Culture and Our Environmental Plight

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People cannot live without changing the natural world around them. But how much natural change is appropriate, and when have our changes gone too far? The questions are elementary and yet we have trouble making sense of them. Is the Earth a vast storehouse of commodities, limited in productivity only by our ingenuity in tapping it? Or is it a fragile ecological fabric, frayed and wearing thin in too many places? The facts seem to point in differing directions and interpretations vary widely. Food production is at an all-time high and mineral prices remain low. Meanwhile, wild species are disappearing, water tables are declining, and climate change is upon us. So where do things stand? Will science and the market yield ever-greater flows of resources for us to enjoy, substituting a new resource whenever an old one runs out? Or have we reached or even exceeded the Earth’s limits, cutting into the planet’s principal rather than living off the interest?

Five Points

To address these questions we need to move slowly. Good facts are essential. But facts supply answers only when placed into an interpretive framework. It is the framework that has proved elusive. We can begin with five foundational points.

First, while we often speak of our “environmental problems” this phrasing miscasts the on-going drama. There is really nothing wrong with our natural home; the Earth is no second-rate planet, ready for trade-in on a better model. Instead, our difficulties have to do with the ways we live on the planet.

Second, how we live on Earth has to do with our numbers and (even more) our cultures. Technology and the market are also key determinants, but they are complexly mixed with culture and are embodiments of it. Necessarily, our environmental problems are rooted in our cultures—our values, perceptions, social orders, and hopes.

To evaluate how well we are living on land, distinguishing good ways of
living from bad ones, we require a baseline of acceptable or good land use. This third point is fundamental and, once stated, self-evident. Yet it is easily overlooked. Somehow, we need to draw lines between the many good changes we make to nature and the bad ones. Until we have a normative standard for telling land use from land abuse our masses of facts simply float in the air, yielding confusion rather than clarity.

Good land use—using “land” here in its fullest ecological sense, as an integrated system of rocks, soils, waters, plants, and animals—is a complex idea. Good land use (the fourth point) should satisfy basic human needs for food, shelter, clothing, and fuel. It would provide pleasing, healthy homes and places for social interaction and recreation. Beyond these factors—all relating to the aggregate welfare of people living today—good land use would show concern for future generations and other life forms while fulfilling our ethical and religious aspirations. In the view of many people, land use is good only when it leaves the land healthy and productive for future generations. It is good only when we take pains to protect all species of life. Perhaps (as some believe) we bear religious duties to tend carefully a planet that was manifestly not made by us. Perhaps (others say) the virtuous life is one that refrains from creating ugliness or inflicting unnecessary pain anywhere. In any event, the relevant considerations are many. Good land use would take them all into account. Also important to good land use are issues of social justice and equity; to the distribution of environmental “bads” (toxic pollution and human-caused flooding, for instance) and to environmental “goods” (clean water, nearby food sources, pleasing recreational places).

Fifth and finally, we cannot fairly assess our environmental predicament without immediately running into our ignorance about nature and how it functions. Despite our research efforts (which are less extensive than they should be), there is a great deal about nature we do not understand. Indeed, the more we learn the more we recognize how little we really know. Even a single human action can trigger ecological ripple effects that become impossible to trace—as when a landowner turns a mixed-species forest into a pine plantation, effecting the entire community of resident life. Routinely we introduce new chemicals into the environment or shift life forms from place to place with little thought to natural consequences. Some gambles, surely, we should not be taking, at least without greater caution and study.
Our Confused Cultural Frames

These last two points—about good land use and human ignorance—are particularly helpful in cutting through today’s clashing rhetoric on environmental issues. Differing views about our environmental plight inevitably make selective use of available facts and statistics: On this issue as on others, carefully picked facts can support a variety of stories. (For instance, in judging the cornbelt of the U.S. Midwest do we look only at the high yields of corn and soybeans or do we pay attention also to silted rivers, fertilizer runoff, and radical declines of many farmland wild species?) Yet today’s rhetorical divide has even more to do with our widely varied assumptions about good land use and about the morality of charging ahead in nature without knowing what we are doing. We disagree less on the facts, that is, than on how we should interpret them. Wild fish stocks have plummeted while aquaculture is booming: these facts are undisputed. But what should we make of them? Are we living well in nature so long as fish is on the table, regardless where it comes from, how it is produced, and who can afford it? Are we, instead, living badly because declining fish stocks have unleashed vast, unknown ecological changes through whole oceans? Do we applaud coastal landowners who cut down mangroves and put in shrimp farms, thereby increasing shrimp production, or do we lament the fact that floods will now cause more damage?

Our answers to such questions vary because we approach them from such different perspectives. Is nature best understood, as some think, as flows of timber, grass, water and other distinct resources that humans need and want? Is it better understood in terms of its ecological functioning (e.g., naturally flowing river systems) and its long-term ability to sustain life? Or should we broaden our assessment even further, taking into account ethical, aesthetic, and social-justice factors and paying special attention to the land’s ability to sustain future generations and rare species?
Where We Stand

When we do take a broad view of things, as serious students of our predicament are increasingly inclined to do, the facts we now possess recount a somber story. Many of the relevant facts are summarized in a multi-volume report prepared by an international team of scholars at the instigation of the United Nations. Entitled the Millennium Ecosystem Assessment and published between 2003 and 2006, the report provides our best look yet at how human activities are changing the composition and functioning of the Earth's basic systems. One need not dig deeply into these volumes (and into similar, less ambitious productions by other groups) to find disturbing conclusions. In ecological terms our planet is in declining condition. We are pressing it ever harder, year by year, and with no end in sight. Consider the following observations:

—According to the U.N. scientific team, the Earth is best evaluated as a collection of integrated ecological “services” that people get from nature (e.g., providing water and fuel, regulating climate and disease, waste treatment and water purification, controlling pests, meeting spiritual and religious needs). Well over half of these ecosystem services are declining or being used unsustainably. The situation is even bleaker when we set aside the specific ecological measures that gauge what we extract from nature (the only measures that are rising) and focus solely on those measures that evaluate nature directly, as a functioning whole. According to the report, ecological declines are “large and growing.” And they are expected to grow “significantly worse” over the next half century absent major social changes that are not now taking place. Ominously, many ill effects of misusing nature can take decades or generations to show. We have yet to see the full effects of the changes we have already made, particularly our disruptions of wildlife habitat and natural cycles for renewing soil fertility. In addition, evidence is mounting that nature's ecological adjustments are not always gradual and incremental; they can be nonlinear and even abrupt, with ecosystems suddenly shifting to lower levels of productivity (as, for instance, when an algae bloom in an estuary suddenly kills nearly all animal life or when deforestation reduces rainfall which in turn leads to a nonlinear loss of forest cover).

—Marine fisheries present an especially stark case. In many sea areas fish
available for harvest are less than one tenth of what they were before industrial fishing began. According to one estimate, 90% of the total weight of large ocean predators (tuna, swordfish, sharks) has disappeared. (In inland waterways, large predator fish have often become unsafe to eat because they concentrate heavy metals, many coming from human fossil-fuel combustion.)

—Some 40% (and rising) of global agricultural lands are degraded by erosion, salinization, soil compaction, nutrient depletion, pollution, and urbanization. In Africa, erosion has caused substantially reduced crop yields.

—Human-caused climate change, already begun, poses “the greatest potential to alter the natural infrastructure of Earth.” Climate change increases flooding, droughts, erosion, landslides, and storms while significantly disrupting natural communities. During the final decades of the twentieth century roughly 20% of the world’s coral reefs were lost and an additional 20% degraded through modest rises in sea temperatures combined with nutrient pollution and overfishing.

—On-going species losses are estimated at approximately 1,000 times higher than the rate at which extinction would occur without human involvement. We should anticipate, the U.N. report predicts, a 10-fold increase in the rate in coming decades. Approximately 12% of all birds, 25% of mammals, and at least 32% of amphibians are threatened with extinction over the next century. Should they disappear, far-reaching, unpredictable changes would occur in the planet’s functioning. A major source of species disappearance is habitat loss, the ill effects of which are typically slow to unfold. According to the U.N. report, “even if habitat loss were to end today, it would take hundreds of years for species numbers to reach a new and lower equilibrium due to the habitat changes that have taken place in the last centuries.” Genetic diversity within species is also falling, particularly among cultivated species. (About diversity within wild species we know very little.) Biodiversity at local scales is becoming more homogenous as human actions move species from one location to another, sometimes with disastrous effects (the arrival of the American comb jellyfish in the Black Sea led to the destruction of 26 commercially valuable fish stocks; the accidental introduction of the zebra mussel into U.S. aquatic systems resulted in the extirpation of native clams in Lake St. Clair and annual costs of $100 million to the power industry and other water users).

—Terrestrial and (especially) aquatic systems are declining functionally due
to major increases in flows of biologically available nitrogen and phosphorus, chiefly due to their use as agriculture fertilizers. Nitrogen flows have doubled since 1960, with a further rise of 66% predicted in coming decades; phosphorus flows have tripled. Such nutrient flows promote the eutrophication of rivers and coasts and the acidification of freshwater and terrestrial ecosystems—causing, most visibly, large biological dead-zones in the Gulf of Mexico and other estuaries. Altered nitrogen flows are directly linked to significant declines in local biodiversity.

—Floods and fires have increased in frequency and force over the past 50 years due to human activities. Many ecosystems are less able than formerly to stabilize soils and buffer heavy rains. Alterations of nature and reductions of biodiversity are also linked to an upturn in the emergence or re-emergence of infectious diseases, leading to heightened fears of catastrophic disease outbreaks (e.g., cholera and influenza).

—Economic pressures to produce market commodities are stimulating land-use changes that significantly reduce overall benefits obtained from particular land parcels, even as the new land uses bring higher incomes for individual owners. The expansion of commercial shrimp farming in Southeast Asia, for instance, “has had serious impacts on ecosystems, including the loss of vegetation, deterioration of water quality, decline of capture fisheries, and loss of biodiversity.” In many regions of the world expanded livestock production “has often led to overgrazing and dryland degradation, rangeland fragmentation, loss of wildlife habitat, dust formation, bush encroachment, deforestation, nutrient overload through disposal of manure, and greenhouse gas emissions.” Shifts from functioning wetlands to intensive farming and from traditional forest uses to unsustainable timber harvesting bring similar, significant declines in ecological functioning and in the overall benefits of land use.

—Ecological degradation routinely harms poor people far more than wealthy ones, exacerbating income inequalities, health problems, and economic and political dependence. Mounting water scarcities are a problem for approximately 1 to 2 billion people around the globe. In many arid regions, fresh water is consumed at rates well above natural recharge even as supplies of safe drinking water are degraded by increasing pollution. According to a 1998 study, roughly half of the
world's poorest people live in ecologically marginal areas that are prone to
degradation and highly vulnerable to floods, droughts, and landslides. For people
accustomed to drawing sustenance from nearby lands, ecological degradation
entails losses that are not simply offset by surpluses elsewhere on the planet.

These, then, are the kinds of ecological changes that we humans are making
to nature, even as, through engineering, we extract more food from intensively
managed landscapes. One attempt at summing these changes into a single bottom
line was undertaken in a 2002 study reported in the Proceedings of the U.S.
National Academy of Science. A scientific team sought to estimate the total load
humans are placing on the planet's bioproductive regenerative capacity. Their
conclusion: Humans in 1961 used essentially 70% of the Earth's capacity. By 1999
that use rate had reached 120% of total biocapacity. If the report is accurate we are
cutting into the Earth's principal, and to a rising degree. When 12% of the planet is
allocated to the protection of biodiversity (as recommended in a prominent 1987
U.N. report), human demand on the Earth reached 100% of capacity by the early
1970s (not the late 1980s), and has now eclipsed 140%.

The Root Causes of Degradation

The U.N. Millennium Ecosystem Assessment only hints at the social and
cultural forces that have brought us to our current state. Some of these forces are
well known, others are not.

• How we use nature has a lot to do with the ways that we perceive nature
  and value it. Particularly influential is the vast gap in modern culture
  between the moral value attached to human life and the low status attributed
to all other life. Humans count morally; the rest of nature is mostly raw
material for us to manipulate at will.

• Humans, in turn, are increasingly understood as free-standing beings
  whose health and welfare are independent of the ecological functioning of
  the lands around them.

• As environmental problems gain complexity, they far outstrip the ability of
  ordinary people to understand them. Increasingly, we see nature through the
  lens of the market, which fragments nature into pieces and, in practice,
treats nearly all life forms and ecosystem processes as worthless and expendable.

• Guided by short-term perspectives we rarely consider the long-term.
• Routinely we label floods, droughts, and fires as “Acts of God”—as the United States does with major Mississippi River floods—as if human behavior had nothing to do with any of them.
• When problems do confront us, we assume the difficulty lies in our lack of information or in proper technology (the levees were not built high enough), without stopping to ask whether the true causes lie elsewhere, in our values, perceptions, over-reliance on reason, and widespread inability to grasp the vital consequences of interdependence.

These cultural tendencies are deeply rooted and influential. They are, in important ways, our true environmental problems.

As we look ahead into the twenty-first century, we have reason to be troubled by many social, cultural, and political changes that are unfolding. Powerful forces are at work in the world—forces that have good sides to them. But a force that yields short-term gains for a few or even many people can also carry long-term costs for masses. In the same way that changes in nature can trigger ecological ripples that transform a seemingly beneficial land activity into degradation, so too cultural and institutional changes that yield surface gains (particularly individual liberty and economic productivity) can stimulate less-visible harms that greatly skew the long-term outcome. No cultural changes illustrate this better than the rises of liberal individualism and of the free market. Both have brought gains, but both pose major problems to the emergence of cultures and institutions that can achieve enduring, healthy ways of living on land.

Two Views of Our Predicament

To see clearly where global culture is heading we can put side-by-side two much different views of the human predicament.

One ideal is that of the liberated, autonomous individual human, who participates in the market as producer and consumer and who forms and expresses preferences that society takes into account, through governance processes and
(mostly) through the market. In this ideal, value emerges out of the summed preferences of individuals, and social and economic structures are crafted largely to maximize individual preferences. This is the ideal of liberal individualism, free market style. It is becoming, if it is not already, the dominant worldwide model.

The other ideal might be termed the ecological-communitarian ideal. In this vision, people live in ways tailored to and constrained so as to respect the landscapes they inhabit. Modes of production and consumption take into account future generations, other life forms, and the natural features of local nature even as they attend to the exigencies of the planetary whole. In this ideal, collective decisions are made more by citizens in concert, not by consumers acting alone, through democratic structures that aspire to promote informed action. Here the assumptions are that people are interconnected and interdependent, and that the healthfulness and fairness of their connections are as vital as individual autonomy.

Collectively we are hurtling to embrace the first of these ideals—of the liberated human, the individual who seeks satisfaction by participating vigorously in a global market. Worldwide, the push is on to expand individual rights; to make private property more secure; and to extend the market’s reach to all corners of the globe and facets of life. Part of this push involves breaking down communal orders, including ones that embrace clear senses of social responsibility. We do this in the name of honoring individuals and increasing economic productivity, calculated in terms of human economic activity. All of this sounds good. But what happens to the planet when competitive individuals are set free everywhere to make their fortunes—cutting, consuming, and altering land largely at will? Can we exalt the individual and liberate the market while at the same time sustaining the land’s ecological health? Can we promote pleasing landscapes and fulfill our ethical duties to future generations while also knocking down the kinds of communal structures that have long sought to promote the common good? Most simply, how do we discipline the market when competitive individualism is the ruling ideology?

At some point, soon, we must ask ourselves: Are liberal individualism and all that it entails (especially private property and the open market) inevitably forces of ecological destruction, even as they boost current consumption and liberate people from oppressive cultural shackles? If they are, what pruning and reshaping are required to domesticate them for our planetary home?
Looking Ahead

These are the questions we face. The answers are unclear. If we can judge from the multi-volume U.N. report, our environmental plight can turn around only if we alter our ways of making decisions about nature. Much destructive behavior is fueled by the market and by the rising ideology that legitimizes economic in pursuit of individual gain, discounting communal harms. In some manner we must rein them in. Necessarily this means confronting both the political power that business now enjoys and today’s exuberant faith in markets and free trade. It means thinking critically about the key institution of private property; somehow we need to reshape private property so that we enjoy its many benefits while also insisting that land be well used. Private owners do not always take care of what they own, and the forces of market competition reward owners who push nature beyond its limits. As we reform American-style private property we also need to craft new governance methods so that people collectively can protect their shared natural homes. We need strongly democratic governance structures at varied spatial scales, governments that operate transparently and in ways that promote sound judgments.

The market can continue stimulating energy and allocating the rewards of labor. But it must be required to operate within rules that better protect the planet’s ecological fabric. If such rules are not in place—and currently they are not—the zeal of market competition will likely bring even greater degradation. In parts of Western Europe, the market engine of development has been checked by laws that protect farmlands and natural areas. In parts of the Western United States, water withdrawals are capped so as to protect the functioning of rivers. In truth, the market can operate just fine within limits that protect nature—just as it can operate within limits that ban slavery or abusive labor practices. All it takes is to identify the limits, make them clear, and then to demand compliance.

As we look at the world today the warning signs are many and troubling. The planet, ecologically, is in clear decline. Yet history tells us that fundamental change does take place. A land-respecting culture is perhaps not out of reach, once we realize how a reformed culture can benefit us as well as other life forms. In a better human culture lies our hope for ecological health.
Imagining a Different Future

Having identified this need for cultural change—leading to new institutions and to limits on the market—we must be sober about the challenges. The list is long. We are a long way from thinking critically about the market as a way of making collective decisions. We have similar troubles making proper use of science in decisions that call for normative judgment and sensitive thought about burdens of proof. Guided by a rising economic liberalism we are loath to criticize land-degrading activities, particularly when the actors are motivated by gain. In our rush to tear down unfair social orders we are too prone to exalt the ideal of the global citizen who is attached to no place and thus devoted to the ecological health of no land. We remain insensitive to the reality that control over scarce resources can easily bring control over the people dependent on those resources. Meanwhile, our academies fragment into ever smaller intellectual pieces while scholars increasingly labor chiefly to help businesses make money. Too few scholars can thoughtfully take in the whole of things, seriously and critically exploring larger contexts. When we add these all together they create a challenge that is truly vast.

In the end, though, perhaps what we need most—the linchpin for reform—is a heightened ability to imagine better ways of inhabiting this fertile, splendid planet. Until we can imagine better landscapes and better ways of living in nature we are unlikely to strive to achieve them. At the moment, we mumble vaguely about sustainability and sustainable development—terms that are long on confusion and short on inspiration. We can do far better. Thoughtful minds have probed the many specific factors that relate to the goodness and badness of how we live on land. Why not assemble the best ideas into alluring, ecologically sound ideals of good land use? The challenge of the twentieth century was to gain recognition of the moral worth of the individual human. The challenge for this century—without losing these important gains—is to help people live right in their chosen natural homes.
1. The Planetary Ecological Crisis

Let us not, however, flatter ourselves overmuch on account of our human victories over nature. For each such victory nature takes its revenge on us. Each victory, it is true, in the first place brings about the results we expected, but in the second and third places it has quite different, unforeseen effects which only too often cancel the first.

—FREDERICK ENGELS

Environmental degradation is not new to today's world but has occurred throughout recorded history with profound negative consequences for a number of ancient civilizations—most notably Mesopotamia and the Maya, which experienced major collapses due to what are believed to be ecological causes. Problems with deforestation, soil erosion, and salinization of irrigated soils were present throughout antiquity. Commenting on the ecological destruction in ancient Greece Plato (c. 427–347 BCE) wrote in Cratias:

What proof then can we offer that it [the land in the vicinity of Athens] is ... now a mere remnant of what it once was? ... You are left (as with little islands) with something rather like the skele-
ton of a body wasted by disease; the rich, soft soil has all run away leaving the land nothing but skin and bone. . . . For some mountains which today will only support bees produced not so long ago trees which when cut provided roof beams for huge buildings whose roofs are still standing. And there were a lot of tall cultivated trees which bore unlimited quantities of fodder for beasts. The soil benefited from an annual rainfall which did not run to waste off the bare earth as it does today, but was absorbed in large quantities and stored in retentive layers of clay, so that what was drunk down by the higher regions flowed downwards into the valleys and appeared everywhere in a multitude of rivers and springs. And the shrines which still survive at these former springs are proof of the truth of our present account of the country.  

What makes the modern era stand out in this respect, however, is that there are many more of us inhabiting more of the earth; we have technologies that can do much greater damage and do it more quickly; and we have an economic system that knows no bounds. The damage being done today is so widespread that it not only degrades local and regional ecologies, as in earlier civilizations, but also affects the planetary environment, threatening the existence of a majority of species on the planet, including our own. There are therefore sound, scientific reasons to be concerned about the current rapid degradation of the earth’s environment.

What we call the environmental problem today is not reducible to a single issue no matter how large, but rather consists of a complex of problems. One of the latest, most important developments in Earth system science, developed by leading scientists, is the concept of “planetary boundaries,” in which nine critical boundaries/thresholds of the earth system have been designated (or are being considered) in relation to: (1) climate change; (2) ocean acidification; (3) stratospheric ozone depletion; (4) the biogeochemical flow boundary (the nitrogen and phosphorus cycles); (5) global freshwater use; (6) change in land use; (7) biodiversity loss; (8) atmospheric aerosol loading; and (9) chemical pollution.

Staying within each of these boundaries is considered essential to maintaining the relatively benign climate and environmental conditions that have existed during the last 12,000 years (the Holocene epoch). The sustainable boundaries in three of these systems—climate change, biodiversity, and human interference with the nitrogen cycle (part of the biogeochemical flow boundary)—have already been crossed, representing extreme rifts in the Earth system, while others—ocean acidification, global freshwater use, changes in land use, and the phosphorus cycle—represent emerging rifts. (Proposed boundaries for atmospheric aerosol loading and chemical pollution have yet to be designated.)

Although each of these rifts in planetary boundaries constitutes a major threat to life on the planet as we know it, it is climate change that is the biggest, most immediate threat, occupying a particularly central place, since it overlaps with all the others. Human-induced increases in greenhouse gases (carbon dioxide, methane, nitrous oxide, etc.) are destabilizing the world’s climate. If humanity does not soon change course, this will probably have horrendous effects for most species on the planet, including our own. Each decade is warmer than the one before, with 2010 tying with 2005 as the warmest year in the 131 years of global instrumental temperature records, and with nine of the warmest years on record in the last decade.

Indications of accelerating problems directly tied to climate change are already beginning to manifest themselves. These include:

* **Melting of the Arctic Ocean ice during the summer, which reduces the reflection of sunlight, thereby enhancing global warming.** Satellites show that end-of-summer Arctic sea ice was 40 percent less in 2007 than in the late 1970s when accurate measurements began. The three years with the least Arctic Sea ice cover at the end of summer were 2007, 2008, and 2010.
- A rise in sea level that has averaged 1.7 millimeters (mm) per year since 1875, but which since 1993 has averaged 3 mm per year, or over an inch per decade, with the prospect that the rate will increase further. The eventual disintegration of the Greenland and Antarctic ice sheets, set in motion by global warming, may result in a huge rise in ocean levels. Even a sea level rise of one to two meters would be disastrous for hundreds of millions of people in low-lying countries such as Bangladesh, Vietnam, and various island states. At present, the Arctic Monitoring and Assessment Program, the scientific arm of the eight-nation Arctic Council, is projecting rises in sea level by as much as just over a meter and a half this century based on current trends. A sea level rise at a rate of a few meters per century is not unusual in the paleoclimatic record. At present, more than 400 million people live within five meters of sea level, and more than one billion within 25 meters.

- The rapid decrease of the world's mountain glaciers, many of which—if business-as-usual greenhouse gas emissions continue—could largely be gone during this century. Some 90 percent of mountain glaciers worldwide are already visibly retreating as the planet warms. The Himalayan glaciers provide dry season water to hundreds of millions of people in Asia; their shrinking will lead to floods and acute water scarcity. Already the melting of the Andean glaciers is contributing to floods in that region. In April 2010 some fifty people were injured in Peru as part of a glacier fell into a glacial lake, causing the Hualcan River coming from the lake to overflow its banks. But the most immediate, current, and long-term problem, associated with disappearing glaciers—visible today in Bolivia and Peru—is that of water shortages, because the glaciers function as water storage reservoirs.

- Warming of the oceans, where some 90 percent of the heat added to the planet has accumulated. This has been implicated in a dramatic decrease in the phytoplankton (microscopic plant-like organisms) that are at the bottom of the ocean food chain—with much of the decline occurring in the last fifty years. Although other causes besides global warming may be involved (see discussion of ocean acidification below), such a remarkable decline of productivity at the base of the ocean's food chain will undoubtedly have a profound negative effect on the future overall productivity of the seas.

- Devastating droughts, expanding possibly to 70 percent of the land area within several decades under business as usual. Effects are already evident in northern India and northeast Africa; while Australia experienced a ten-year drought in the opening decade of this century (with the rains only just returning). But even when rains come, they frequently are so intense that flooding and loss of life occurs, as with the 2010 floods in Pakistan and the 2011 floods in Australia. As reported in the Independent (UK) with respect to Pakistan: "The twin hazards of perilously low levels of water for most of the year followed by summer weeks of calamitous flooding illustrate the scale of the problem for countries such as Pakistan. It is often the same countries that suffer limited supplies of clean water that also endure flood devastation."

- Warmer winter and summer temperatures that have already upset regional ecosystems. One example concerns the white bark pine tree that normally grows to a very old age—with some over a thousand years old—on the upper elevations of the western mountains in the United States. These stands have provided habitat and food for many species of birds and mammals, including bears. The pine bark beetle, now able to reproduce at the higher elevations because of warmer temperatures,
is infesting these zones and turning huge areas of white bark pine trees into “ghost forests.” The death of the forests in turn means no food for the animals, forcing them to move to lower elevations. In addition, snow melts more quickly in the dead forests, causing faster melt and runoff in the spring and low and warm rivers in the summer, with adverse effects on fish.\textsuperscript{14}

- **Negative effects on crop yields as average global temperature rises.** Higher levels of CO\textsubscript{2} in the atmosphere may increase the production of some types of crops, but they may then be harmed in future years by a destabilized climate that brings either dry or very wet conditions. Losses in rice yields have already been measured in parts of Southeast Asia, attributed to higher night temperatures which cause the plant to undergo enhanced nighttime respiration. This means that plants at night lose more of what they produced by photosynthesis during the day.\textsuperscript{15} A study in Africa found that for each day the temperature was above 30°C (86°F) corn yields decreased by one percent if plentiful water was available and by 1.7 percent under drought conditions.\textsuperscript{16} A study of climate and agricultural production since 1980 indicates that detectable decreases in global corn and wheat production are already occurring due to changes in climate.\textsuperscript{17}

- **Extinction of species due to rapid shifts in climate zones or “isotherms”—regions in which a given average temperature prevails and to which specific species are adapted.** Studies of more than a thousand species of plants, animals, and insects have found that whereas the average migration to the north and south (toward the poles) was four miles per decade in the second half of the twentieth century, isotherms have been “outrunning” species, moving poleward at a rate of about 35 miles per decade over the last thirty years. At the same time species that live at the poles (such as polar bears) and in alpine regions have nowhere to move and are simply being run off the earth.\textsuperscript{18}

All of this points to the fact that climate change does not occur in a gradual way, with equal change each year, but rather takes the form of tipping points fed by amplifying feedbacks that can hasten change and its consequences. Seen in this way, the melting of Arctic ice is an “amplifying feedback.” The rapid melting of white ice and its replacement with blue seawater is decreasing the earth’s relectivity (the albedo effect) resulting in the absorption of additional radiation and the acceleration of global warming. Such amplifying feedbacks shorten the time separating us from major tipping points, beyond which there is no stopping a process. Such a major tipping point, as we have mentioned, is the disintegration of ice sheets in Greenland and West Antarctica, which would lead to a dramatic rise in world sea levels. Loss of the entire West Antarctic ice sheet would raise sea level by 20 to 25 feet and open the way to the ocean for the much larger East Antarctic ice sheet.\textsuperscript{19}

**Other Planetary Rifts**

Climate change, as noted, is only one of a number of planetary rifts brought on by the crossing of planetary boundaries.

Like climate change, ocean acidification is a product of increased emissions of carbon dioxide. The boundary for ocean acidification, recently proposed by scientists, is determined on the basis of the global mean saturation state of aragonite (a form of calcium carbonate) in surface seawater. A decline in the number indicates an increase in the acidity of the ocean. The preindustrial value was 3.44 (surface ocean aragonite saturation state); the proposed boundary—after which there would be a massive die-down of shell-forming organisms—is 2.75; and the current state is 2.90. Ocean acidification is often referred to as the “evil twin” of climate change, since it derives from increases in carbon dioxide emissions and has equally devastating implications for the planetary system.\textsuperscript{20}
One area that appears to have been brought under control in the 1990s, but raised serious concerns because of the rapid increase in ultraviolet radiation from the sun that was occurring up to that time, is stratospheric ozone depletion. The preindustrial value of ozone concentration was 290 (in Dobson Units—the measurement of atmospheric ozone columnar density); the proposed planetary boundary is a concentration of 276, after which life on the planet would experience devastating losses; and the current status is 283. The decline in stratospheric ozone concentrations has now been halted between 60°S and 60°N. Nevertheless, it will take decades for the Antarctic ozone hole to disappear, and Arctic ozone loss will also likely persist for decades. Life on the planet had a close call.21

The preindustrial annual rate of species loss, considered the “natural” or “background” rate, was 0.1–1 per million. The planetary boundary recently proposed by scientists is 10 per million, whereas the current rate is greater than 100 per million (100 to 1,000 times the preindustrial background rate).22 Species are disappearing at accelerating rates not only because of global warming but also—more importantly at present—through direct human impact on species’ habitats. We are living in an era that scientists have characterized as the “sixth extinction,” which threatens to rival the great mass extinctions of the geological past, the most recent of which was the dying out of the dinosaurs 65 million years ago. The sixth extinction, emerging in our time, is distinct from these earlier mass extinctions in that it is brought on chiefly by a living species: our own.

A 2009 survey by the International Union for Conservation of Nature estimated that over 17,000 animals and plants are at risk of extinction. “More than one in five of all known mammals, over a quarter of reptiles, and 70 percent of plants are under threat, according to the survey, which featured over 2,800 new species compared with 2008. ‘These results are just the tip of the iceberg,’ said Craig Hilton-Taylor, who manages the list. He said many more species that have yet to be assessed could also be under serious threat.”23 As species disappear, ecosystems that depend on a multitude of species to function begin to degrade. One of the many consequences of degraded ecosystems with fewer species appears to be greater transmission of infectious diseases.24

The overloading of the environment with nitrogen and phosphorus runoff from fertilizers represents another ecological rift affecting the biogeochemical cycles of the planet. For nitrogen, the proposed boundary introduced by scientists is concerned primarily with the amount of nitrogen removed from the atmosphere by chemical means (the Haber-Bosch process), as well as nitrogen fixation through the cultivation of legumes, in millions of tons per year. Before the rise of industrial capitalism (more specifically before the rise of the Haber-Bosch process early in the twentieth century) the amount of nitrogen removed from the atmosphere was relatively low. The proposed boundary limit to avoid global ecological degradation from excess nitrogen is 35 million tons—including both agricultural legume-fixed nitrogen and the industrial production of “fixed” nitrogen (mainly for nitrogen fertilizers)—while its current status is 121 million tons. Although the limit suggested is not sufficient to produce all the needed grain crops, it is clear that annual nitrogen fixation can, and should, be reduced significantly from its current level with better systems in place to cycle nutrients in human and animal waste back to farmland. In spite of the fact that phosphorus runoff is currently less of a threat than nitrogen, it is rapidly growing in significance. The preindustrial amount of phosphorus flowing into the oceans per year was 1 million tons. The proposed boundary is 11 million tons, while the current status is 8.5 to 9.5 million tons and rising rapidly.25

There are literally hundreds of locations around the world where these chemicals, flowing into the oceans, are resulting in an explosion of phytoplankton. As the massive quantities of phyto-
plankton die, decomposing organisms lower in the oceans create very low oxygen zones—technically referred to as hypoxic or low oxygen zones, but sometimes called “dead zones”—in which many species of fish cannot exist. One of the largest of these is the dead zone where the Mississippi River enters the Gulf of Mexico. The largest such area occurs in Europe’s Baltic Sea.

The global freshwater boundary is also being transgressed. Thresholds of both blue water (liquid) flows and green water (vapor) flows are being disrupted, threatening the entire hydrological cycle. At present an estimated 25 percent of the world’s river basins run dry before reaching the oceans as a result of human use of freshwater resources. The preindustrial use of freshwater was 415 km³ (cubic kilometers) per year. The proposed boundary for freshwater consumptive use recently designated by scientists (beyond which there is a significant risk of collapse of terrestrial and aquatic ecosystems on regional and continental scales) is 4,000 km³. The current status is 2,600 km³.

With respect to direct human needs, the global freshwater crisis is already upon us. As Maude Barlow writes in Blue Covenant: “The world is facing a water crisis due to pollution, climate change and a surging population growth of such magnitude that close to two billion people now live in water-stressed regions of the planet. Further, unless we change our ways, by the year 2025, two-thirds of the world’s population will face water scarcity.” In some areas, such as northern China, northern India, and the part of the U.S. Great Plains that sits over the Ogallala aquifer, water is being pumped out faster than it can be replenished, with deeper extraction only delaying the end of these sources. In the Punjab region, which grows about half of India’s grain reserves, water is being pumped out of the ground 45 percent faster than rains can replenish it—a recipe for disaster.

Changes in the land use associated with human production represent a further rift in planetary boundaries. The conversion of forests and other ecosystems to agricultural land is reaching what scientists believe to be a critical threshold, threatening biodiversity and undermining the regulatory processes of the Earth system. For example, conversion of the Amazon rain forest into agricultural land could reach a level where it would tip the rain forest system into that of a semi-arid savannah. In South America, rain forests are commonly first converted to extensive pastures and later used for export crops such as soybeans. In Southeast Asia land is being converted into oil palm plantations—with the oil exported as a feedstock for making biodiesel fuel. This destruction of tropical forests, in addition to displacing the forests’ indigenous people, is causing an estimated 25 percent of all human-induced release of CO₂. Soil degradation by erosion, overgrazing, and low levels of organic matter application threatens the productivity of large areas of the world’s agricultural lands.

There were relatively low amounts of preindustrial anthropogenic changes in land use. The proposed boundary—a threshold the transgression of which would lead to major ecosystem disruptions globally—is 15 percent of ice-free land converted to agriculture uses. The current status of land converted for agriculture worldwide is 12 percent.

Aerosol atmospheric loading with soot, sulfates, and other particles is viewed as a global process posing a potential planetary boundary, but due to its complexity (and problems of measurement) a safe boundary has not been designated. Aerosols both influence the climate system and have an adverse effect on human health. The global concentration of most aerosols has doubled since preindustrial times. Aerosols affect the Earth’s radiation balance by scattering incoming radiation back into space or indirectly affecting cloud reflectivity and balance. Aerosols have thus played a role in tempering climate change. They also influence the hydrological cycle and may have a substantial effect on monsoons. The negative effects of aerosols on human health are substantial, resulting annually in some 800,000 premature deaths.
Scientists working on planetary boundaries have not yet determined a boundary for chemical pollution due to the numerous, complex issues involved, and the vast quantity of synthetic chemicals in use, which number in the tens of thousands (without counting all the possible combinations in which these chemicals interact in the environment, which are astronomical in number). Nevertheless, it is clear that the spread of chemical pollution in the form of radioactive compounds, heavy metals, and a wide range of organic compounds introduced by industry represents a threat to biodiversity, to human life, and interacts in complex ways with other global environmental stresses such as climate change. Some of these chemical pollutants, such as the metal mercury, go up smokestacks to later fall and contaminate soil and water, while others are leached into surface waters from waste storage facilities.

Many ocean and freshwater fish are contaminated with mercury, as well as numerous industrial organic chemicals. The oceans contain large "islands" of trash of various kinds, though predominantly plastics, the product of the petrochemical industry. "Light bulbs, bottle caps, toothbrushes, Popsicle sticks and tiny pieces of plastic, each the size of a grain of rice, inhabit the Pacific garbage patch, an area of widely dispersed trash that doubles in size every decade and is now believed to be roughly twice the size of Texas. Sunlight and warm temperatures partially degrade the massive amount of plastic in the oceans into ever-smaller particles. There is so much of this material in the seas that "a handful of sand or cup of sea water from nearly anywhere in the world will probably be peppered with microplastics—pieces that are tinier than a small pea and often invisible." These small pieces of plastic can harm small animals at the bottom of the food web as the plastic degrades within the organism and may do even more damage because it absorbs and concentrates toxic chemicals in the water.

In the United States, drinking water used by millions of people is polluted with pesticides such as atrazine, as well as nitrates and other contaminants of industrial agriculture. We are all contaminated by a variety of industrial and agricultural chemicals, and there is great concern about the health consequences. Agricultural pesticides are of special concern for people working with them or living in areas in which they are widely used. However, many foods we eat are also contaminated with pesticides. For example, more than half of the frozen blueberries and nearly half of the strawberries tested by the U.S. Department of Agriculture had detectable levels of a fungicide (boscalid); over half of the strawberries contained detectable levels of the fungicide captan; 50 percent of the grape juice tested contained the insecticide carbaryl; 75 percent of potatoes tested positive for the herbicide chlorpropham; about half of the green onions, collards, and kale tested positive for the herbicide DCPA; 40 percent of the sweet potatoes tested positive for the fungicide dicloran; almost 70 percent of broccoli tested positive for the insecticide imidacloprid; and 40 percent of summer squash tested positive for the insecticide endosulphan. Some produce was contaminated with multiple chemicals. For example, from 20 to 100 percent of strawberries tested positive for each of sixteen different pesticides. And the list goes on and on.

A survey of twenty physicians and nurses who were tested for sixty-two chemicals in blood and urine—mostly organic chemicals such as flame retardants and plasticizers—found that "each participant had at least 24 individual chemicals in their body, and two participants had a high of 39 chemicals detected." All participants had bisphenol A (BPA), a suspected carcinogen, used to make rigid polycarbonate plastics used in water cooler bottles, baby bottles, linings of most metal food containers—and present in the foods inside these containers, kitchen appliances, and the thermal paper receipts people receive from supermarkets, automatic teller machines, gas stations, etc. Likewise each had: (1) some form of phthalates, found in many consumer products such as hair sprays, cosmetics, plastic products, and wood finishers;
might change in the future, but not because of a change of heart 
by the business community regarding the poisons in their 
products. "The chemical industry seems less opposed to a regulatory 
overhaul [than in the past], in part because lax regulation may 
help low-cost Chinese chemical companies more than American 

firms."43

The President’s Cancer Panel, in its 2010 report, summarized 
the situation as follows:

A growing body of research documents myriad established and 
suspected environmental factors linked to genetic, immune, and 
endocrine dysfunction that can lead to cancer and other dis-
eases. . . . Weak laws and regulations, inefficient enforcement, 
regulatory complexity, and fragmented authority allow avoidable 
exposures to known or suspected cancer-causing and cancer-

promoting agents to continue and proliferate in the workplace 
and the community.44

It is beyond debate that the ecology of Earth—including the 
life support systems on which humans and all other species 
depend—is under sustained and severe attack by human activi-
ties. It is also clear that if we don’t radically change our ways, the 
results will be devastating. The multifaceted, complex, and 
rapidly accelerating character of the planetary environmental crisis is 
traceable to a single systemic cause: the economic and social 
order in which we live. The principal cause of ecological degra-
dation, insisted Rachel Carson, author of the classic work Silent 
Spring, which sparked the modern environmental movement, is a 
society that worships “the gods of speed and quantity, and of the 
quick and easy profit, and out of this idolatry monstrous evils 
have arisen.”45
the wish to have a dependable supply of excellent food and by the fear of contaminating that supply. The increase of economic intimacy between a city and its sources would change minds (assuming, of course, that the minds in question would stay put long enough to be changed). It would improve minds. The locality, by becoming partly sustainable, would produce the thought it would need to become more sustainable.

—1991

CHAPTER THREE

CONSERVATION IS
GOOD WORK

There are, as nearly as I can make out, three kinds of conservation currently operating. The first is the preservation of places that are grandly wild or "scenic" or in some other way spectacular. The second is what is called "conservation of natural resources"—that is, of the things of nature that we intend to use: soil, water, timber, and minerals. The third is what you might call industrial troubleshooting: the attempt to limit or stop or remedy the most flagrant abuses of the industrial system. All three kinds of conservation are inadequate, both separately and together.

Right at the heart of American conservation, from the beginning, has been the preservation of spectacular places. The typical American park is in a place that is "breathtakingly" beautiful or wonderful and of little apparent economic value. Mountains, canyons, deserts, spectacular landforms, geysers, waterfalls—these are the stuff of parks. There is, significantly, no prairie national park. Wilderness preserves, as Dave Foreman points out, tend to include much "rock and ice" and
little marketable timber. Farmable land, in general, has tempted nobody to make a park. Wes Jackson has commented with some anxiety on the people who charge blindly across Kansas and eastern Colorado, headed for the mountains west of Denver. These are nature lovers and sightseers, but they are utterly oblivious of or bored by the rich natural and human history of the Plains. The point of Wes Jackson’s anxiety is that the love of nature that limits itself to the love of places that are “scenic” is implicitly dangerous. It is dangerous because it tends to exclude unsenic places from nature and from the respect that we sometimes accord to nature. This is why so much of the landscape that is productively used is also abused; it is used solely according to standards dictated by the financial system and not at all according to standards dictated by the nature of the place. Moreover, as we are beginning to see, it is going to be extremely difficult to make enough parks to preserve vulnerable species and the health of ecosystems or large watersheds.

“Natural resources,” the part of nature that we are going to use, is the part outside the parks and preserves (which, of course, we also use). But “conservation of natural resources” is now in confusion because it is a concept that has received much lip service but not much thought or practice. Part of the confusion is caused by thinking of “natural resources” as belonging to one category when, in fact, they belong to two: surface resources, like soils and forests, which can be preserved in use; and underground resources, like coal or oil, which cannot be. The one way to conserve the minable fuels and materials that use inevitably exhausts is to limit use. At present, we have no intention of limiting such use, and so we cannot say that we are at all in-

interested in the conservation of exhaustible resources. Surface or renewable resources, on the other hand, can be preserved in use so that their yield is indefinitely sustainable.

Sustainability is a hopeful concept not only because it is a present necessity but because it has a history. We know, for example, that some agricultural soils have been preserved in continuous use for several thousand years. We know, moreover, that it is possible to improve soil in use. And it is clear that a forest can be used in such a way that it remains a forest, with its biological communities intact and its soil undamaged, while producing a yield of timber. But the methods by which exhaustible resources are extracted and used have set the pattern also for the use of sustainable resources, with the result that now soils and forests are not merely being used but are being used up, exactly as coal seams are used up.

Since the sustainable use of renewable resources depends on the existence of settled, small local economies and communities capable of preserving the local knowledge necessary for good farming and forestry, it is obvious that there is no simple, easy, or quick answer to the problem of the exhaustion of sustainable resources. We probably are not going to be able to conserve natural resources so long as our extraction and use of the goods of nature are wasteful and improperly scaled, or so long as these resources are owned or controlled by absentee owners, or so long as the standard of extraction and use is profitability rather than the health of natural and human communities.

Because we are living in an era of ecological crisis, it is understandable that much of our attention, anxiety, and energy is focused on exceptional cases, the outrages
and extreme abuses of the industrial economy: global warming, the global assault on the last remnants of wilderness, the extinction of species, oil spills, chemical spills, Love Canal, Bhopal, Chernobyl, the burning oil fields of Kuwait. But a conservation effort that concentrates only on the extremes of industrial abuse tends to suggest that the only abuses are the extreme ones when, in fact, the earth is probably suffering more from many small abuses than from a few large ones. By treating the spectacular abuses as exceptional, the powers that be would like to keep us from seeing that the industrial system (capitalist or communist or socialist) is in itself and by necessity of all of its assumptions extremely dangerous and damaging and that it exists to support an extremely dangerous and damaging way of life. The large abuses exist within and because of a pattern of smaller abuses.

Much of the Sacramento River is now dead because a carload of agricultural poison was spilled into it. The powers that be would like us to believe that this colossal "accident" was an exception in a general pattern of safe use. Diluted and used according to the instructions on the label, they will tell us, the product that was spilled is harmless. They neglect to acknowledge any of the implications that surround the accident: that if this product is to be used in dilution almost everywhere, it will have to be manufactured, stored, and transported in concentration somewhere; that even in "harmless" dilution, such chemicals are getting into the water, the air, the rain, and into the bodies of animals and people; that when such a product is distributed to the general public, it will inevitably be spilled in its concentrated form in large or small quantities and that such "accidents" are anticipated, discounted as "acceptable risk," and charged to nature and society by the powers that be; that such chemicals are needed, in the first place, because the scale, the methods, and the economy of American agriculture are all monstrously out of kilter; that such chemicals are used to replace the work and intelligence of people; and that such a deformed agriculture is made necessary, in the first place, by the public's demand for a diet that is at once cheap and luxurious—too cheap to support adequate agricultural communities or good agricultural methods or good maintenance of agricultural land and yet so goofily self-indulgent as to demand, in every season, out-of-season foods produced by earth-destroying machines and chemicals.

We tend to forget, too, in our just and necessary outrage at the government-led attack on public lands and the last large tracts of wilderness, that for the very same reasons and to the profit of the very same people, thousands of woodlots are being abusively and wastefully logged.

Here, then, are three kinds of conservation, all of them urgently necessary and all of them failing. Conservationists have won enough victories to give them heart and hope and a kind of accreditation, but they know better than anybody how immense and how baffling their task has become. For all their efforts, our soils and waters, forests and grasslands are being used up. Kinds of creatures, kinds of human life, good natural and human possibilities are being destroyed. Nothing now exists anywhere on earth that is not under threat of human destruction. Poisons are everywhere. Junk is everywhere.

These dangers are large and public, and they inev-
itably cause us to think of changing public policy. This is good, so far as it goes. There should be no relenting in our efforts to influence politics and politicians. But in the name of honesty and sanity we must recognize the limits of politics. It is, after all, much easier to improve a policy than it is to improve the community the policy attempts to affect. And it is also probable that some changes required by conservation cannot be politically made and that some necessary changes will have to be made by the governed without the help or approval of the government.

I must admit here that my experience over more than twenty years as part of an effort to influence agricultural policy has not been encouraging. Our arguments directed at the government and the universities by now remind me of the ant crawling up the buttocks of the elephant with love on his mind. We have not made much impression. My conclusion, I imagine, is the same as the ant's, for these great projects, once undertaken, are hard to abandon: we have got to get more radical.

However destructive may be the policies of the government and the methods and products of the corporations, the root of the problem is always to be found in private life. We must learn to see that every problem that concerns us as conservationists always leads straight to the question of how we live. The world is being destroyed, no doubt about it, by the greed of the rich and powerful. It is also being destroyed by popular demand. There are not enough rich and powerful people to consume the whole world; for that, the rich and powerful need the help of countless ordinary people. We acquiesce in the wastefulness and destructiveness of the national and global economics by acquiescing in the wastefulness and destructiveness of our own households and communities. If conservation is to have a hope of succeeding, then conservationists, while continuing their effort to change public life, are going to have to begin the effort to change private life as well.

The problems we are worried about are caused not just by other people but by ourselves. And this realization should lead directly to two more. The first is that solving these problems is not work merely for so-called environmental organizations and agencies but also for individuals, families, and local communities. We are used to hearing about turning off unused lights, putting a brick in the toilet tank, using water-saving shower heads, setting the thermostat low, sharing rides, and so forth—pretty dull stuff. But I'm talking about actual jobs of work that are interesting because they require intelligence and because they are accomplished in response to interesting questions: What are the principles of household economy, and how can they be applied under present circumstances? What are the principles of a neighborhood or a local economy, and how can they be applied under present circumstances? What do people already possess in their minds and bodies, in their families and neighborhoods, in their dwellings and in their local landscape, that can replace what is now being supplied by our consumptive and predatory so-called economy? What can we supply to ourselves cheaply or for nothing that we are now paying dearly for? To answer such questions requires more intelligence and involves more pleasure than all the technological breakthroughs of the last two hundred years.

Second, the realization that we ourselves, in our daily economic life, are causing the problems we are trying to solve ought to show us the inadequacy of the
language we are using to talk about our connection to the world. The idea that we live in something called "the environment," for instance, is utterly preposterous. This word came into use because of the pretentiousness of learned experts who were embarrassed by the religious associations of "Creation" and who thought "world" too mundane. But "environment" means that which surrounds or encircles us; it means a world separate from ourselves, outside us. The real state of things, of course, is far more complex and intimate and interesting than that. The world that environs us, that is around us, is also within us. We are made of it; we eat, drink, and breathe it; it is bone of our bone and flesh of our flesh. It is also a Creation, a holy mystery, made for and to some extent by creatures, some but by no means all of whom are humans. This world, this Creation, belongs in a limited sense to us, for we may rightfully require certain things of it—the things necessary to keep us fully alive as the kind of creature we are—but we also belong to it, and it makes certain rightful claims on us: that we care properly for it, that we leave it undiminished not just to our children but to all the creatures who will live in it after us. None of this intimacy and responsibility is conveyed by the word environment.

That word is a typical product of the old dualism that is at the root of most of our ecological destructive-ness. So, of course, is "biocentrism." If life is at the center, what is at the periphery? And for that matter, where is the periphery? "Deep ecology," another bifurcating term, implies that there is, a couple of layers up, a shallow ecology that is not so good—or that an ecosystem is a sort of layer cake with the icing on the bottom. Not only is this language incapable of giving a true description of our relation to the world; it is also academic, artificial, and pretentious. It is the sort of language used by a visiting expert who does not want the local people to ask any questions. (I am myself an anthropobiophotheointerpenetrating philosopher and a gastrointoreovironmentalistic, but I am careful to say so only in the company of other experts.)

No settled family or community has ever called its home place an "environment." None has ever called its feeling for its home place "biocentric" or "anthropocentric." None has ever thought of its connection to its home place as "ecological," deep or shallow. The concepts and insights of the ecologists are of great usefulness in our predicament, and we can hardly escape the need to speak of "ecology" and "ecosystems." But the terms themselves are culturally sterile. They come from the juiceless, abstract intellectuality of the universities—which was invented to disconnect, displace, and disembodv the mind. The real names of the environment are the names of rivers and river valleys; creeks, ridges, and mountains; towns and cities; lakes, woodlands, lanes, roads, creatures, and people.

And the real name of our connection to this everywhere different and differently named earth is "work." We are connected by work even to the places where we don't work, for all places are connected; it is clear by now that we cannot exempt one place from our ruin of another. The name of our proper connection to the earth is "good work," for good work involves much giving of honor. It honors the source of its materials; it honors the place where it is done; it honors the art by which it is done; it honors the thing that it makes and the user of the made thing. Good work is always modestly scaled, for it cannot ignore either the nature of individ-
ual places or the differences between places, and it always involves a sort of religious humility, for not everything is known. Good work can be defined only in particularity, for it must be defined a little differently for every one of the places and every one of the workers on the earth.

The name of our present society’s connection to the earth is “bad work”—work that is only generally and cruelly defined, that enacts a dependence that is ill understood, that enacts no affection and gives no honor. Every one of us is to some extent guilty of this bad work. This guilt does not mean that we must indulge in a lot of breast-beating and confession; it means only that there is much good work to be done by every one of us and that we must begin to do it. All of us are responsible for bad work, not so much because we do it ourselves (though we all do it) as because we have it done for us by other people.

Here we are bound to see our difficulty as almost overwhelming. What proxies have we issued, and to whom, to use the earth on our behalf? How, in this global economy, are we to render anything like an accurate geographical account of our personal economies? How do we take our lives from this earth that we are so anxious to protect and restore to health?

Most of us get almost all the things we need by buying them; most of us know only vaguely, if at all, where those things come from; and most of us know not at all what damage is involved in their production. We are almost entirely dependent on an economy of which we are almost entirely ignorant. The provenance, for example, not only of the food we buy at the store but of the chemicals, fuels, metals, and other materials necessary to grow, harvest, transport, process, and package that food is almost necessarily a mystery to us. To know the full economic history of a head of supermarket cauliflower would require an immense job of research. To be so completely and so ignorantly dependent on the present abusive food economy certainly defines us as earth abusers. It also defines us as potential victims.

Living as we now do in almost complete dependence on a global economy, we are put inevitably into a position of ignorance and irresponsibility. No one can know the whole globe. We can connect ourselves to the globe as a whole only by means of a global economy that, without knowing the earth, plunders it for us. The global economy (like the national economy before it) operates on the superstition that the deficiencies or needs or wishes of one place may safely be met by the ruination of another place. To build houses here, we clear-cut the forests there. To have air-conditioning here, we strip-mine the mountains there. To drive our cars here, we sink our oil wells there. It is an absentee economy. Most people aren’t using or destroying what they can see. If we cannot see our garbage or the grave we have dug with our energy proxies, then we assume that all is well. The issues of carrying capacity and population remain abstract and not very threatening to most people for the same reason. If this nation or region cannot feed its population, then food can be imported from other nations or regions. All the critical questions affecting our use of the earth are left to be answered by “the market” or the law of supply and demand, which proposes no limit on either supply or demand. An economy without limits is an economy without discipline.

Conservationists of all kinds would agree, I think,
that no discipline, public or private, is implied by the
industrial economy and that none is practiced by it.
The implicit wish of the industrial economy is that pro-
ducers might be wasteful, shoddy, and irresponsible
and that consumers might be gullible, extravagant, and
irresponsible. To fulfill this wish, the industrial econ-
omy employs an immense corps of hireling politicians,
publicists, lobbyists, admen, and adwomen. The con-
sequent ruin is notorious: we have been talking about
it for generations; it brought conservation into being.
And conservationists have learned very well how to
address this ruin as a public problem. There is now no
end to the meetings and publications in which the hor-
rifying statistics are recited, usually with the conclusion
that pressure should be put on the government to do
something. Often, this pressure has been applied, and
the government has done something. But the govern-
ment has not done enough and may never do enough.
It is likely that the government cannot do enough.

The government's disinclination to do more than it
does is explained, of course, by the government’s
bought-and-paid-for servitude to interests that do not
want it to do more. But there may also be a limit of
another kind: a government that could do enough, as-
suming it had the will, would almost certainly be a
government radically and unpleasantly different from
the one prescribed by our Constitution. A government
undertaking to protect all of nature that is now abused
or threatened would have to take total control of the
country. Police and bureaucrats—and opportunities for
malfeasance—would be everywhere. To wish only for
a public or a political solution to the problem of con-
servation may be to wish for a solution as bad as the
problem and still be unable to solve it.

The way out of this dilemma is to understand the
ruin of nature as a problem that is both public and
private. The failure of public discipline in matters of
economy is only the other face of the failure of private
discipline. If we have worked at the issues of public
policy so long and so exclusively as to bring political
limits into sight, then let us turn—not instead but
also—to issues of private economy and see how far we
can go in that direction. It is a direction that may take
us further and produce more satisfactory and lasting
results than the direction of policy.

The dilemma of private economic responsibility, as
I have said, is that we have allowed our suppliers to
enlarge our economic boundaries so far that we cannot
be responsible for our effects on the world. The only
remedy for this that I can see is to draw in our economic
boundaries, shorten our supply lines, so as to permit us
literally to know where we are economically. The closer
we live to the ground that we live from, the more we
will know about our economic life; the more we know
about our economic life, the more able we will be to
take responsibility for it. The way to bring discipline
into one's personal or household or community econ-
omy is to limit one's economic geography.

This obviously opens up an agenda almost as daunt-
ing as the political agenda. The difference—a consoling
one—is that when we try to influence policy, only large
jobs must be done; whereas when we seek to reform
private economies, the work is necessarily modest, and
it can be started by anybody anywhere. What is re-
quired is the formation of local economic strategies—
and eventually of local economies—by which to resist
abuses of natural and human communities by the larger
economy. And, of course, in talking about the formation
of local economies capable of using an earthly place without ruining it, we are talking about the reformation of people; we are talking about reviving good work as an economic force.

If we think of this task of rebuilding local economies as one large task that must be done in a hurry, then we will again be overwhelmed and will want the government to do it. If, on the other hand, we define the task as beginning the reformation of our private or household economies, then the way is plain. What we must do is use well the considerable power we have as consumers: the power of choice. We can choose to buy or not to buy, and we can choose what to buy. The standard by which we choose must be the health of the community—and by that we must mean the whole community: ourselves, the place where we live, and all the humans and other creatures who live there with us. In a healthy community, people will be richer in their neighbors, in neighborhood, in the health and pleasure of neighborhood, than in their bank accounts. It is better, therefore, even if the cost is greater, to buy near at hand than to buy at a distance. It is better to buy from a small, privately owned local store than from a chain store. It is better to buy a good product than a bad one. Do not buy anything you don’t need. Do as much as you can for yourself. If you cannot do something for yourself, see if you have a neighbor who can do it for you. Do everything you can to see that your money stays as long as possible in the local community. If you have money to invest, try to invest it locally, both to help the local community and to keep from helping the larger economy that is destroying local communities. Begin to ask yourself how your money could be put at

minimal interest into the hands of a young person who wants to start a farm, a store, a shop, or a small business that the community needs. This agenda can be followed by individuals and single families. If it is followed by people in groups—churches, conservation organizations, neighborhood associations, groups of small farmers, and the like—the possibilities multiply and the effects will be larger.

The economic system that most affects the health of the world and that may be most subject to consumer influence is that of food. And the issue of food provides an excellent example of what I am talking about. If you want to reform your own food economy, you can make a start without anybody’s permission or help. If you have a place to do it, grow some food for yourself. Growing some of your own food gives you pleasure, exercise, knowledge, sales resistance, and standards. Your own food, if you grow it the right way, will taste good and so will cause you to wish to buy food that tastes good. So far as you can, buy food that is locally grown. Tell your grocer that you are interested in locally grown food. If you can’t find locally grown food in stores, then see if you can deal directly with a local farmer. The value of this, for conservationists, is that when consumers are acquainted and friendly with their producers, they can influence production. They can know the land on which their food is produced. They can refuse to buy food that is produced with dangerous chemicals or by other destructive practices. As these connections develop, local agriculture will diversify, become more healthy and more stable, employ more people. As local demand increases and becomes more knowledgeable, small food-processing industries will enter the local economy. Everything that is done by the
standard of community health will make new possibilities for good work—that is for the responsible use of the world.

The forest economy is not so obviously subject to consumer influence, but such influence is sorely needed. Both the forests themselves and their human communities suffer for the want of local forest economies—properly scaled wood-products industries that would be the basis of stable communities and would provide local incentives for the good use of the forest. People who see that they must depend on the forest for generations, in a complex local forest economy, will want the forest to last and be healthy; they will not want to see all the marketable timber ripped out of it as fast as possible. Both forest and farm communities would benefit from technologies that could be locally supplied and maintained. Draft horses, for example, are better than large machines, both for the woods and for the local economy.

The economy of recreation has hardly been touched as an issue of local economy and conservation, though conservationists and consumers alike have much to gain from making it such an issue. At present, there is an almost complete disconnection between the economic use of privately owned farm and forest land and its use for recreation. Such land is now much used by urban people for hunting and fishing, but mainly without benefit to the landowners, who therefore receive no incentive from this use to preserve wildlife habitat or to take the best care of their woodlands and stream margins. They need to receive such incentives. It is not beyond reason that public funds might be given to private landowners to preserve and enhance the recreational value—that is, the wildness—of their land. But since governments are unlikely to do this soon, the incentives need to be provided by consumer and conservation groups working in cooperation with farm groups. The rule of the food economy ought to apply to the recreation economy: find your pleasure and your rest as near home as possible. In Kentucky, for example, we have hundreds of miles of woodland stretching continuously along the sides of our creek and river valleys. Why should conservation and outdoor groups not pay an appropriate price to farmers to maintain hiking trails and campsites and preserve the forests in such places? The money that would carry a family to a vacation in a distant national park could thus be kept at home and used to help the local economy and protect the local countryside.

The point of all this is the use of local buying power, local gumption, and local affection to see that the best care is taken of the local land. This sort of effort would bridge the gap, now so destructive, between the conservationists and the small farmers and ranchers, and that would be one of its great political benefits. But the fundamental benefit would be to the world and ourselves. We would begin to protect the world not just by conserving it but also by living in it.

—1991
THE FIRST thing to know when starting to climb a hill is where the summit lies. The second is that there are no completely painless ways to get there. Failing to know those things may lead one up a deceptively easy path that never reaches the top but meanders off into a dead-end, frustrating the climber and wasting energy.

The currently popular slogan of “sustainable development” threatens to become such a road. Though appealing at first view, it appeals particularly to people who are disheartened by the long, arduous hike they see ahead of them or who don’t really have a clear notion of what the principal goal of environmental politics ought to be. After much milling about in a confused, contentious mood, they have discovered what looks like a broad easy path where all kinds of people can walk along together, and they hurry toward it, unaware that it may be going in the wrong direction.

When contemporary environmentalism first emerged in the 1960s and '70s, and before its goals became obscured by political compromising and diffusion, the destination was more obvious and the route more clear. The goal was to save the living world around us, millions of species of plants
and animals, including humans, from destruction by our technology, population, and appetites. The only way to do that, it was easy enough to see, was to think the radical thought that there must be limits to growth in three areas—limits to population, limits to technology, and limits to appetite and greed. Underlying that insight was a growing awareness that the progressive, secular, and materialist philosophy on which modern life rests, indeed on which Western civilization has rested for the past three hundred years, is deeply flawed and ultimately destructive to ourselves and the whole fabric of life on the planet. The only true, certain way to the environmental goal, therefore, was to challenge that philosophy at its foundation and find a new one based on material simplicity and spiritual richness—to find other ends to life than production and consumption.

I do not claim this conclusion was shared by everyone in those years who wore the label environmentalist, but it was obvious to the most thoughtful leaders of the movement that this was the road we had to take. But since it was so painfully difficult to make that turn, to go in a diametrically opposite direction from the way we had been going, many began looking for a less strenuous way. By the mid-1980s such an alternative had emerged, called “sustainable development.” First it appeared in the World Conservation Strategy of the International Union for the Conservation of Nature (1980), then in the book Building a Sustainable Society, by Lester R. Brown of Worldwatch Institute (1981), then in another book Gaia: An Atlas of Planet Management, edited by Norman Meyers (1984), and then most influentially in the so-called Brundtland Report, Our Common Future (1987), directed by Gro Harlem Brundtland, Norwegian Prime Minister and chairwoman of the World Commission on Environment and Development. The appeal of this alternative lay in its international political acceptability among the rich and poor nations alike, in its potential for broad coalition among many contending parties. As Richard Sandbrook, executive vice-president of the International Institute for Environment and Development, explained: “It has not been too difficult to push the environment lobby of the North and the development lobby of the South together. And there is now in fact a blurring of the distinction between the two, so they are coming to have a common consensus around the theme of sustainable development.”

So: lots of lobbyists coming together, lots of blurring going on—invariably, lots of shallow thinking resulting. The North and the South, we were told, could now make common cause on a new, more progressive environmentalism without much difficulty. The capitalist and the socialist, the scientist and the economist, the impoverished masses and the
urban elites could now all happily march together on a straight and easy path, if they did not ask any potentially divisive questions about where they were going.

Like most popular slogans, sustainable development wears thin after a while, revealing a lack of any new core idea. Although it seems to have gained a wide acceptance, it has done so by sacrificing real substance. Worse yet, the slogan may turn out to be irredeemable for environmentalist use because it may inescapably lead us back to using a narrow economic language, to relying on production as the standard of judgment, and to following the progressive materialist world-view in approaching and utilizing the earth, all of which was precisely what environmentalism once sought to overthrow.

My own preference is for an environmentalism that talks about ethics and aesthetics rather than about resources and economics, that places priority on the survival of the living world of plants and animals regardless of their productive value, that cherishes what nature's priceless beauty can add to our deeper-than-economic well-being. I will return to that alternative later on, but first want to expose more fully the shaky ground of sustainable development. So far we have not had a probing analysis of this slogan, despite all those books and reports mentioned above. Although I myself cannot offer any full analysis of it here, I do want to draw attention to the important subject of language, the words we cobble together to capture our ideals, and particularly to ask what is implied in that magic word of consensus, "sustainability."

We have no full history of the word, but its origins appear to lie in the concept of "sustained-yield" that appeared in Germany during the late eighteenth and early nineteenth century. Germany depended in a most essential way on its forests for the wood needed to support its economy, and those forests were in a state of decline—shrinking with overuse, disappearing as the population increased. Fear of impending resource depletion, poverty, and social chaos prompted some citizens to find a solution based on the authority of science. They began talking (the exact date is still not clear) about managing the forests so that periodic harvests matched the rate of biological growth. Science could reveal that rate, they believed, thus indicating precisely how many trees could be taken without diminishing the forests themselves or undermining their long-term biological continuity. It was a hope based on a view of the natural world as a stable, enduring order, a view Newtonian in its roots, in which even the growth of a complex entity like a forest followed a steady, predictable cycle on a chart.

Science, according to this ideal of sustained-yield, could become the
basis for a steady prosperity, a tool of economic growth, and could thereby lay the foundations for a lasting social order. Laws and regulations of harvest could be made scientific, and experts in the science of biological growth could become the architects of a more secure nation. Robert Lee has argued that Germany of the period was not yet the “stable, hierarchical, stratified and highly structured society” it later became but rather was still divided into competing religious persuasions, Protestant and Catholic, and had been devastated by a long era of war, rebellion, and many antisocial, private usurpations of resources. “Sustained-yield,” he writes, “appears to have been a response to uncertainty and instability... [It] was an instrument for ordering social and economic conditions.”

Americans like Bernhard Fernow (1851-1923), an immigrant from Germany, and Gifford Pinchot (1865-1946), the first Chief Forester in the Department of Agriculture, imported the sustained-yield theory of environmental management into the United States in the last two decades of the nineteenth century. Fernow was of Prussian extraction, trained in sustained-yield techniques in the Prussian Forest Academy at Munden, and a critic of the laissez-faire economy of his adopted home. The forest resource, he explained,

is one which, under the active competition of private enterprise, is apt to deteriorate, and in its deterioration to affect other conditions of material existence unfavorably;... the maintenance of continued supplies as well as of favorable conditions is possible only under the supervision of permanent institutions with whom present profit is not the only motive. It calls preeminently for the exercise of the providential functions of the state to counteract the destructive tendencies of private exploitation.

German notions of the state as a necessary counterweight to the anarchic, short-term thinking of laissez-faire capitalism were a key part of the sustained-yield idea. Pinchot, who studied at the French Forest School in Nancy and examined model forests in France, Germany, and Switzerland, likewise believed the state, guided by technically trained professionals like himself, must take an active role in managing the nation’s natural resources in order to secure a sustainable future. For both men, nature was little more than a utilitarian commodity to be managed and harvested for the common good. They had absorbed completely the dominant world-view of their era, which taught that the primary goal of social life is economic progress—steadily increasing production over the long term—adding only the corollary that such production must be directed by the state and its experts to avoid destroying the organic social order.
“Sustained development” is therefore not a new concept but has been around for at least two centuries; it is a product of the European Enlightenment, is at once progressive and conservative in its impulses, and reflects uncritically the modern faith in human intelligence’s ability to manage nature. All that is new in the Brundtland Report and the other recent documents is that they have extended the idea to the entire globe. Now it is Planet Earth, not merely a beech forest, that is to be managed by trained minds, an eco-technocratic elite. Though never explicitly, the contemporary advocates of sustained development are pushing a political ideal as well as an environmental policy: one of more centralized authority that can manage disinterestedly the whole global ecosystem. Neither capitalistic corporations nor traditional folk communities can be trusted, they hint, to find unaided the sustainable path to the summit of universal affluence.

I cannot disagree that a world of aggressive nations and individuals grabbing resources for their own selfish enrichment, regardless of how others are faring, is bound to end in violence. And it will cause an ecological degradation that will finally bring everybody down. The multinational corporations are taking us that way fast, while the little folk villages of the past are dwindling away and seem powerless to stop the outcome. But can we really trust the state and its scientific experts to save us from this situation and show us how to manage successfully the global ecosystem, 8,000 miles in diameter, 500 million square miles in extent—show us how to make it yield greater and greater production, until everyone on earth enjoys a princely life, and all that without destroying its capacity for renewability? The ground on which this hope rests is suspicious terrain.

Sustainability, to begin with, is an idea that has never been really defined. Until we have a clearer consensus on it, we cannot know what is being promised or sought. Consider the matter of a time frame. Is a sustainable society one that endures for a decade, a human lifetime, or a thousand years? It is not enough merely to say “sustainable for a long time,” or even “for the next generation,” if we want to hand over more authority to the development experts. On the other hand, no one really expects sustainable to mean “forever”; that would be a utopian expectation that no society has ever achieved. If we cannot expect to achieve a perfect sustainability that lasts forever, what then can we hope for and work toward? What degree of sustainability should we settle on? No one, to my knowledge, has yet made a definitive answer.

Besides giving us no clear time frame, the ideal of sustainability presents us with a bewildering multiplicity of criteria, and we have to sort
out which ones we want to emphasize before we can develop any specific program of action. Among the dozens of possible sets of criteria, three or four have dominated public discussion of late, each based on a separate body of expertise, and they share little common ground. 4

The field of economics, for example, has its own peculiar notion of what sustainability means. Economists focus on the point where societies achieve a critical take-off into long-term, continuous growth, investment, and profit in a market economy. The United States, for instance, reached that point around 1850, and ever since has been growing endlessly, despite a few recessions and depressions. By that standard any and all of the industrial societies are already sustainable, while the backward agrarian ones are not. 5

Students of medicine and public health, on the other hand, have a different notion of the word; sustainability for them is a condition of individual physiological wellness, a condition to be measured by physicians and nutritionists. Thus, they focus on threats of water and air pollution or on food and water availability, or they talk about the threat of diminished genetic stock to the practice of medicine and the supply of pharmaceuticals. Despite the existence of many such threats today, most health experts would admit that human health has made great strides over the past few centuries in every part of the earth. By their criteria, therefore, the human condition is far more sustainable today than it was in the past—a fact that explosive population growth and longer lifespans for most societies demonstrate. By the standard of physiological fitness people living in industrial societies are doing far better than our ancestors or our contemporaries in the nonindustrial societies.

Still another group of experts, the political and social scientists, speak of “sustainable institutions” and “sustainable societies,” which apparently refer to the ability of institutions or ruling groups to generate enough public support to renew themselves and hold onto power. 6 Sustainable societies are then simply those that are able to reproduce their political or social institutions; whether the institutions are benign or evil, compassionate or unjust, does not enter into the discussion. By this reasoning, the communist regimes of eastern Europe and the Soviet Union have not proved to be sustainable and are being swept onto the ashheaps of history.

These are all leading, important uses of the word found among various fields of expertise, and undoubtedly they all can be given very sophisticated (and far more precise than I have indicated) measurements. In contrast to them, we also have some simpler, more popular notions of the word. One of the clearest, most pithy, and least arcane definitions comes
from Wendell Berry, the American writer and trenchant critic of all expertise. He called specifically for a more sustainable agriculture than we have today, by which he meant an agriculture that “does not deplete soils or people.” That phrase expresses, as so much of Berry’s work does, an old-fashioned agrarian way of thinking, steeped in the folk history and local knowledge of his rural Kentucky neighbors. Like everything Berry writes, it has a concise, elemental ring, and the great virtue of recalling to our attention that people and the earth are interdependent, a fact that those specialized academic approaches by economists and the rest generally ignore.

In Berry’s view the only truly sustainable societies have been small-scale agrarian ones; no modern industrial society could qualify. His own model, which is based on the livelihood and culture of the Jeffersonian yeoman farmer, must be seen as part of the economic past; it has virtually disappeared from modern American life. One might ask, as Berry’s critics regularly do, whether he is offering us more of a myth than a reality: Did such non-depleting rural communities ever really exist in the United States, or are they only idealizations or indulgences in a false nostalgia? But even if we accept Berry’s distinction between “sustainable agrarian” and “unsustainable industrial,” it is still not clear what the preconditions for sustainability, or the measurement of its success, would be. What meaning can we give to the idea of “people depletion”? Is it a demographic or a cultural idea? How much self-reliance or local community production does it require, and how much market exchange does it allow? For that matter, what is referred to in Berry’s notion of soil depletion? Soil scientists point out that the United States has lost, on average, half of its topsoil since white European settlement began; but then many of them go on to argue that such depletion is not a problem so long as we can substitute chemical fertilizers. Once more we are back in the muddle of whose expertise, language, and values are to define sustainability. Berry would answer, I suppose, that we should leave the definition to local people, but national and international policy makers will want something more objective than that.

All those definitions and criteria are floating around in the air today, confusing our language and thinking, demanding far more of a consensus of meaning before we can achieve any concerted program of environmental action. To be sure, there is a widespread implication in the literature I have cited that sustainability is at bottom an ecological concept: the goal of environmentalism should be to achieve “ecological sustainability.” What that means is it that the science of ecology is expected to cut through all the confusion and define sustainability for us; it should point
out what practices are ecologically sustainable and which are not. Once again we are back in the business of looking for a set of expert, objective answers to guide policy. But how helpful really are those experts in ecology? Do they have a clear definition or set of criteria to offer? Do they even have a clear, coherent perception of nature to provide as a basis for international action?

Ecologists traditionally have approached nature as a series of overlapping but integrated biological systems, or ecosystems. In contrast to most economists, for whom nature is not a relevant category of analysis, they have insisted that those systems are not disorganized or useless but are self-organizing and productive of many material benefits that we need. The role of ecologists then, as we have generally come to understand it, is one of revealing to laymen how those ecosystems, or their modifications into agroecosystems, undergo stress from human demands and of helping us determine the critical point when that stress is so severe that they collapse.

If we accept that expert tutoring, the ecological idea of sustainability becomes, quite simply, another measure of production, rivaling that of the economists: a measure of productivity in the economy of nature where we find such commodities as soils, forests, and fisheries, and a measure of the capacity of that economy to rebound from stresses, avoid collapse, and maintain output. Unfortunately, compared with economists, the ecologists have lately become very uncertain about their own advice. Their indices of stress and collapse are in dispute, and their expertise is in disarray.

A few decades ago ecologists commonly believed that nature, when left free of human interference, eventually reaches a balance or equilibrium state where production is at a steady rate. The origins of this idea go back deep into the recesses of human memory, deep into the past of every civilization before the modern. For westerners in particular the idea of nature as a balanced order has ancient Greek, medieval Christian, and eighteenth-century rationalist antecedents, and it survived even the profound intellectual revolution wrought by Charles Darwin and the theory of evolution through natural selection. From the time of its emergence in the late nineteenth century the science of ecology echoed that long-standing faith in the essential orderliness of nature, and until recently almost all ecologists would have agreed that sustainability is a matter of accommodating the human economy to that constancy and orderliness. Now that is no longer the case.

Beginning around 1970, ecology went off in search of new ways to describe forests, grasslands, oceans, and all the other biomes of the
planet, and the outcome is the emergence today of a more permissive set of ideas that rejects virtually all notions of stability, equilibrium, balance, and order, new or ancient, and instead portrays a nature that is far more lenient toward human activity. We live in midst of a nature that has been undergoing profound and constant change for as far back as we can look, scientists now argue with the aid of new scientific techniques; we confront a nature populated by rugged individualists, eager opportunist, and self-seekers. There is no integrated community in that nature, no enduring system of relationships; no deep interdependence. To be sure, the sun seems to come up regularly every day and in predictable spots; the four seasons come and go with a great deal of regularity. But pay no attention to all that, they say; look at the populations of plants and animals that live in any given area that we might call wild, pristine, or natural, and you will find no regularity, no constancy, no order there at all.

Many of these ideas appear in a recent book entitled *Discordant Harmonies* (1990), which is self-described as "a new ecology for the 21st century." Here is how its author, Daniel Botkin, a leading California ecologist, sees the current situation in his science:

Until the past few years, the predominant theories in ecology either presumed or had as a necessary consequence a very strict concept of a highly structured, ordered, and regulated, steady-state ecological system. Scientists know now that this view is wrong at local and regional levels...that is, at the levels of population and ecosystems. Change now appears to be intrinsic and natural at many scales of time and space in the biosphere.

"Wherever we seek to find constancy" in nature, Botkin writes, "we discover change."9

The basis for this new ecology is a body of evidence that is essentially historical, including pollen samples, tree rings, and animal population cycles, all of which show the world of nature to be in a constant flux, as unstable as the human scene where wars, assassinations, invasions, depressions, and social turmoil of every sort constitute the only normal condition we know.

For example, one can observe the history of a small, old-growth forest in New Jersey that was preserved from real-estate development in the 1950s under the assumption that it was a surviving remnant of the mature climax forest, dominated by oaks and hickories, that once grew in the area. Scientists suppressed fire in the forest to keep it pristine and undisturbed. By the 1960s, however, they began to discover that maple trees were invading their preserve from the outside. If they suppressed all fires, if they tried to keep their forest "natural," they were bound to fail. What
then, they had to ask themselves, was the state of equilibrium in this habitat? What could be called natural? What was the true order of nature?

Other evidence comes from pollen taken from pond and lake sediments all over North America, and indeed from all the major continents. They show that every area of the earth has experienced a wide variation in vegetation cover from year to year, from century to century, and from the glacial to the interglacial period. When the great ice sheets flowed over the North American continent, all the plants retreated south or into the lowlands—and it was not the orderly retreat of an organized, superorganic community but a chaotic rout. Then when the glaciers retreated, leaving the land bare, the same plants made a ragged, chaotic invasion of their old ground. There was no organized return of whole communities.

Here is Botkin again:

Nature undisturbed by human influence seems more like a symphony whose harmonies arise from variation and change over every interval of time. We see a landscape that is always in flux, changing over many scales of time and space, changing with individual births and deaths, local disruptions and recoveries, larger scale responses to climate from one glacial age to another, and to the slower alterations of soils, and yet larger variations between glacial ages.10

But Botkin later makes a very telling amendment to that statement when he adds that “nature’s symphony” is more like several compositions being played at once in same hall, “each with its own pace and rhythm.” And then he comes to what is really the practical upshot of his ecology for policy makers, environmentalists, and developers: “We are forced to choose among these [compositions], which we have barely begun to hear and understand.” Or one might say that after learning to hear all those discordances of nature, we humans must also assume the role of conducting the music. If there is to be any order in nature, it is our responsibility to achieve it. If there is to be any harmony, we must overcome the apparent discord. “Nature in the 21st century,” this scientist concludes, “will be a nature that we make.” Such a conclusion is where Botkin’s science has been leading him all along: to a rejection of nature as a norm or standard for human civilization and to an assertion of a human right and need to give order and shape to nature. We are arriving, he proclaims, at a new view of Earth “in which we are a part of a living and changing system whose changes we can accept, use, and control, to make the Earth a comfortable home, for each of us individually and for all of us collectively in our civilizations.” I believe that this new turn toward revisionism and
relativism in ecological science is motivated, in part, by a desire to be less disapproving of economic development than environmentalists were in the 1960s and '70s. Botkin criticizes that era for its radical, sometimes hostile, rejection of modern technology and progress. We need a science of ecology, he believes, that approaches development in a more "constructive and positive manner."  

Those conclusions constitute what I would call a new permissiveness in ecology—more permissive toward human desires than the the traditional, pre-1970 ecology was and emphatically more permissive than the ecological imagination found among environmentalists of the 1960s and '70s was. This new ecology makes human wants and desires the primary test of what should be done with the earth. It denies that there is to be found in nature, past or present, any standard for, or even much of a limitation on, those desires. Botkin hints at this denial in the beginning of his book when he criticizes the environmentalism of the sixties and seventies as "essentially a disapproving, and in this sense, negative movement, exposing the bad aspects of our civilization for our environment..." What we must do, he argues, is move away from that critical environmentalism toward a stance "that combine[s] technology with our concern about our environment in a constructive and positive manner."

This new turn in ecology presents several difficulties that I do not think the sustainable development advocates have really acknowledged. In the first place, the whole idea of a normal "yield" or "output" from the natural economy becomes, if we follow Botkin’s reasoning, far more ambiguous. Scientists once thought they could determine with relative ease the maximum sustained-yield that a forest or fishery could achieve. They had only to determine the steady-state population in the ecosystem and then calculate how many fish could be caught each year without affecting the stock. They could take off the interest without touching the fixed capital. Botkin argues that it was just such assurance that led to overfishing in the California sardine industry—and to the total collapse of that industry in the 1950s.

But if the natural populations of fish and other organisms are in such continual flux that we cannot set maximum sustained-yield targets, could we instead set up a more flexible standard of "optimum yield," one that would allow a more generous margin for error and fluctuations? That is where most ecological sustainability thinking rests today. Harvest commodities from nature, but do so at a slightly reduced level to avoid overstressing a system in stochastic change. Call it the safe optimum notion. But that formula does not really address the more basic challenge implicit in recent ecological thinking. What can sustainable use, let alone
sustainable development, mean in a natural world subject to so much disturbance and chaotic turbulence? Our powers of prediction, say ecologists, are far more limited than we imagined. Our understanding of what is normal in nature now seems to many to be arbitrary and partial.

The only real guidance Botkin gives us, and this is likewise true of most ecologists today, is that slow rates of change in ecosystems are "more natural," and therefore more desirable, than fast rates. "We must be wary," Botkin says, "when we engineer nature at an unnatural rate and in novel ways." And that is all he really offers. But when we have to have more specific advice to manage this or that acre of land successfully, the ecologist is embarrassingly silent; he or she can hardly say anymore what is "unnatural" or what is "novel" in light of the incredibly changeable record of the earth's past.

In the much acclaimed partnership between the advocates of ecological sustainability and of development, who is going to lead whom? This is the all-important question to ask about the new path that so many want us to take. I fear that in that partnership it will be "development" that makes most of the decisions, and "sustainable" will come trotting along, smiling and genial, unable to assert any firm leadership, complaining only about the pace of travel. "You must slow down, my friend, you are going too fast for me. This is a nice road to progress, but we must go along at a more 'natural' speed."

In the absence of any clear idea of what a healthy nature is, or how threats to that collective biological whole might impinge on us, we will end up relying on utilitarian, economic, and anthropocentric definitions of sustainability. That's where, it seems to me, the discussion is right now. Sustainability is, by and large, an economic concept on which economists are clear and ecologists are muddled. If you find that outcome unacceptable, as I do, then you must try to change the elementary terms of the discussion.

I find the following deep flaws in the sustainable development ideal:

First, it is based on the view that the natural world exists primarily to serve the material demands of the human species. Nature is nothing more than a pool of "resources" to be exploited; it has no intrinsic meaning or value apart from the goods and services it furnishes people, rich or poor. The Bruntland Report makes this point clear on every page: the "our" in its title refers to people exclusively, and the only moral issue its raises is the need to share natural resources more equitably among our kind, among the present world population and among the generations to come. That is not by any means an unworthy goal, but it is not adequate to the challenge.
Second, sustainable development, though it acknowledges some kind of limit on those material demands, depends on the assumption that we can easily determine the carrying capacity of local and regional ecosystems. Our knowledge is supposedly adequate to reveal the limits of nature and to exploit resources safely up to that level. In the face of new arguments suggesting how turbulent, complex, and unpredictable nature really is, that assumption seems highly optimistic. Furthermore, in light of the tendency of some leading ecologists to use such arguments to justify a more accommodating stance toward development, any heavy reliance on their ecological expertise seems doubly dangerous; they are experts who lack any agreement on what the limits are.

Third, the sustainability ideal rests on an uncritical, unexamined acceptance of the traditional world-view of progressive, secular materialism. It regards that world-view as completely benign so long as it can be made sustainable. The institutions associated with that world-view, including those of capitalism, socialism, and industrialism, also escape all criticism, all close scrutiny. We are led to believe that sustainability can be achieved with those institutions and their values intact.

Perhaps my objections can be fully answered by the advocates of the sustainable development idea. I suspect, however, that their response will, in the end, rest on the argument that the idea is the only politically acceptable kind of environmentalism we can expect at this point. It is desirable simply because it represents the politics of compromise.

Having been so critical toward this easy, slogansmmering alternative, I feel obliged to conclude with a few ideas of my own about what a real solution for the global crisis will require. I grant that it will be more difficult to achieve, but would argue that it is more revolutionary in impact and more morally advanced.

We must make our first priority in dealing with the earth the careful and strict preservation of the billion-year-old heritage achieved by the evolution of plant and animal life. We must preserve all species, subspecies, varieties, communities, and ecosystems that we possibly can. We must not, through our actions, cause any more species to go extinct. To be sure, we cannot stop every death or extinction, since the death of living things is part of the inevitable workings of nature, but we can avoid adding to that fateful outcome. We can stop reversing the processes of evolution, as we are doing today. We can work to preserve as much genetic variety as possible. We can save endangered habitats and restore those needed to support that evolutionary heritage. We can and must do all this primarily because the living heritage of evolution has an intrinsic value
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that we have not created but only inherited and enjoyed. That heritage demands our respect, our sympathy, and our love.

Unquestionably, we have a right to use that heritage to improve our material condition, but only after taking, in every community, every nation, and every family, the strictest measures to preserve it from extinction and diminution.

To conserve that evolutionary heritage is to focus our attention on the long history of the struggle of life on this planet. In recent centuries we have had our eyes fixed almost exclusively on the future and the potential affluence it can offer our aspiring species. Now it is time to learn to look backward more of the time and, from an appreciation of that past, learn humility in the presence of an achievement that overshadows all our technology, all our wealth, all our ingenuity, and all our human aspirations.

To conserve that heritage is to put other values than economic ones first in our priorities: the value of natural beauty, the value of respectfulness in the presence of what we have not created, and above all the value of life itself, a phenomenon that even now, with all our intelligence, we cannot really explain.

To learn truly to cherish and conserve that heritage is the hardest road the human species can take. I don’t even know, though I have plenty of doubts about, whether it is realistic at this point, given the state of affairs in global politics, to expect most nations to be ready or willing to take it. But I do know that it is the right path, while following the ambiguities, compromises, and smooth words of sustainable development may lead us into quicksand.