Pushing the Limits of Boundaries

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Not everything that can be measured is important,
Not everything that is important can be measured.

– author unknown

I

Each spring, millions of birds migrate from their winter sojourn in Central America, South America, and the Caribbean, to their summer breeding grounds in the north. This global pilgrimage is an extraordinary reaffirmation of ecological processes that transcend jurisdictional boundaries.

A characteristic of modern humans is our tendency to establish lines of ownership and jurisdiction, to draw clear boundaries, to compartmentalize ideas. These abstract distinctions often become limitations to our thinking and our understanding of the world around us.

The history of humankind can be seen as an on-going struggle to define boundaries in understanding our place as a species in the great and complex universe in which we live. It was not long ago that we gazed into the sky and perceived that the sun revolved around us. We carried with us the arrogance that we were a sovereign species, at the top of the pyramid of life and, in fact, at the center of the universe. However, mathematics and science eventually proved us wrong and we were forced to accept that we were, in fact, not at the center of the universe. While Sigmund Freud saw the history of man as the history of "the dethronement of man," Roderick Nash (1989) described the progressive extension of rights–from the aristocracy to common people, women, diverse races, and perhaps to other species and to Nature itself–as an expansion of the boundary dividing those perceived as "us," or within our own community, and those perceived as outside of it.

The history of humankind has also been one of changing paradigms where the existing framework for perception becomes less and less adequate in interpreting the observed world. When the framework finally becomes no longer usable, a new one is adopted (Kuhn 1962). In the early 1900s Einstein and other physicists found that the sub-atomic world did not follow classical Newtonian laws of physics. Their discovery of the dual particle/wave nature of matter called into question the very foundation of their world view—their concept of the reality of matter. Their view of matter as consisting of progressively smaller particles no longer worked. Their willingness to accept a new approach, quantum physics, led to tremendous advances (Capra 1982).

As we shall show below, our tendency to draw boundaries and compartmentalize is not only counterproductive, but actually destructive. As our conscience and intellect have grown and evolved, and our ability to anticipate and predict the future has improved, and our power to transform the earth around us has become more potent, our tendency to draw boundaries has become both a practical and a moral dilemma.

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My discoveries have satisfied me that it is possible to reach knowledge that will be of much utility in this life; and that . . . knowing the nature and behavior of fire, water, air, stars, the heavens, and all the other bodies which surround us. . . . We can employ these entities for all the purposes for which they are suited, and so make ourselves masters and possessors of nature.

— René Descartes,
Discourse on Method

II

Discourse on Method (1637) was a swift and powerful triumph of technique over philosophy, in which Descartes laid the foundation for utilitarian science and analytical reasoning as the basis for all discovery and understanding of the universe around us. These assumptions so prevalent in our society today are a result of a unique blending of Judeo-Christian, early Greek, and medieval views regarding the place of *Homo sapiens* in the organizational structure of the universe. The union of these philosophies with rational, analytical techniques during the Age of Enlightenment set forth a framework of perceiving the earth known as "Cartesian rationalism": the notion that all aspects of the universe (including *Homo sapiens*) can be understood through analytic deduction and mathematically correct, logical, universal principles.

Modern science is based on Cartesian rationalism. It carries with it an underlying assumption that only that part of the universe which can be objectively measured, described, or predicted, is important, and thus, useful (Bowers 1992). Cartesian rationalism is so prevalent today, that many ecologists and other scientists do not even conceive of the possibility of any approach other than the Cartesian approach (Capra 1982), and problems that cannot be framed in Cartesian terms are considered unworthy of study.

The mechanistic objectification of nature, and the subsequent lack of concern for the spiritual and emotional (or subjective) qualities of the human species has led to a separation or *dualism* between *Homo sapiens* and the rest of the universe (Capra 1975). This has led to a view of human-environment relations in which *Homo sapiens* is the dominant force—a perspective in which the purpose of

science is to predict, control, and use nature for our own purposes. Nature is viewed as an object rather than as a thing with dignity, which deserves respect and has intrinsic value in and of itself (Kant 1959; Taylor 1981).

Analytic reasoning and utilitarian science affect our daily life, acting as filters for our perception of reality: how we recognize and define problems, how we approach problems, and the alternative solutions that we see as being possible. This reductionistic framework has led us to dissect and compartmentalize the world around us in an attempt to better understand it. Ironically, we may be building more barriers than bridges to understanding, for systemic properties—the interrelationships, patterns, and dynamics—are destroyed when a system is dissected, either physically or theoretically, into isolated elements. Although we can discern individual parts in any system, the nature of the whole is always different from the mere sum of its parts. Living form is essentially an indicator of the dynamics of underlying processes (Capra 1982).

Sweet is the love
which nature brings
Our meddling intellect
misshapes the beauteous form of things
We murder to dissect.

—William Wordsworth,
"The Tables Turned"

David Orr (1993) suggests that we experience nature as a medley of sensations that play upon us in complex ways—as sights, sounds, smells, touches, tastes. If this is so, then why do we analyze and divide landscapes into soil, water, vegetation, geology and air quality, and then attempt to re-synthesize the pieces using complex modeling and other analytical techniques? *All the King's horses, and all the King's men, couldn't put Humpty Dumpty together again.* Like Humpty Dumpty, once the landscape has been dissected and organized into abstractions for intellectual convenience, we are not able to put it back together again.

We have made enormous progress in understanding the structures and functions of many of an ecosystem's subunits. Nevertheless, we remain largely ignorant of the coordinating activities that integrate those operations into the functioning of the ecosystem as a whole. It is becoming increasingly clear that the integrative activities of living systems cannot be understood within a reductionist framework. We can understand the axis and rotation of the earth, and still miss the sunset.

Our failure to question the underlying assumptions of Cartesian rationalism and a mechanistic and compartmentalized view of the world has also resulted in a system of academic, political, and economic institutions that support each other and have become all but blind to the dangerous imbalance of the value system which motivates them (Capra 1982). With compartmentalized disciplines and knowledge we become loyal to the abstraction of the discipline rather than loyal to the earth (Orr 1993).

The Cartesian reductionist method has brought spectacular progress in certain areas and continues to produce exciting results. The fact that it is inappropriate for other problems has left entire areas of questions and problems neglected. Whether we talk about cancer, environmental degradation, or energy shortages, the dynamics underlying these problems are but different facets of a single crisis. They are systemic problems, closely interconnected and interdependent. They cannot be understood within the fragmented methodology characteristic of our approach. Such an approach will never resolve any of our difficulties but instead merely shift them around in the complex web of social and ecological relations.

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The great ecological issues of our time have to do in one way or another with our failure to see things in their entirety.

—David Orr,
"The Problem of Disciplines / The Discipline of Problems"

III

OWLS VS. JOBS

The northern spotted owl is one species that has been imperiled by the loss of 90% of the old-growth forest in the Northwest. Scientists have established that, in general, spotted owls need multi-layered forest with at least 50% of the trees eleven inches in diameter or larger, and a 40% canopy coverage. After the northern spotted owl was listed as a threatened species in 1990, an interdisciplinary, interagency team drafted a recovery plan for it. The plan defines a comprehensive program, including interagency efforts to ensure that the species will survive over the long run. A major component of the plan is its designation of "conservation areas" where forest and other land management activities must give precedence to the owl. In the intervening areas, 50% of an agency's land must be managed to retain habitat through which owls can disperse to neighboring conservation areas.

Through political and scientific reductionism, the complex issues related to the management and protection of the forests has been reduced to a question of saving owls or saving jobs. Debate has raged over the impact of loggers' activities on the old-growth forest community, over the minimum number of owls necessary for long-term viability, over what habitat characteristics are the minimum necessary for owls, and over how many jobs will be lost in order to save the owl.

Through reductionist thinking a large complex issue is broken into smaller pieces. A great question becomes reduced in scale and value, and what should be a moral debate becomes a mathematical problem. But arithmetic is no a substitution for wisdom. Numbers do not provide the answers we seek.

Countervailing scientific expertise is offered on both sides of the mathematical argument. While these experts might bring more detail to the problem, they rarely bring more light or clarity regarding the great underlying question. We continue to dissect the problem until each side's focus is so narrow that neither side is right.

PRIVATE VS. PUBLIC LANDS

Environmental groups and other interest groups as well as private citizens place considerable value on their ability to influence the decisions of federal agencies. The National Environmental Policy Act provides for public participation in agency decision-making. Some agencies, such as the U.S. Forest Service, have administrative appeal processes to resolve differences short of the courts. Where the government fails to follow prescribed procedures or where individuals consider themselves harmed by a government action, people have the right to legal redress in the courts. These avenues provide significant opportunities for citizen oversight over the way federal lands and resources are managed.

However, two-thirds of the land in the United States is not owned by the federal government. It should be obvious that ecosystems and ecological processes cross the boundaries of ownership and jurisdiction. How can ecosystems be conserved if we ignore private lands?

In presenting a program for the long-term conservation and recovery of the northern spotted owl, the draft recovery plan focuses primarily

on the management of federal and state lands. Required action on private land is largely related to the prohibition against "taking" owls. Many other steps that would contribute to the long-term survival of the species are left to the voluntary discretion of the individual landowner (Bart et al. 1992).

By ignoring ecosystem processes on private lands we are in effect giving license to individual landowners to impair or destroy the ecosystems on their lands. Inevitably, ecosystems over a much wider area are also damaged. By taking a compartmentalized and reductionist approach to protecting ecosystems, we eliminate all possibility of success.

THE ROLE OF SCIENCE

As ecological knowledge has expanded, its application in the management of national parks has steadily, albeit slowly, expanded. Following its own history of Cartesian rationalism, however, science too often concentrates on only those things that are quantifiable, turning living systems into mathematical models. More often than not, the objective of this research has been to increase our technological capability to protect and restore or, in other words, manipulate resources.

What are the ethical values associated with how we undertake these studies? What should the future of science in national parks be? These questions are all the more important with the establishment of the National Biological Survey, under which all biological and related research on Department of the Interior lands will be subsumed, and the diversity of researchers' perspectives will inevitably decline.

In the 20th century, physics has gone through several conceptual revolutions that clearly reveal the limitations of the mechanistic world view and lead to an organic, ecological view of the world which shows great similarities to the views of mystics of all ages and traditions. Physicists no longer see the universe as a machine, made up of a multitude of separate objects, but as a harmonious indivisible whole, a network of dynamic relationships that include the human observer and the observer's consciousness in an essential way. One of the main lessons that physicists have had to learn is the fact that all the concepts and theories we use to describe nature are limited. Scientific theories can never provide a complete and definitive description of reality. They will always be approximations of the true nature of things.

Science must journey beyond the limitations or Cartesian rationalism and concentrate efforts on understanding the interrelationships between *Homo sapiens* and all other species who live in an interconnected world of ever-changing, dynamic processes. This new paradigm of science would view the world in terms of relationships and integration, rather than as building blocks that can be reduced to smaller units. The difference between our current approach based on the Cartesian system and this new approach can be seen in the way that an anthill, a beehive, and a family are more than just the sum of individual ants, bees, and humans. Similarly, a wilderness is more than just the sum of individual trees and animals inhabiting it. Science must focus on the complex web of relationships rather than on the individual parts (Capra 1982).

Wisdom demands a new orientation of science and technology towards the organic, the gentle, the non-violent, the elegant and beautiful.

—E. F. Schumacher

IV

If we are to move towards a more sustainable path we need to develop a new way of understanding ourselves, and our relationship with nature. We need to recognize that actions we take based on Cartesian rationalism are in fact disrupting the sustaining capacities of the earth's ecosystems. This perspective, on which our cultural beliefs and scientific practices are based, is not the only possible view of the world. It must be replaced with a new ecologically sustainable vision, complete with new rules, and a new vocabulary. This paradigm shift will require non-exploitive science and technology, together with the cultivation of wisdom and conscience, and a holistic approach to the art of discovery and investigation of the world around us.

Sustainable thinking emphasizes respect for living ecological systems, and a sense for dignity in the land. According to David Orr (1992a), sustainable thinking is "the set of perceptual and analytic abilities, ecological wisdom, and practical wherewithal essential to making things that fit in a world of microbes, plants, animals, and entropy. In other words, [sustainable thinking] is the careful meshing of human purposes with the larger patterns and flows of the natural world, and careful study of those patterns and flows to inform human purposes."

A sustainable approach involves removing artificial limitations such as the boundaries between the U.S. Bureau of Land Management, U.S. Forest Service, and U.S. National Park Service land, as well as boundaries between private land and public land. We are not recommending that parks and wilderness be opened for exploitation, nor should all lands be treated as parks and wilderness. Instead, the boundaries should be replaced with respect, for respect implies a different kind of limit: "things one does not do, not because they cannot be done, but because they should not be done" (Orr, 1992b). Sustainable thinking does not ask what is the minimum number of owls we need or what is the greatest number of trees that can be legally cut, nor does it distinguish between human activities and "natural processes." Caring for the Earth involves people at all levels, acting at a variety of scales, from a grove, to a watershed, to a bioregion. It requires that everyone—agency managers, scientists, planners, and designers, as well as loggers, environmentalists, and politicians—understand and integrate the principles of sustainability in their work and their lives. Most importantly, we must learn to manage ourselves, and not the land.

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Exploration of the atom at the turn of the century forced physicists to revise their basic concepts of the nature of physical reality in a radical way. The enormity of today's crises demand a new way of thinking as well.

—Fritjof Capra

V

We have attempted to show that our cultural beliefs and attitudes are responsible for the approach we take to solving environmental problems. This approach has been counterproductive, and the attitude it reflects concerning

the relationships between humankind and the Earth has, in fact, exacerbated our environmental problems. By recognizing that we are part of the Earth, and attending to dynamic interrelationships rather than retaining a mechanistic focus on components and a reliance on boundaries, we will not only be more successful in resolving environmental problems, but there will be fewer problems in need of solving.

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EPILOGUE

During the controversy last winter over whether to kill wolves in Alaska to provide more game for hunters, scientific debate focused on two points of view. On the one hand there were the wildlife biologists and managers who talked of harvesting the wolves, of caribou calf crops, and game population densities (Peterson 1993). On the other hand were those who cared for the well-being of the wolves, but who felt compelled to bring in their own countervailing expertise to present opposing facts on population densities and distribution. It was as if a simple reverence for life was not a sufficiently persuasive argument. In the end, both sides had reduced the great question to such a narrow view that they were both wrong.

Not burdened by the reductionist limitation of Western utilitarian thinking, the Nootka Indians of the Pacific coast of Canada understood the value of all life. They gave utmost respect to the wolf. For they knew that when orca whales went walking on the land they did so as wolves (Peterson 1993).

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