll nuclear weapons tests.

The evidence that nuclear waste is entering our food chain, our water supplies, and our soil is enough to convince people here in the U.S. that nuclear materials cannot be safely stored, processed, or disposed of. It's almost a given that flirting with nuclear power is just too dangerous an undertaking for an

ecologically sensible nation. Yet it takes great wealth to be so sensible.

## Cheap Nuclear (Is Not Cheap)

In spite of their deficiencies, at least 26 dangerously outmoded Soviet-built nuclear power plants still operated in Eastern Europe and the Soviet Union by the end of 1990.

The reason: Money to modernize the plants is not available. Soviet officials say they cannot close the plants because they need the energy. In fact, there have been reports that energy shortages may force the reopening of some previously deactivated nuclear plants.

Czechoslovakia, Hungary, and Bulgaria face impossible energy choices. They have cheap coal, but it is highly polluting. Oil must be imported from the Persian Gulf at unmanageable cost. Their nuclear reactors pose enormous risks. One of them came close to a meltdown during a fire in 1975.

The power plants at issue are not the graphite-cored reactors of the type that failed at Chernobyl in 1986. They are pressurized-water reactors, the type widely used in the West.

In fact, the former Soviet states, even before they seceded from their union, had a history of frightening nuclear incidents rather resembling ours. The symptoms of people living downwind of the former Soviet Union's Semipalatinsk nuclear test site in Kazakhstan are similar to those of American "downwinders." In one extreme case, the likes of which we, so far, we have been able to avoid, an explosion at the Kyshtym nuclear waste storage site in the Urals in 1957 caused scores of

towns to disappear from official maps of the region. The area remains contaminated.

## Fusion

Fusion power probably will not deliver the goods, either. The advent of commercial fusion, like the horizon, seems to recede as we approach. Assuming the technical problems can be solved, and a clean source of abundant electrical power results, there is yet another ecological unbalance to consider. It is heat pollution.

Physicists are straining to bring fusion to what is called the "break even point", at which the process produces more energy than it absorbs. Sooner or later, they will learn how to make surplus energy from fusion, but it is likely to be an incredibly inefficient process, producing usable power only at the expense of an immense flux of waste heat. To some extent, we have the problem already.

Both conventional and nuclear power plants are presently warming coastal waters, thus changing the ecological balance of some areas where they discharge cooling flow. There appears to be little immediate danger in creating a few warm spots in the ocean. There is also little danger from the emissions of a few automobiles. These things tend to be matters of scale.

## Green Devolution

In its struggle to remain self-contained, the world is losing yet another great battle — the campaign to feed itself. "Every

day nearly 40,000 children die from preventable causes," lamented the director of the United States Peace Corps in 1987. Sadly, there is ample evidence that 40,000 is not nearly enough if Earth is to remain human kind's sole habitat.

Intensive irrigation, it turns out, is not going to provide the hoped-for answer to world hunger. Instead, by forcing the agricultural yield of meager turf to exceed its natural limitations, we have produced nothing but disaster. Kesterson Reservoir in northern California is an example of that kind of failure.

The picture in 1982 was bleak. All but one species of fish had disappeared from the marshes at Kesterson Reservoir National Wildlife Refuge in California's San Joaquin Valley. The chicks of the wild waterfowl that nested there were born horribly deformed. Researchers discovered that the culprit was the chemical element selenium, high concentrations of which were found in irrigation drainage. It has leached from the soil of 42,000 acres of farmland adjoining the refuge. The Department of Health warned people not to eat locally caught waterfowl. Two years later, Kesterson was declared a toxic waste dump.

San Joaquin Valley rests on an impermeable layer of clay, which prevents irrigation water from draining properly. Instead, it collects near the surface, soaking crop roots in a chemical stew. Some farmers built underground networks of pipes to remove the water, which then drained into Kesterson.

The contaminated water has to go somewhere. Reusing it would damage crops further, so it is dumped into the San Joaquin River, which supplies drinking water to Los Angeles through the California Aqueduct. In fact, about half the water imported by Southern California originates in the San Joaquin River.

At least one million acres of western San Joaquin Valley farmland need agricultural drainage to remain productive. Toxic levels of selenium have been found in alfalfa, corn, sugar beets, and cattle raised there. In addition to the selenium, molybdenum and boron are among twenty-three "troublesome" substances found in subsurface drainage.

Any of the proposed strategies for dealing with agricultural toxic waste would cost hundreds of millions of dollars to implement and, if it is true that experience is the best teacher, would generate problems of their own. The result is likely to be the abandonment of several million acres of farmland in one of the richest agricultural regions of the United States.

As the agricultural arts have been pushed to produce more on a globe which sometimes appears to be shrinking, sophisticated methods of pest control have become big business. Pesticides work. They are responsible for boosting crop yields the world over by saving a a large fraction from the ravages of insects and rodents. Here as elsewhere, however, the solution has become a problem.

## Bhopal, et. al.

On December 2, 1984, in Bhopal, India, a gas of incompletely known composition (but it was mostly methyl isocyanate) escaped from a tank at a Union Carbide pesticide manufacturing facility. The poisonous cloud crept across the sleeping city of 800,000, exposing 200,000, permanently disabling 20,000, and killing 3,800 outright.

Almost 30% of the 500,000 people in the affected area suffered eye problems, respiratory ailments, and psychiatric disorders. The miscarriage rate doubled.

In a mixed blessing, trading economic pain for environmental safety, the Union Carbide plant in Bhopal never resumed operations.

Although Bhopal may have been the first of such incidents, and certainly was one of the most dramatic of recent times, it will not be the last. Many pesticide manufacturing plants in the Third World are virtually unregulated, and workers and the environment go unprotected.

The record includes wastes discharged from a drain directly into the Mediterranean Sea at an Egyptian plant converted from the manufacture of dye. Another plant near Cairo has discharged wastes into the Nile, killing fish. The same sorts of abuses occur in Central America, where pesticide manufacturing zones are located inside cities, and where there are no safety systems.

An explosion at an insecticide plant, the Agricultura Nacional de Veracruz, in the city of Cordoba, Veracruz State, May 3, 1991 forced nearly 1600 people to evacuate their homes and sent at least 500 seeking medical attention from the Red Cross and local hospitals.

The blast spread a cloud of parathion over the plant in an area shared by primary schools, kindergartens, and nurseries. Parathion is a commercial insecticide, used mainly on fruit. It can be lethal if ingested by humans. Runoff of fire-fighting water from the plant contaminated the local water supply.

About 27,000 people are poisoned, 10% fatally, each year in the Chinese province of Jiangsu. It is the growing use of pesticides without adequate safety instructions, according to the Chinese press, that is the culprit. Instructions. Education. Whatever. At bottom, it's the need for proximity to poison that kills. And that need is a product of enclosure.

But could something like Bhopal happen in an "advanced" Western country like the United States? The answer is predictable. "There is no question that 'Bhopal' could happen in the United States," said Richard Boggs, a management consultant on employee health issues. "You are dealing with such terribly dangerous chemicals that human failures can be catastrophic. The potential is there, and it can happen, maybe today, maybe fifty years from now."

Five thousand residents were evacuated from the vicinity of the Elyria, Ohio Aztec Catalyst Co. Friday, August 27, 1993, when a cloud of caustic fumes drifted into the community from the site of an explosion and fire at the plant. Elyria was lucky, as so was Ohio Aztec. No one died.

## Risky Business

Disaster aside, there is evidence that agricultural chemicals like those sprayed on crops, and, inadvertently, on people, cause birth defects. What's more frightening than the possibility of birth defects from this cause is that circumstances force us to use these chemicals even though their effects on us are largely unknown.

In the *Journal of American College of Cardiology*, researchers form the University of Arizona have reported that Yuma, on the western edge of Arizona on the way to Southern California, has about twice the national rate of congenital heart disease. Why? Because Yuma is an agricultural region where fields border housing developments and crop dusters routinely douse those on the ground with chemical sprays.

Confusing the picture is the fact that there are several obvious environmental factors besides agricultural chemicals

that arouse concerns. The Marine Corps Air Station at Yuma, where soil and groundwater have been contaminated by jet fuel, is a federal Superfund cleanup site. A Mobile Oil Corporation site outside the Yuma city limits has been contaminated by leaking underground gasoline storage tanks. However, none of the pollutants are reaching the city's water supply, according to tests. Many residents say they suspect crop dusting as the cause because of their frequent exposure to it. But studies of the effects of farm chemicals on migrant workers have not detected an increase in birth defects. So what's going on? We don't know. We risk it anyway.

Cecil Miller, president of the Arizona Farm Bureau, said in 1990 that "If you took fertilizers and pesticides away from fruit and vegetable growers, production would go down by half and price would go up by 35 percent."

In other areas, overgrazing of range animals produces multiple environmentally damaging effects. Top soil is lost with the ground cover through wind and water erosion. Both the quality and quantity of water resources are degraded. Surface water is contaminated with silt. Rain water runs off rather than percolating into underground aquifers.

The experience of the Navajos in northern Arizona provides an example of overgrazing. Two million grazing animals occupy land that can only handle a third of that number. But that is not likely to change. Navajos rely on livestock, particularly sheep, for their livelihood.

Are we seeing zero-sum behavior in which greedy farmers and ranchers are risking the lives of innocents and spoiling the land in order to turn a fast buck? Or are we looking at a desperate pumping-up of the earth's carrying capacity to keep food prices low, or just to survive? Either way, enclosure is responsible. For those who do not wish to be poisoned, there's really no cleaner place to go.

Herbicides, pesticides, fertilizers and other potentially harmful materials we use to force the earth to accommodate more billions fail because of enclosure. In the long term, their use has an effect opposite that which we intend. Inevitably, the poisons we produce escape into the environment, where they reduce the earth's carrying capacity in unanticipated ways. What we have been trying to build turns out to be an exceedingly complicated perpetual motion machine. Such machines do not work. Equilibrium societies are living perpetual motion machines. They do not, and cannot, work either.

The risks we take to foster equilibrium might be acceptable if there were something to be gained. There is not. The developed world is engaged in a struggle merely to maintain what it has. If that struggle continues, it will involve the use of more powerful technologies on a grander scale, leading to disasters of historic proportions involving engineered objects. The earth is too small to absorb the consequences of repeated mega-engineering mistakes. And mistakes must be made. That is how engineers learn.

## Storm Clouds

John Roebling, designer of the Brooklyn Bridge, studied the failures of previous suspension bridges and learned how to avoid them. New Yorkers recently celebrated the 100th anniversary of the bridge's completion, and it is expected to last another 100 years. This was a success produced by previous failures.

The reason for the collapse of the Tacoma Narrows Bridge near Seattle is familiar to every mechanical and structural engineering student today. But in 1940, when the failure

occurred, engineers hardly gave a thought to the interaction of the wind with long, narrow structures. The explanation for the disaster had to wait for Dr. Theodore von Karman's formulation of the idea of vortex shedding. Well-known now, but mysterious then, the failure of the Tacoma Narrows Bridge was caused by the formation of whirlpools of air in the wake of the bridge at a rate close to the structure's natural frequency. This made the bridge's center span vibrate like a plucked string, until it broke.

Even such a safety-conscious field as commercial aviation makes its share of design errors, each of them a learning experience. The crash of a DC-10 in Chicago in 1979 was attributed to two separate and distinct failures. Maintenance crews violated safety precautions when mounting one of the engines, placing stress on the structure sufficient to begin a crack. When the improperly mounted engine tore away from the airliner on takeoff, it severed hydraulic lines to the flight controls.

An airliner should be able to survive the loss of an engine, or even the loss of one hydraulic system. In this case, however, redundant hydraulic lines were routed close together, so that the primary and backup lines were broken simultaneously.

The collapse of a bridge, the loss of an airliner, even the massacre of sleeping thousands by poison gas, must represent acceptable losses, or we wouldn't accept them. Yet they are puny compare to what we should expect from errors in mega-engineering projects aimed at redesigning the earth. And those loses will be for nothing. We will not be undertaking save-the-world programs for gain, but just to survive, with no real hope of success in the long term.

Why? Because we will be attempting the engineering of a global system which we do not understand, with stakes so high that we must neither fail nor permit delay. This environment of

fear is just the one most likely to turn the final solution into a terminal disaster.

Such an outcome is what we are to expect, though, if we continue to make Earth humanity's one and only home. It is already easy to see the storm clouds gathering ahead. For one thing, the forests are dying.

# Chapter 10: Decline of the Forests

*This is not just an industrial or political process we are witnessing, but a human drama. People die because of deforestation, and they do it in large numbers.*

In the old and optimistic days of the early '80s, environmentalists told us, maybe with a little too much relish, that tropical rain forests were disappearing at the rate of 30 acres a minute. A study based on more recent data shows that deforestation was sweeping the tropics at a nearly twice the expected rate, even then, and the pace is increasing in spite of international efforts in control it.

A U.N. Food and Agricultural Organization study, released in September of 1991, found that the world lost 42 million acres of tropical forest in 1990 compared to 29 million in 1980. This agrees with a 1990 study of tropical deforestation by the

United Nations and the World Resources Institute. So the real rate of disappearance was more like 60 acres a minute in 1980. Ten years later, the rate was 80 acres a minute. Even if the rate of destruction stops growing, the world's rain forests will all but vanish in fifty years. As these words are written, people who can read them will see the end.

## Root and Branch

Tropical rain forests are a main part of the ecological apparatus of Earth. No part of the system is as prolific a bearer of life. The equatorial sun and abundant moisture typical of these regions provide ideal conditions for plant life, for the incredible variety of animals which live among the lower branches and for the microbes that feed in the loam of the forest floor.

The genetic diversity which the forest represents is valuable in its own right. It has produced the root stock which we have bred for food, and it remains the gene bank we must go to when alterations in that stock are required. It produces the raw material of pharmaceuticals and natural insecticides. When it vanishes, it will take with it much that is still undiscovered. Those undiscovered and valuable commodities will not matter, of course, because the vanishing rain forest will also take with it much that is necessary for life on Earth.

The current expectation is that at least 20% of the world's species will become extinct, and with them will go any opportunity to employ their genetic diversity in the service of agriculture and medicine. Climate change, accompanied by serious global economic dislocation (starvation included) will follow, because forest vegetation influences climate by absorbing carbon dioxide, evolving oxygen and controlling

evaporation rates. Forests determine the availability of drinking water and the frequency and severity of floods. Expect more droughts. Expect more floods.

## Poverty of the Landless

This is not just an industrial or political process we are witnessing, but a human drama. People die because of deforestation, and they do it in large numbers.

Four thousand people, among them 1200 squatters inhabiting Isle Verde in the middle of the Anilao River, died in a flood November 5, 1991 after a storm dropped six inches of rain on the Philippines in six hours. Logging got most of the blame for the flood. The removal of trees stripped away the forests which would otherwise slow runoff during storms. But clearing for sugar cane plantations and slash-and-burn farming were heavy contributors, too.

Though largely unrecognized still, the root cause of deforestation is not primarily the greed of wealthy industrialists, but the hunger of rising populations whose only means of making a living is to clear land for agriculture. A frontier can support this kind of activity. The people who do it are acting as if they lived on a frontier, because that is what the species is designed to do.

"The primary, though not the only, cause of deforestation is the poverty of landless people in rural areas," remarked C. Hollis Murray, assistant director of the U.N. agency's forestry department not long ago. "These people are driven to this simply because they have no other resources except their own energy."

## Threatened by Conservation

Two truths emerge instantly from these facts. First, the effects of global deforestation will be devastating. Second, the causes are linked directly to mankind's need to eke out a living from the earth.

The chief culprit in deforestation is none other than the need to grow food. Ironically, jungle land is not suitable for growing things because it becomes poor in nutrients as soon as the trees are removed. That is because the organisms which live in the rain forest floor use nutrients as they are produced. They are part of the balance of the forest. So cleared land loses its productivity in a couple of years, and more trees fall to the axe and the chain saw.

The process is unstoppable by means politicians contemplate today. Where the forest is being slashed and burned in Africa and South America and Asia, the people need food today, or there will be no tomorrow for them. But they need more than food. They need fields and pastures and the sight of cleared land because that is their humanity, their hope for something more than subsistence. So every minute the engine of life on this planet gets smaller by eighty acres.

In the industrialized middle latitudes, in Europe and in North America, the forests are falling, too. Not to the axe, but to more subtle destroyers like ozone and acid rain. The dense forests of central Europe, which have inspired legends and blocked the progress of armies, are dying, not because anyone wills it, but because of the mere presence of human beings and their industries. Forests in the U.S. and Canada are threatened as much by our conservation efforts as by anything else. Sometimes the effects and their interactions are agonizingly indirect.

## Fuel Load

European explorers of Northern and Central Arizona described in their diaries a landscape of large, grassy meadows spotted with copses of ponderosa pine. Today, the dense stands of pine that have replaced the grasslands are in danger of dying from disease and disappearing in huge firestorms because of conservation efforts to prevent forest fires.

Natural fires thin out stands, keeping the forests open. But once you've built a cabin in the woods, permitting natural fires no longer seems like an option. Forest fire prevention is, on the face of it, a virtuous goal — isn't it the aim of every Scout, Girl or Boy; isn't it what Smokey the Bear told us boomers to do back when the world was simple? But when conservationists prevented forest fires, something else happened.

Tree density increased from the normal 17-20 trees per acre in pre-settlement days to 851 trees per acre today. In the new and improved forest, trees suffer from lack of light, space, nutrients, and moisture. Their weakened condition makes them susceptible to pine-bark beetle infestations. In the absence of fire, moisture is absorbed by the duff (dry needles, cones and other debris) on the forest floor. In fact, the moisture content of the soil below the duff, from which trees draw nourishment, is greater where there has been burning. When these things happen, it's not called a forest anymore. It's called "fuel load."

## No Good Deed

No one has a plan to reduce the fuel load, and no one knows where the money to support such a plan would come from. The so-called "Dude" fire in 1990 burned 28,480 acres in

Tonto National Forest, killed half a dozen firefighters and destroyed several homes. The cost to fight the fire was $12 million, larger than the total annual budget of Tonto National Forest ($10.5 million).

Ideally, Earth would be a park. Its inhabitants would opt to live in such places and in such numbers that natural processes, including natural fires, would supersede property rights. When settlers lacked the means to detect and extinguish fires wherever and whenever they occurred, that condition was, de facto, satisfied. With the passing of the frontier, we began to do ourselves in. The condition of the northern Arizona forests is one result. Whatever we can imagine doing about it, chances are excellent that it will backfire, too. If we try, I'd be willing to bet we'll accidentally wipe out something ... a fungus, say, that everything else depends on.

## Tapestry

Chanterelle is a mushroom. Like all mushrooms, it's a fungus. It exists in a symbiotic relationship with trees, providing water and nutrients. It is also prized as a delicacy, and if not for this fact it is unlikely anyone would have noticed its slow disappearance from European forests, along with 100 other mushrooms of the form *mycorrhiza*. Half as many species populated the forests in 1993 as in 1950. Biologists think the cause of the decline is pollution from automobiles and industry. As the mushrooms disappear, the health of the trees they help nourish is also impaired. The fabric of forest life, like a tapestry, is fully capable of unraveling with the removal of a single thread.

## Dreams of Empire

Much the same is true in the United States and in eastern Canada, where acid rain and its effect on northeastern forests has been the subject of some tension between the two governments. Human intervention is also changing the composition of forests in the western United States.

A 1990 study found 29.7% of Yosemite's Ponderosa and Jeffrey Pines (chosen because they are sensitive to air pollution) were suffering from ozone damage characterized by browning and loss of needles. Chemical messengers emitted by the distressed trees attract bark beetles, which finish them off. A similar study conducted five years earlier found that only about 6% of the pines showed mottling due to ozone damage. Over time, 50 to 75 years, oak is expected to replace the pine. What is significant about the change is not that oak is in any way better or worse than pine. What matters is that we are witness to a change effected not by natural selection, but entirely by human emissions into an environment too small to absorb them.

These events underscore the central fact that the frontiers of Earth have been exhausted. If human beings are to continue to call Earth home, they must stabilize conditions here at enormous expense and without any guarantee of success. On the contrary, eventual failure is the only guarantee. Our very humanity stands in the way of success. The same force which drives tropical ranchers and farmers to clear land causes the citizens of industrialized nations to pursue a course just as destructive. Every human being has dreams of riches and empire. Earth has become too small to satisfy enough of those dreams.

# Chapter 11: The Whole Earth

*Floods, hurricanes, droughts — the only plague missing was frogs.*
Newsweek*, January 22, 1996, in its recap of 1995's weather*

The idea that we can have business as usual is wishful thinking of the most extreme kind. The swarm of global malfunctions which are reported daily in the press are in fact related to one another by the conflict between the need to expand and an absence of room for growth. Ignoring the problem, calling it fiction, and trying to deal with each flare-up in isolation have, predictably, made matters worse.

Now is the time to look at the earth whole and recognize that the wreckage we see stems from a single cause. At best, our efforts at damage control amount to buying time. At worst, further blunders will cut short what time remains.

## Fatal Sunburn

The seriousness of the situation is not easy to perceive by casual observation. Days slide by, passing into years, with only a growing ring of smog around the city center and an occasional headline to mark time. Yet we know that the changes we see are not favorable. We mount campaigns to force action, even though it is far from certain what the results will be. And then something else turns up.

In 1977, or thereabouts, unknown even to the most careful environmental observers, Antarctica became the back door through which a new player entered. With the coming of September and the first light of Antarctic sunrise, a hole opened in the stratospheric ozone layer over Halley Bay. By 1981, British researchers had noticed the change. But it was not until 1985 that it was reported that the springtime amounts of ozone in the upper atmosphere of the region had decreased by more than 40% between 1977 and 1984.

Ozone in the stratosphere, a fringe of atmosphere on the edge of space, absorbs ultraviolet radiation, preventing most of it from reaching the surface of the earth. In fact, it makes life on Earth possible. Mars has no such filter, and on Mars, though it is further form the sun, an unprotected organism would suffer fatal sunburn in 30 seconds flat. On Earth, even a small increase in exposure can cause skin cancer, cataracts, and immune deficiencies in humans. The Environmental Protection Agency has estimated that every one percent drop in stratospheric ozone means an eventual increase in skin cancer (fatal and non-fatal varieties) of five to six percent.

# Extinction Event

A Nimbus satellite launched in 1978 recorded data which, if it had been converted from binary to useable form in time, would have shown an ozone hole forming over Antarctica seven years ahead of its actual discovery. As it was, British scientists using ground-based instruments at a research station in Antarctica collected the first evidence of an ozone hole in 1985. Since that time, the discovery has sparked debate on whether the hole is a natural occurrence, whether it's getting bigger, whether another ozone hole is going to appear over the north polar region, whether the ozone layer is thinning globally, and, if so, why. And, finally, if the ozone is thinning, is there a matching increase in ultraviolet radiation reaching the earth's surface? Let's review some of the evidence.

The lifetime risk of developing melanoma, the most dangerous kind of skin cancer, has increased more than 12-fold in America since 1935, from one in 1500 to one in 120. The reason for the increase is unclear, although there are several theories. More people live in the Sun Belt. A changing standard of attractiveness calls for a "healthy" tan. Some studies point to a doubling of cancer risk associated with a high-fat diet.

But there is circumstantial evidence that points to an increase in ultraviolet flux as at least part of the reason for the surge in cancer risk. In Australia, the Royal Society for the Prevention of Cruelty to Animals reports 500 cases a year of feline skin cancer, compared to almost none prior to 1995. These are not Sun Belt cats. They don't pay much attention to human standards of attractiveness. And Australian cats, in particular, do not follow American food fads.

Frog populations are especially sensitive biological indicators whose water-permeable skin and position high on

the food chain put them at risk from environmental degradation. In 1990, herpetologists meeting in New Orleans, Louisiana, concluded that entire species of frog were disappearing from large parts of Europe, Canada, the western United States, Mexico, Central America, and South America. The leading suspects are heavy metals accompanying acid rain, stray pesticides, and an increase in ultraviolet radiation (owing to ozone depletion).

At least one fact pointed to the last possibility. The extinctions did not appear to be taking place in polluted urban environments, but in wilderness areas, mostly at high elevations.

It wasn't until 1994 that Researchers at Oregon State University in Corvallis, Oregon, completed their survey of several species of frogs and toads in the Pacific Northwest in search of a clue to frog disappearances all over the world. They found that species which were not declining produced high concentrations of an enzyme which helps protect them against ultraviolet light.

## Missing Data

By 1991, the Antarctic ozone hole had extended to touch southern Chile, for the first time positioning itself over a site of human habitation. Farmers near Chile's southernmost city, Punta Arenas, reported that their sheep experienced temporary loss of sight. Local scientists blamed cataracts from increased exposure to ultraviolet light. Chilean teachers reported skin allergies and unusual sunburns among their students.

Perhaps most disturbing, scientists detected a reduction in the growth of algae in southern Chile during spring. Algae is a

bottom link in the ocean's food chain. Without it, seafood harvests could plummet, deepening an already serious global food shortage.

There was another indication of the reality of ozone depletion and a measure of the radiation that now reaches the surface where it didn't before. Biologists have noted that the plankton and krill in the Weddell Sea off Antarctica are changing color. They explain the change as a process of natural selection in which the pigmented individuals, better protected from the most penetrating kind of ultraviolet radiation (UV-B), survive.

A NASA report issued at the end of 1991 summarized the situation as follows: Ozone depletion over the South Pole was worse than ever. Ozone depletion in the northern hemisphere lasted longer, starting earlier in the summer instead of being confined to late summer and fall. The ozone layer was thinning everywhere except around the tropics. Still, no one had actually succeeded in measuring an increase in ultraviolet radiation at the earth's surface anywhere but Antarctica. That evidence took another two years to come in.

## Canadian Research

Near the end of 1993, two Canadian researchers reported the first measured increase in UV radiation reaching the earth's surface. Measurements had not been obtained before because clouds and pollution absorb UV radiation, masking trends. The results were published in November 12, 1993 issue of *Science*.

Measurements taken in Toronto, Ontario, showed UV levels increasing at the rate of 35 percent per year during the

winter and 7 percent per year during the summer from 1989 to 1993.

Measured ozone levels above Toronto dipped 4.1 percent annually in the winter and 1.8 percent in the summer.

Most of the increase was in the shorter wavelengths (the most damaging). Longer wavelengths, which pass through the ozone layer, were not affected as much, leading the researchers to conclude that the cause of the increase was, in fact, ozone loss. Their speculation was that plants, in particular, may not be able to cope with the increase in UV intensity.

## Resolve to Act

The threat of ozone depletion is not easy to perceive by casual observation. Ozone had been gradually disappearing from the stratosphere for decades before the loss was discovered. More than ten percent has gone since World War II. Even when satellite measurements of stratospheric ozone concentration began in 1978, no one recognized what was happening over the pole.

The chemistry of ozone destruction had been understood since 1974, yet the information that something very much like the predicted result was actually occurring out there slipped by. Not until ground observers stumbled on the hole did researchers review the data and discover their mistake. Since then, an additional five percent of Earth's ozone shield has vanished.

Sherwood Rowland and Mario Molina of the University of California at Irvine issued the first ozone alert in 1974, based on their new understanding of the chemical mechanism which drives the depletion of ozone at great altitudes. CFCs (many of

them known by the trade name Freon) are non-combustible, non-toxic and chemically inert. They don't react with other constituents of the atmosphere to form liquids or solids which precipitate out of the atmosphere as other chlorine compounds do. The same properties that make them useful permit escaped CFCs to retain their chemical identity until they reach the upper atmosphere, where intense ultraviolet light breaks up their molecules, liberating free atoms of chlorine.

The amount of ozone in the upper atmosphere, less than one part per million, is the result of a balance. Ozone, a molecule of three atoms of oxygen instead of the normal two, is constantly being broken up and reformed during the process that absorbs ultraviolet light. The presence of free chlorine drives the ozone-forming half of the reaction backward, destroying the ozone in favor of more oxygen. The chlorine itself is not consumed. It can remain in the atmosphere for 75 to 100 years. Thus ozone destruction will continue for a century, even if the release of CFCs stops immediately.

That is a summary of the knowledge of atmospheric chemistry that was available before ozone got its big publicity boost from the discovery of the Antarctic ozone hole. Such knowledge was enough to prompt the U.S. government, in 1978, to ban the use of chlorofluorocarbons as a propellant in aerosol products.

Most European nations didn't follow the aerosol ban. Nor are CFCs used only in spray cans. Automotive air conditioners, among the worst offenders, leak about 65% of their Freon coolant before getting to the shop. Printed circuit boards are immersed in pools of Freon to clean them prior to soldering. Mechanical parts are degreased in Freon prior to receiving surface coatings.

Resistance to the outright ban of CFC production is a powerful one. It is the dream of riches, more formally known

as economics. The market for Freon in 1976 was 820,000 tons. 350,000 tons of which were used in aerosol cans. In 1985, it was 775,000 tons and aerosol use worldwide dropped to 235,000 tons. Non-aerosol use of CFCs had actually increased by 70,000 tons.

A worldwide ban on CFC production (among the developed countries anyway) went into effect in 1996. Is the problem then solved? No. The United States once had a virtual lock on CFC production. That status has now passed to China, and there has been no accord with China to cease production of CFCs until at least the end of 2010. CFCs are cheaper to make, safer to use, and more effective than the available substitutes. Given continuing changes in economic conditions, it is unclear in what direction the hierarchy of needs may drive us.

Some things are certain. Instruments have recorded a global decrease of four to seven percent in stratospheric ozone, a decrease six times steeper than the mathematical models predicted. In 1988, a panel assembled by NASA to perform an ozone layer accounting concluded that a loss of 2.3 percent over the middle latitudes of the earth since 1969 should be attributed to chlorofluorocarbons. Near the equator, the drop was 0.5 percent to 1.8 percent from 1978, when satellite data first became available. Lets assume that the release of CFCs into the atmosphere stops immediately, that China is an honest broker in its reporting, that there is no bootlegging of CFCs anywhere in the world, and that global warming, which accelerates ozone destruction by cooling the stratosphere, is not much of a factor. Then the rational expectation is for a depletion of five percent to twenty percent of the earth's ultraviolet shield over the next 100 years. This will have certain obvious effects, such as a 25 to 100 percent increase in the incidence of skin cancer, and probably other bad news more difficult to guess. Enclosure is a relentless predator.

## Hottest on Record

If changes in the atmosphere were due solely to the ravages of an exotic man-made compound, we might conclude that the evils of technology are responsible for the mess, and that the appropriate thing to do is to stamp out technology. There is a distinct odor of cowardice about that philosophy. Besides, the byproducts of technology are the smaller part of our environmental problem. As it happens, not only the outer layer, but the entire body of Earth's atmosphere is changing, mostly due to the effects of desperation agriculture in parts of the world that have not yet experienced the industrial revolution — and are, in fact, living just as anti-technologists would have us live: barely.

In 1984, the Associated Press reported a finding which, on the face of it, seemed a little abstract. Studies of air trapped in glaciers had shown that the amount of methane in the atmosphere had doubled in the last 500 years. Methane, the chief constituent of natural gas and a product of biological decay, is one of several gases which contribute to global warming.

The study, "Greenhouse Effect and Sea Level Rise", by researchers at the University of California's Scripps Institution of Oceanography, was a breakthrough of sorts. It made the "A" section of most newspapers with the prediction that sea levels would rise one to five feet within 100 years because of the melting of polar ice.

By 1986, the figures, and the news coverage, had been revised somewhat. The story that hit the front pages was "Greenhouse effect tragedy may be coming fast, hard." Methane of agricultural origin, as well as carbon dioxide and chlorofluorocarbons from industry and nitrogen-rich fertilizers

would push the world's average temperature up nine degrees by the year 2020. Sea levels would rise 12 feet by 2100.

The year 1988 was a year of near panic. The U.S. Midwest, the world's breadbasket, crisped during an unusually warm and dry summer. In some sections, the loss of staple crops was total. A team led by James Hansen, chief of NASA's Goddard Institute for Space Studies, concluded that Earth's average temperature had already risen 0.7 degrees in the first five months of 1988.

Higher than usual temperatures were reported elsewhere as well, and the fall brought a new phenomenon: the first example of a greenhouse-bred monster storm. Hurricane Gilbert, packing nearly 200-mile-per-hour winds, all but leveled Jamaica, crossed Mexico's Yucatan Peninsula, sending tens of thousands to shelters, and then turned toward the coast of Texas.

## The Melting

In May of 1990, March made all the newspapers. Not because of any particular event in March, not because of an anniversary, and not because March included anyone's birthday. March made the papers because it was the hottest March on record, fully a degree and-a-half (Fahrenheit) hotter, on the average, than any previous March on record.

Cherry blossoms in New York and Tokyo beat the records for early blooming by 10 or 11 days.

The dogwoods bloomed earlier than usual in Atlanta, and the Magnolias in West Virginia were two weeks ahead of schedule.

In the Caribbean, concerned marine biologists monitored the early onset of coral bleaching. (Caused by warm water, coral bleaching is the loss of algae, with which the coral has a beneficial relationship.)

Summer-like warmth ranged from Scandinavia to Spain, with temperatures up to 12 degrees above normal.

A tropical typhoon formed in the Bay of Bengal, talking 450 lives when it charged ashore in India and Sri Lanka.

At the end of the decade, the books recorded that the1980s were the warmest ten years in the 100-year history of keeping temperature records. Reliable monitoring of snow cover did not start until satellite data became available in 1972, so most scientists were saying it was too early to connect the change with global warming, but the '80s also produced the least snow on that meager record. California experienced a prolonged drought as a result of the reduced snow pack.

In June of 1990, Peter Wadhams, of the Scott Polar Research Institute in England, published his finding that part of the polar ice sheet had recently become thinner, possibly due to global warming. The ice sheet in a 115,000 square mile area north of Greenland thinned from an average of 17.5 feet to 15 feet between 1976 and 1987.

Three years later, Lonny G. Thompson, a glaciologist from Ohio State University, discovered that the melting of glacial ice on top of tropical mountains was proceeding much faster than normal. Snowcaps on mountains in South America, Africa, Tibet, and the former Soviet Union all show signs of faster-than-normal melting. The data supports a conclusion for a global temperature increase of 1 degree centigrade (1.8 degrees Fahrenheit) since 1976.

The frequency of killer storms rose, too. The World Meteorological Organization retires the names of hurricanes which cause enormous damage or loss of life. Those retired since 1960 include the storms in the Atlantic, Caribbean, and Gulf of Mexico tabulated below. Note that the decades of the '60s through the '90s averaged 9 storms of such destructive effect that it would have been panic-inducing to reuse their names. The decade of the '90s saw 15 such storms. Between 2000 and 2008 there were 24 killer hurricanes. As serious as it is, the threat of more powerful storms is only half the bad news for coastal cities. The world's oceans have been rising since the 1930s, although the nature of this trend has only recently become clear.

The surf is advancing at the rate of six feet per year or more at the south shore of Long Island, New York, along the North Carolina Coast, and along Texas beaches. In 1983, West Coast winter storms pushed waves to shore levels higher than seen before.

List of retired names by year

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | **1954** Carol Hazel | **1955** Connie Diane Ione Janet | **1956** | **1957** Audrey | **1958** | **1959** |
| **1960** Donna | **1961** Carla Hattie | **1962** | **1963** Flora | **1964** Cleo Dora Hilda | **1965** Betsy | **1966** Inez | **1967** Beulah | **1968** Edna | **1969** Camille |
| **1970** Celia | **1971** | **1972** Agnes | **1973** | **1974** Carmen Fifi | **1975** Eloise | **1976** | **1977** Anita | **1978** | **1979** David Frederic |
| **1980** Allen | **1981** | **1982** | **1983** Alicia | **1984** | **1985** Elena Gloria | **1986** | **1987** | **1988** Gilbert Joan | **1989** Hugo |
| **1990** Diana Klaus | **1991** Bob | **1992** Andrew | **1993** | **1994** | **1995** Luis Marilyn Opal Roxanne | **1996** Cesar Fran Hortense | **1997** | **1998** Georges Mitch | **1999** Floyd Lenny |
| **2000** Keith | **2001** Allison Iris Michelle | **2002** Isidore Lili | **2003** Fabian Isabel Juan | **2004** Charley Frances Ivan Jeanne | **2005** Dennis Katrina Rita Stan Wilma | **2006** | **2007** Dean Felix Noel | **2008** Gustav Ike Paloma | **2009** |

Table courtesy of The World Meteorological Organization

Eighty to ninety percent of U.S. beaches are disappearing, and reclamation projects such as sea walls and sand replacement haven't worked.

## Bubbles Tell

Meanwhile, if the results of computer modeling of the atmosphere are not overly optimistic, the earth's average temperature will continue to rise a little less than one-tenth of a degree Fahrenheit per year. The best modeling techniques available indicate that even drastic conservation measures will not stop the process, although they may slow it at a cost which the models are not designed to predict.

How accurate are such models? They are accurate predictors of trends. The precise numbers, even the dates of predicted occurrences, may be in error, but the underlying truth remains. The real message of the Club of Rome in its famous and often misunderstood 1972 report, *The Limits to Growth*, is not that the end of the world is coming, but that there are limits. Scientists don't know exactly what those limits are because of deficiencies in the general state of knowledge about the planet.

Our understanding of such complex subjects as world economics and planetary atmospheres is restricted at least as much by the lack of reliable input as by incomplete theoretical understanding and inadequate computing power. What is the state of an economy or of the earth's atmosphere on a given date? For the most part, the modelers will not know the answers in anything like sufficient detail to expect an exact prediction. But the trends are inescapable.

There is also some corroborating physical evidence. Air trapped in bubbles of polar ice a hundred years ago is measurably different in composition from today's air. Not only has the concentration of methane increased, but the studies of polar ice by the National Oceanographic and Atmospheric Administration (NOAA) have shown a 25% increase in carbon dioxide concentration since the 1850s. The analysis of polar ice showed no change prior to that time. This agrees with our knowledge of the spread of civilization across the planet. It comes as no surprise that the clearing of forests and increased industrial activity in the Americas, Earth's last frontier, should change mankind's relationship with the earth forever

So What? Summers can get hotter or colder. Sea levels rise and fall. The only thing you can be sure they won't do is remain the same. The crisis lies not in change itself, but in the rate of change. We are seeing rapid alterations on a global scale and in an ecological system which science is only beginning to understand.

## Something … Anything

In fact, we understand just enough to know we are headed for serious trouble. Ironically, the clue which gives us that vital bit of information comes from a recent cooling trend, a four-degree (Fahrenheit) cooling from 1325 to 1815 which resulted in the so-called "Little Ice Age." Crops failed throughout Europe. In Scotland, a crop failure became the prelude to British conquest. And North America was ice-bound clear to New York, even in summer.

Scientists studying how Canadian forests responded to the Little Ice Age correlated deposits of pollen found in lakes with a computer model they developed. (The changes in forest

growth distribution among types of trees were given by the pollen studies. The computer model added biomass information.)

The cooling period lowered temperatures in Southern Ontario by an average 2 degrees C (3.6° F) over 650 years.

According to the scientists' calculations, the cooling period reduced forest productivity by 30 percent. The forest was still out of equilibrium by the end of the simulation in the year 2000.

The results, published in the November 25, 1993 issue of *Nature*, were the first to suggest that a minor climate change could have such a dramatic effect on forest growth. The model indicates that the rate of change is more important than the direction. Current predictions are that global warming will proceed at a rate several times faster than the cooling trend used in the study.

In 1990, the U.N.-sponsored Intergovernmental Panel on Climate Change, comprising analysts from several dozen nations, concluded that the impacts of global warming would be most keenly felt in developing regions: Brazil, Peru, sub-Saharan Africa, China, Southeast Asia and the Asian portions of the former Soviet Union. Developed nations would adapt better because of their water-distribution infrastructure. The panel concluded that an average global temperature rise of two degrees Fahrenheit was likely by 2025. With that went a sea level rise of 8 inches to 2 feet by the end of the 21$^{st}$ century.

Most vulnerable will be those living near rivers and seacoasts. Floods and storm surges will take a toll on such areas with increasing frequency. By further undermining already shaky economies, global warming will also boost urban pollution and speed the spread of disease in the Third World.

There is enormous pressure to do something....anything.

## Almost Abstract

Computer models predict a significant chance of a drought-driven global agricultural failure by 2050. Industrialized countries will be asked to bear most of the burden of reducing carbon dioxide emissions because they are prodigious consumers of energy, most of it derived from the burning of fossil fuels. The cost of controlling carbon dioxide emissions is still uncertain, but it is clearly going to be enormous. That, in itself, is a powerful economic motive of the kind that usually precipitates either ill-considered short-term answers or a terminal case of denial.

In addition, the National Academy of Sciences, in a 1991 report, concluded that population growth is the "biggest single driver of atmospheric pollution." What makes that a chilling assessment is that population growth had been all but acknowledged to be uncontrollable ever since "zero population growth" became a synonym for futility in the '60s. The report cited a 25 percent increase in atmospheric carbon dioxide concentration in the last century, with a continuing increase of 0.5 percent per year. Global temperatures were reported to have risen 0.5 to 1.1 °F at the same time, with an anticipated additional rise of 1.8 to 9°F — enough to make the twentieth century look like an ice age.

With sublime irony, the report issued a call for a new generation of nuclear power reactors.

Anyone could see how dangerous the situation had become. Nuclear power, dismissed half a generation earlier as inadmissible because of its environmental hazards, had re-

emerged as salvation from another set of environmental hazards. If the Third World were in fact to rely on nuclear energy to elevate its standard of living with today's technology, it would certainly pay a horrendous price in radiation poisoning from cheap, unsafe construction and waste storage. Yet that is the direction in which we are driven.

In spite of a stack of evidence that global warming is a genuine threat to human survival, not to mention human economic prosperity, the odds are overwhelming that nothing will be done about it. The reasons are simple. We're talking about changes that are small, not directly observable, almost abstract, compared to the economic hardship that any corrective action would require. And any misstep in applying that correction might well result in an outcome worse than the one we fear. Consider recent history.

In 1988, America was convinced the world was galloping to its doom because of one hot, dry summer. Editors just couldn't cram enough global warming anguish into their headlines. But December of 1990 produced record lows on Christmas day in 125 U.S. cities. Flowers froze on Rose Bowl floats in usually balmy Pasadena, California. Sacramento experienced a record low of 24 degrees. Snow covered eastern Texas and western Louisiana. Frost damage in usually mild agricultural areas led to predictions of price increases (doubling) for citrus, lettuce and some winter vegetables. (Note: If memory serves, prices did go up substantially, at least for lettuce.) But ...

In Kodiak, Alaska, Christmas Day brought a record high of 47° F, one degree above the previous mark set in 1984.

Confusing, isn't it?

One of the things that makes global warming difficult to appreciate is that it is not a locally observable trend. The

temperature does not rise smoothly and perceptibly everywhere at once. It goes in fits and starts. The average can be increased by elevating the lows, even though the highs are not increasing. It's a subtle effect, tough to measure and even tougher to prove.

Scientists who analyzed 10 years worth of temperature data from the Tiros-N series of weather satellites reported in the March 1990 issue of the journal *Science* that they did not find a warming trend. Reports of global warming are based on ground data, which is much more abundant and covers a longer period (about 100 years), but is collected at widely-scattered sites, most of them near cities. Although the satellite measurements of Earth's temperature showed no sign of global warming from 1979 through 1988, the authors contended that a decade is too short a period in which to detect a climate change. So the debate rages on. Do we face fire or ice? Even if we knew, do we have the skill to save ourselves, or are we like monkeys monkeying with a loaded shell?

## Fire or Ice?

Collectively, we know just a little bit more than enough to be dangerous. We know that we know enough to be dangerous, and part of that knowledge is the understanding that, Allah help us, we could easily bring about an ice age with even infinitesimal tampering. We simply don't know where all the pressure points are.

The usual explanation of ice ages is that they are caused by variations in Earth's orbit and inclination of its spin axis. Some recent research, however, suggests that the precursor to an ice age is an increase in global temperatures. Reason: glacier formation requires snow as a raw material. As Earth warms, the

air picks up more moisture and snowfall increases in the polar regions. Not all of the increased accumulation of snow melts in summer. As glaciers grow, they reflect more sunlight into space, beginning an accelerating plunge into a new age of ice.

Gifford Miller is a prominent ice-age researcher at the University of Colorado. He says: "Everything we learn about past ice ages teaches us the climate is more sensitive than we thought, and we just have no idea what kind of damage we are doing today by tampering with it."

Moral: Anything we do to correct the perceived problem of global warming might turn events in a completely unexpected and disastrous direction.

Such is the complexity of the atmosphere and our ignorance of its interactions that efforts to minimize acid rain could accelerate global warming. Sulfur dioxide produced by the burning of sulfur-bearing fossil fuels, especially coal, produces an airborne mist, or aerosol, which reflects sunlight back into space, cooling the earth. The effect is local, and temporary.

Sulfur-dioxide aerosols also form the nuclei of the water droplets that comprise clouds. In fact, a researcher at the National Oceanic and Atmospheric Administration has reported a finding that cloud cover increased 2 to 3 percent over the United States since 1950.

The effect of sulfur in the atmosphere may explain the exaggeration of global warming apparently produced by climate computer models so far. The theory, backed by satellite data, has been offered as an explanation of why the observed warming (0.5 °C over the past century) has fallen short of predictions.

Some scientists point out that it also explains why little or no warming was measured in the northern hemisphere from 1940 through the 1980s while the southern hemisphere did warm noticeably. Fossil fuel burning is concentrated in the northern hemisphere. The effect of sulfur cooling is both regional and temporary because the sulfur precipitates out of the atmosphere as acid rain or snow. Carbon dioxide, on the other hand, can remain in the air for decades.

The combined effect of greenhouse gas emissions and a cessation of sulfur dioxide pollution could be a sudden global temperature increase.

## The Graffiti on the Garden Wall

Curiously, neither the threat nor the evidence in support of the argument that there is a threat is compelling to America's leaders. The same could be said of Americans themselves, or of the citizens of any other country.

The rule is simple, and those who wish to change the world ignore it at their own peril: People won't take action to avoid a less-than-obvious and immediate threat. There's no profit in it. In Western democracies, this trait of individuals translates into policy. History provides clear examples of democratic leadership which ignored indirect threats to the well-being of their nations until it was almost too late. England's belated involvement in Adolph Hitler's war is a perfect example. The United States almost made the same mistake. Western democracies tend to perceive war as all sacrifice because they do not, in general, covet booty.

The Japanese assault on the American automobile industry is another case in point. Even after it became obvious that

Japanese manufacturers were offering a superior product at a reasonable price, winning the hearts and minds of America consumers, Detroit, Motown, the home of the Big Three, did nothing. Perfectly understandable. There was nothing to gain. The best American manufacturers could have hoped for was to avoid losing what they already had. As we have seen, avoidance of loss in a poor motivator. Japan, on the other hand, having been thoroughly schooled in the methods of Western democracies, had the best of motives. It had little to lose, a world to win.

Let’s examine a final example, a little closer to home. Sooner or later, neighborhoods in many American cities find themselves in decline. People are trapped in those neighborhoods because they wait too long to get out. It generally isn't because they don't see the graffiti on the garden wall, the abandoned grocery carts in the street, the knots of insolent young people on street corners, the broken windows, the worn-out roofs, the weed-choked yards. They don't really believe things are going to get better, either. They don't even hope it. There's just nothing to gain. Without an infusion of cash, a better job, a fantastic deal on a house in a better neighborhood, the best the neighbors can hope for is to avoid the loss of what they have. Hence, they do nothing.

Individuals do act, however, when they see the possibility of personal gain — even in the absence of a threat, even if the real probability of gain is small. Consider the phenomenon of gambling, and that of state lotteries in particular. Say, typically, a lottery requires a winner to correctly guess six numbers out of 50 possibilities. A student of probability would calculate the chances of winning at about one in 16 million. By way of contrast, an entrepreneur's chances of starting a successful business are about one in ten. An artist's chances of hitting the big time are somewhere between the two extremes. Yet a significant number of people go into business for themselves or

spend years of their lives writing novels they hope will catapult them into a fortune.

Fact is, people will spend their last dollar on a lottery ticket. You can argue that a dollar spent on a lottery ticket is a negligible risk, while $50,000 a year, or so, won in a lottery, is a great return on the investment. The risk/benefit ratio is low, even if the probability of realizing the benefit is lower. But the risk taken by boat people from Vietnam or Haiti to have a crack at the entrepreneur's one-in-ten chance is not negligible. The risks undertaken by the New World's first colonists were not negligible, either. The mountains and the great deserts of the American west were littered with reminders of tragedy for those lucky and brave enough to pass them. They came anyway, not to avoid loss, but to risk everything they had for a chance to have it all.

In every case, what we see is that people reject the idea of sacrifice without the possibility of profit, while embracing risk for gain as an organizing principle.

Sometimes the rejection of sacrifice is so strong that it resorts to subterfuge in the cause of self deception. Take George Bush the elder.

Remember the 1988 Bush campaign promise to "combat the greenhouse effect with the White House effect"? One year later, the Office of Management and the Budget, a White House accounting organ, changed the text of NASA testimony before the Senate Committee on Science, Technology and Space in order to soften its conclusions. Among the conclusions: that the accumulation of carbon dioxide and other gases in the atmosphere would bring about substantial increases in temperature, drought, and severe storms.

Of course, the news leaked. A NOAA scientist, Jerry Mahlman, told the Senate panel that the OMB had

unsuccessfully attempted to alter his testimony. In all, seven leading scientists from the National Oceanographic and Atmospheric Administration (NOAA), NASA and the U.S. Geological Survey told the Senate panel that the greenhouse effect is accelerating.

The White House defended its censorship of greenhouse testimony (from NASA's Dr. James Hansen, among others) by claiming that the edited remarks reflected policy rather than scientific conclusions. Later, White House Press Secretary Marlin Fitzwater claimed the editing had been done by a minor functionary "five levels down from the top."

The United States was alone among Western economic powers in its opposition to an international conference on global warming. The conference took place anyway. As expected, the Third World demanded unsustainable economic concessions. The industrialized nations, except for the United States, promised things they couldn't deliver. So there was a kind of logic underlying the president's intransigence. Unfortunately, it was a logic that ignored the problem.

That's the default approach. It's easy. It's the path of least resistance, the usual course in the absence of a possibility of profit. Whatever happens, happens.

## Like Dragons' Teeth

Knowing that we would probably see no result of any saving action for a century, and knowing that any action we do take might backfire, inaction would seem almost reasonable.

Here's what reasonable people should have expected to happen.

The ozone level drops 10% from 1992 levels by 2000, with a corresponding increase in the occurrence of fatal varieties of skin cancer by 10%. Nonfatal varieties of skin cancer occur at a rate 30% higher. (That's a conservative estimate. The British scientist who discovered the ozone hole, Joseph Farman, estimated that ozone depletion could be as deep as 30 percent by 2000. Australian public health officials have recently reported a tripling of skin cancer rates.)

The accompanying increase in UV radiation damages crops and reduces the harvest from the oceans, leading to global food shortages and price increases. (In Australia, crops of wheat, sorghum and peas have already been affected.) There will be an increase in the incidence of blindness due to cataracts. The increased exposure to ultraviolet light will also break down human immune systems, causing increased susceptibility to disease.

The good news about global warming is that it may not have much effect on the northern hemisphere because other forms of industrial pollution evoke heavier cloud cover, providing a partial screen. But these effects are local, which means that temperature differences will increase as the rest of the world warms. Temperature differences, not average temperature, drive weather patterns.

Scientists at the Center for Clouds, Chemistry and Climate at Scripps Institution of Oceanography in La Jolla, California, believe that an El Nino is responsible for promoting the weather patterns that led to the recent severe drought in California. El Nino is a warming of the South Pacific Ocean east of Australia and west of South America, so named because its occurrence corresponds with the Christmas season, hence El Nino, the Child. By warming the air above the water, El Nino promotes the kind of temperature differences, or gradients, that

lead to severe alterations in the weather, including changes in rainfall.

As global warming proceeds, the carbon dioxide concentration in the atmosphere climbing to perhaps twice its pre-industrial level, climate will change. The industrialized world: Europe, North America, parts of Asia and the South Pacific, will strain its water distribution infrastructure to the limit to keep up. The wealthier countries probably *will* keep up in the short term. Not so parts of the world with little or no infrastructure.

Famines and plagues will become common in the "developing" world. Killer storms will spring up more often, and, as the forests disappear, there will be sensational loss of life occasioned by flooding.

Refugees will stream from the more afflicted parts of the world into North America and Europe primarily, bringing social and economic dislocation with them. Back home in Africa and Asia and elsewhere, ruthless dictators will spring up as if from dragons' teeth, fully armed with the knowledge of how to divert attention from empty bellies by the making of war.

Famine, war, and pestilence. Biblical, isn't it?

## Anything but Clear

Now, for the sake of argument, let's see what happens as the result of aggressive government action against chlorofluoro-carbons, CFCs, the ozone's principal foe. CFCs in the form of Freon are the backbone of a massive global investment in air conditioning and refrigeration. People who are asked to give up their serviceable older appliances for more

expensive newer ones are going to feel ripped off. People don't take kindly to being ripped off.

As one engineer/correspondent to the technical journal *Machine Design* put it recently, CFCs will be manufactured to meet demand, not necessarily in the United States. People who can run drug labs can run Freon labs. To the everlasting delight of those who brought us the North American Free Trade Agreement, tourism to Mexico will surge. Cars will cross the border going south with their windows rolled down and return with their windows rolled up and their air conditioners fully charged. (And probably their tires, too.) It's easy to predict a booming black market in older, but still functional, appliances serviced and restored by the guerilla repairmen of Latin America, Chicago, and New York.

Although CFCs have been banned as aerosol propellants in the U.S. since 1978, not everyone’s highest priority is saving the ozone. In Moscow, for example, eager buyers snap up any aerosol spray cans and foam products that make it to the market, no questions asked.

It is also reasonable to ask just how serious the federal government is, really, about phasing out CFCs if it means economic trouble. In one possible sign, the Environmental Protection Agency, at the end of 1993, itself asked DuPont, this country's principle supplier of Freon refrigerants, to continue CFC production into 1995. The company had previously announced its intention to phase out production at the end of 1994, but the federal agency determined that that would leave insufficient supplies to service existing air conditioners and refrigerators.

Nor are CFCs the only contributor to increased UV radiation at the earth's surface. Scientists at the University of California at San Diego discovered in 1991 that nylon manufacturing had been responsible for 10% of an alarming

increase in atmospheric nitrous oxide, a gas which contributes both to ozone loss and to global warming.

Besides human activities, sources of nitrous oxide ("laughing gas" used as an anesthetic in dentistry) include algae and bacteria. The overall concentration of nitrous oxide in the atmosphere has been increasing at the rate of 0.2% per year.

Nitrous oxide has a long half-life: about 150 years. It can survive long enough to reach the stratosphere, 15 miles up. Like carbon dioxide, it absorbs infrared radiation, raising the temperature of the atmosphere. And it catalyzes the destruction of ozone.

Researchers have also found evidence for another ozone destroyer, more potent than CFCs, in methyl bromide, which might be released by fungicides and pesticides. Those are the very chemical weapons which we thought, in what now seems the far and naive past, would win us the war against starvation.

The stratosphere, where the ozone layer lies 10 to 15 miles above the ground, is home to such an amazing variety of vital, complex and interacting chemical reactions that anyone who is not afraid of messing with them probably needs psychiatric help. Among recent discoveries, ozone's absorption of ultraviolet radiation heats the atmosphere. So CFCs have a slight cooling effect. If they are eliminated, global warming might heat up.

## Nowhere to Hide

Compared to previous generations of nearly helpless reliance on Earth's bounty, this ability to inadvertently modify that which gives us life is a remarkable development. It is

evidence of maturing brute power in our species. But it is a dangerous time as well, for the earth and for ourselves, because it is far from certain that we match our brawn with controlling intelligence.

Unlike a good story, global disaster is unlikely to proceed swiftly and directly to its conclusion. There will be remissions. Farmers will bring in record harvests and grouse about low prices. The storms will quiet for a time. Ozone and greenhouse headlines will disappear from the front pages, these subjects having ceased to be news.

Our relationship with the earth is changing in other ways as well. Whereas once isolated human colonies dotted the globe, we have merged into a single colony. Expansion has stopped. Transportation systems tie every point in our planet-wide colony together, so that even the most remote place is only a day's travel time away. The danger in this is that it removes isolation as a barrier to the spread of infection; it denies us distance as a defense against aggression, and it leaves nowhere to hide.

# Chapter 12: The Global Colony

*A human range that was once large compared to the speed of transportation has become too small for safety.*

It is a masterpiece of irony that, at the time of our greatest achievements in technology and medicine, we are encountering, or creating, a wave of new plagues and a recurrence of old ones.

The list includes Legionnaires' disease, Lyme disease, herpes, toxic shock syndrome, and AIDS. Some have exotic names like Ebola fever, Brazilian purpuric fever, delta hepatitis, Seoul virus, dengue fever. They're all killers. They're all new, or newly lethal. Some kill swiftly, leaving behind stunned survivors and puzzled doctors. Others bring death only years after the initial infection, but they do it with terrifying certainty.

There's an old saying in public health: "You can never be healthy when your neighbor is sick." For proof, look at the U.S. southern border, where deadly microbes have incubated in Mexico and spread to the United States through impoverished border communities.

Hepatitis A, measles, syphilis, pertussis, tuberculosis, diseases once thought to be controlled or eliminated by the widespread use of antibiotics and vaccines, are making a comeback, especially in border states. In Arizona, the incidence of infectious disease has hit levels not seen since vaccines first became widely available. The American Medical Association's Council on Scientific Affairs calls the Mexican border a "virtual cesspool and breeding ground for infectious diseases."

## Vibrio El Toro

More than 41 million people annually enter the United States along its 2,000-mile-long border with Mexico. They're all potential carriers of who-knows-what. Sure, every Mexican has a constitutional right to health care. But, in practice, the resources just aren't there.

The same is true of the rest of the continent south of the Rio Grande. An outbreak of cholera sprang up in the port city of Chibote, 225 miles northwest of Lima, in January 1991. It's a nasty little disease. The symptoms of cholera include diarrhea, dehydration, and cramps. Untreated, it can kill in a few hours.

Ecuador saw this coming and ordered the fumigation of the border area and the cleaning of a trash-filled canal that forms the boundary between the two countries. Argentina and

Paraguay cancelled soccer games in Peru. On it came anyway, at the rate of 2,000 new cases a day. Eventually it struck 52 percent of the population of Peru and claimed more than 2,000 lives in six South American nations.

Supposedly, cholera was eliminated in Latin America in the 1890s. So what happened? South America ran out of frontier at about the same time as the north, but it never had the north's resources. The slide into terminal enclosure began with the loan failures of the 1980s. With economies bankrupt and inflation-ridden, governments put an almost complete halt to the construction of new sewage and water systems. Poverty provides ripe conditions, not only for cholera, but for malaria, yellow fever, and tuberculosis. In Peru, 70 percent of the population is poor. Sixty percent have no running water. Even proximity to the indigent can be risky. Just ask the 50 employees of Peru's Economy Ministry in Peru's capital city of Lima. All of them came down with cholera after eating in the ministry cafeteria, where they were served food prepared under unsanitary conditions. Maybe they were poisoned, in a sense, by their own failures.

"The dining room where they serve is near a square where food vendors go to the bathroom in the open air because there are no public restrooms," a patient said.

Maybe it was poetic justice. It's tempting to think so, but let's be reasonable. After a certain point, when enclosure has brought the economy to its knees and population growth is checked by Malthusian principles rather than by emigration to open frontiers, then it is too late for even the best of bureaucrats to do much but protect themselves from the worst effects.

A plan to rehabilitate sewer systems and make potable water available to all Peruvians by 2000 did, in fact, exist. But it would have cost $4.6 billion, an unthinkable amount for the

destitute nation. Add to the economic effects the biological effects of enclosure: The organism that struck Peru in 1991 was not the same strain that medicine vanquished in the last century — not the usual *Vibrio cholerae*, but the relatively new strain *El Tor Vibrio cholerae*, which appeared first in the Red Sea region around the turn of the century. *El Tor Vibrio* does not need a host to survive. It can live in river water, on the gills of fish, and on plankton.

The disease spread along the coast as raw sewage washed into the Pacific Ocean, contaminating seafood. Then it jumped to the east coast of the United States, where eight people in New Jersey developed cholera after eating crab illegally imported from Ecuador.

In the United States along the border with Mexico, in San Diego, and in the squatters' camps in Texas, no one has access to latrines or to potable water. There, conditions are worse than they are in Peru. The cholera will be back.

## Almost, But No Andromeda Strain

Because poverty, malnutrition, crowding, perpetual revolution, and poor-to-nonexistent health care are the legacy of enclosure in tropical developing countries, places like Zaire in Central Africa have become wonderful incubators of virulent diseases, some of them real mysteries, like Ebola fever.

The first recorded occurrence of Ebola fever killed hundreds in northwestern Zaire near the Ebola River in 1976. Then it vanished as mysteriously as it came. Luckily, it was a blood-borne infection, spread by reuse of unsterilized syringes in a hospital. If it had been transmitted by cough droplets in the air, it could have become what one CDC (Centers for Disease

Control, in the U.S.) expert termed an "Andromeda strain" (after the Michael Crichton novel of the same name). And it wouldn't have stayed in Zaire. Enclosure has converted the planet into the equivalent of a tribal village, every point within a day's walk, even if that walk includes a brief rest on a transoceanic airliner. This fact makes it possible for newly-evolved disease organisms to jump across continents at nearly the speed of sound, spreading before even the carriers know they're infected.

As one example, delta hepatitis, a devastating form of liver disease, has caused disastrous outbreaks of the more virulent form in South America and is now making inroads in Asia. It is caused by a human disease agent called a “viroid” that infects individuals already ailing with Hepatitis B. More than 200 million people are estimated to be chronic carriers of Hepatitis B.

Seoul virus, which causes acute disease of the kidneys leading to kidney failure, originated in Asia, where doctors identified it during the Korean War. Rats, which are carriers but are not affected, spread it. Humans who inhale dust contaminated by rat urine or feces contract the disease, which also causes hypertension and strokes. But the story doesn't end there. Seoul virus had never caused an epidemic. Its mutant cousins did.

In the late spring of 1993, a mysterious flu-like disease killed a 23-year-old Indian man in the Four Corners area of Arizona, New Mexico, Utah, and Colorado. Ten more victims, most of them young and healthy, died in quick succession. Same symptoms. Doctors gave the disease the name "unexplained respiratory distress syndrome".

The virus found in the blood of victims was a hantaan virus, one of the family of bunyaviruses that was already well known. It had simply never caused the kind of symptoms

observed in these victims. By now, the focus of the epidemic was clearly the Navajo reservation in Gallup, New Mexico. And the disease was Hantavirus, or Navajo fever, a new strain of Seoul virus. This time, it was carried not by rats, but in the urine and feces of prairie dogs that built their mounds upwind of human habitations on the Navajo reservation. Instead of shutting down the kidneys, it shut down the lungs.

By July, the disease had shown up in Zavalla, Texas, where it killed a woman living in a rural area of the Angelina National Forest. The carriers were deer mice. In Texas alone, sixteen possible cases of Hantavirus had been reported in twelve counties. Six of the victims had died. Of 23 possible cases reported nationally, fifteen cases of Hantavirus had been confirmed. Eleven people had died. It was getting scary out. This was not a disease of the old or the young or the weak or the somehow deviant. Eighty percent of the victims were between 20 and 40. They were normal, healthy adults.

The Hantavirus epidemic, never the terror it could have been, finally vanished from the news radar in January of 1994. It had killed 32 people in 14 states west of the Mississippi, and at least one in Louisiana. A Florida resident recovered after three weeks in the hospital. There is a lesson in that one case in particular.

Hurricane Andrew, which struck Florida in August of 1992, had left piles of debris ... ideal breeding grounds for the vermin that carry the disease. From now on, Navajo fever will add a new dimension to the aftermath of natural disasters on this crowded planet.

## AIDS and the Boeing 747

Another microbial jet-setter, incubated in Asia, dengue fever is transmitted by a mosquito. The disease suddenly became more virulent in the 1950's, especially in children. Victims break out in a rash and begin bleeding from the nose and mouth. Many go into shock and die. More than 600,000 cases were reported in 1987, up from 2,060 in 1967. The mosquito which carries the disease has reached the United States, although the disease itself has not shown up yet. What happens next, we'll have to wait and see. Chances are we'll be surprised, perhaps as surprised as we were when we first encountered AIDS in the early '80s.

Some time later, in 1988, James J. Kilpatrick, a political columnist based in Washington D.C., asked the rhetorical question, "Why have we gone crazy about the AIDS 'epidemic'?", and his argument went like this:

In the 1300s, the bubonic plague killed a quarter of the population of Europe within a few years. AIDS had been around for a decade, and the numbers of victims, as a fraction of the total population, were miniscule. Only 37,481 cases of AIDS were reported between 1981 and 1987. In 1985, there were 19 million Americans with heart conditions; 771,000 died of heart disease; 462,000 died of cancer; 46,000 died in car accidents.

So why is AIDS a big deal?

It is a big deal because AIDS hides, and, unlike heart disease, cancer, and car accidents, it always kills. And there is evidence that the virus which causes AIDS remains infectious while it is hiding. Six weeks after infection, the virus seems to disappear from the victim's system. It can stay hidden for two

years or longer. The victim seems healthy and the disease does not show up on screening tests, yet it remains transmissible.

If a high proportion of infected people must display symptoms or die before others act to protect themselves, the results could easily be catastrophic. The disease spreads quickly compared to the display of symptoms.

In 1988, only 64,000 Americans had the disease and 36,000 had died. By the end of 1991, the U.S. had 200,000 reported cases. AIDS had killed 126,000 Americans. In the same year, the U.S. Centers for Disease control estimated one million Americans were infected with the human immunodeficiency virus (HIV), the agent which causes AIDS.

It is even conceivable that, had AIDS not been identified, it could have infected a large fraction of the earth's population before the soaring death rate alerted us that something was wrong.

If the prospect of a runaway global epidemic isn't frightening enough, consider the mysterious nature of the disease. AIDS is probably the most complex and formidable malady ever discovered. The virus that causes it mutates so fast that some doctors report patients dying from a different strain than the one that infected them.

In fact, one of the theories offered to explain why antibodies don't attach to the virus is that its coating mutates too fast. Chances are this virus will not, as in Michael Crichton's novel *Andromeda Strain*, spontaneously mutate into something benign.

Luc Montagnier, director of the viral oncology unit of the Pasteur Institute in Paris, is the codiscoverer of the AIDS virus with American Robert Gallo of the National Cancer Institute in

Bethesda, Maryland. Montagnier is actively engaged in the pursuit of new treatments and an eventual cure for the disease.

He thinks that the virus is old, that it may have wiped out previous civilizations. (The first American case of AIDS was reported in 1979, but AIDS antibodies have been found in a sample of plasma taken from Africans in 1959.) Its appearance now, he believes, is due to a number of cofactors which combine to create an epidemic. These include industrial pollution (which weakens the immune system), sexual promiscuity, and drug use (all of them symptoms of enclosure, which is the real disease).

His reasoning about the age of the disease goes like this: HIV is similar, but not identical, to viruses found in various species of monkey, including green monkeys, mangabeys, baboons, and mandrills.

"The AIDS virus may be as old as the evolution of primates," Montagnier says, "because the viruses diverged with the different species themselves. The AIDS virus's complexity shows it has undergone an arduous process of selection. With nine genes, it's the most complex retrovirus known to man."

The mingling of people in a global culture makes AIDS a global threat.

"You could say that AIDS is a disease of the Boeing 747", Montagnier says. "The big jets are its vector, and without them there would be no AIDS epidemic."

## Mutant Bugs

More precisely, it is the breaking down of natural barriers, like distance, faster than we spread out that is killing us.

Isolated, but technologically advanced, human communities out of reach of the big jets would know about AIDS, but they wouldn't have it. And AIDS is only one of the destroyers. The uncontrolled spread of disease is in large part a result of unhealthy containment, like colonies of mold growing together in a laboratory Petri dish. Isolation is the most effective known barrier to the spread of disease, and isolation born of distance is a natural consequence of expansion. It exists without any need to enforce quarantines by closing borders (a strategy that we saw fail with cholera in South America).

Germs, the little bugs that kill, display probably the most adaptive behavior on the planet. Changes in their genetic makeup produce armies of newly camouflaged invaders to throw against their hosts' immune systems, and the rate of such changes, called mutations, seems to be increasing.

Disease organisms evolve with such alarming speed because they are small. Their relatively simplicity — nearly all are single-celled — gives them exposure to environments much more packed with mutagenic influences, like radiation and chemicals, than the protected interior cells of larger organisms will ever see. Add to that the influences of bateriophages, viruses which infect bacteria and carry into their genetic code new instructions for medical mayhem, and you have a threat against which the only effective strategy might be isolation.

The organism that causes Brazilian purpuric fever is an example of a relatively benign pathogen turned killer by an internal genetic change, a mutation. In this case, the raw material was a bacterium that causes conjunctivitis. The disease first surfaced in 1984, when ten children from a small Brazilian village were rushed to the hospital with high fever and huge purple splotches on their skin. All died.

In 1990, under the headline "Strep cases turn toxic", an Arizona newspaper reported the emergence of a new disease

with symptoms of low blood pressure, rash, peeling skin and multisystem involvement, killing 20% to 30% of its victims almost as soon as the infection hit the bloodstream. The cause turned out to be a mutation of a common microbe, Group-A streptococcus, which kills with symptoms similar to those of the staph bacteria that causes toxic shock syndrome, linked to tampon use.

Hepatitis B is a disease of the liver which usually does not kill. But studies by researchers in Japan, Israel, and the United States reported in the *New England Journal of Medicine* in June, 1991 that they had discovered a mutant form of the hepatitis B virus kills 60 to 70 percent of its victims.

Small changes in the virus's genetic code were responsible for the transformation. Mutations again.

In the same year, Finish researchers reported the rapid emergence of strains of group A streptococcus that are resistant to the drug erythromycin. Only 4 percent of blood cultures were resistant in 1988 versus 24 percent in 1990. Up to 54 percent of pus samples in the Kuopio area of Finland proved to be resistant.

## Emigration Safety Valve

The threat is serious. Physicians may lose the use of erythromycin, which is the antibiotic of choice for people who are allergic to penicillin. Penicillin still kills strep, but that too could change.

Some strains of the common bacterium pneumococcus have become resistant to penicillin, following the same course of evolution that strep could follow.

Most people who carry pneumococcus don't have any symptoms, but the bug can cause fatal cases of pneumonia and meningitis, as well as the ear infections for which they are best known.

Studies conducted at the Children's Medical Center in Dallas, Texas between 1981 and 1983 found that 8 percent of the pneumococcus strains were resistant to penicillin. By 1993, 19 percent of the strains were resistant to penicillin, and some strains had also developed a resistance to another whole class of drugs used to treat meningitis.

Antibiotic-resistant bacterial infections began showing up outside the United States in the late '60s. Resistant strains, like any new disease, can spread around the globe in a day because of the loss of isolation that develops from enclosure. A human range that was once large compared to the speed of transportation has become too small for safety.

A communal lifestyle brought about by the necessity for all the adults in a household to work is also a contributing factor. Said one Dallas pediatrician, "The major factor in the spread of this resistance is day care." As we have seen in Chapter 1, a similar set of economic and social conditions developed in England during the nineteenth century, also the result of enclosure. Because we have failed to provide the emigration safety valve England had in its colonies, we will get to see how things would have worked out without one. Disease is certainly part of the picture.

The fact that antimicrobial resistance is a widespread and growing problem is reflected in the statistics. In some hospitals, nearly all strains of the staphylococcus bacterium, a common cause of infection, are resistant to penicillin. And the drugs most commonly used to fight tuberculosis are ineffective in about 10 percent of cases.

The occurrence of deadly infections that fail to respond to antibiotics increased 20-fold in the first four years of the '90s, according to the Centers for Disease Control and Prevention in Atlanta, Georgia. It continues to increase at runaway speed. Death rates for certain blood infections caused by the so-called "superbugs" top 36 percent.

Vancomycin, the antibiotic of last resort, which, although expensive, never previously failed to counter infections, now fails with increasing frequency. In 1989, Vancomycin-resistant infections accounted for less than 0.5 percent of all enterococcal infections (caused by germs which originate in the intestine). The 1993 figure was 8 percent, 14 percent in intensive care units.

The overall death rate for Vancomycin-resistant strains is 26 out of nearly 300 reported cases (8.6 percent). Enterococcal bacteria could become a reservoir for the spread of resistance traits to other bacteria, any of which might exist, say in a sewer, or in a river in an undeveloped part of the world. When that happens, the new organism will migrate around our too-small world with a speed unprecedented in nature and unhealthy in the extreme.

## Asian Tiger

Disease organisms are just one life form harmful to humans and their economies. Together with unwelcome varieties of higher plants and animals, such destructive species are termed "biohazards." In the natural course of things, biohazards spread on the wind. Or they float to new destinations on the wrack and wreckage of storms. If the barriers are not too great, they move of their own volition, driven by the instinctive need for

territorial expansion. In an enclosed world, commerce spreads them with unnatural speed.

The Asian tiger mosquito appeared in the U.S. in 1985, when imports of used tires from 13 Asian countries doubled. They were found colonizing tire dumps near Houston. Since then, they have become established in at least 17 states. The insect transmits dengue fever, encephalitis, and yellow fever.

Not only is the mosquito a carrier of disease, it is especially aggressive, avidly seeking out humans, hence the term "tiger." It is also transviral, meaning that the viruses it carries are passed from one generation to the next, persisting even if there are no infected hosts to bite.

The Asian tigers in the U.S. are the temperate type, equipped with a mechanism that keeps the eggs from hatching in the coldest months and an antifreeze that can keep them alive in subfreezing temperatures. They have a summer range as far north as Maine.

## Not from Around Here

In the summer of 1990, children playing in the brush near a community in Bangladesh suffered the stings of an insect never seen in those parts before. The stings sickened hundreds. Thirty, mostly children, died. Investigators discovered a mysterious, diamond-shaped insect feeding on the leaves of a particular kind of plant, the *Ipomoea crassicarlis* bush, which grew near the village where the children had lived. The stinging insects had apparently traveled from Africa via India.

Other life forms also spread quickly in the global community.

Tumbleweeds, practically a symbol of the American West, are in fact Russian immigrants, brought to this country by mistake in the late 1800s as stowaways in a shipment of rye seed. The weed is correctly called Russian thistle.

These particular immigrants are freeloaders. They can't root in the hard desert soil. They thrive only where the ground has been disturbed, mostly in vacant lots. People have tried to use them as cattle feed, but the cattle won't eat them. They don't burn well, so you can't make fire logs out of them. But the town of Chandler, near Phoenix, Arizona has found a use for tumbleweeds. Chandler's claim to fame is its municipal tumbleweed Christmas tree, 40 feet tall, made of 1,000 piled-up tumbleweeds spray-painted and decorated with colored balls.

It is a relatively harmless addition to the southwestern landscape, except perhaps to desert-dwelling suburbanites whose streets are invaded in the fall by the wind-driven brush that rolls into carports and scratches new cars.

Like Russian thistle, the ash whitefly is more of a nuisance than a threat. Thought to have originated in the Mediterranean area it turned up in Los Angeles County in July, 1988. By 1989 it had reached Arizona, where it irked urban owners of homes shaded by ash trees. There's only one other thing worth mentioning about the whitefly, something perhaps worth thinking about. It is impervious to insecticides.

## Like Asking Coyotes to Tend Sheep

Technically, they are a "nonindigeous species". More than 200 such immigrants have crossed U.S. borders since 1980 alone. They can be expensive guests. In the 20th century, 79 of

them cost more than $97 billion in damages. Fifteen new ones could cost another $134 billion. Because the tale of its progress across the continent reads like a horror story, the African honey bee is probably the best known, and their adventures the most documented, of all nonindigenous species.

In one respect, the introduction of African bees to this side of the Atlantic was atypical. It was not an accident. A Brazilian researcher, Dr. Warwick Estevan Kerr, imported the bees in 1956 in order to breed what he thought would be a hardier honey-producer. The next year, 26 swarms escaped from their apiary into the wild. The bees immediately established themselves in the new environment. The first colonies reached Mexico in 1986. It was a painful economic blow to a country already long on population and poverty. Honey is Mexico's second largest agricultural export.

Breeding with European bees did not moderate the Africans' disposition. Some experts estimate a human toll of 700 to 1,000, including 150 in Mexico, since their escape into the wild in 1957.

The bees entered the United States through Texas in October, 1990. A gardener at a Brownsville, Texas mobile home park became the first U.S. victim of a killer bee attack in May, 1991. That attack was non-fatal. An elderly rancher in Starr County, near the Southern tip of Texas on the border with Mexico, had the distinction of suffering the first fatal attack of a killer bee swarm in the United States on July 15, 1993. Attacks occurred the same year in Tucson and Phoenix, Arizona.

African bees look like the European variety, but they're a lot meaner. A standard bee aggression test measures the timing, intensity, and persistence of the bees' attack on a black leather ball brought into contact with their hive. In this test, Africanized bees respond more quickly to the presence of an

intruder, within three seconds compared to 19 seconds for the European bee. European honey bees attack a test object a few times a second. Africanized bees attack 7 to 24 times per second. One U.S. Department of Agriculture researcher, who fortunately was wearing protective clothing, removed 395 stingers from just one shoe after a test involving an African colony. Africanized bees also continue their attack over a greater distance, following the intruder up to 187 yards compared to 27.5 yards for the less aggressive strain. And the attack lasts longer — up to an hour compared to two to three minutes.

Dealing with killer bees adds a hazard to the traditional American picnic that, who knows, may put an end to the practice. But the real damage is economic. Because the African strain is more aggressive than the European honey bee which it displaces, beekeepers require heavier and more expensive equipment for protection. Africanized bees also make less honey and pollinate crops less efficiently than European bees. Normally, bees are transported from one farm to the next to help pollinate fruit and vegetable crops. But if you try to move Africanized bees, they get angry and attack. "It's like asking coyotes to tend sheep," commented a spokesman for Texas A&M University.

The U.S. beekeeping industry expects to lose $26 million to $58 million annually. Crops will become more expensive to pollinate, and that will force food prices up.

The first death in one of Mexico's famous tourist resorts in 1991 made it clear that tourism is likely to be a loser, too. The victim was a local man clearing land in the city's beachfront hotel district. He fell while trying to escape and "he died almost instantly", according to witnesses. A pregnant woman and her two children were seriously injured in the attack.

A fire department spokesman said Acapulco had been virtually overrun by the bees. He said 800 nests had been destroyed in the previous three months.

In Phoenix, a tourist Mecca on the U.S. side of the border, a swarm of bees attacked several people and stung three dogs to death in a bizarre Halloween incident near the end of October, 1993. The previous June, the same kind of thing had happened in Tucson, 120 miles to the south. Local papers published the information that the bees can fly up to 15 miles per hour and that victims caught in the open might have to run half a mile to shake them. This is not exactly what golfers and dude ranch vacationers want to hear.

Governmental expenses go up too. In Texas, state funds couldn't keep up with the cost of hunting down and killing swarms of killer bees as they crossed the border. So the Texas Senate approved an emergency appropriation of almost $200,000 to cover the deficit. It is logical to expect bee eradication expenses to become a permanent item of state budgets.

## Super-Termites that Eat Steel

While Africanized bees get all the press, other insect invaders pose threats of varying degrees. The Russian aphid, an insect indigenous to Iran and Afghanistan, could eventually attack 50% of the U.S. wheat crop. Aphids suck the liquids from plants, inhibiting their growth. By 1988, damage in Texas and Colorado was already heavy and 12 other states had been affected.

Astronomically destructive Formosan termites have gained a beachhead in the United States, too. Originating in China, the

insects travel by pallet from port to port. They like warmth and humidity, and they have already found comfortable homes in New Orleans' French Quarter. Besides that, they have caused millions in damage from Florida to Tennessee and in Hawaii.

Formosa termites have harder mandibles than the domestic strain, and their colonies are much larger, numbering in the tens of millions (rather than the hundreds of thousands, which is normal for the domestic subterranean variety). The insects can chew through soft steel or iron or asphalt to get to wood. Because Formosans can fly, damage two or three stories up is a clue to their presence in a structure. Like killer bees, Formosans tend to drive out native varieties by their aggressiveness.

In the fall of 1991, the poinsettia whitefly, a variant of the relatively innocuous ash whitefly, attacked melon, broccoli, carrots, cabbage and cauliflower in the Imperial Valley of southeastern California, completely wiping out the $22 million melon crop.

This is no minor mishap. The Imperial Valley is the source of almost 90 percent of America's fall and winter produce. Called 'superbug' by locals because of its appetite, the insect's menu includes 500 plants, and the list continues to grow. It's also a super-survivor, just like its cousin of ornamental tree fame. Conventional insecticides don't work. Agricultural experts expect to have to write off twenty percent of the Valley's production, a fact Americans will be paying for at the supermarket from now on.

The poinsettia whitely is believed to be native to Iraq or Pakistan. Growers discovered it on poinsettias in Florida in 1986. From there, it spread to Texas, Arizona, and northern Mexico before arriving in California. If it had traveled on the wind, as the whitely normally does, it would have traveled

from west to east, instead of the east-to-west route it actually took.

What is significant about that is the implication that human movement within a world that has grown too small for us has become a vector of colonization for the whitefly, and many other species besides. The insects prosper after they reach their new environment, where nourishment is abundant and evolution has not yet balanced their rising numbers by the introduction of natural enemies.

We all know what happens next. Some bright young scientist in the Agriculture Department decides to import a bug-eating critter from back home in Whoknowswhere. Sounded like a great idea at the time, but soon, because of ignorance or oversight, it backfires, becoming just another turn in the convoluted path to ruin. The human path may be more tortuous than most, but it leads to the same destination arrived at by all living things which, for whatever reason, fail to expand their range.

# Chapter 13: Suicide and Hope

*"I am 15 years old, and I am terrified of the future." ... letter to the editors of* OMNI*, 1988.*

Adolescents have always been a little afraid of the future, at least of their own, personal futures. You can call it the unknown if you want. But the fear is especially justified at this juncture between realities because what's out there is, if not known, at least sensed. It's like being chauffeured over the edge of a cliff by a blind man.

Even parents no longer profess to admire or believe in their leaders. They don't admire or believe in each other, either. Otherwise, why aren't they married, still or ever?

## Street Gangs Understand

We're dying here. Check it out — overpopulation, famine, war, acid rain, ozone holes, global warming, street violence, red tides, AIDS, cancer. If you want to breathe clean air in Mexico City, you buy bottled oxygen from a vending machine. You go to school, you can see the teachers, most of them, don't care. They're just trying to get through the day. You go to church, they tell you everything you hear on the outside is lies. All they tell you is pray. The cops are a joke. So is jail. Reality bites.

When Children's Defense Fund (CDF) President Marian Wright Edelman says, as she did at a conference at Disney World in 1993, that we, as a nation, have to learn again to value giving service to others instead getting material goods for ourselves, she is acknowledging the emergence of the zero-sum ethic. Gang members understand very well what are the facts of life. There isn't enough for everybody; you get what you need by taking it. They don't necessarily like this reality. On the other hand, they didn't make the world.

It's not just abused, impoverished inner-city street kids anymore. White, middle-class and upper-class kids are getting involved in gangs, too. Some are joining established groups, like the Crips and the Bloods, while others are fashioning their own yuppie-clone versions.

Social welfare experts and the police say the development seems to defy the usual social and economic theories used to explain gang membership. Some theories: a desire for adventure, easy money from drugs, self-defense against the members of established gangs, dysfunctional families at every level of society, and a desire to shock parents.

Part of the problem is simply lax judicial procedure. Jesus Hernandez, 16, picked up for murder in Texas, said of his previous arrests, "I thought it was all a joke. I got picked up so many times and they'd never do anything."

Medical science provides a glimpse of another answer. Stress can alter the brain chemistry of some genetically vulnerable children to predispose them to violence, according to recent research. The research also suggests that environmentally altered genes for aggression endure, and can be transmitted to following generations. Although these results may tell us something about the biochemistry of behavior, they shed more light on effects than on causes. In all likelihood, what we are seeing amounts to an adaptive mechanism that prepares the confined organism — that's us — to survive by any means necessary. Street gangs understand.

## Disorganized Rebellion

Simple demographics get some of the blame. James Fox, a professor of criminal justice at Boston's Northwestern University, is one of a number of people who predicted the crime wave of the 90's. In a phenomenon he calls the "baby boomerang", the offspring of the baby boomers (those born after World War II) are entering their adolescent, crime-prone years.

But this crime wave was qualitatively as well as quantitatively different from the "juvenile delinquency" people worried about in the '60s. What made it bigger and badder is a pervasive feeling of hopelessness caused by the failure of established institutions to do anything about vanishing opportunities. That is even truer of the current situation. Recent leadership can be accused of optimism, but not of success.

Violent crime is what the establishment calls it when the powerless take charge. We are witnessing a disorganized rebellion. Kids have decided to make their own rules because their parents' generation so clearly doesn't know what it's doing that it no longer owns the moral authority to lead.

## Notes on Virginia

A member of the South Bay Family gang in Hermosa Beach, California, put it this way: "This is the '90s, man. We're the type of people who don't take no for an answer. If your mom says no to a kid in the '90s, the kid's just going to laugh."

That the kids don't know what they're doing either is somewhat less apparent to them, although it shows up in their generally declining physical and mental condition. They're fatter, more suicidal, and deadlier than their parents were. Researchers from Stanford University and the National Bureau of Economic Research reported in the journal Science that the status of American youth had degenerated in the three decades since the 1960s despite increased spending per child. The suicide rate among teenagers 15 to 19 went from 3.5 per 100,000 in 1960 to 11.3 in 1988 (it tripled). The homicide rate for children in the same age group rose from 4 per 100,000 in 1960 to 11.7 in 1988. While obesity rates went up, from 18 percent in 1960 to 27 percent in 1978, SAT scores fell.

This occurred in spite of the fact that juvenile crime prevention programs include prenatal care, Head Start, child abuse investigations, day-care services, recreational opportunities, and parenting classes.

The fear is that the burgeoning criminal activities of young offenders will overwhelm the criminal justice system, and that

America is developing an underclass in which robbery, rape and murder is a pattern so common it goes undocumented. The United States is simply not used to having an underclass.

Merlyn Moore, a criminal justice professor at Sam Houston State University says of America's newest criminal underclass (these are our kids, remember), "They have become predators in every sense of the word. That is the only way they can survive. They don't have any skills. They'd as soon kill you and me as a cockroach, and if you put them on a polygraph the next day, they'd probably pass it."

It wouldn't matter if they had skills. Who would give them work? You train every kid to be an engineer and all you wind up with is a lot of unemployed engineers.

These circumstances echo the sentiments of Thomas Jefferson about Europe in the 19th century. Of the larger European cities, Jefferson observed in his Notes on Virginia (rewritten around 1804) that a lack of food and other essentials had brought "a depravity of morals, a dependence and corruption, which renders them an undesirable accession to a country whose morals are sound."

Europe had been sliding into a new episode of enclosure for a century. The pressure valve had cracked. Immigrants were trickling into the new frontier. That trickle would soon become a flood.

## Destructive Behavior

It needs to be said that not all kids rebel to the extent of joining a gang and subscribing, heart and soul, to a zero-sum philosophy. But nearly all of them know they're in trouble. The art of 50 Phoenix high school students in a recent experimental

program portrayed censorship, poverty, pollution, gang violence, teen suicide, racism, fear of nuclear war and failure. Not a happy theme in the lot. Their teachers called this "facing reality."

Even their parents have a tough time with the modern realities. Among other things, they feel overwhelmed by the conflicting demands of home and work. A survey commissioned by a Phoenix newspaper, *The Arizona Republic*, in January of 1991 determined that most of the women, but some of the men also, wanted to quit their jobs to become full-time parents. However, most felt pressured to stay on the job in order to maintain their standard of living. A majority of the fathers said they felt guilt at not spending enough time with their children because of career pressures.

Other research finds that Americans believe their political, religious, and business leaders have failed them, that they have no universally-accepted moral code, no moral consensus. If adults are confused, how can children be otherwise?

Confusing cause and effect, some researchers cite the availability of guns and drugs as factors in a rising tide of teen depression and suicide. This conveniently ignores the reality that depression is at the root cause of drug use and violence.

For kids, fear of the future has become the norm, and not everyone copes with it successfully. The percentage of older adolescents (15- to 19-year-olds) suffering from depression and manic-depression, so-called "affective disorders," has increased five-fold in the past 40 years.

"I think the rise in depression, suicide and eating disorders is mostly environmental in nature," said Frederick K. Goodwin, the scientific director of the National Institute of Mental Health (NIMH), in 1986. "Sure, genetics provides the vulnerability, but over the past 20 years there has been an erosion of an

external sense of esteem — religious identity, family cohesiveness, patriotism, etc. The many traumas that have rocked our society since the 1960s have forced people to turn inward, analogous to the grief process."

The anguish is reflected not only in depression, but in a constellation of destructive behaviors that accompany depression, including suicide and drug abuse.

## The Enclosure Generation

One aspect of depression in particular is on the rise. It is suicide. The overall suicide rate in the U.S. has tripled in the past 30 years, mostly among males 15 to 24 years old. By one 1987 estimate, there were 5,000 young adult suicides per year in the U.S. Another 95,000 per year made the attempt.

The next year, 1988, the press reported that one American teenager attempts suicide every 78 seconds. A suicide was successful every 90 minutes. Work out the numbers, and you'll see that they represent only a slight increase in actual suicides (20 percent), but a four-fold increase in the number of attempts.

Suicide is now the second-leading cause of death among teens, right after automobile accidents. And many of those accidents may actually be suicides. That's what put Dr. Kevorkian's favorite subject on the agenda of the Society of Automotive Engineers' at its 1994 conference. One of the papers scheduled for presentation at the SAE Congress and Exposition in Detroit was entitled "Intentional Acts of Violence in Motor Vehicles: Suicide and Murder."

In spite of its meteoric rise, the actual suicide rate among teenagers, in cold, hard numbers, is not that daunting. The rate is 11 out of 100,000. That's only 0.01 percent. However, a

federal survey conducted in 1990 found that 27% of high school students in all 50 states had planned suicide at some point in their lives.

The engine of suicide is depression. And depression is a result of repeated trauma, according to a theory advanced by NIMH psyhopharmacologist William Potter in 1986. Each new worry somehow diminishes the system's resilience, eventually provoking a self-destructive response.

In 1984, television commentator Ted Koppel hosted a special on suicide among college students. The not-surprising conclusion was that college kids were killing themselves in record numbers because they were under increasing pressure to perform in more difficult emotional circumstances. Since not much has changed, it is appropriate to name those circumstances in the present tense. A lot of them, more than ever, come from broken homes. Partly because of that, they lack emotional support and have their own relationship problems. They face stiffening competition for jobs and graduate school, and they wonder whether the struggle is worth it. The threat of global cataclysm of one kind or another dims prospects for a long and happy life. The common thread is hopelessness about the future.

Unprecedented difficulties face the under-30 generation, which may as well be called the "enclosure generation," since they are the first to feel its effects in the modern age. They might also be called the "faint hope generation," or the "goner generation" if their elders fail to come to their aid. And that will not be easy. Previous episodes of enclosure were much easier to remedy. For nineteenth-century Englishmen, the solution was emigration to a place their forebears had prepared for them.

## Of Cotton and Kids

So what are these tough, new problems, never faced before, that only a frontier will solve? We examined some of them in previous chapters. There is now some very solid evidence that the life support systems of the planet are going awry in ways that are completely new in human experience. They include, but certainly are not limited to, global warming, ozone depletion, massive water and atmospheric pollution, radiation poisoning, vanishing energy reserves, agricultural failures and the rapid spread of harmful insects and agents of disease. AIDS especially threatens young people, who have not yet chosen their mates. These factors combine with others, like spreading violence and diminishing choices, to make prospects seem a little less than exciting. Finally, the new generation really does lack emotional support, because enclosure is working its destructive magic on American families in this culture just as it did in the culture of 19th century England.

In the England of Charles Dickens, it was common wisdom that industrial machinery was responsible for wrecking English families. The big engines made it possible to employ women and children in occupations which formerly required a man's muscle power, the argument went.

Actually, surplus labor is what cheapened wages to the extent that entire families had to work, the same as it does now. We know because of what happened in England when the jobs went away, even though the engines of industry remained. During the American Civil War, when the United States Navy blockaded southern ports, it not only weakened the Confederacy militarily and economically, but inflicted economic pain on Great Britain by preventing the shipment of cotton to English factories. During the so-called "cotton crisis," a physician sent by the English government to investigate the

sanitary condition of the cotton operatives discovered that the crisis had produced several advantages. One of them was that women "now had leisure to give their infants the breast, instead of poisoning them with 'Godfrey's cordial'" (a preparation made from opium to calm children).

Political economists in England of the 1860s observed a correlation between infant death rates and employment of mothers. Medical researchers in England of the last century found that mothers employed by industry or in farm gangs not only neglected their offspring, but often resorted to ill-disguised infanticide and dosing the children with opiates (the aforementioned cordial).

The sale of opium for the use of adults was a major item of commerce of the nineteenth century. Infants that were given the drug "shrank into little old men" or "wizened like little monkeys," according to the literature of the day. "We here see how India and China avenged themselves on England," wrote Marx in a footnote to *Das Kapital*.

## Taking the Edge Off

The obvious similarity between Dickens' time and ours does not prove, as doubtless some people will suggest, that "things have always been that way." They weren't that way on the American frontier of the same period. They weren't that way in the memories of most of Americans over 50.

What it does demonstrate is the similarity of circumstances. The catch phrase "surplus population" fit England well in the mid-nineteenth century. Dickens makes effective use of it in his classic *A Christmas Carol* when he causes Scrooge to

respond to a plea for charity to prevent the deaths of orphans, "They'd better do it then, and decrease the surplus population."

That was then, as they say. Still, every Christmas season Scrooge seems a little more modern in his attitudes. So let us see what makes little Scrooges of 21st century kids.

At the 99th Annual Convention of the American Psychological Association in 1991, researcher Paul Crowe of Loyola University in Chicago commented, "They see all these problems, and they don't see any way out of it. They don't feel they can ever succeed. Some of them start using drugs. Some just give up."

Jami (a pseudonym) was, in 1988, an 18-year-old recovering alcoholic whose case was reported in a Phoenix-area Arizona newspaper. Thoughts of suicide and problems at school landed her in a treatment center before she was 16.

"I didn't know who I was, and I didn't think I was good enough", Jami said of her experience. She ignored advice about drinking and drugs.

"I knew how it (alcohol) made me feel, and I knew what was best for me," she said.

"I spent a lot of time trying to forget I was alive, trying to cover up feelings and just trying to numb myself."

If Jami's case is typical, and clearly the local publisher thought it was, the disease is depression, not drug or alcohol addiction.

The symptoms: a state of mind that demands escape, "trying to forget I was alive", in Jami's words and a feeling of inferiority ("I didn't think I was good enough").

A 1991 survey by the Inspector General's Office of the Department of Health and Human Services showed that, contrary to stereotype, a significant number of teens who drink, drink alone.

"They drink deliberately to change the way they feel," said then Surgeon General Antonia Novello.

And, while the kids may be drinking alone, they have company in a sense. About half of kids in grades 7 through 12 use alcohol to take the edge off life, according to the report. Of 20.7 million in those grades, 10.6 million drink.

## Children of Sunshine and Moondog

Drugs don't need pushers, and they don't have to come from Asia or South America. There are alternatives to alcohol.

A 1988 survey of American high school students showed decreased use of marijuana and cocaine. It also showed an increase in the use of inhalants such as spray paint, gasoline, nail polish remover, and typewriter correction fluid. The trend continued into 1990, when another survey gave similar results. Clearly, it doesn't help to limit access to illegal drugs of such common replacements are available.

In the prosecution of the so-called "war on drugs" the science of statistics has been abused almost beyond recognition. For example, a 1990 National Household Survey on Drug Abuse, sponsored by the National Institute on Drug Abuse, claimed huge reductions in illegal drug use — 72 percent for cocaine — over the preceding five years. Crowed then-president George H. W. Bush (the elder), "The news we have today suggests that our hard work is paying off and our national drug strategy is having an effect."

But critics pointed out that this decline was not reflected in the reports of health care professionals, police, and drug treatment experts because the survey was restricted to middle-class kids who were still in school. The survey had missed more addicts than it counted.

A conflicting study by the Senate Judiciary Committee estimated a number of people using cocaine at least once a week almost four times as high as the household survey reported. It found that the number of hard-core cocaine users had actually increased by 200,000 rather than declined, as indicated in the Institute survey.

Administration officials acknowledged an increase in habitual cocaine abusers, but counted a smaller increase (only 46,000). It admitted that the Institute's household survey missed homeless people and people in prisons, shelters, hospitals, and dormitories. It is also true that 18 percent of the households contacted declined to participate.

Overall, the consensus seemed to be that the use of certain illegal drugs (that might be called "traditional" — cocaine, marijuana, and heroin) was declining, but only among those best equipped to resist their lure.

The consensus was probably wrong. In reality, kids are dropping cocaine for LSD. Top students from the suburbs are more likely to use LSD than inner city kids. It was one of the most frustrating things about the war on drugs, said one Florida cop.

"We look for crack and we look for coke and we look for marijuana — and then something like this pops up."

By 1992, California was ready to declare a cease-fire, the national obsession with "zero tolerance" having cost it a soaring corrections budget (to $2.5 billion) and an exploding

prison population. In Los Angles and San Francisco, people became upset about slower police response times, so officers were forced to forgo collaring petty drug users. Drug arrests slowed down.

Two years later, a University of Michigan survey of 51,000 high school and eighth-grade students in more than 400 schools found marijuana use was up. The study also reported a gradual increase in LSD use, and an increase in the use of inhalants (like glues, solvents, and aerosols). It did not show an increase in crack or cocaine use, although the author reported what he called a softening of attitudes toward the dangers of drug use. This, he predicted, would be a prelude to an increase.

Overall, it's probably best to remember this: The motivation to find an escape route from a society dominated by aging hippies is overwhelming. It may be that the children of Sunshine and Moondog, kids who wish not to be hassled about their habits (and who know from experience they will be if they confess, even anonymously), simply answer surveys in a way they think serves their best interests. Even if you get rid of the drugs, and everything else that could possibly be harmful, you've accomplished nothing until you get rid of the causes of those fatal diversions, which are the same as the causes of suicide. Neither is a police matter.

To be sure, the boys and girls of planet Earth have been dealt a nasty hand. Their lives and freedom are on the table, and everything depends on the wild cards in the next deal.

# Chapter 14: Wild Cards

*The pace of change in this era of political instability, want, and avarice dictates that most of the information in any book about politics and technology will be dated by the time the first reader opens its cover. The information will be out of date, but the news won't be better. It will be worse, possibly much worse.*

The past century of enclosure has produced for us a losing hand that no riverboat gambler would take on a bet. You're riding a Mississippi half-alligator boat from hell, head on a snag, high pressure valve soldered down, seven billion souls on board and in danger of going to the devil.

Policy planners face deadly distractions that demand Band-Aid solutions we can't afford and that wouldn't work anyway. They must all but ignore those distractions. If we play that

hand, we lose. And time is running out. Any of these things could stop us ...

We contemplate famine-driven wars and modern crusades accompanied by such environmental damage that the future of biological diversity, if not life, on this planet is in question. Environmental terrorism has become a fact of life. Fueled by religious intolerance and ignited by a pathological lust for power, Middle Eastern wars have left miles of beach paved with oil oxidizing in the heat. In some places, not even algae will grow.

## Potential for Destruction

Intentional environmental destruction has a long history as an instrument of war. Roman armies salted Carthaginian fields in 146 B.C. to undermine the agriculture of their enemies. Corpses of diseased animals were catapulted over the walls of cities under siege in an effort to promote plagues in the closed environment. In some quarters, the indiscriminate destruction of buffalo herds is construed as a military strategy aimed at Native Americans. Some patches are still dead at Verdun, where World War I artillery rained shells on entrenched troops for months. Dutch defenders breached dikes in May 1940 to slow the German advance. After the fertile lowlands were flooded with salt water, it took 30 years to leach the salt from the soil. The fear of environmental destruction by radioactive fallout may have pushed the Japanese into surrender faster than any consideration of the immediate effects of the atomic bomb. In Vietnam, U.S. forces dumped millions of gallons of herbicide on tropical rain forests to deny cover to the enemy. That cost the Vietnamese five million acres of forest and farmland. Full recovery may take 200 years.

It is said that Iraq's Saddam Hussein brought environmental terrorism into our vocabulary by his fouling of the Persian Gulf with huge slicks of crude oil and his ignition of hundreds of Kuwaiti oil wells. This technique is not new, and it should not have been a surprise. What is new is the magnitude of destruction that can be brought about by the whim of a single individual. The potential for destruction is no longer local, or even regional, but global. Efforts to meet the threat focus on preventive management, limited engagements, "nation building", and the avoidance of unlimited warfare at any cost. If we have learned nothing else from history, we should have learned that that won't work...unless we are prepared to give up our freedom for peace. That would probably entail giving up our lives as well.

## Chernobyl AIDS

Attempts to use nuclear energy as a replacement for expensive oil- or gas-fired power plants in Third World places has given us genuine sports and monsters, and a real danger that the care of short-lived human mutants will be the enduring price we pay for cheap electricity on Earth.

Years after the nuclear reactor accident at Chernobyl, newspapers reported that more than half of the children in the Nardodischsky region of the Ukraine suffered from thyroid disorders of the type caused by radiation. Cancers of the lip and mouth had doubled since the accident. Farm animals were born without heads and limbs, or were otherwise deformed at birth.

The explosion and fire at Chernobyl on April 26, 1986, killed at least 31 people immediately. That remains the official death toll. It also resulted in the contamination of millions of

acres of land and the permanent relocation of almost 100,000 people.

The disaster may actually have killed 10,000 people on the spot, or shortly after the explosion. At least that's what one Russian scientist, the director of the so-called "exclusion zone" surrounding the Chernobyl site, believes. Vladimir Chernousenko, the director, was himself dying of exposure to radiation when he made the observation. He, like the miners and military men who assisted in the cleanup, had his tissues bathed in lethal streams of ionizing radiation that escaped from the crippled reactor core when the explosion breached its containment. Whether they knew it or not, they were dead men as soon as they alighted from their helicopters to begin construction of a giant steel and concrete sarcophagus for the still-smoldering remains of reactor number four.

Besides them, the accident exposed 3.5 million residents of Kiev to radiation exceeding safe levels by hundreds of times. Half a million of those were already sick by April 1991, the fifth anniversary. Three million Soviets still live in areas that received fallout from the accident (in three republics — the Ukraine, Byelorussia, and Russia). Of 1.7 million Ukrainians, including 336,000 children, living in heavily contaminated areas, 10 percent risk death from radiation.

Radioactive iodine was released in bulk during the accident. The thyroid gland concentrates iodine, especially in growing children. Scientists with the World Health Organization say children exposed to radiation from Chernobyl are suffering from a deadly form of thyroid cancer.

In the Gomel region, just north of the reactor in Belarus, the rate of thyroid cancer is 80 times the world's normal rate. "Ordinarily, children would be expected to survive thyroid cancer, but this disease is really quite aggressive," said

American radiation scientist Dr. Keith Baverstock, who was in Russia to help manage the crisis.

Childhood leukemia rates are four times normal.

One physician in the delegation reported the appearance of a new immune system disorder that had earned the name "Chernobyl AIDS."

Another medical specialist returning from the Soviet Union commented, "Everyone you talk to is telling you that every time they look, the situation is worse than before."

The tomb in which the reactor is encased is widely thought to be unsafe. Most of the reactor's fuel, buried inside the mass, could shift, sparking a renewed chain reaction and further radiation leaks. In addition, *Tass* reported in October 1991 that the hastily-constructed concrete mass had developed cracks. Rain was seeping through and leaching radioactive elements into the ground.

It is easy to find fault with the Russians for permitting the disaster of Chernobyl to occur. Yet much the same kind of thing happens in the United States when it comes to reckless abuse of toxic materials. The Russians need cheap power. Cheap nukes are the way they get it.

## On the Beach

Not only for the Russians, but for Americans as well — for all of us — the future depends on how we handle the inevitable catastrophes of enclosure. Chernobyl has already cost the Russian government about $16 billion. The full cost will likely come to at least $350 billion, by one estimate. In this instance, and in all of those to come, humanity will have to decide

whether to pay the bill for making itself perfectly safe or take further risks to master the techniques of territorial expansion. The wrong choice, the one that causes us to turn our backs on extraterrestrial frontiers, will cost us everything we have, and then we'll die anyway.

It started decades ago. A 1990 clean air bill to get tough on acid rain, urban smog, and toxic industrial air pollution today represents outlays of $31 billion annually according to an EPA estimate. While this does not sound like a lot compared to some of the Federal Government's recent spending, that expenditure omits the cost to the domestic economy of jobs driven offshore by increased regulation. It also does not account for the future cost of dumping high levels of environmental toxins into the earth's atmosphere in China and India. Both of these costs remain unknown. Even the most zealous of informed environmentalists expect pollution control costs to cause further economic problems.

That's just air pollution. In the United States, one of the wealthiest and most advanced of nations, medical waste — including syringes and bloody dressings — have washed up on the beaches of at least 17 states. New York and New Jersey beaches closed at least 80 times during the summer of 1989 alone because of sewage overflows. Pollutants from urban and agricultural runoff add gasoline and pesticides to coastal waters. Heavy metals like mercury, arsenic, and lead are showing up in fish. U.S. cities that previously met federal clean air standards now failed to meet them, suggesting that cities are losing their war on pollution.

## Change in the Air

The harm caused by the release of chlorofluorocarbons, a uniquely human pollutant, is for all practical purposes an accomplished and irreversible fact. The leaders of an arctic expedition sponsored by NASA and the National Oceanic and Atmospheric Administration (NOAA) reported in 1989 that conditions were ripe for the creation of a second ozone hole over the North Pole, similar to Antarctica's existing ozone hole. Since then, scientists have collected evidence of depressed ozone levels over heavily populated regions of the northern hemisphere.

Certain very distinct dangers, dangers only vaguely perceived to be connected, are emerging on a global scale. They include the environmental impacts of technological error, of everyday pollution, and of intensive agriculture. The prediction of the World Watch Institute in Washington D.C. is that the coming decades will be a progression along the lines established by the North American drought and the flooding of Bangladesh, India, Thailand, and Sudan beginning in 1988.

The flooding is caused by deforestation, the result of clearing land for agriculture and for fuel. Without the forest growth to slow runoff and promote its absorption into the soil, rivers swell and overflow their banks, carrying away topsoil with the water.

In Asia, Africa, and South America, the loss of the rain forest adds carbon dioxide to the air as vegetation is burned. The destruction of the vegetation slows the conversion of carbon dioxide to oxygen by photosynthesis. Meanwhile, the world's 400 million cars, averaging 20 miles per gallon of gasoline, add 547 million tons of carbon dioxide to the atmosphere annually. Whether the results show up immediately

or not, it is understood that the wholesale addition of carbon to the atmosphere is a threat to the stability of the earth's climate.

## Population Bomb

The Third World's population is exploding.

Population in the Third World countries is expanding out of control at the same time that agricultural failure is becoming widespread. The so-called "Green Revolution," which multiplied global food production by 2.6 times between 1950 and 1984, has failed, and per capita food production has dropped 14% since 1984. It is now at the same level as it was in 1970.

The total amount of stored food (except for China's storage, which skeptics believe may not exist at all) is also dropping. In 2005 it stood at 47 million tons. By 2008, the number had dropped to 27 million tons. Although year-to-year variations may occur, long-term improvement is unlikely because of persistent drought conditions in the grain-producing parts of the world, including the United States and China.

There are no new technologies waiting to be applied, like the spread of hybrid corn or the nine-fold increase in the use of fertilizer that fueled the last quantum jump in food production. However, there are forces, so far held at bay by fate alone, not by human intervention, that threaten to reduce production further. They are the accidental spread of diseases and pests, the short-sighted abuse of marginal land for near-term profits, and adverse climate changes in the world's growing regions.

In 1972, when the Soviet Union decided to offset a crop shortfall by importing grain, high prices stimulated short-term production. Much of the increase resulted from plowing highly

erodible land and by drawing down water tables for irrigation. This kind of increase cannot be sustained, but it can turn farmland into wasteland. The inevitable result is a retrenchment in crop acreage and irrigation, depressing long-term food production.

During the summer of 1988, a severe drought in the American Midwest, a drought which some attributed to changing global climate, added a new debit to the balance of food and world population. While the consequences of that drought are well known, what is less well known is that similar difficulties occurred elsewhere.

China is the other great food-producing country, but in 1988 its production did not meet expectations. China Daily described the drought in one province as the worst in 20 years, and in another as the worst in a century. Canada's grain crop was also reduced. World grain reserves fell to 54 days, lower than the 57-day reserve that prompted a doubling of food prices in 1973. Lester Brown, president of the World Watch Institute and a former U.S. Agriculture Department official, called 1988's global food production falloff the steepest decline in recorded history.

The current global drought affecting all of the world's major food production regions is leading some experts to predict a 20% to 40% plunge in food reserves. The main hope is that China's food storage is as large as the Chinese government says it is, about 60 millions tons.

None of this seems promising. It amounts to an inexorable decay, a loss of vitality that we can see, but which no policy based on the fiction of sustainable development can curb. So predictable! So dull! What say we add of couple of additional wild cards, like Armageddon and economic collapse?

## Weapons Factories

While this planet's already inadequate resources are further depleted, those who have the least to lose are acquiring both weapons of mass destruction and the means to deliver them.

Countries that are part of the official "nuclear club" include the United States, the fragments of the former USSR, Great Britain, France, and India, which acquired "the bomb" in 1974. In addition, Pakistan's pursuit of uranium enrichment and other nuclear technologies has allowed it to emerge as the world's first nuclear-armed Islamic country. Israel probably has a covert arsenal. South Africa may also have a secret nuclear stockpile. Iran has atomic aspirations. Brazil and Argentina have ambitious nuclear programs.

North Korea has detonated what appear to be nuclear weapons of low yield, probably "dirty bombs." Taiwan has shown interest in acquiring nuclear weapons of its own, this in spite of the fact that both nations are signatories to the Nuclear Non-proliferation Treaty. But so what? Even the U.S. sometimes fails to honor a treaty in spite of its watchdog press, and many developing countries have no such guardians.

The Ukraine became the world's third-largest nuclear power with the breakup of the Soviet Union. Soviet weapons on Ukrainian soil are now under the control of nationalists.

According to Cuban defector Jose Oro, a planner of Fidel Castro's nuclear program, Cuba was, in 1991, developing uranium reprocessing technology in a clandestine "Workshop No. 4" 10 miles outside Havana. The reprocessing would enable Castro to obtain enriched, weapons-grade uranium and plutonium from spent reactor fuel. Activity was probably suspended in 1992, when Russia withdrew funding for two

nuclear reactors in Cienfuegos province. Recently, however, Russia agreed to renew its cooperation with Cuba's Nuclear Energy Agency as it awarded its highest honor in nuclear research to Fidel Castro Diaz-Balart, the dictator's son.

An Egyptian newspaper, *Al Watan al Arabi*, reported toward the end of 1991 that Iran had purchased three atomic bombs from one of the states of the former Soviet Union for $150 million, and had hired 50 Soviet experts at $5,000 per month to assemble them. The Russians denied it. But, given the state of their union at the time, how would they know? The official stance of the International Atomic Energy Agency today is that "there is no evidence" for an Iranian nuclear weapon.

In January 1994, The London Times reported that Japan, probably reacting to the crisis over North Korea's development of nuclear weapons, was on the verge of assembling its own bomb, having abandoned its non-nuclear stance. All it needs is plutonium.

Japan is importing plutonium.

Should the world worry about a Japan bristling with city-busters, trying to muscle its way out of its confining island chain? The Japanese tried that before. We called it the war in the Pacific. Today, they have even more to lose than they did in 1941. Fact is, if Japan's relations with its fellow riders on the planet were not as good as they are, we would know nothing about its armament. And that is a real cause for alarm. Consider the success of Sadaam Hussein's clandestine weapons factories, which succeeded in operating even after Iraq's 1991 military defeat, in the very shadow of U.N. inspections.

## Big Business and the "Islamic Bomb"

Aggressive Third World dictators, especially those with oil, can rely on First World industrialists, motivated by the need to prevail in business, to supply their wants. "If we don't do it, someone else will," the argument goes. So what if that line makes moral pygmies of those who use it? The statement is correct. It is part of what makes enclosure fatal to societies that allow it.

In early 1989, *The New York Times* revealed that German companies had built poison-gas factories in Libya and Iraq. The Germans denied it, but eighteen months later a German Todeskrammer ("merchant of death") went to jail.

It also turned out the French had been selling missile guidance systems to Iraq for use in a nuclear weapons delivery system.

In March of 1990, American and British agents seized a shipment of nuclear triggers on their way to Iraq via London's Heathrow Airport. The "triggers" are precision electronic switches needed to control the detonation of the tricky conventional explosives used to implode the uranium fuel of atomic weapons. Such control also requires low-inductance, high-voltage capacitors, which are not readily available either.

In the same year, two British companies, Euromac and Atlas Equipment Ltd. were indicted in the United States for attempting to smuggle warhead detonation capacitors to Iraq. The capacitors, vital components of the triggers used to initiate the sudden nuclear chain reaction, were made by CSI Technologies in San Marcos, California, which was paid $10,400 for the capacitors.

Just three weeks before the invasion of Kuwait, German customs officials intercepted a shipment of 350-grade maraging steel bound for Iraq. The export of the material is controlled because its high tensile strength makes it indispensable for the construction of high-speed gas centrifuges used to separate bomb-grade fissionable materials form naturally-occurring uranium.

Three weeks later, just after the invasion of Kuwait, Swiss police raided a facility where five computer-controlled lathes (the kind needed for making centrifuge parts) were being readied for shipment to Iraq under the label "optical machinery." Further investigation revealed that all that had been intercepted was the tail end of a shipment, most of which had already reached its destination — with the approval of Swiss customs.

All this at a time when Western analysts were still saying, at least publicly, that Iraq would never master the technology of nuclear weapons, or, at any rate, that the event was years away. Or that Saddam Hussein, a tyrant who had demonstrated that he would stop at nothing to extend his rule, would get religion, have a mid-life crisis, suffer a stroke, or be overthrown.

Dow Chemical shipments to Iraq, financed by the U.S. taxpayer, were "unlikely to be used for the production of chemical weapons," according to an Export-Import Bank of the United States news release. "Unlikely!" crowed the *Times*' William Safire, "Tell that to the 5,000 Kurdish dead in a poison-gas attack on Halabja."

There are an estimated 5,000 Soviet scientists with critical nuclear knowledge who are living on small pensions or no pay at all. So it's no wonder that, after the fall of the Soviet empire, Russian scientists at several weapons labs began assigning patents to themselves and peddling their expertise abroad:

"Will do R&D for $10,000 per year per scientist." Their equipment is lousy, but the cost in the West is 15 or 20 times as much.

Libya's Moammar Gadhafi takes the novel approach of offering to finance nuclear programs in Pakistan and missile programs in Brazil. In this way, the leader of a nation which sponsors global terrorism can broaden his access to the technology of nuclear warheads and intercontinental ballistic missiles. His oil income will allow him to afford both.

True, the Gadhafi approach doesn't always work. In the late 1970s, India turned down an offer from Libya to pay more than $15 billion for its nuclear technology. In 1992, Libya offered jobs at its Tajura Nuclear Research Center to out-of-work Russian nuclear scientists. The Libyans offered $2,000 a month. The average monthly Soviet salary was then about $10 at the official exchange rate. The scientists said no. But the strategy works often enough.

Talented technical people who cannot find another outlet for their passions will fall under the influence of power-lovers willing and able to pay for their help in the fabrication of arms. The life and legacy of Gerald V. Bull is a case in point.

## Big Guns

At 22, Gerald Bull was the youngest doctoral graduate in the history of the University of Toronto in Ontario, Canada. His specialty was aerophysics: the science of high-speed flight. At 32, Bull was the golden boy of Pentagon ballistics, deemed so valuable to national security that Congress passed special legislation to backdate his citizenship to qualify him for access to U.S. nuclear secrets.

Dr. Bull's record of achievement included a 1966 altitude record for artillery of 112 miles, part of a joint U.S. - Canadian effort called the High Altitude Research Project (HARP). His ingenuity made possible the creation of the astonishing South African G5 155 mm howitzer, with a range far in excess of other weapons in its class. The gun played a major role in the fighting in Angola.

Bull formed a company, Space Research Corporation, to capitalize on his expertise. But when U.S. interest in weapons delivery turned toward conventional rockets, the big gun expert had to look elsewhere for support. His new associations landed him in federal prison at age 52 for violating U.S. arms laws and a U.N. embargo against South Africa.

In June 1988, Sheffield Forgemasters, a British manufacturer of steel piping, received an order from a petrochemical project in Iraq. The requirements for close tolerances and extreme toughness of the material sounded suspiciously like gun parts to some of the engineers. Had they given the incident the scrutiny it deserved, they would have found it even more suspicious that the order was transmitted by Brussels-based Space Research Corporation, headed by master gun-maker Dr. Gerald Bull.

On March 22, 1990 Gerard V. Bull died in the doorway of his Brussels apartment with two bullets to his neck from a silencer-equipped 7.65 mm pistol. The killer left $20,000 in cash on his victim's body. It might have been the Mossad (the Israeli intelligence service) or the government of Iran that marked Gerald Bull for death. Both had motive, because the arms expert was working for their mutual enemy, Iraq.

A month later, the world learned that British authorities had raided the facilities of Sheffield Forgemasters and seized 8 segments of a 52-piece shipment to Iraq. The evidence pointed to a gun 130 feet in length with a barrel diameter of 39 inches.

U.S. intelligence concluded later that Iraq had in fact begun the assembly of three so-called superguns, each with a range of 465 miles.

So the expertise to manufacture weapons of mass destruction is readily available. What about fissile materials, the basic ingredients of atomic bombs?

## Sold! (To Terrorists)

Seizures of contraband fissile material in Europe starting in 1991 provided the first evidence of a global nuclear black market. In November 1991, authorities intercepted 65 pounds of low-grade enriched uranium in Zurich, Switzerland. The month before, police in Como, Italy interrupted a shipment of a minute amount (.1 milligram) of nearly pure bomb-grade plutonium. Plutonium and high-grade enriched uranium in sufficient quantity can be used to produce a bomb. The tiny blob may have been a sample. Low-grade enriched uranium saves a bomb-maker steps in the process of refinement.

While it was true that the amount of fissile material seized could not make a bomb, the hints of Soviet or East Block involvement had to be taken as a storm warning. Documents taken with the plutonium in Como were written in Cyrillic, the Russian alphabet. The level of uranium enrichment in the Zurich shipment was consistent with that reached during use in Soviet-made reactors.

Japan plans to achieve energy independence by the use of breeder reactors fueled with plutonium, the fissionable material of choice for the construction of thermonuclear weapons. To do that, it will have to import 40 tons of plutonium a year from

France, 13,000 miles away by ship. Each shipment weighs about a ton, enough plutonium to make 150 nuclear warheads.

The shipments, though secret, are guarded only by a lightly-armed Japanese Maritime Safety Agency cutter. The voyage takes seven weeks. It has been described as "fraught with peril" because of the potential for environmental disaster if the cargo is spilled and geo-political disaster of it falls into terrorist hands.

In May 1994, Japanese officials insisted that some of that plutonium had not been diverted from a processing facility in Japan, even though they couldn't locate it, exactly. The whereabouts of 154 pounds of the toxic, radioactive material was unknown because of a design flaw in a nuclear fuel-making plant that made the material hard to track. At almost the same time, FBI Director Louis J. Freeh told the Senate Permanent Investigations Subcommittee that Russian organized crime was attempting to obtain and sell nuclear weapons and nuclear materials (weapons-grade plutonium or uranium). Some of the sales would probably be to terrorists, he said.

## Plutonium by the Pound

Enough plutonium escaped into 4,000 feet of air ducts in the Rocky Flats weapons plant near Denver, Colorado during its thirty years of operation to make seven atomic bombs. According to an independent study, sufficient plutonium had accumulated in the ductwork to raise the possibility of an accidental nuclear reaction. And the federal government didn't know it was there.

About 62 pounds of the weapons-grade fissile material turned up in exhaust ducts of the plant, which processes plutonium into triggers for thermonuclear weapons. Plutonium is so toxic it is usually accounted for in quantities of grams (about one five-hundredth of a pound). EG&G, Inc., of Wellesley, Massachusetts, operated Rocky Flats for the federal government. Employees of EG&G, in failing to maintain filters in the glove boxes at Rocky Flats, allowed the deadly radioactive carcinogen to accumulate in the plant's exhaust ducts. (Glove boxes are isolation chambers which permit hazardous materials to be manipulated remotely.) Fortunately, filters prevented the material from escaping into the atmosphere.

The presence of the plutonium in the air ducts, without the government's knowing it was missing, raises the possibility that sufficient plutonium to make a bomb may have been diverted by terrorists or foreign agents.

U.S. "bomb factories" like those at Oak Ridge, Tennessee and Rocky Flats, where the nation's nuclear arsenal is assembled, have "a long history of embarrassing security breakdowns, ranging from inability to account for small amounts of plutonium to unauthorized admission of visitors from a Warsaw Pact nation to an area they were not supposed to see," according to *The Washington Post*. The *Post* also reported that an inspection of the Rocky Flats weapons plant discovered unauthorized transportation of plutonium by workers there.

## Nothing to Lose

In fact, the means of delivering warheads by rocket are becoming widespread. Iran and Iraq used Soviet-made "Scuds"

in their Persian Gulf War that lasted from 1980 to 1988. Saudi Arabia, not to be outdone, has 1600-mile-range missiles it purchased from China. Syria has 75-mile-range Soviet missiles. Israel produces its own 900-mile-range missile.

In all, about 20 nations have ballistic missiles, some with intercontinental range. Overall, the expert assessment is that the Third World arms race is far more likely than its prototype in the First World to find expression in war.

The arms spiral got its start in the '80s, when the United States, the Soviet Union, Great Britain, France, and West Germany supplied missiles to Third World client states, who, in some cases, modified and resold them.

In 1982, Argentina used a French-built Exocet to sink a British cruiser during the Falkland Islands war. Five years later, an Exocet launched by Iraq in the Iran-Iraq war nearly sent a U.S. destroyer, the *U.S.S. Stark* to the bottom of the Persian Gulf.

In 1989, Saudi Arabia cut a deal with China for a supply of CSS-2 ballistic missiles with a range of 2,200 miles and a payload of 4,500 pounds.

Israel has shipped its Jericho missile to China.

Egypt has developed missiles with the help of German scientists and Argentine support.

Libya has purchased missiles from Brazil. And Brazil has bought some form China.

Libya fired Scud-B missiles at the US Coast Guard base at Lampedusa, off the coast of Italy, in 1986, proving two things: (1) that, even before the Persian Gulf War and Sadaam Hussein, there existed national leaders willing to use such

weapons against anyone and (2) while it may be easy to build a missile, it isn't as easy to build one that will hit what it's aimed at.

Other nations boasting ballistic missiles in their arsenals include India, Pakistan, Taiwan, South Africa, and Syria. India has the bomb, and in addition the two-stage Agni missile, which it calls a space research rocket.

Iran has been funding the development of a medium-range ballistic missile in North Korea, which first test-fired the missile, called the No-dong 2, over the Sea of Japan in June 1992. The No-dong 2 is a more powerful variant of the Iraqi Scud missile launched against Israel and Saudi Arabia during the 1991 Gulf War. The new weapon brings Israel into range of the "Islamic bomb" for the first time.

Third World countries covet ballistic missile technology because (tipped with weapons of mass destruction) it gives them the means to influence regional, or even global, policy. Some U.S. policymakers view this with trend with alarm and are prepared to counter it with "ballistic missile defense" (or "strategic defense") initiatives. While the history, purposes and value of President Ronald Reagan's Strategic Defense Initiative is a story in itself, this much is clear: it is a tempting distraction.

Typical of one apparently rational point of view, Congressman Jon Kyl, a Republican from Arizona, wrote in a 1990 editorial that, "The United States must act to eliminate the utility of the ballistic missile to prevent it from becoming the weapon of choice in the Third World. Ballistic missile defense is the way to do that."

Kyl, among others, favored a missile defense system consisting of ground-based missile interceptors and space-based kinetic energy kill interceptors like "brilliant pebbles"

(An improvement of the so-called "smart rocks" which, rather than exploding near a target, are guided to a collision with it).

The ground-based interceptors, so-called "theater defense" weapons, would be effective against tactical ballistic missiles, aircraft and some (but not all) cruise missiles. They would be useless against nuclear and other weapons delivered stealthily by truck, ship, and civilian aircraft. And they might well wind up being embarrassingly easy to defeat by such methods as cheap decoys.

What makes the concept attractive is that the threat is real. Further, the idea of space-based interception appeals to the far-sighted as a step toward the creation of a frontier in space, and a solution to the core problem of enclosure.

The pace of change in this era of political instability, want, and avarice dictates that most of the information in any book about politics and technology will be dated by the time the first reader opens its cover. The information will be out of date, but the news won't be better. It will be worse, possibly much worse.

Other than its inevitable spread, the most troubling aspect of ballistic missile technology is the ease with which it can be stolen. In June of 1988, a U.S. rocket propulsion expert and two others were arrested and charged with attempting to ship missile components to Egypt. Authorities picked up two men, including an Egyptian colonel, as they tried to load missile structural materials and nosecones onto an Egyptian C-130 at Baltimore-Washington International Airport. The Egyptian claimed diplomatic immunity and just walked away. The rocket expert, who had recently become an American citizen, was arrested at his place of employment, Aerojet Solid Propulsion Company near Sacramento, California.

With one of the world's fastest-growing populations and with negligible economic resources, Egypt could wind up being the nuclear-armed country with nothing to lose. For the time being, enlarged dependence on the United States is a solution for Egypt, but that solution is not sustainable.

That is, a policy of dependence is not sustainable unless the United States, say, becomes the virtual property of some tyrant willing to employ nukes while Americans are not. If we were uncertain before, the past decade should have taught us this: that the control of the technology of megadestruction is largely a sham.

The military superpowers are disappearing, their economies having been overwhelmed by enclosure. At the same time, nuclear weapons threats include a growing list of countries with little to lose, little love for the U.S. and its allies, or festering historical animosities: Iraq, Iran, North Korea, India, Pakistan, Israel, Egypt...

To deny nuclear, chemical and biological weapons to any potential combatant everywhere on the globe would require not only the destruction of weapons and stockpiles everywhere (assuming we can find them), but also the killing-off of the men who carry the knowledge of how to build them. Said CIA Director Robert Gates (in the Bush administration) about scientists with the knowledge to design nuclear and biological weapons, "We know from experience that small numbers of key people count."

We also know from experience that the detection of weapons programs in Third World countries is virtually impossible. By even the most pessimistic Israeli estimates, Iraqi nuclear warhead production was at least two years away in November 1990. Most Western analysts said five to ten years.

But, in August 1991, after Iraq's defeat in the Persian Gulf War, U.N. inspection teams found in Baghdad a covert factory built to produce centrifuges for concentrating weapons-grade uranium. Both its location and sophistication were a surprise to Western authorities. Within a year, the centrifuges produced at the Baghdad facility could have generated enough enriched uranium for several bombs.

Apparently the only thing standing in the way of nuclear weapons production in Iraq was a lack of fissionable material. Iraq was known to be pursuing four different uranium enrichment techniques. Inspection teams found components for one of them, centrifugal enrichment, buried in the sand. The team's leader, David Kay, estimated that Iraq was 12 to 18 months away from industrial-scale production of fissionable material.

Attribute it to the brazenness of the Iraqis if you want, but in the wake of the Persian Gulf War, Iraq hid, for four months, 17.6 pounds of irradiated uranium it planned to process into fissile material for a nuclear weapon. Three successive U.N. inspection teams failed to find the uranium, which Iraqi troops moved around by truck.

U.N. inspectors found blueprints for an atomic bomb that, lighter and smaller than the Hiroshima bomb, could have been ready for a missile warhead in as little as a year. Iraq had already conducted test blasts of its components.

In addition to the nuclear weapons, Iraq had built a stockpile of chemical weapons so vast that U.N. teams charged with destroying it said the job would take at least two years. Inspectors found 2,000 bombs and 6,200 artillery shells filled with mustard gas. There were also thousands of 122mm missile warheads filled with the nerve gas sarin. And the industrialized world, with its spy satellites and aircraft and optics capable of resolving a tennis ball from orbit, had no idea. What else is

going on in the hidden places of the earth without our knowledge?

## Pharming

In an enclosed environment, even a moderately skilled individual, acting alone, could hold the world hostage to a killer virus, or just plain wipe it out by accident. Sound fantastic? Welcome to the world of high tech pharming.

Disease organisms change their genetic characteristics all the time; it's part of the process of natural selection. They mutate accidentally, randomly, without direction. But wait, here come the biohackers with a plan. That's right. Biohackers. Why not? The technology of bioengineering is not all that complicated. The ingredients are readily available. Any bright kid can master the process to become a biohacker. So can any bright terrorist. Combine the ability to make a deadly microbe with the pre-existing ability to spread it universally, courtesy of enclosure, and you have a formula for an epidemic that can do for us what the bubonic plague, the Black Death, did for Europe in the fourteenth century. Release a killer virus in, say, the main concourse of JFK International Airport in New York, and the disease will be global before the first symptoms appear.

Something has to be done about it, right? Maybe legislation to keep this dangerous technology out of the hands of criminals?

No, it's just another distraction. What is needed is a world big enough to tolerate the kind of damage we're capable of doing. Human destiny will be shaped according to whether its leaders manage to shape a course toward territorial expansion or veer off in diverse directions every time a new symptom of

enclosure shows itself. Whether the United States can lead or even assist in this most critical of enterprises is arguable.

## Junk Treasury Bonds

The United States may be losing the economic power to control even its own destiny.

In the late 1980s, economists began expressing concern about the growing portion of the U.S. national debt that was owed to foreigners. At that time, the figure was $400 billion, or 40 percent of the debt of $1 trillion. (In May 2009, the U.S> owed $772 billion to China alone.) It was not the first time the U.S. had spent beyond its means, but this time the mounting debt appears to have special significance.

The U.S. borrowed abroad in the 19th century, too. It used the money to build factories and railroads which produced the wealth to repay the debt. In the 1980s, we borrowed to buy foreign cars and stereos. We are currently spending our national substance to subsidize failed banks and to satisfy profitless "entitlements" which we call "investments." Our foreign creditors are justifiably concerned about how we intend to repay the debt this time. In a speech at Beijing University in June of 2009, Secretary of the Treasury Timothy F. Geithner assured his hosts that they need not worry about the more than $770 billion they had invested in U.S. Treasury Bonds. "Chinese financial assets are very safe," he said, drawing laughter from the crowd.

Japan, too, has invested heavily in U.S. bonds. It is worried about its return on the investment, so it wants Uncle Sam to borrow less.

The sale of interest-bearing bonds and notes is how the U.S. government covers its debt. It goes without saying that the more foreigners finance the federal government's spending machine, the greater their voice in American government. It is not rationale to expect a leadership that is financially indebted to China, for example, to make decisions inimical to that natin'os interests. To some extent right now, decisions about major American spending programs are being made abroad.

In 1990, the United States agreed to raise its tax revenues in return for Japan's promise to relax restrictions on retail sales, let in more imports and open business opportunities to Americans. The accords were aimed at reducing the trade imbalance between the two countries. The United States has a huge deficit, Japan a huge surplus.

## Sellout

In December 1990 Japan's largest manufacturer of consumer electronics, under such names as Panasonic, Quasar, and Technics, bought MCA, Inc., the U.S. entertainment giant which runs Universal Studios. Matsushita Electric Industrial Company bought 77.7 million shares of MCA stock (97%) for $66 a share.

Australian News Corp. bought 20th Century Fox in 1985.

Sony Corp. bought Columbia Pictures Entertainment Inc. in 1989.

Italian Pathe communications bought MGM-UA Communications Company in November 1990.

In the case of Sony and Matsushita, the purchases were intended to gain control of the "software" to run on the

"hardware" they already produce. Some of that software: *Star Wars*, *ET*, and *Jaws*.

MCA president Sidney Sheinberg said at the time of the purchase that "They (Matsushita) have indicated their respect for our autonomy and corporate culture." Probably, that was intended as reassurance for those concerned about foreign control of a potential propaganda machine, such reassurances must be considered in the light of Matsushita's past actions.

As part of the deal, MCA chairman Lew Wasserman, anxious to avoid taxes on the cash sale of his stock, instead was to receive an equivalent amount of preferred stock in Matsushita. Preferred stock is non-voting stock.

Film and music are important drivers of public opinion. Foreign ownership means foreign control. In a zero-sum world, how likely is it that Americans will ever again see or hear anything from MCA not in the very best interests of the Empire of the Sun?

What is true in the entertainment industry is true in other industries as well. In 1988, John Young, CEO of Hewlett-Packard, remarked that before 1970 "U.S. producers had a 100 percent share of the domestic consumer electronics market. In 1988, American companies held just five percent. You can see the same thing in machine tools, telephones, and semiconductors."

By 1988, six percent of total U.S. assets were owned by foreigners. Europeans and Asians had invested $800 billion in U.S. acquisitions over the preceding five years. Foreigners owned 1% of manufacturing. Three million Americans worked for foreign-owned companies. One quarter of all commercial loans were made by foreign-owned banks.

By 2004, the proportion of U.S. corporate equities owned by foreigners had jumped to 12%. Foreigners held 24% of U.S. corporate bonds and 43% of U.S. Treasury bonds. Foreign investors have been intent on gaining global control of key industries to produce advanced weapons, airplanes, spacecraft, and computers. These are the items that have defined American technological leadership since the beginning of the space age. The choice of target is probably not an accident.

Foreign ownership of banks is particularly disturbing, since it means that a significant fraction of U.S. business had to go to foreign sources for startup capital. This gives our competition the lever it needs to determine which new business can start in America. Any notion that political interests do not enter into these commercial proceedings is, to say the least, a dangerous self-delusion.

## New Realities

In 1988, the Swedish government issued bonds in yen, the Japanese currency, in response to advice that a dollar-based offering might not fare well. Fifty billion yen in bonds were snapped up by international investors. Tokyo's financial community has been pressuring even the U.S. Treasury to issue bonds in yen. The issue is control of financial resources, and at least one economist (Daniel Burnstein, author of Yen! Japan's New Financial Empire and Its Threat to America) predicts a drop in the American standard of living as the world adopts a new standard currency, the Japanese yen.

The U.S. economy will shortly begin to fall prey to resource depletion as well. The price of imported oil, in particular, acts as a tax on American consumers, driving up the

cost of everything that uses energy or travels, which means everything.

David Wyss, chief financial economist for DRI-McGraw-Hill in Lexington, Mass, predicted in the summer of 1990 that unemployment, then at 5.5 percent, would rise to 6.75 percent by the next spring, if certain things happened. The prediction was based solely on the impact of those things on the price of oil. It assumed, bottom line, that shipments from Iraq and Kuwait (then occupied by Iraqi forces) stopped. They did, and unemployment shot up, almost as if the price of energy were the only driver of economic prosperity in the modern world. Maybe it is, and that should give us pause.

It could have been worse...should have been, really, and, amazingly, wasn't. A worst-case prediction based on the loss of the combined production of Iraq, Kuwait and Saudi Arabia would have sent inflation into orbit, along with interest rates. It would have put two million Americans out of work. As this sentence is written, crisis in the Middle East could do those things, still. The one certainty is that once the trigger is pulled, there will be no time to act before the hammer falls. The United States would lose the foundation of its economic infrastructure over night.

According to a report by U.S. Federal Reserve Bank economists written in the closing years of the '80s, growth in Third World economies during the 1990s will take up the slack created by oil conservation measures. As petroleum exporting countries reach full capacity, the cost of oil will rise, with corresponding increases in the cost of fuel. Things probably won't get as bad as they did, briefly, in the '70s. But they will be a permanent drag on the U.S. economy. According to the Fed's report, "Rising oil prices will strengthen economic growth in energy-exporting countries while hindering

economic growth in energy-importing countries like the United States."

The Fed might have added, "...and Japan." With few natural resources of its own, Japan is even more vulnerable than the United States. Other nations are in similar straits. That may explain why there has been an infusion of foreign capital into U.S. space enterprises, notably from Japan. The Japanese are seeking to manufacture products that consume little terrestrial energy and material resources, but have high economic value. They have been involved in risk-sharing and direct investment with, for example, Microgravity Research, makers of ultrahigh purity gallium arsenide wafers for semiconductors. They also helped to finance Star Net Structures, which designs and markets construction systems for orbital and lunar projects. The aerospace trade magazine *Aviation Week & Space Technology* reported near the end of 1988 that some U.S. businessmen believe the cost of such money is too high, that the Japanese are buying U.S. space technology for a bargain price in the same way they bought U.S. semiconductor technology.

## Survivors from Earth

Wall Street seems to reason differently. It has little interest in the space business, or in risk of any kind. The best way to make money, according to them, is to siphon it from existing wealth. Thus Wall Street invented the leveraged buyout, in which you buy something with nothing and charge it. The debt incurred accomplishing takeovers, or resisting attempts at takeovers, uses up resources that are needed for growth. The need to raise cash quickly to repay debt closes factories and can even threaten public safety.

Transworld Airlines and Eastern were bought with borrowed money. It wasn't long before employees at both airlines were charging that the level of debt was hurting maintenance and investment in new equipment. Both airlines have since failed.

Readers of Ayn Rand's 1959 novel *Atlas Shrugged* will recognize that this progression leads to "stopping the motor of the world." In fact, our current difficulties do have an end-of-the-road character to them. Our environmental woes defy solution at any cost. Totalitarian leaders of primitive tribes are about to acquire the tools to hold cities ransom and spark the fires of Armageddon. And while Earth sinks into a coma, humanity runs amok, its numbers spinning out of control even as its cupboards stand empty and its spirit shrivels.

If we had better understood the words of the American Historian Frederick Jackson Turner, uttered in obscurity over a century ago, none of this would have taken us by surprise.

"To the frontier the American intellect owes its striking characteristics," the young professor at the University of Wisconsin told his audience. It was an audience which had sat through a series of painfully boring papers to hear his words, staying on the strength of a rumor that something important was to be said. "What the Mediterranean Sea was to the Greeks, breaking the bonds of custom, offering new experiences, calling out new institutions and activities, that, and more, the ever retreating frontier has been to the United States directly, and to the nations of Europe remotely. And now, four centuries from the discovery of America, at the end of a hundred years of life under the Constitution, the frontier has gone..."

Without exception, life fails when it is contained. Like the second law of thermodynamics, which defines the impossibility of a perpetual motion machine, there is a law which defines the

impossibility of sustainable equilibrium in an enclosed environment like today's Earth. The law is stated most simply like this: grow or die. The opposing idea that, by conservation and recycling, by scaling back our expectations for economic growth and by adopting a universal ethic that places Earth first, we will somehow distinguish ourselves from God's other creatures ... that idea is a death wish. Contained, Homo sapiens will go the way of the dodo. Our intellect may make the course of our extinction complex, the mechanism so incredibly convoluted that it defies comparison with previous extinctions, but, stay put, and we're dust.

The world is sick to death, yet it needn't die.

It has become clear that only the opening of a frontier beyond Earth can make future life on our home planet tolerable, or even possible. It is also clear that we have delayed our departure much too long. Those who leave in the future will have to struggle for the opportunity to do so, enduring danger and hardship — not just the peril and adversity of cold space and hard radiation, but the hazards of an enclosed and volatile Earth: famine, plague, war, poverty, and infamy ... Those travelers, if they make it at all, will think of themselves as the lucky few. Refugees. Survivors from Earth.

# About The Author

Laurence B. Winn is an aviator, adventurer, author, and aerospace engineer

with more than 30 years of experience as a technology leader, including work on advanced turbine engines and manned space systems. Currently president of SpaceFarers Corporation in Tucson, Arizona, he has lived and worked in most parts of the United States and overseas. He is married to Patricia Catherine, a talented teacher and microbiologist who always insisted that she would follow him anywhere, and has.