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Eulah C. Laucks
President
P.O. Box 5012
Santa Barbara, CA.
93150-5012

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"If the world were by some miracle to become sustainable, would it also be a world at peace? Not necessarily ... Sustainability is now a necessary but insufficient condition for peace, and peace is now a necessary but insufficient condition for sustainability."

- David Orr

This issue of the **Reprint Mailing** is entirely devoted to the essay "The Ecological Foundations of National Security" by David Orr. Professor Orr is co-founder of the Meadowcreek Project, an environmental education and research center in Fox, Arkansas. He is currently Professor of Environmental Studies at Oberlin College.

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THE ECOLOGICAL FOUNDATIONS OF NATIONAL SECURITY

David Orr

Throughout history, security has been regarded as the product of military strength. To be safe was to be well armed. Weakness only invited invasion, pillage, and destruction by aggressors. This may not always have been the case. Riane Eisler purports to show that war was not characteristic of human societies in Europe prior to 5000 B.C. Whatever the evidence reveals of our past and possibly of our future, history has been generally unkind to peaceful, pastoral societies. One by one they have been conquered or assimilated by their more aggressive neighbors. If the race is not to the swift nor the battle to the strong, you could not tell it from the record of civilization. History is a catalogue of human bloodshed and depravity dominated by the mighty.

The logic of a "war system" has been the accepted norm since the Treaty of Westphalia, signed in 1648. The treaty sanctioned the idea of self-help in a system of independent, sovereign nation-states. Security was defined implicitly as a function of military power. Threats originated from other nation-states whose interests ran counter to one's own. This system "worked" until 1914, when World War I began.

Threats to the well-being of citizens since the Treaty of Westphalia have increasingly originated from other sources, including citizens' own states. Moreover, the system of self-help created at Westphalia has proved incapable of meeting a growing array of problems that require cooperative solutions. Foremost among these are the precarious problems of providing security in the nuclear age and managing global commons (the atmosphere, the oceans, and critical habitats). Both of these problems now threaten the survival of humankind. They differ primarily in the speed with which they might render the planet uninhabitable, but not in their finality. There is simply no conceivable kind of self-help that can insulate a nation from the direct or indirect effects of nuclear war. Nor is there any purely national policy that can defend against pollution, acid rain, ozone depletion, or climate change.

Because of these changed circumstances, old measures of power tell us less and less about how secure people are from assaults on their well-being. In fact, many of these measures have become obsolete. For citizens in industrial countries, early death is much more likely to result from industrially created carcinogens and the careless use of technology (including automobile accidents) than from marauding armies. The most vital economies of the late twentieth century are those least burdened by military expenditures. Both the United States and the Soviet Union are sinking under the burden of debt, trade deficits, and the costs of militarization. Meanwhile, the well-being of the populations entrusted to the governments of the superpowers is being compromised by the very efforts designed to protect them. Military aircraft crash into civilian areas. Factories designed to build weapons, like those at Rocky Flats, Colorado, or Fernald, Ohio, leak radioactivity. The "opportunity costs" of military expenditures—that is, the expenditures foregone because of military expenditures—are even greater. The costs of military "preparedness" include unbuilt schools and hospitals, deteriorating infrastructure, declining democratic institutions, and wasted human potential. Why has military spending become so counterproductive?

First, as war has become more destructive it has become a less useful instrument of rational policy. The creation of atomic and hydrogen bombs marked a clear watershed in the history of human conflict, ensuring that war could no longer remain limited. The successful use of laser-guided weapons and "smart" bombs in the Persian Gulf War may have rehabilitated war, but it is simply too soon to know what the long-term effects of high-technology weaponry will be. It is worth noting that the costs of precision-guided munitions is low, that the technology is difficult to keep secret, and that it may ultimately enable our adversaries to launch missiles from cargo ships fifty miles off the coast of New York City. Future Saddam Husseins will be more careful to have terrorist networks in place before they act. Technologically advanced societies are filled with all kinds of tempting targets for terrorism—nuclear power plants, centralized energy-supply networks, concentrated population centers, vulnerable water and food systems. Moreover, as Hussein demonstrated by igniting the oil fields of Kuwait, a demented leader facing defeat can saddle both the victors and third parties with considerable environmental costs that may well exceed the gains of victory. Hussein managed to punish the West by fouling the Persian Gulf with oil spills and setting fire to half the Kuwaiti oil fields, causing acid rain to fall on surrounding areas and significant amounts of carbon dioxide to enter the atmosphere and speed the pace of global warming.[1] When all the bills are totaled, we may discover that a wiser course of action might have been a patient policy of economic sanctions along with new energy policies cutting our dependence on imported oil. The increasing destructiveness of weapons and the growing technological sophistication of every nation has effectively democratized the potential for terror. As a result, the nation-state, which originally justified its existence by its ability to defend national territory, can no longer provide security

against adversaries, terrorists, or even technological accidents.

Second, economic life has changed with the creation of an integrated world economy. Industrial economies are more and more dependent on the international flow of capital, resources, and technologies. Prosperity increasingly rests on technological mastery, not on conquest. International competition demands continual improvement in productivity, consumer products, and other factors that contribute to economic power.

The same technologies that strengthen competitiveness, however, also can lower the quality of life and damage ecosystems. To balance its international accounts, for example, the United States exports grain. But for every bushel of grain produced, it loses the equivalent of two-to-three bushels of topsoil. Increasing labor productivity through the use of automated technologies such as robots creates a class of permanently unemployable people. Even "clean" industries like the manufacture of computers have caused significant environmental problems. We can no longer assume that economic growth, global interdependence, or technological change necessarily will improve people's lives or protect national security.

The term national security must now be broadened in recognition of the linkages among security, resources, and ecological stability. The reality of interdependence means that security is becoming planetary and can no longer be defined in purely national terms. Threats to particular nations remain, but they are now part of a larger fabric of forces and trends. The world in which sovereign nation-states controlled their own destiny, if it ever existed, is now past.

One of the biggest challenges now confronting the nation-state is its management of the flow of low entropy: materials, food, water, energy, and waste. Assaults on the well-being of citizens are increasingly coming from poisons in the air, water, and food. The future viability of a nation's economy now depends on its ability to manage the resource and ecological base on which the economy and all life forms depend.

The term "sustainable," first popularized by Lester Brown, has come to mean living within one's ecological means or "carrying capacity." But carrying capacity is a complex concept, measuring the levels of resource use, technology, and population against natural thresholds that are poorly understood. Advocates of sustainable development typically focus on the rate of population growth, the percentage of resource use that is nonrenewable, and the resulting burdens on the environment. These are straightforward enough. Questions arise when one asks about timing, rates of change, and orders of magnitude. Over what time period must a society become sustainable? What population size is sustainable at what levels of resource use? To what extent does sustainable development imply self-sufficiency? What is the relationship between sustainable development and equitable distribution? Advocates of sustainability differ on many of these questions. For some, the transition to a sustainable future implies a "paradigm shift" in values, institutions, and life-styles. For others, the transition is simply a matter of adjusting markets and prices or developing new technologies.

We may discover that the goal of sustainability, however necessary, is not to our liking. It may require sharp changes in many aspects of modern life to which we have grown accustomed, including mass consumption and easy mobility. Growth in western societies, for example, has been used as an all-purpose political solvent to avoid issues of distribution. If sustainability implies slower growth, no growth, or even economic contraction, how will the national wealth be divided? The rich have not often acquiesced gracefully in matters of equity, and it is certainly possible that efforts to promote sustainability will result in increased political repression.

Much in the way that medieval man placed his belief in religion, modern society has invested its faith in science and technology. Can these save us from ecological malfeasance? Any understanding of the crisis of sustainability must confront the Janus-like nature of scientific knowledge and technological innovation. Any solution to the crisis that does not confront the need to redirect technology will not work for long.

The transition to sustainability will lead to a very different kind of society. International politics from 1648 to the present have reflected the values and priorities of the dominant states. Domestically and internationally, the world of the twentieth century has unraveled on the altar of military power, technological change, and economic growth. The world of the twenty-first century and beyond, if sustainable, just, and peaceful, will require the creation of an entirely new system of security.

If the world were by some miracle to become sustainable, would it also be a world at peace? Not necessarily. Even if we eliminate the growing potential for interstate disputes over resources, land, water, and population, conflicts rooted in bigotry, sexism, pride, greed, arrogance, and pure human recalcitrance would remain. Given the human genius for conflict and malfeasance, the goal of sustainability should not be confused with utopia. Sustainability is now a necessary but insufficient condition for peace, and peace is now a necessary but insufficient condition for sustainability.

To paraphrase Charles Dickens, we live in the best of times and the worst of times. The dissolution of the Iron Curtain and the Cold War after forty-five years gives us a chance to build a durable system of peace. But time is short. We may have only a decade or two to reverse the trends of ozone depletion or global warming. And the Bush Administration has yet to show leadership in these matters remotely comparable to that which it displayed in opposing Saddam Hussein. To the contrary, the United States remains well behind other industrial nations in devel-

oping far-sighted policies to control global warming and to promote sustainable development at home and abroad.

A TALE OF TWO SYSTEMS

The Westphalian system was created when world population was 500 million, when the fastest speed attainable was by horse, and when the most destructive weapon was a naval gun that could hurl an eight-pound iron ball several hundred yards. This system made the territorial state the principal arbiter of issues of war and peace. For the next three hundred years, territory and territorial resources were the primary issues on the international agenda.

For reasons its founders could not have foreseen, the Westphalian system of nation-states no longer works. First, the system has failed to limit conflict; the twentieth century has been a period of unparalleled bloodshed.

Second, the state system now confronts the consequences of political events characterized by greater complexity and speed. The interaction of technological, economic, political, social, and military forces that produce change are poorly understood or undiagnosed altogether. Compared to the world of 1648, the sheer volume of events and interactions in the world system has risen by orders of magnitude, as have the adverse consequences of unanticipated change.

Third, the costs of resorting to violence or preparing to use violence have undermined the Westphalian system of military self-help. Since 1945, for example, military weapons have increased in cost 105 times while prices have increased only 6.5 times.[2] The direct costs of the Westphalian system, however, do not tell the full story. There are also "opportunity costs" exacted from society by military expenditures. Gold-plated military systems contrast markedly with declining cities, crumbling roads and bridges, and growing poverty. Militarization imposes more subtle costs as well. The veil of secrecy which is drawn around the process of weapons acquisition has allowed corruption of the most venal sort, as well as the monumental incompetence evident in large cost overruns.

Fourth, the Westphalian system has become ecologically implausible. War, the ultimate expression of sovereignty, has become too destructive for victor and vanquished alike. Any conceivable nuclear war, even a small one, would be utterly catastrophic, triggering "nuclear winter" and probably other ecological consequences which cannot be anticipated. Conventional wars have higher ecological costs, too. While environmental damage from the Persian Gulf war is not fully known, it clearly is substantial. It is also clear, as noted above, that terrorist actions targeted against nuclear power facilities, toxic waste dumps, population centers, and food and water supplies would change the balance sheet for even "small" wars.

The international system exists within a larger system, the biosphere, which operates independent of human volition. Until recently, statesmen could assume the stability of this larger system—and most remained ignorant of the biosphere's existence altogether. But assumptions of ecological stability that underlay the Westphalian system no longer hold. For example, hidden in the old logic of international politics are unstated beliefs that climate would remain stable, that resources for growth would be readily available, that the entire human population could be fed, housed, and clothed, that the biosphere would absorb all human wastes, that science and technology would be benign, that energy would be cheap and abundant, and that complexity would be managable. In other words, it was assumed, wrongly, that the ecological and biospheric foundations of our political, social, and economic systems were secure. But as our knowledge of the natural world expanded, we have learned not only to compose new materials and life forms, which the medieval alchemists only dreamed of creating, but also to expect that unfettered human creativity and procreativity can have tragic ecological and biological consequences. Knowledge of these consequences has regrettably developed more slowly than the reductionist knowledge necessary to tinker with nature. Gradually, we have discovered limits that must be the basis for any new peace system.

Limits of the Biosphere

Humans are now the dominant force on the planet, as powerful as the forces of previous geologic upheavals. Agriculture, energy use, and manufacturing lie at the heart of the impact of human beings on the globe. Since 1850, nine million square kilometers have been converted into permanent cropland. Energy use has risen by a factor of 80, disrupting natural geochemical cycles of carbon, nitrogen, and sulfur. Industrial production is up more than 10,000 percent. The area of forested land lost since 1700 is larger than Europe. Sediment loads in major rivers have increased by 300 percent, and in smaller rivers by as much as 800 percent.[3] Increased water use in the same period is roughly equal to the volume of Lake Huron. Methane in the atmosphere has doubled. Heavy metals and toxins can now be found everywhere in measurable quantities. Humans are causing a biological holocaust that is destroying life 10,000 times more rapidly than the natural rate of extinction.[4] Most of this change has occurred since 1945, and the pace is still accelerating.

Perhaps the most ominous trend is global warming, caused by the release of heat-trapping gases such as carbon dioxide from the combustion of fossil fuels and deforestation, methane from anaerobic decay, and chemicals released by industrial processes, including chlorofluorocarbons (CFCs), bromine, and halons. As a result, the earth has warmed by 0.5 to 0.7 degrees Celsius since 1860, and five of the warmest years on record occurred in the 1980s. Data on the rate of carbon dioxide

accumulation show a rise beginning in 1987 from 1.5 parts per million to 2.4 parts per million.[5] One explanation for the increasing level of carbon dioxide in the atmosphere is the effect of warmer temperatures on the rates of plant decay and respiration. Planetary warming, which may well be irreversible, also will cause substantial changes in rainfall, flooding some areas and causing droughts in others.

Another instance of our exhausting the biosphere is the depletion of planetary ozone. The primary culprit, identified in the early 1970s, is a family of chemicals known as CFCs. Since their discovery in the 1930s, CFCs have been used widely in many industries as solvents, propellants, and cleaners, and in products ranging from computer chips to refrigerators. But they do not break down quickly, and once released they accumulate in the stratosphere where their decomposition releases chlorine which then destroys ozone. Each day we release some 2700 tons of CFCs to the atmosphere. The results have been one ozone "hole" over the South Pole that covers the Antarctic and extends as far as Australia, the beginnings of another hole over the North Pole, and a general thinning throughout the mid-latitudes. Even with an immediate ban on CFCs, stratospheric ozone is expected to decline sharply over the next thirty years.[6] Global warming and ozone depletion also may be linked; as the lower portion of the atmosphere warms, the upper layers cool and form ice crystals that destroy ozone.

Several conclusions are beyond contention. First, we are crossing, or will soon cross, thresholds affecting long-term climate stability. Second, we do not understand many of the critical causal linkages between complex ecosystems and human actions. Third, we do not have data about the "vital signs" of the planet comparable, to say, the Dow Jones Index. Finally, most research is still directed toward manipulation of the natural world, not toward understanding the results of our tinkerings or toward development of low-impact alternatives.

Population and Food Limits

World population reached one billion sometime around the year 1800, two billion after 1900, three billion in 1958, four billion in 1975, and five billion in 1987. The United Nations Population Division estimates that world population in the year 2025 will reach 8.5 billion. Given existing fertility rates and the age structure of the current population, we will add one billion people to the planet in each of the next three decades. Ninety-five percent of the growth will be in the poorest countries, which can least afford more mouths to feed.[7] While there is disagreement about the total population that the earth can support, three conclusions can be drawn from these numbers. First, population growth is exerting great pressure on ecosystems nearly everywhere. In developed nations environmental impacts are compounded many times over by high rates of resource consumption. In poor nations, the effects of growing population are evident in soil erosion, desertification, and deforestation. Second, perhaps 25 percent of the present population of the planet is malnourished.[8] While inadequate distribution and the decline in local subsistence farming are to blame, these figures cast doubt about how well we might do with a much larger population in the coming decades. Third, the race between population growth and food production will become more difficult as the effects of climate change, ozone depletion, and acid rain worsen.

The economist Thomas Malthus was among the first to recognize that population tends to increase exponentially while food supply grows arithmatically. If history proved Malthus wrong, as is commonly believed, it may have done so only partially and temporarily. Population has continued to increase exponentially. The food supply has increased as well, much more than Malthus could have known, primarily because of the greater availability of land for agriculture and cheap energy. But "Green Revolutions" work only with large inputs of fertilizer, pesticides, herbicides, and machinery, all of which depend on a stable supply of low-cost oil. U.S. agriculture, for example, uses about ten calories of fossil-fuel energy to put one calorie on the plate.[9] Conventional agriculture is becoming more and more dependent on chemical solutions for fertility and pest control, but insects are becoming increasingly resistant to pesticides.[10] World soil loss caused by poor farming practices is now estimated to be 24 billion tons per year.[11] These trends explain why the specter of famine once raised by Malthus continues to stalk many nations in Africa and Asia. At least one study has shown that as fossil energy supplies dwindle and prices for inputs rise, famine may visit developed countries as well.[12]

Climate change is now the joker in the deck. Projections made by the National Center for Atmospheric Research indicate that the grainbelt in the Midwest will become both hotter and drier, and that the prime growing area will shift northward to Canada.[13] Early studies on the effects of increasing ultraviolet radiation show that it suppresses biotic activity.[14] Crop productivity will also be reduced by acid rain and by air pollution, particularly in the form of ground-level ozone.

We have not escaped the trap Malthus described. In fact, we may have made it a much larger trap. Technology, dependent on fossil fuels, has increased our carrying capacity for a time. Whether this represents a permanent or temporary increase depends on a level of technological heroism that Malthus never could have imagined. We have only avoided starvation by using cheap energy and plentiful land, but these are fast disappearing. If feeding the world continues to depend on an energy input/output ratio of ten to one, Malthus will have the last groan. Additions to farmable land also will be much more difficult in the future. In fact, with global warming we will be losing land to rising oceans. In places like Bangladesh, flooding may well be catastrophic.

The rate and volume of fossil-fuel use are two of the most distinctive features of the modern world. The ability to burn fuels at a time and rate of our choosing has facilitated vast increases in human population, the rise of large cities, and the growth of industry. Without fossil fuels, the world in its present form and scale simply could not have been created. The enormous increases we have seen in industrial and agricultural production are the result of our growing ability to substitute energy for labor. Yet we have been curiously slow to understand our dependence on energy supplies and our vulnerability to sudden cutoffs.

The low prices for energy in the late 1980s created a sense of unwarranted complacency. Now, however, the U.S. Department of Energy (DOE) projects sharp increases in the price of oil by the mid-1990s, perhaps reaching $30 a barrel. At the same time, DOE expects an increase in the demand for oil by developing countries of some 2.5 million barrels per day.[15] More ominously, a decade of increasing efficiency in the United States leveled out in 1986, and our appetite for all kinds of energy once again increased. The United States is now importing more oil than it produces, and this predicament could well worsen.[16] U.S. oil production peaked around 1970 and has been declining ever since. Despite huge outlays for exploration, proven U.S. reserves of oil have decreased from 32 billion barrels in 1977 to 27 billion barrels in 1989, and experts give no hope that this decline can be stopped.[17] Simply stated, we are running out of oil, and unless we find substitutes our dependency on foreign oil is bound to increase.

All U.S. energy sources now have a declining energy return on investment (EROI), which, according to Charles Hall, Cutler Cleveland, and Robert Kaufman, represents the ratio of the "gross amount of fuel extracted in the energy transformation process to the economic energy required to make that fuel available to society."[18] EROI, or net energy, is a much more important figure than total reserves available. It tells us how much energy it costs to deliver a given quantity of fuel. When it costs a barrel of oil to deliver a barrel of oil we have reached an EROI of 0. A close look at EROI measures reveals that fossil fuels have a declining return on investment. For example, one study of selected Louisiana oil fields indicates that the break-even point will be reached in the late 1990s. When that point is reached, the question of whether or not there is still oil in the ground will be moot. There will be no good reason to remove oil with an EROI of 0. From this perspective, efficiency gains in the use of energy may sooner or later be offset by the declining EROI of various energy suppliers.

While fossil fuels have shaped the modern world, our dependence on them now poses severe threats to a stable and sustainable future. Combustion of fossil fuels is the primary cause of global warming and acid rain. As we learned in the Persian Gulf War, oil-importing economies are now hostage to the unstable politics of the Middle East. After world oil production peaks sometime in the first quarter of the next century, the decline of the fossil-fuel era may be traumatic, unless timely measures are taken to begin another era based on efficiency and renewable energy sources. These measures will not be cheap, only cheaper than the socioeconomic and ecological price to be paid if renewable sources of energy are not sought. The good news about energy is that efficiency improvements that are now technically feasible could substantially reduce consumption of all energy forms. A DOE study shows that U.S. energy consumption could be reduced by fifty percent with present technologies, and with a positive net impact on the economy.[19]

Nuclear power, at least in its present form, is not a viable alternative. The problem of energy scarcity has to do with a shortage of liquid fossil fuels that are used primarily in transportation and in heating, not a shortage of electricity. Moreover, aside from the well-known problems of the nuclear fuel cycle, including reactor safety, waste disposal, and weapons proliferation, nuclear energy also suffers from a low to negative EROI when *all* costs are counted, such as those of decommissioning plants. As for the argument that nuclear power is an answer to global warming, Gregory Kats and William Keepin have shown that even under conservative assumptions dollars spent on conservation in effect remove seven times more carbon than those spent on nuclear power. Nuclear power is simply not an answer to the global-warming crisis.[20]

From a policy perspective, we must chose among three broad courses of action: economic policies that rely on heroic technological breakthroughs to increase energy supplies in the face of declining rates of EROI; efficiency improvements that more than offset declining EROI; or national plans that prepare us for slower economic growth or even economic contraction. The crucial necessity is to ask of each course: Can this be done in time? At what cost? And what happens if the underlying assumptions turn out to be wrong?

The Westphalian system of political economy is now in conflict with the biosphere because each works in fundamentally different ways.

First, the biosphere functions by processes of evolution and ecology. The "machinery of nature" is a vast interconnected web of relationships, biogeochemical cycles, and energy flows. Its logic is evolutionary, adaptive, co-evolving. It is as dependent upon cooperation as on competition. Predator-prey relationships are seldom "zero-sum" games at the species level. James Lovelock, author of *Gaia*, argues that evolution legitimately applies to the planet more than to separate species. The passions that lead humans to genocide, mass warfare, and violent nationalism have no counterpart in nature. The war system, in contrast, is driven by the logic of power. The resort to force is most typically played as a zero-sum game —winner takes all. As the Westphalian order grew into the global war system, each

nation worked assiduously to perfect its technology for destruction. In the words of Solly Zuckerman: "The momentum of the arms race is undoubtedly fueled by the technicians in governmental laboratories and in the industries which produce the armaments."[21] The technological revolution in warfare now exceeds the capacities of the biosphere and humans to manage it. The result is a widening "gap between mechanical intelligence and human intent," with weapons systems "passing out of human control."[22] Behind this technological momentum are worst-case fears institutionalized in defense bureaucracies and the dark side of human ingenuity. There is no apparent counterpart in natural systems for these dynamics; nature plays out its role in a more tentative and cautious way.

Second, natural evolution has occurred over millions of years, while the human-based political economy has been speeding up decade by decade for the past two centuries. Economic growth since 1945 has been more of an eruption than an evolution. Computers and instantaneous communication across the planet have changed the speed at which humans think, work, and live. The revolution in military technology now means that decisions about the fate of 2.5 billion years of evolution will be made in minutes, or seconds. There is a disjunction between the rhythms of nature measured in billions or millions of years, and technological time, measured in days, hours, minutes, seconds, and nanoseconds. As technological time is superimposed on older patterns of day and night and changing seasons, human behavior is increasingly disoriented in ways that suggest that speed has become an addiction.

Third, the evolution of ecosystems leads toward increasing diversity, ecological complexity, stability, and balance. Left to itself, nature evolves in ways that tend to create stable systems over long periods of time. As systems "mature," nutrient cycles become tighter and more energy goes into maintenance than into growth. Life at the planetary level, according to Lovelock, is an active agent in maintaining the climate and temperature conditions necessary for more life. As conditions move away from those suitable for life, biological organisms act to restore the balance. The purpose of human systems, in contrast, has become to grow as large as possible. Having eliminated most or all of their natural competitors, humans now face no limits other than those imposed by the planet or the perverse consequences of their own actions. Evolution has equipped humans with no instinct to know when enough is enough.

Fourth, natural systems are organized as a kind of loose hierarchy with a great deal of redundancy and diversity. Species fit together in a complex tangle of varying relationships, niches, and trophic levels, all governed by how efficiently they use available energy. The demise of any one life form has little effect on the rest of the system. Evolution has equipped ecosystems with spare parts, backup systems, and, at the genetic level, lots of information about what to do in emergencies. At the planetary level, Lovelock has made a convincing case that the feedback systems have been remarkably successful at maintaining atmospheric stability within fairly narrow limits for the past two billion years. The structure of human society, however, is increasingly homogeneous. What was once a great diversity of human cultures is being rapidly destroyed by modernization. Humans are now being lumped together into one great experiment. Gaia would have never wagered it all by attempting to replace the planet's diverse life forms with just rain forests or just deserts, for if there were any flaws in the logic, science, or adaptability underlying this great wager, the entire system would be in jeopardy. If the resources and energy on which Gaia depends run short, the system will collapse catastrophically. Cultural diversity, like diversity in natural systems, provided a margin for error. Not so long ago human societies constituted hundreds of experiments, each coping with different problems in different settings. The failure of any one did not pose significant problems for the others. The rise of a global civilization, whatever its benefits, has no such margin. Today, nations following the Westphalian logic simply assume that the human mind can create solutions faster than it can create problems.

THE AMBIGUITIES OF SUSTAINABILITY

A sustainable society, as commonly understood, would not undermine the resource base and biotic stocks on which future prosperity depends. To be sustainable means to live on income, not capital. The word "sustainable," however, conceals as much as it reveals. Hidden beneath its simplicity are assumptions about growth, technology, democracy, public participation, and human values. In 1987 the Brundtland Commission adopted sustainable development as the pivotal concept in its report, *Our Common Future*. As defined by the Brundtland Commission, development is sustainable if it "meets the needs of the present without compromising the ability of future generations to meet their own needs."[23]

This definition of sustainability, however, raises as many questions as it answers. It presumes that we know, or can discover, levels and thresholds of environmental carrying capacity — that is, how to determine what is sustainable and what is not. But a society could be sustainable with a number of different configurations of technology, people, and resources. The phrase also deflects consideration of the sustainability of political and economic institutions, which are often quite fragile. In effect, the commission hedged its bets between two versions of sustainable futures — *technological* sustainability and *ecological* sustainability. In the most general terms, the difference is whether perpetual technological innovations and proper pricing will be sufficient to remove limits to economic growth and with them any need for moral improvement or discipline, or whether

instead we must learn to live within certain limits and reshape our economies, governments, and societies accordingly.

Advocates of technological sustainability believe that every problem has either a technological answer or a market solution. Resource scarcity, they claim, will be solved by materials substitution or genetic engineering. Energy shortages will be met by more efficiency improvements and, for some, by nuclear fusion. The World Commission on Environment and Development calls for a "new era of growth," by which is meant "more rapid economic growth in both industrial and developing countries, freer market access for the products of developing countries, lower interest rates, greater technology transfer, and significantly larger capital flows."[24] The commission plainly regards growth as the engine for sustainable development everywhere. Still, nagging questions remain.

First, since growth and environmental deterioration have occurred in tandem, how can the destruction of the ecological balance of the earth be stemmed with further growth? It is not easy to envision sustainable growth in the principal sectors of an industrial economy—energy, chemicals, automobiles, and extractive industries. Moreover, newer parts of the economy such as genetic engineering may spawn entirely new threats to the habitability of the planet. Growth will certainly lead to vast new concentrations of wealth, which will pose new challenges to democracy and development. Growth in the industrial world not only has failed to contribute to Third World development but also has widened the gap between the world's rich and poor. Why would future growth in the developed world lead to different results?

Second, advocates of technological sustainability are not clear on what it is that is being sustained: Are we seeking to maintain current growth with greater efficiency? The Brundtland Commission compounded the confusion by defining sustainable development in terms of economic growth. Sustainable growth, in Herman Daly's words, "implies an eventual impossibility" of unlimited growth in a finite system. Development implying qualitative change, however, and not just quantitative enlargement, might be sustainable. The distinction is fundamental and often overlooked. Since quantitative growth cannot be sustained in a universe governed by the laws of thermodynamics, we must confront issues of size and sufficiency. "We need something like a Plimsoll line," Daly writes, "to keep the economic scale within ecological carrying capacity."[25] But carrying capacity, defined as the total population times the resource-use level that a given ecosystem can maintain, cannot be determined with precision.[26]

A related ambiguity concerns the relationship between developed and less developed economies. For example, growth in the developed economies depends on a steady flow of energy, minerals, and agricultural goods from the less developed world. For theorists of sustainability these dependencies raise practical and ethical questions: Must any country's population and resource-use pattern stay within the limits of its own national carrying capacity? What level of imports, of which commodities, constitutes unsustainable development? The Japanese, for example, have preserved their forests at the expense of those in Alaska, Brazil, and Southeast Asia. In Daly's words: "A single country may substitute man-made for natural capital to a very high degree if it can import the products of natural capital from other countries which have retained their natural capital to a greater degree."[27] Either some nations must agree to remain undeveloped while others develop, or the structural disparity between developed economies and less developed economies must be reduced.

Advocates of technological sustainability often assume that unsustainable practices can be changed by "finding and using the (right) policy levers,"[28] adjusting prices to reflect true scarcity and real costs, and developing greater efficiency in the use of energy and resources. The policymakers, scientists, corporations, and international agencies that support technological sustainability, however, rarely mention citizen groups or grass-roots efforts around the world. They portray technological sustainability largely as a painless, rational process managed by experts who are pulling levers and pushing buttons while sitting coolly in the control room of a postmodern, computerized society. There is little evidence that its proponents understand democratic processes or comprehend the relevance or power of an active, engaged, and sometimes enraged citizenry.

A different approach to sustainability holds that we won't get off so easily. Wendell Berry, for example, writes: "We must achieve the character and acquire the skills to live much poorer than we do. We must waste less, we must do more for ourselves and each other."[29] This, however, has less to do with pulling "policy levers" than it does with making moral improvements in society. Ivan Illich regards "development" as a fundamental mistake:

> The concept implies the replacement of widespread unquestioned competence at subsistence activities by the use and consumption of commodities; the monopoly of wage labor over all other kinds of work; redefinition of needs in terms of goods and services mass-produced according to expert design; finally the rearrangement of the environment in such fashion that space, time, materials, and design favor production and consumption while they degrade or paralyze use-value oriented activities that satisfy needs directly.[30]

According to Wolfgang Sachs, advocates of technological sustainability "transform ecological politics from a call for new public virtues into a set of managerial strategies."[31] Without challenging the economic framework, they argue that one cannot question the "notion that the world's cultures converge in a steady march

toward more material production."

Another group of advocates, known as eco-developers, propose a multifaceted agenda for ecological sustainability. Their position assumes that we live in a world of limits and that humans are limited, fallible creatures. Wendell Berry, for example, argues:

> We only do what humans can do, and our machines, however they may appear to enlarge our possibilities, are invariably infected with our limitations. . . . The mechanical means by which we propose to escape the human condition only extends it.[32]

Advocates of ecological sustainability stress two different kinds of limits: those on our ability to coordinate and comprehend things beyond some scale, and those inherent in our nature as moral creatures. Even if the first could be overcome by some nightmare of artificial intelligence, the second would infect the results. In other words, we cannot escape our "creaturehood."

Another component of ecological sustainability has to do with the political role of the citizen. Biologist Garrett Hardin argues that except for climate change or acid rain there are few genuinely global problems. Most "global problems" are, in fact, aggregations of national or local problems, for which the only effective solutions reside in the character and intelligence of people at the national or local level. Ecological sustainability, then, could restore civic virtue and develop ecological literacy and competence throughout the population.

Ecological sustainability is rooted as much in past practices, folkways, and traditions as it is in the creation of new knowledge. Michael Redclift, for example, writes that "if we want to know how ecological practices can be designed which are more compatible with social systems, we need to embrace the epistemologies of indigenous people, including their ways of organizing their knowledge of their environment."[33] One of the conceits of modern science is the belief that it can be applied everywhere in the same manner. Traditional knowledge, in contrast, as economist Richard Norgaard puts it, "is location specific and only arrived at through a unique co-evolution between specific social and ecological systems."[34] Traditional knowledge does not fit easily with what we call modern science. It is rooted in and functions as part of a local culture. It is a source of community cohesion and a framework that explains the origins of things (cosmology). It also provides the basis for preserving fertility, controlling pests, and conserving biological diversity and genetic variability. Knowledge is not separated from the complex task of living well in a specific place over a long period of time. The crisis of sustainability has occurred only when this union of knowledge, livelihood, and living has been broken and when knowledge is used for the single purpose of increasing productivity. It may be, as Redclift says, that a "more urgent question is whether 'we' [the "developed" nations] are prepared for the cultural adaptation that is required of us." The loss of traditional knowledge, Norgaard believes, is directly related to increased species extinction and the rise of a unified system of knowledge and economics controlling agriculture worldwide:

> [T]he patchwork quilt of traditional agro-economies consisted of social and ecological patches loosely linked together. The connections between beliefs, social organization, technology, and the ecological system were many and strong within each patch, for these things coevolved together. Between patches, however, linkages were few, weak, and frequently only random. The global agro-economy, on the other hand, is tightly connected through common technologies, and international crop, fertilizer and pesticide, and capital markets.[35]

In the present system, any failure of knowledge, technology, research, capital markets, or weather can prove highly destabilizing or fatal. Disruptions of any sort ripple throughout the system. Not so for traditional agroeconomic systems. A failure of one patch did not threaten others. Finally, Norgaard points out that the "global exchange economy" treats all parts of the world the same regardless of varying ecological conditions. Since "the diversity of the ecological system is intimately linked to the diversity of economic decisions people make," there is a steady reduction of biological diversity. Biological diversity is a factor in social risks, because "agroeconomic systems with many components have more options for tinkering and stumbling upon a stable combination or for learning and systematically selecting combinations with stabilizing negative feedbacks."[36]

Advocates of ecological sustainability regard nature not just as a set of limits but as a model for the design of housing, cities, neighborhoods, farms, technologies, and regional economies. Sustainability depends upon replicating the structures and functions of natural systems. Ecology, for example, is the basis for the work of John and Nancy Todd on the design of bioshelters (which recycle waste, heat and cool themselves, and grow a significant portion of the occupants' food needs) and solar aquatic systems (which purify waste water).

Amory and Hunter Lovins similarly draw on ecology to design resilient technological systems. Resilience implies the capacity to withstand external disturbances and internal malfunctions. Resilient systems absorb shocks more gracefully and are more forgiving of human error, malfeasance, or acts of God. Resilience does not imply a static condition, but rather a flexibility that permits a system "to survive unexpected stress; not that it achieve the greatest possible efficiency all the time, but that it achieve the deeper efficiency of avoiding failures so catastrophic that afterwards there is no function left to be efficient."[37] Like the process of evolution,

designers of resilient systems tend to follow the old precepts such as: KISS (Keep It Simple, Stupid); if it ain't broke, don't fix it; don't put all your eggs in one basket; and if anything can go wrong, it will, so plan accordingly. Resilience implies small, locally adaptable, resource-conserving, culturally suitable, and technologically elegant solutions, which if they fail, will not jeopardize much else. Wes and Dana Jackson use the prairie as a model for farms that do not rely on tillage and chemical fertilizers. Ecologically and aesthetically, these farms would resemble the original prairie that once dominated the great plains. For the Jacksons, "the patterns and processes discernible in natural ecosystems still remain the most appropriate standard available to sustainable agriculture. . . . What is needed are countless elegant solutions keyed to particular places."[38]

The use of nature as a model and standard for farms, housing, cities, technologies, and economies rests on two propositions. First, the biosphere is a catalogue recorded over millions of years of what works and what doesn't, including life forms and biological processes. Second, ecosystems are the only systems capable of stability in a world governed by the laws of thermodynamics. The principle characteristics of ecosystems — energy efficiency, closed loops, redundancy, and decentralization — allow them to swim upstream against the force of entropy. Industrial systems, on the contrary, assume perpetual growth and progress, which can only increase entropy and decrease stability.

Among the most important questions raised by using nature as a model for human systems are those of scale and centralization. If ecology is our model, should society be more decentralized? Surface-to-volume ratios limit the size of biological organisms and physical structures. Are there similar principles of optimum size for cities, nations, corporations, and technologies? Leopold Kohr, E.F. Schumacher, and many others have supported decentralization and appropriate scale on two grounds. The first has to do with limits on the ability of human beings to understand and manage complex systems. Increasing scale increases the number of things that must be attended to and the number of interactions that can go wrong. Rising scale also increases the costs of carelessness. Preoccupation with quantity replaces the concern for quality: farms become agribusinesses; cities become megalopolitan regions; small shops become corporations; tools become complicated technologies; legitimate concerns for livelihood become obsessions with growth; and weapons become instruments of total destruction.

The second reason for decentralization is that centralization undermines the potential for ethical action and increases the potential for mischief. As scale increases, it becomes easier to separate costs and benefits, creating winners and losers who are mostly strangers to each other. The likelihood of ethical behavior decreases as the distance in time and space between beneficiaries and losers grows.

Scale also can make power unaccountable. Who is responsible for acid rain? Carbon-dioxide-induced climate change? Species extinction? Chernobyl? In each case the costs are widely distributed in the form of environmental damage and health effects, but so is the blame. Responsibility is diffused among political leaders, utilities, corporations, government agencies, and the consuming public. At a gargantuan scale everyone is responsible — and no one can be held accountable.

As with all metaphors, we must ask where ecological sustainability applies and where it does not. Two categories are particularly problematic. Cities will always be something of an exception to the model of natural systems. Even under the best conditions, many large urban areas will import substantial amounts of food, energy, water, and materials, and they will export roughly equivalent amounts of sewage, garbage, pollution, and heat. Many municipal problems could be mitigated by better use of mass transit, solar energy, urban agriculture, reforestation, conservation laws (like bottle bills), and organic waste treatment. While significantly reducing environmental damage, these measures still will not produce "sustainable cities" such that the net environmental impact of urban concentrations is within the absorptive and healing capacities of the surrounding natural systems. The sheer concentration of large numbers of people will reduce environmental resilience, encroach on wildlife habitat, and impose significant resource costs elsewhere. Urban concentrations ultimately must be justified on the basis of their contributions to intellectual, economic, and cultural life, not their sustainability.

Another and increasingly problematic area is that of technology. The cumulative effects of technology extend human power over nature so that we can transcend the limits of gravity, space, time, biology, and mind. In the process we remove ourselves farther and farther from the natural conditions, both good and bad, that previously constrained human development. The goal of a sustainable society based on the model of natural systems is not antithetical to technology, but questions exist about what kinds of technology, at what scale, and for what purposes.

Technological sustainability and ecological sustainability represent fundamentally different approaches to the crisis. Yet they are complementary. The vital signs of a heart-attack victim must first be stabilized, and only then can follow the longer-term process of changing the problems of diet and lifestyle that really caused the trauma. Advocates of technological sustainability are correct to propose policy changes, particularly in the pricing of resources. And some technologies can improve the efficiency with which we use resources. Both can buy time. But time for what? This is a harder question about the fundamental direction of society, about the root causes of our problems, and about human potentials.

FRAGMENTS OF A STRATEGY

In thinking about strategies to reach a sustainable world we have three broad choices: relying on markets and economic self-interest; attempting to change values through education; and using public policy, government power, and regulation. Each of these offers important insights about how our society can ensure its survival.

Market Strategies

Adam Smith once described a strategy of change in these words:

> As every individual, therefore, endeavors as much as he can both to employ his capital in the support of domestic industry and so to direct that industry that its produce may be of the greatest value . . . he intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention. . . . By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it.[39]

As individuals pursue private interests they create wealth, part of which circulates in the larger society and becomes available for others. The advantages of these kinds of economic strategies are clear. They require no leap of consciousness, no Aquarian conspiracies, and no quick "paradigm shifts." They make no heroic assumptions about our moral possibilities. Does the same logic hold if sustainability, not economic expansion or private accumulation, is the goal? To what extent can rational economic self-interest be harnessed to control its earlier excesses?

Amory and Hunter Lovins maintain that there is a convergence between economically rational "least-cost" energy choices and longer term collective benefits. By purchasing the most efficient energy-consuming and energy-generating technologies, consumers and utilities can lower costs while conserving resources. It is cheaper and less risky to weatherize houses than it is to fight wars and to maintain a military presence in the Persian Gulf. Their research suggests that the same may hold true for other resources as well, such as water, food, and strategic minerals.

As a strategy of change, the least-cost approach promises five major benefits. First, it is aimed to take us as far down the road to greater energy and resource efficiency as possible. By all evidence this will be a long way. Second, by steadily wringing inefficiency out of the economy, the strategy buys us time that could be put to good use in rethinking long-term goals. Third, it harnesses the powerful engine of economic self-interest for the cause of lowering energy and resource use per dollar of GNP, and thereby it reduces environmental impacts. Fourth, by identifying win/win options, the strategy avoids unnecessary conflicts. Finally, the strategy avoids preaching altruism, which appeals only to a limited audience.

Since there can be no good case for waste, least-cost approaches to greater efficiency are, to a point, beyond reproach. But the driving force of rational self-interest also has built-in limitations. We have no choice but to be self-interested. Nevertheless, how people define their self-interest, or what economists call utility, is unclear. Utility is whatever people define as valuable. Even if we assume that people consistently seek out least-cost options, as theories of rational economic behavior predict, by definition they will not act if costs are high or rates of marginal return are low. The potential for good is limited to those cases where least-cost choices and ethics converge. But they may not converge as often as one might hope, and in some cases self-interested people might keep them from converging. Self-interested people will know that least cost is not the same as true cost. Food prices, for example, do not include the loss of topsoil, groundwater contamination, stream destruction, health costs to farmers and farm workers, or government subsidies for public water or transportation. Nor do we pay a depletion tax on nonrenewable resources or disposal costs for our trash and toxic wastes. If we did so, the true costs of many goods would be considerably higher. But our willingness to pay full costs, especially for no immediate gain, has very little to do with rational behavior as economists use the term, and has everything to do with ethical behavior that comes from a sense of responsibility and obligation. All of this underscores the persistent conflict between rationality applied to means (economics) and rationality applied to ends (ethics).

None of this is intended as an argument against economic rationality in the realm to which it legitimately applies. I would argue, however, that thoroughly rational economic behavior, which implies the willingness to analyze means *and* ends, ironically depends on an ethical perspective and a larger vision that transcends self-interest. Strategies that are based on the priority of economics over ethics will sooner or later founder on the shoals of human recalcitrance or technological malfeasance. When we have exhausted all those instances where ethics and economics converge and face more costly choices, it will matter a great deal whether or not we remember how to distinguish right from wrong and act accordingly.

Education as Strategy

Americans overwhelmingly agree that U.S. public education is a disaster, and many believe that higher education is not much better. It is probably true that we produce young adults who cannot read, write, or think. But there is a more serious

shortcoming — our rising rates of ecological illiteracy and incompetence with respect to natural systems. Most critics of education worry that poorly educated students will be unable to compete successfully with the Japanese. I worry about a new generation who will not know, or care to know, that they are only a "cog in an ecological mechanism," as Aldo Leopold put it, whose well-being is ultimately dependent on their stewardship of nature. Most students now leave twelve or sixteen years of formal education without any such comprehension, let alone the competence to act on it. And why should it be otherwise? Few public schools or institutions of higher education have asked what planetary "finiteness" has to do with the way they define and transmit knowledge. This may be because good answers to these questions would upset comfortable educational priorities and research agendas.

Education in the fullest sense of the word will aim higher and will seek to produce persons with good character, broad knowledge, and commitment. A fully educated person, in J. Glenn Gray's words, is one who has "grasped the simple fact that his [or her] self is fully implicated in those beings around him, human and non-human, and who has learned to care deeply about them."[40] If we are to understand our implicatedness, as Gray argues, we must recognize that *all education is environmental education.* By what is included or excluded, emphasized or ignored, we teach that we are either a part of the larger fabric of life, or apart from it. We inculcate either attitudes of care and competence toward natural systems, or attitudes of carelessness and dependence. Above all, we teach that the experience of the natural world is an important element of good thinking in a world governed by the laws of ecology and thermodynamics, or we perpetuate the illusion that we alone stand above the laws of nature.

Comprehending the challenges of sustainability and peace cannot be done from the vantage point of any one academic discipline. It requires the broader perspectives of the liberal arts, including biology, physics, history, philosophy, religion, sociology, economics, and politics. Analysis of the vital signs of ecosystems or of world peace will require knowledge of mathematics, statistics, and computers. But art, poetry, literature, and music are elementary to the sense of humane celebration that will undergird a more life-centered culture. These disciplines need to be integrated in a way that overcomes disciplinary narrowness.[41] Whether through interdisciplinary courses or an integrated core curriculum, the goal should be the same — the development of young minds capable of thinking across artificial academic boundaries.

Beyond the linking of disciplines, a deeper connection must be made between practical experience and intellectual development. Gray argues for the inclusion of manual skills as a part of liberal education: "For unless the educated man learns to use his hands, unless he acquires the feel of an instrument exquisitely fitted for its function, he runs a danger of missing a whole area of his relation to the world." Liberal education, Gray writes, "can be pursued in the kitchen, the workshop, on the ranch or farm, in the casual acquaintanceships of every day as from the rarer friendships where we learn wholeness in response to others."[42] Alfred North Whitehead argued more explicitly that the relationship between good thinking and direct experience is "intimate and reciprocal." The lack of "productive activities," in his view, explains the "mediocrity" of the academy. What passes for higher learning has become more and more abstract, separating us from the natural and human environments. The danger is that we confuse abstractions with reality, committing what Whitehead called the "fallacy of misplaced concreteness."[43] Having done so we can only act simple-mindedly within complex systems with predictably disruptive results. Liberal education that includes carefully crafted experience is an antidote to the perils of specialization and excessive abstraction, and provides an essential foundation for a democratic citizenry.

Most colleges and universities, however, are designed to prevent ordinary experience from intruding into the educational process. As John Dewey once put it, "The school has been so set apart, so isolated from the ordinary conditions and motives of life that [it] is the one place in the world where it is most difficult to get experience — the mother of all discipline worth the name."[44] Dewey proposed developing the school and the local community as laboratories for education. To the extent that this can be done, a curriculum ceases to be abstract and distant. With few exceptions these proposals have been ignored. But from the perspective of sustainability, one can see that these ideas not only have educational merit but also offer a way for educational institutions to become leverage points for change.

One common criticism of using education as part of a political strategy is that the payoff is so far in the future. This year's graduate will not be in a position of responsibility to effect change for one or two decades, if then. This criticism, however, ignores the role of students in recent history, from the Vietnam protest movement to Tiananmen Square. The young have always been a potent source of change. The environmental movement and the peace movement have been largely built by persons in their twenties, who did not know that they lacked influence. They simply rolled up their sleeves and went to work.

If, as H.G. Wells once said, "we are in a race between education and catastrophe," then catastrophe is all but certain. Education has not yet come to the starting gate. The word *excellence* which administrators sprinkle through their university catalogues has become a buzzword denoting more of the same — high-tech research, computers in every nook and cranny, bioengineering, and big science. If we take human survival seriously, however, true excellence would lead to a more life-centered curriculum.

Politics and Change

The prospects for sustainability ultimately rest on political decisions about who eats and who goes hungry, who owns and who rents, who flies and who takes the bus. The politics of sustainability have to do with the siting of strip mines, power plants, and dumps — things no one wants. The politics of sustainability are about issues of fairness, risk, human rights, animal rights, and ecological rights. They are about how much we take from our descendants and what we leave behind. We need to create a politics of the earth to protect the biosphere, and we need to reinvent politics at the ecosystem level. Without pressure from an engaged citizenry, governments are too willing to settle for symbolic action that appears to solve problems while never doing so. And without competent citizens rooted in a place and willing to fight for it, "environmental protection" will come to mean trade-offs determined by experts and unaccountable elites. There is no reason to believe that any such nation, or world, would be either sustainable or democratic.

Paradoxically, Americans take environmental issues more seriously in 1990 than they did in 1970 or 1980, but they have not yet translated this interest into national political campaigns. Why? One answer is that these issues are complex and long term, while politics is about short-term issues like jobs and crime. Politicians who talk about complex issues and difficult choices do not win elections, or so we are told. Issues of environment and sustainability entail a radical critique of industrial societies, but Americans are conservative and pragmatic. In the words of Walter Truett Anderson:

> The whole style of American politics is nonecological. Ecology is a comprehension of systems, interdependencies, webs of relationship, connections extending over space and time—and the very essence of our politics is to zero in on single causes.[45]

In other words, the environment has not yet been incorporated into our political theories, political institutions, political language, and political symbols. To do so raises fundamental questions about power, economics, and citizen participation.

The first task of political reconstruction is to rediscover the proper role for various levels of government. National governments are too small to deal with pressing global issues of planetary warming, ozone depletion, rain-forest protection, and biological diversity. For these we need global institutions. Yet national governments are often too large and cumbersome to handle most other problems effectively.

Beyond the issues of appropriate size and authority of government institutions, beliefs about the causes of our problems and their solutions differ. Robert Heilbroner and E.F. Schumacher could both agree that the ecological crisis is real while reaching opposite conclusions about the appropriate degree of centralization. For Heilbroner, "the centralization of power [is] the only means by which our threatened and dangerous civilization can make way for its successor."[46] William Ophuls cautions that "ecological scarcity" will create "overwhelming pressures toward political systems that are frankly authoritarian."[47] Garrett Hardin finds no solution other than "mutual coercion mutually agreed upon." Each assumes that the crisis can be managed only by the total centralization of government power. This is not a conclusion disagreeable to men of opposite bent like nuclear physicist Alvin Weinberg, who once proposed a "Faustian bargain" between scientists and society to "solve" the energy crisis.

Beneath such proposals are unstated beliefs about the causes of the crisis and about the capabilities of large institutions. From very different perspectives, Heilbroner, Weinberg, and others believe that an authoritarian state can manage nature and uphold its end of the Faustian bargain, while coping in perpetuity with its own increased size and complexity. This position, however, is not well supported by what we know about governments and large organizations.

Decentralists have a different response. They begin with the belief that the centralization of power is a cause of the earth's ecological crisis, not its cure. Once power is centralized, it is difficult to hold it accountable. Hence the transfer of power, authority, resources, talent, and capital from the countryside, neighborhoods, and communities to cities, corporations, and national governments have undermined responsibility, care, thrift, and social cohesion — qualities essential to sustainability. In contrast to Heilbroner and others, decentralists assume that people, given the chance, are capable of disciplined self-government. Democracy in this view has not failed; it has not been tried.

The reinvention of politics at the ecosystem level first requires clarity about what should be done locally and what should be done at higher levels, and why. In the transition to sustainability, the federal government must correct market distortions that undervalue biotic resources, ensure equity, establish environmental standards, disseminate information, and establish global environmental institutions. But many other essential aspects of society ought to be decentralized to increase social resilience, minimize environmental impacts, and achieve true economies of scale. Among these we can list agriculture, energy systems, property ownership, wealth, some aspects of governance, and certain technologies. Practically, this means ending subsidies and preferred tax treatment for agribusiness, large corporate enterprises, energy companies, utilities, and land speculators. On the other side, local communities, small towns, and neighborhoods that have suffered from decades of neglect must be rebuilt.

The reinvention of politics at the ecosystem level also requires the revitaliza-

tion of regional economies that serve the interests of communities. This may require a community to disengage selectively from the global economy and to integrate carefully its own economy, culture, educational system, and institutions of governance with the ecology of the region. Another name for this process is bioregionalism. But bioregionalism is also a political strategy. In Kirkpatrick Sale's words:

> [Bioregionalism] asks nothing of the Federal government, and needs no national legislation, no government regulation, no Presidential dispensation . . . only Federal obliviousness to permit it. . . . [N]or does bioregionalism envision a takeover of the national government or a vast rearrangement of the national machinery . . . the task after all is to build power at the bottom not to take it from the top.[48]

This strategy has its roots in the nineteenth-century anarchism of Peter Kropotkin, and more recently in the thinking of Lewis Mumford, who concluded his magnum opus with the proposal that we withdraw from organized power to "quietly paralyze it."

In recent years there has been a proliferation of ideas in alternative economics, including the writings of Herman Daly and Hazel Henderson, the papers delivered at the Alternative Economic Summit, the works brought together by Paul Ekins, and the articles published in the *Human Economy Newsletter*. We are not without good ideas and workable bioregional alternatives to the economics of unlimited growth. In different ways, these authors propose to reward good work, provide basic needs for everyone, conserve biotic resources, expand barter and gift relationships, retain wealth in the community, subordinate economic to social relationships, and strengthen local cultures.

The emergence of bioregionalism also will require the development of different forms of technology. These have been characterized over the years by terms such as "convivial," "alternative," "appropriate," and "soft." They are generally small in scale, based on renewable energy, relatively inexpensive, widely dispersed, locally owned and controlled, and environmentally benign. The discussion of alternative technology, pro and con, has tended to focus too much on tools and too little on bioregionally appropriate designs and procedures that reduce the need for expensive and destructive technologies. Pliny Fiske in Austin, Texas, has developed a catalogue of cost-competitive materials available in each bioregion such as caliche and mesquite.[49] Similar inventories need to be done elsewhere to discourage the import of expensive, environmentally damaging materials. Similarly, the work of Chris Maser, Alan Savory, and Wes Jackson points to methods of forestry, land management, and agriculture adapted to specific bioregions and microregions that minimize the need for technology.[50] And Gary Nabhan's studies of the Papago Indians of the Southwest reveal elegant possibilities for weaving local culture and ecologies together in the sparest environment.[51]

The transition to a sustainable world also will require the revitalization of the practice of citizenship. Benjamin Barber's proposals for creating "strong democracy"[52] are relevant here—they are roughly equivalent to rebuilding the crumbling foundation before trying to remodel the house. Despite our rhetoric about democracy, real democratic participation is declining. Whether from apathy or disgust, half of the eligible population in the United States does not vote. Opportunities for participation have declined with the rise of the mega-corporation and public bureaucracies. People are losing control over the basic conditions of their lives. What Tocqueville regarded as the seedbed of democracy, the civic association, the small town, the neighborhood, is in disarray. In John Dewey's words, "democracy must begin at home, and home is the neighborly community."[53] Restoration of the civic tradition depends on our ability to "rise above the language of individualism" to sustain a political conversation on the important issues of our time. The language of individualism, which is mainly about consumption and private interests, must give way to a renewed civic discourse on the responsible use of shared power.

Politics is the process by which we define the terms of our collective existence. Democratic politics is grounded in the faith that everyone is entitled to a voice, and that no one, whether by circumstances of wealth or of birth, is entitled to more. Representative democracy is an uneasy compromise between democracy and demography, with a touch of fear about mob rule. Strong democracy is premised on the belief that people can and do act responsibly given the opportunity, and that those opportunities can be nurtured in a mass society. Barber proposes twelve steps toward this end, including a national system of neighborhood assemblies, a civic communications cooperative, a national initiative and referendum process, electronic balloting, a lottery for local offices, universal citizens service, workplace democracy, and a new architecture of civic space.[54] He argues that strong democracy is the "only legitimate form of politics [and] constitutes the condition for the survival of all that is most dear to us."[55] To this I would add that strong democracy or some comparable program of civic renewal is a prerequisite for sustainability and real security as well.

Significant mischief in human affairs most often begins behind closed doors, and concentrated power enables a few to close doors to everyone else. The usual arguments for oligarchy of any kind rest on the premise that the public is incompetent to decide matters of public concern. Behind Oliver North's efforts to "create democracy" in Nicaragua was the belief that democracy does not work here and therefore must be subverted by whatever means necessary. The case for technocracy is similar. Issues, we are told, are so complex that only experts can make intelligent choices. In the full light of day, such arguments can be seen for what

they are: self-serving chicanery by people who have little or no sense of the public interest, little understanding of the democratic process, and a great deal to gain by remaining aloof from both.

The steady erosion of democratic participation also affects the prospects for sustainability and, I think, for peace. Centralization of power has removed many resource decisions from the public arena. Disposition of large tracts of land and resources, including the use of common properties like air and water, are made as if they were private decisions with wholly private consequences. The concentration of power has led to the development of the technology necessary for large-scale resource manipulation and extraction—machinery that can level mountains, divert rivers, split atoms, and alter genes.

The crisis of sustainability has resulted largely from centralized power being exercised without effective public regulation, citizen complaints, or private morality. These constraints were eroded as the independent shopkeeper, the family farmer, and the small businessman became employees in enterprises over which they had no control. If dependence begets venality, as Jefferson once said, it also leads to demoralization and passivity in the face of wrongs. But frequently these wrongs occur incrementally in quiet crises and in remote areas where few can see what is happening. In either case the institutions, attitudes, and independence necessary to resist are weakened at the source. Orwellian nightmares are no longer idle fantasies in a world of genetic engineering, computers, fusion reactors, and star-wars technologies. Can anyone believe that sustainability will be taken seriously by persons so single-mindedly captivated by Faustian ideas of progress?

Civic renewal begins with the dispersion of power and the extension of the range of civic responsibilities decided by those affected. Participation is a way to acknowledge those effects and to elevate public discourse. In Jefferson's words, there is "no safe depository of the ultimate powers of the society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them, but to inform their discretion."[56] Informed public involvement is also a way to develop more prudent policy choices. Where an active citizenry is involved, we may expect greater equity in the distribution of costs and benefits. We might also expect their vigilance to counter elite interests. As Tocqueville, Dewey, and others have noted, civic education can only occur though participation in the neighborhood, community, and workplace. Civic education for the sustainable management of food, energy, water, materials, and waste can only occur if people have a part in these decisions and understand their consequences.

Strong democracy and civic renewal are necessary conditions for sustainability, but there is still a need for transformative leadership at all levels. The rebirth of environmental awareness across the planet has occurred without significant political leadership. Great figures capable of defining, clarifying, and motivating people toward a sustainable future have yet to appear at the national level. But they are beginning to appear at state, local, and neighborhood levels. Transformative leadership must first articulate what people feel in their bones and then translate this into a coherent agenda of reform.

PRINCIPLES FOR REAL SECURITY

The primary threats to human well-being increasingly come directly or indirectly from ecological malfeasance: overpopulation, pollution, energy inefficiency, species extinction, and industrial accidents. The best steps any nation can take to ensure its security are those leading toward the protection of biological diversity and the sustainable management of resources. The measures of sustainability may be more difficult to calculate than those of military power or economic growth, but they are the best indicators of national viability in the twenty-first century. Sustainable resource management and sound environmental policies promote security by reducing vulnerability to sudden change, lowering dependence on critical materials, increasing competitiveness, promoting social and political stability, safeguarding public health, and reducing risks of technological accidents. A society in the throes of overshoot, having exhausted its natural endowment, will be vulnerable to internal disruption and external intervention. Its leaders will be tempted to spend biological capital and incur risks that they otherwise would prefer to avoid. At some point such a society will simply cease to be a civilized and responsible member of the world community. Three principles can serve as guidelines against such outcomes — ecological responsibility, justice, and decentralized democracy.

Ecological Responsibility

In the course of recent history, equal rights have gradually been given to minorities, women, and children. These rights now should be extended to future generations, to other life forms, to natural systems, and to the earth itself. Doing so would acknowledge that our well-being is bound to that of an entire community of life and that a society lacking the wisdom to protect the interests of its children or those of its natural systems cannot in the end protect any of its own interests. This recognition of ecological interdependence should affect every transaction between humans and the natural world.

Being responsible ecologically also carries with it the possibility of learning from nature. Ecosystems provide the best model we have of systems capable of withstanding stress. They are decentralized; they have back-up systems, redun-

dancy, and multiple pathways; and parts can fail without jeopardizing the whole. Resilient societies should mimic these attributes by having a dispersed structure with linkages that are numerous, short, loosely coupled, and simply designed.

Justice

Justice is a prerequisite for sustainability, particularly redistribution of wealth. In 1800 the ratio of per-capita income between the richest and poorest nations was three to one. At present this ratio is roughly 25 to one. Even in the United States the gap is widening. In 1975 the wealthiest one percent controlled 17 percent of the nation's wealth, but by 1985 the figure had grown to 35 percent. In the years between 1979 and 1987 the average income of the poorest fifth of the population declined by 6.1 percent while that of the top fifth rose by 11.1 percent.[57] Extreme income inequality diminishes the prospects for sustainability not only by weakening democracy but also by undermining civic competence, social morale, and local economies, each of which is integral to social stability and social longevity. The challenge of building secure and sustainable societies will require limits on inequity within and among societies.

Sustainable development must begin in the developed world. No amount of exhortation will convince Third World leaders to change until economic priorities in the First World reflect a similar commitment. Economic development is driven as much by comparison as by logic. Until sustainable development is no longer thought of as second-class development, it will not be widely accepted. But there are other reasons for First World action as well. The developed world is the major source of toxins, carbon dioxide, CFCs, acid rain, and radioactive waste. It is also the main source of economic pressure on Third World ecosystems. It extracts timber from rainforests, minerals from Africa, soybeans from Brazil, livestock from Central America. "The impacts of rich countries are so great," in the words of Paul and Anne Ehrlich, "that these nations should be called not developed, but overdeveloped."[58] Until this pressure is reduced, the devastation of the biosphere will continue.

Democracy and Decentralization

In the long sweep of history, democracy appears to be an artifact of abundance. Its emergence in Europe coincided with the growth of national economies and the discovery of a New World with vast new resources and land. Some believe that the long shadow of resource shortages may now force its contraction. Robert Heilbroner, for example, has written that "passage through the gauntlet ahead may be possible only under governments capable of rallying obedience far more effectively than would be possible in a democratic setting."[59] The problem, however, does not lie in the excesses of democracy but in its anemia. We suffer not from too much democracy but from too little. The environmental movement, for example, has been largely created by citizens opposing the abuse of power by various government agencies: the Corps of Engineers, Department of Interior, Bureau of Reclamation, Forest Service, Park Service, Department of Energy, Department of Defense, Department of Commerce, and even the Environmental Protection Agency. Without the freedoms of press, speech, and protest, and without the right to "vote the scoundrels out," the environment would have no effective protectors whatsoever. The same is true in Europe and now in the Soviet Union. An informed and active citizenry is always the best protector of nature.

GLOBAL POLICIES FOR REAL SECURITY

Six actions are called for immediately if we are to secure the sustainability of our nation and of our world. The first is to extend the Montreal Protocol on CFCs to a total worldwide ban on their manufacture and use.

A second policy challenge is posed by the trillion-dollar Third World debt, most of which cannot be repaid. Attempts to collect the debt will exact an increasingly serious environmental toll through the exhaustion of Third World timber, minerals, and food resources. Third World nations now pay $43 billion more in debt service than they receive in foreign assistance.[60] To meet their debt payments, many countries are now forced to trade future biological productivity and ecological stability, and nearly all find themselves unable to meet basic human needs. This is a set of choices that no government should have to face. Debt forgiveness will be far cheaper than the alternative political and ecological consequences.

Third, governments must address the threat of global warming. The Prime Minister of Norway has proposed the creation of a world atmosphere fund that would collect tax revenues from the use of fossil fuels and provide assistance with energy efficiency to poor countries. But carbon-dioxide emissions represent only half of the problem. The other half is caused by deforestation and the release of other heat-trapping gases such as methane, halons, and CFCs. In addition to a marked increase in energy efficiency worldwide, the manufacture of other greenhouse gases must be curtailed, and carbon must be trapped through reforestation and better agricultural methods. The Worldwatch Institute recommends the reforestation of 130 million hectares in the Third World and another 40 million in the industrial countries in order to reduce carbon-dioxide emissions by a quarter.[61]

A fourth global priority is to stabilize population growth as rapidly as possible. This means much greater funding for the United Nations Population Fund and for

the International Planned Parenthood Federation. It also means a shift in the established policies of the Catholic Church that prohibit the use of birth control. And it means long-term plans to reduce the global population to a level that can be sustained in dignity. Population in the 1990s will increase by 90 million. In fact, the United Nations' population estimates were revised upward in the spring of 1989 to reflect new information about fertility rates, which have not dropped as rapidly as expected. In the meantime, soil-erosion rates worldwide are estimated to be 24 billion tons per year. The gap between these two curves, population demand and food supply, will grow in severity in coming decades at the same time as warming and ozone depletion reduce crop productivity.

A fifth priority is to preserve rain forests and biological diversity. At present rates we will have driven 15 to 20 percent of the life forms now living into extinction by the end of the century, a rate 10,000 times higher than "normal." We are in the midst of a biological holocaust, the vast extermination of irreplaceable life forms on the planet. The best way to preserve biological diversity is to preserve habitat, which also would slow rates of global warming and protect indigenous populations.

A final policy priority involves the creation of institutions that can protect the global commons: the atmosphere, the oceans, and critical habitats. The U.N. Trusteeship Council could become an environmental security council, assisted by a greatly expanded U.N. Environmental Program. With increased power, international institutions could restrict the power of national governments to make unilateral decisions that affect the global environment. The process of building international institutions to protect planetary commons will require the kind of vision and statesmanship that was necessary to meld thirteen independent states into a nation between 1776 and 1789.

U.S. POLICY CHANGES

Since the United States is the largest source of CFCs, carbon dioxide, solid waste, toxins, nitric oxides, and sulfur oxides, and has one of the least energy-efficient industrial economies, we are a large part of the problem. But our culpability also underscores how much we can do to facilitate a global transition to sustainability.

The keystone for this transition is an energy policy that maximizes efficiency through higher prices for fossil fuels. This would reduce emissions of carbon, sulfur, and nitrogen that cause global warming and acid rain; lower the nation's dependence on foreign oil suppliers; reduce the environmental costs of mining, transportation, and processing of fossil fuels; shrink the annual $400 billion bill we pay for energy; and raise the competitiveness of U.S. businesses, which now begin with a 5 percent cost disadvantage vis-a-vis Japanese companies because the latter are more energy efficient.

The potential for conservation is enormous. A 1986 Department of Energy study showed that existing technologies could reduce energy expenditures by half, saving $200 billion. We lose as much energy through our windows as flows through the Alaskan Pipeline. Refrigerators can be designed to use one-quarter the energy of current models. Efficient electric motors use forty percent less electricity then conventional ones. A compact flourescent light bulb is now available that uses thirteen watts to provide the same light as a sixty-watt incandescent bulb — and it can keep four-hundred pounds of carbon dioxide out of the atmosphere over its expected lifetime. Existing technology can reduce energy for commercial lighting by 75 percent. Present least-cost energy options applied worldwide in the transportation, residential, industrial, and commercial sectors between 1990 and 2010 could reduce carbon-dioxide emissions by three billion tons per year. No other policy can deliver so much or solve so many problems at once.

Can we afford energy efficiency? Data from a variety of sources indicate that the front-end costs of purchasing and installing most efficiency measures have remarkably short pay-back times. Their life-cycle costs are considerably lower than those of inefficient technologies. For example, one efficient light bulb will burn ten-thousand hours and use 160 kilowatt hours (kwh) of electricity. At New York City electric rates, 14 cents per kwh, the total cost for the bulb and its electricity comes to $39. Using incandescent lighting with lower costs, less efficiency, and lower life span to produce the same amount of light costs $94. Improvements in electrical efficiency average about two cents per kwh, while existing electric rates nationwide average 7.8 cents per kwh and the real costs of new electricity are considerably more. The same pattern holds for efficiency improvements across the range of fuels and uses. It is cheaper by far to improve efficiency than to increase supply.

The United States now uses more oil for transportation than we produce. New regulations will raise standards for efficiency to 27.5 miles per gallon (mpg), but experimental vehicles now get between 90 and 114 mpg. Simply raising the standard to 35 mpg would save 660,000 barrels of oil per day; over a thirty year period it would save as much as a 7.8-billion-barrel oil field. The policy measures that will move us toward fuel efficiency include both higher standards for auto efficiency and higher gasoline taxes. Before the Gulf War, U.S. consumers paid an average of 92 cents a gallon, while the Japanese paid $2.89, the French $2.95, and the West Germans $2.09. Higher gasoline prices would spur energy efficiency, improve our balance of payments, lower crop damage caused by ground-level ozone, and reduce air pollution, acid rain, and carbon-dioxide emissions.

If the government is to create a sustainable economy, it must correct market

distortions to ensure that "prices tell the truth" about long-term scarcity and environmental costs. Markets frequently give misleading signals because subsidies and external costs are not counted, because oligopolies can fix prices, and because prices cannot always reflect future scarcity. Given more accurate prices, the market can be an efficient allocator of scarce resources. The government must ensure that prices in a sustainable economy reflect the real costs of consumption and production.

Full-cost pricing would leave the market substantially intact but also would include severance taxes on nonrenewable fuels to capture their environmental and social costs, as well as disposal taxes to meet real costs of cleanup. Such taxes must be high enough to encourage conservation and gradual enough to permit an orderly transition to renewable resources. Revenues from these taxes should be used to offset the costs of research on alternatives and to cushion the effects on low-income citizens. Consumers would make whatever decisions about energy use they wanted and could afford, but at least prices would reflect real costs. Sustainability requires a more accurate accounting that includes loss of natural and biotic capital and a system of price and tax incentives for their conservation and regeneration. It must reward good farming, good land husbandry, and good forestry; and it must penalize those who choose to waste precious resources.

Current forest policy provides one of the clearest examples of poor resource accounting. In Alaska's Tongass Forest, the U.S. Forest Service sells five-hundred year-old trees to the Japanese for pulpwood for "the price of a cheeseburger."[62] On the open market the same tree would command a price of $300. In some years the Forest Service has lost 98 cents for every dollar spent on timber sales in the region. Annual Forest Service subsidies run $40 million, but only a fraction of that amount returns to benefit local economies. This pattern is repeated throughout the 180 million acres of forest in the custody of the Forest Service, which now believes its business to harvest trees like corn.

The same pattern is evident elsewhere. According to Robert Repetto, the government has "typically sold off timber too cheaply" for "purposes that are intrinsically uneconomic."[63] Charles Peters of the Institute of Economic Botany has estimated that tropical rain forests are twice as valuable for providing fruits and latex as for supplying lumber.[64] The real value of forests, however, includes ecological and social values as well. Present methods of accounting do not include these values; rather they acknowledge only the short-term benefits of unsustainable practices.

The flow of materials in our society can be reduced by increasing product durability and giving priority to essential needs. In a 1977 study of the economies of developed countries, Dag Poleszynski estimated that 87 percent of energy consumed went into "less essential production." By this he meant the weapons, food-processing, packaging, cosmetics, and fashion industries. To these I would add political polling, advertising, and pet psychologists. Economists often defend the production of junk because it creates jobs and adds to the GNP, but a sustainable and humane economy will provide adequate work in the production of durable, useful, and high-quality products.

Finally, sustainability requires accountability. There is a long-standing pattern of the federal government providing subsidies for economic turkeys: for nuclear power instead of conservation and renewables; for virgin materials instead of recycled materials; for agribusiness instead of owner-operated family farms; for automobiles instead of trains, bicycles, and public transport. This pattern stems from the proximity of power and money to government officials. For the transition to sustainability, politicians must be held accountable. We must separate money from politics by publicly financing all federal and statewide elections and by outlawing all private contributions.

While we send young offenders to the penitentiary for vandalism, we do no such thing to the president of Exxon for having vandalized Prince William Sound and destroyed the livelihood of thousands of local people. The story is repeated hundreds of times daily. Heads of corporations guilty of environmental dereliction do not, as a rule, go to prison or even appear in court, while minor offenders are packed off in droves. This creates both disrespect for the law and great comfort to those who do not wish to be made accountable. Full accountability means that companies should have to pay the full costs of environmental restoration following damage of whatever sort.

Citizen action in the transition to sustainability will require right-to-know laws such as the Federal Community Right to Know Act, which requires manufacturers to detail chemical emissions. A similar bill, Proposition 65 in California, now requires companies to prove that their products are safe and to post warnings where such proof cannot be given. The Canadian government labels products that meet rigorous environmental standards. These measures enable an informed citizenry to use its buying power to reward and penalize companies on the basis of more complete information than is now available.

CONCLUSION

The recent conflict with Iraq illustrates the new security equation. First, traditional threats to security continue to exist in some parts of the world. Saddam Hussein is not likely to be the last to attempt conquest, although his humiliation may deter others for a time. Second, the factor which made Kuwait a tempting target for Hussein is oil and the dependence of industrial nations on it. Until that dependence is reduced through energy efficiency and renewable energy resources,

the potential for trouble of one sort or another will grow. Third, even though Iraq was defeated, it was able to exact sizeable costs on its neighbors by releasing massive amounts of oil into the Persian Gulf and igniting oil wells that will burn an estimated ten-to-twenty percent of Kuwait's proven reserves. The effects on human health of those living downwind of these fires will be severe, and acid fallout hundreds of miles away will exact a long-term cost on forests and agricultural productivity. The combustion of an estimated 4.5 to five million barrels of oil per day may add a quarter of a billion tons of carbon dioxide per year to the atmosphere and speed the pace of global warming.[65]

When the euphoria over the war fades, as it will, a more sober analysis of the costs and benefits of the war will reveal several truths. This was a war over energy. If we are ever to halt global warming and insulate national security from sudden oil cutoffs, we must wean ourselves away from oil. But we are not yet in the mood to study the ironies of victory. While the Administration fought the war with dispatch, it has felt no comparable sense of urgency to fight for energy efficiency or the transition to a less destructive energy system. It will also soon become apparent that the ecological effects of the war are severe and long-term. While Hussein's troops were forced out of Kuwait quickly, the effects of his occupation will last for years, perhaps even decades. This is the yardstick which should be used to judge whether sanctions would have "worked." Patience and intelligent resolve — without violence — might have accomplished better results at a far lower cost.

What can be said for certain is that the war diverted our attention from problems which, in the broad scope of things, are far more important. I am referring to the growing burden of the national debt, crumbling infrastructure, decaying cities, poor schools, homelessness, poverty, crime, environmental deterioration, and climate change. The war, we are told, made us proud to be Americans again. This is false pride, purchased on the cheap without our having solved any of the major challenges before us. Sooner or later, we will have to address the use and misuse of the earth's air, water, soils, forests, minerals, and life forms. Until these realities become the keystone of national policies, real security will continue to elude us.

NOTES

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8708 NE. 20th St.
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