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## RE-MODELING NATURE AS VALUED

### 6.1 Radical, but How New?

One of the advantages of accepting lots of speaking engagements around the country and in Europe is that one meets many fine and charming people who share a deep concern for the environment. I have greatly enjoyed meeting leading scholars in other fields of import in addressing environmental problems. This is a benefit of doing philosophy in a public policy context; had I remained a narrow disciplinarian, limiting my studies and writing to philosophy, I would probably not have this opportunity very often. Whenever I am among the giants of another field, I try to learn something about the way they think; and I cannot begin to describe how much I have learned in such discussions, formal and informal. When I had a chance to engage Donald Worster, a pioneer among environmental historians and a wide-ranging and unconventional thinker, I expected provocation. About a decade ago, I had a conversation with Worster at a Prairie Festival, and though I've forgotten most of what we conversed about—as I'm sure he has—I remember one brief exchange about environmental ethics that left me thinking. I finally have something to say in response to Worster's thought-provoking comment on the enterprise of environmental ethicists.

Somehow our topic drifted toward radical environmental philosophy and the philosophical discussions of Intrinsic Value theory; I suppose I said something brashly critical of the whole idea; as I was wont to do in those days (and sometimes today), I may have decried the concept of intrinsic value as unclear and useless, and on and on. Worster's response, which brought me up short, was "I see these people as the 'deep divers' of environmental thought; it's important that someone ask the really deep questions about environmental value, and even if they don't get it right, it's important to have people like them

stirring things up." Two things caught my attention, as I thought about the matter: first, Worster did not address the specific conceptual issues I raised, but rather recontextualized what radical environmentalists say, making it a part of a larger, community-based and historically dynamic situation. He did not evaluate the movement according to the usual critical standards a philosopher would apply to proposed moral theories. Second, I did agree strongly with Worster's recognition of the important function played by deep divers; and yet I wanted to question—though I could not find the words at the time—whether current philosophical speculation about intrinsic value in nature represents truly deep thinking. Let us then begin our positive discussion of environmental values, which will occupy this and the next two chapters, by thinking a bit about what really counts as "deep thinking" in response to the modern environmental "crisis" and the role of environmental values in it.

Both environmental economics and environmental ethics, as professionally staffed, distinct subdisciplines located in university departments, represent relatively new fields of study. In the United States the development of these disciplines responded to increased environmental awareness, fueled by underlying shifts in social demographics, which began after World War II and accelerated in the 1950s and 1960s. These trends saw population shifting from the countryside to urban areas; increases in standards of living, which provided people more leisure time; and changes in people's priorities, which shifted from subsistence exploitation toward amenities and recreational use of natural areas. Eventually, these trends, and associated increases in the popularity of outdoor recreation, resulted in vastly changed attitudes and norms regarding nature, natural systems, and wildlife.<sup>1</sup> Corresponding to these trends, environmental economics took on recognizable form in the 1950s and early 1960s,<sup>2</sup> and it became an important policy force with the creation of Resources for the Future (RFF) in Washington, DC. Begun as a unit of the Brookings Institute, RFF split off and became an independent research institute; it remains an important player in environmental economics and policy formation today. Environmental ethics, as noted in chapter 5, developed as a distinct subdiscipline of philosophy in the 1970s.

Both new fields were immediately recognized as involving important, and controversial, departures from the theoretical commitments and viewpoints of the core disciplines of which they were modifications, economics and philosophy. In economics, the development of theory to support monetary valuation of nonuse goods, for example, was strongly criticized and resisted by mainstream economists. These values, and the contingent valuation methodology they require, are still looked upon with suspicion by many purists among professional economists. From a disciplinary viewpoint, then, pioneering environmental economists' innovations seemed new and jarring. The

theoretical applications of environmental ethicists, especially nonanthropocentrists, were likewise considered strange, even unintelligible; practitioners of the new field are thus seen by their more mainstream philosophical colleagues as challenging central beliefs and principles of traditional ethics; both practitioners and commentators describe this approach as radical. Nonanthropocentrism lays claim to its label because it calls into question the moral significance of the human-nonhuman divide, central to all ethical theorizing in the Western tradition at least since Socrates. Other environmental ethicists are considered radical because they question moral individualism, the view that moral obligations must always be obligations to individual human persons, which has been pervasive since the Enlightenment and has gained strength throughout the modern period in Western thought. According to these lines of thought, environmental ethics must depart from traditional ethics by considering the possibility that nonindividuals, such as species and ecosystems, could be morally considerable in themselves. The rise of environmentalism and the loud, if sometimes inarticulate, advocacy of new classes of values, it can be argued, has indeed made a convincing call for new and creative thinking about environmental values.

I heartily agree that we need more creative thinking. For all the claims of novelty, however, a careful look at the new disciplines of environmental economics and environmental ethics reveals no creative leaps in conceptualization of environmental values. Their practitioners build upon the basic concepts of their parent disciplines, and they have not provided any new and useful vocabulary for thinking and talking about environmental problems or environmental values. In fact, the basic vocabularies of the two disciplines involve fairly straightforward *extensions* of existing disciplinary vocabularies with new applications to the changed situation and to changed sensibilities of the populace. Thus, although both new disciplines apparently embodied important leaps in theory, they merely extended the application of existing theory and did nothing to enrich the normative or theoretical vocabularies available for conceptualizing and evaluating actions. Environmental economics expanded the realm of application of the vocabulary of commodity and exchange values, which was developed for describing and measuring privately owned goods, to apply to public goods. Since public goods lack the key aspect of exclusivity, which anchors the idea of private ownership, the application of measures of exchange value to nonuse values—by definition not exchanged in markets—was indeed conceptually jarring. Decisions affecting environmental public goods were thus assimilated, through the fiction of hypothetical or “shadow” markets, into the system of price values, creating a new “kind” of economic value, value that is represented not by a real price, but by a “shadow” price, as explained in section 5.4.

For environmental ethicists, the so-called radical innovations have involved a similar expansion of the existing theory without improvement in conceptualization or the addition of new terms with which to discuss environmental values. In ethics, the theoretical extension proposed was to expand the class of morally considerable individuals or entities and to apply existing normative terms and concepts of human-based ethics: rights, interests, and especially the idea that some beings can be said to have intrinsic value, making them objects of moral concern. Elements of nature, by virtue of this expansion, become moral subjects, or at least moral "patients" (as they are sometimes called).

What we have here, then, are two *theoretical* leaps that were not accompanied by associated advances in conceptualization and vocabulary; and it is usually new vocabulary and new conceptualizations—new "mental models" of nature, one might say—that create true revolutions in human thought. In both cases, basic evaluative approaches that were developed for carefully delimited domains were simply expanded in application to new values normally untouched by the original theory. In both of these cases, the proposed expansion flies in the face of original, key distinctions that virtually defined the boundaries of the parent disciplines. Environmental economics came into existence by flaunting the original restriction of economics to the study of *economic* value (value that arises in exchanges in the processes of production and consumption), a restriction that originally defined economic value, *as distinct from other kinds of value*. Shadow pricing ignores this foundational distinction and applies the idea of price far beyond its original application. Similarly, environmental ethics flaunts the original distinction between human *persons*, who were traditionally thought to demand a special kind of respect and standing as free and rational beings, and nonhuman "objects," which were thought to fall outside the realm of ethical behavior.

Although one might consider these innovations brave, one might just as well describe them as obstinately foolhardy, since they flaunt the very distinctions that gave rise to the parent theory's specialized evaluative vocabulary. These theoretical departures may seem radical, deep-diving, because they attack what has been considered "common sense" for decades or even centuries. I would argue that they are radical only in the limited sense that they create conceptual chaos, ignoring as they do differences crucial to the very application of the key normative and theoretical terms central to their parent disciplines. In this sense they provide no new terms or distinctions that might reconstitute the normative landscape and truly replace—rather than merely extend—their disciplinary orthodoxies. One might say, then, that both environmental economics and environmental ethics have labored to force the new wine of expanded environmental concern into old skins of disciplinary con-

ceptualization. In my view, neither environmental ethics nor environmental economics is *radical enough* in its departure from the traditional theories and conceptualizations, including the operative vocabularies, of its parent discipline.

We need to do more than simply broaden the range of application of old, narrow, discipline-based terms and theories. As we have seen, terms and vocabulary are constrained by theories, which identify the types of objects recognized, and these theoretical constraints infect the very meaning of the terms used. As a result, trying to pour new, breakthrough ideas into old terminology is fraught with confusion and often with unnecessary conflict, as new and creative ideas, rather than replacing older and more limited ones, appear as direct assaults on widely held and comfortable viewpoints. If we are truly facing a new kind of crisis, a global pressing-against-limits that is unprecedented in human history, why should we expect simple transfer of the normative vocabularies of old-think to somehow transform consciousness and get us thinking aright? Maybe stretching the old wineskins is too limited a response; maybe we need to be *really* radical, and develop new conceptualizations and terms. What we need is a whole new way of looking at, and speaking about, nature and the human place in it.

Now after a rather theoretical examination (here and in chapter 5) of the failures of environmental economics and environmental ethics to provide a comprehensive and effective theory of environmental values, we have arrived once again at the beginning point of this book—the realization that we do not have a vocabulary that is adequate to the task of communicating human hopes and fears about the environment. Failure of communication about environmental goals and values is ultimately the most important intellectual problem in the search for more acceptable environmental policies. The theoretical analysis of environmental values, begun in chapter 5 and unfolding throughout part 2, explains the theoretical basis of the practical problem of communication that so confounds environmental policy discussions. Our examination of these theoretical problems has thus led us back to the central working hypothesis of this book: there are serious problems in communicating about—and even thinking about—environmental values because of what I have described as towering at the U.S. EPA and because of the more general poverty of vocabularies available to evaluate and integrate environmental policies.

We have reinforced, from a theoretical direction, the hypothesis that environmental problems have resisted solution because of failures of communication, which stem from the lack of an integrative vocabulary for discussing environmental goals and values. These failures of communication are public symptoms of the lack of adequate normative theories in economics and philosophy. The response of those disciplines to growing environmental prob-

lems has been to extend inadequate terms and concepts to apply to more instances—to extend existing value theory to apply more broadly; it is a too limited response to the novelty of our situation. That, I think, is what I wanted to say to Worster: Yes, it is important that we dive deeply in our search for better ways to describe the value of nature, but the simple extension of traditional disciplinary concepts may well be diving to the bottom of the shallow end of a very deep pool.

If we think of Economism and IV theory as practice dives at the shallow end of the pool, our critical attitude shifts from evaluating such ideas as the "one and only correct theory of environmental value" to welcoming them as contributions to an ongoing chaotic but creative discussion. Better ideas emerge from more diverse mixes, according to pragmatist epistemology, so we see value in efforts to extend traditional concepts. But these methods are not adequate, in and of themselves, to the situations we face. It's time to move to the deep end of the pool.

But how do we know, surveying from above, before we dive, which is the truly deep end? How will we know when we are even swimming in the right direction? We have just seen an important part of the answer: expanding the range of theories and approaches—putting lots of swimmers and divers in the pool—allows us to take many more soundings into the depths of environmental values and valuation. Provided we have means of communication, multiple divers can expand our experience base. Hence the tolerant attitude, within an adaptive management process, toward multiple expressions of value (pluralism) and toward having many local experiments and pilot projects as tools of management and as opportunities to learn and reduce uncertainty. Disciplinary "models" should never be considered *a priori* constraints on the variety and diversity of value expression in public discourse. A free and open competition of ideas and vocabularies is a resource and can encourage social learning.

Another clue is what we have learned by our examination of unsatisfactory communication regarding environmental values, as in the case of wetlands mitigation and countless other values. Most environmental policy discussions are framed as dichotomies (e.g., conservation versus preservation, human versus nonhuman interests) or as extremes (e.g., exploiters versus tree-huggers). Again we are driven back to the conclusion that there exists no useful, neutral vocabulary for talking about environmental problems, and especially for talking about values and environmental management goals. Early efforts at theories of environmental values, we have just seen, did not dive deep enough. Merely extending the application of old concepts, limited to individualistic, human-based ethics, does not move us past all-or-nothing classifications of objects as mere instruments or as goods in themselves. Extensionist

theories understood monistically result mainly in academic turf wars and in failures of communication. If we think of them as adding diversity and new ideas to the intellectual mix, however, they can be seen as practice dives for the real intellectual deep diving that must take place if we are to improve communication across disciplines and among interest groups.

## 6.2 A Naturalistic Method and a Procedure

In section 6.1 I argued that what has passed for deep diving—radical environmental philosophies in environmental ethics and pricing “non-market” values in environmental economics—has not gone deep enough; these approaches do not, I concluded, provide a vocabulary well designed to communicate the dangers and opportunities we face today. What has changed in recent history, long after our moral codes were developed, is the human ability to employ pervasive and powerful technologies, as humans exert more and more dominance over natural systems. The effect of these changes on human morality is that we live in a hugely expanded moral universe of human responsibility. The changes in natural processes attendant upon human population and technological expansion represent a series of more and more irreversible experiments in reducing the complexity and diversity of the planet’s life and cultural practices. Natural systems, as well as conventional cultural practices, are undergoing constant “disturbance” at every level and on every scale. What we need is a new way of talking about and evaluating rapid, often irreversible changes that will result from continued economic and technological growth. Here, I think, we are getting near the deep end of the pool. Here we may finally figure out a proper role for environmental ethics, or environmental value studies, in a process of adaptive management.

I wish I knew how to take accurate soundings, to tell when we have found the deep end, but I don’t. I do, however, have a hunch. My hunch is that if we’re going to find a conceptual breakthrough that will help us to reconfigure our thinking about environmental problems, it will result from reexamining deeply held assumptions about the relationship between facts and values. We are thus diving in a quite different part of the conceptual pool, far from environmental ethicists, who have hardly questioned the dichotomy between facts and values. They have instead sought to reconfigure our thinking about nature by disturbing the traditional application of the categories of standard ethical theory, working mainly within the theory of value—ethics—and hardly questioning the sharp separation between descriptive and prescriptive discourse. Similarly, we dive far from economists, who simply broadened their concept of commercial value—commodities—to cover nonmarket values. My hunch, however, leads me to believe that before we can get the moral and

normative concepts right—before we can develop a new ethic for the new, dominant situation in which humans find themselves—we will have to reconceptualize our place in the world. And such a reconceptualization may have more to do with the way we *understand* nature than it does with how we value nature.

In order to explore the implications of a reexamination of the fact-value dichotomy in the next section, I here propose an alternative to the usual ways of thinking about the interaction of these “realms.” What I propose, if it needs a label, is a form of “methodological naturalism.” I first explain the need for methodological naturalism by showing how it is an essential element of a philosophy of adaptive environmental management. Once the context is set, I show how a naturalistic method, based in experience—experiment and observation—can serve as a self-corrective device capable of gradually pointing communities toward improved goals and values.

Let us then begin our fresh look at environmental valuation with an examination of the relationship between facts and values in public political discourse. We abandon, at least for now, the search for a monistic theory of environmental value and adopt moral pluralism as our theoretical starting point. We embrace pluralism in two senses. First, we believe it represents a true empirical statement about the values expressed by citizens in diverse, democratic modern societies.<sup>3</sup> It is a simple fact that when citizens are asked to articulate their environmental values, they express those values in many ways; and even the most ardent advocate of monism is hard pressed to encompass even most of these values in a single, monistic vernacular. Monists inevitably end in intellectual hand-waving at best and in marginalizing important values at worst.

Second, we embrace pluralism as the best starting point in the search for improved theories and expressions. Pluralism encourages us to think of environmental conflicts as problems of choosing among multiple goods, not all of which can be fully supported with available resources, rather than as problems of maximizing a single kind of good such as intrinsic value or economic efficiency. This formulation encourages a search for creative, win-win situations; and sometimes it is possible to form coalitions of citizens and groups who support common objectives on the basis of very different values—as when, for example, Ducks Unlimited and the Audubon Society collaborated to increase protection of wetlands in the major flyways of migratory birds, the classic case mentioned in chapter 5.

What we need, if we are to live with pluralism, is a process that can create at least temporary agreements to act together, even in the face of disagreements regarding some elements of the science base and in the face of pluralism and disagreement about values. For this process to work, given pluralism and

a need to act, we want a method that can do three things. First, it must be capable of supporting action, even when there is uncertainty and disagreement about facts and values, on a day-to-day basis (the action phase). Second, it must provide a method—careful description and experiment—that is iterative and self-corrective and applies to value disagreements as well as to factual ones (the reflective phase). Third, this method must be embedded in a process that is inclusive, open, and democratic. The method will be inseparable from the process in the sense that the process has to be stable enough to allow both action *and* reflection; effective reflection provides feedback about the process, encouraging social learning that will continually improve the process over time. The method we embrace must thus be compatible with, and effective within, a diverse community committed to discourse, deliberation, and cooperative action. We need, in short, an evaluative method that will complement an activist agenda such as adaptive management.

This sounds like a daunting task, but fortunately we are not starting from scratch. Justification of actions, like justification of beliefs, is illuminated by the analogy of Neurath's boat. Pragmatism is committed to a community-level application of a method that expands collective experience through observation and experiment. Pragmatic ethics, like pragmatic epistemology, welcomes diversity and pluralism; faith in the method to sort out errors, however slowly, provides for the rudiments of a self-correcting system for ethics as well as for science. Pragmatism, then, by asserting the unity of the method of inquiry, with both ethics and science based on experience and sharing a common logic of discourse and reason-giving, recognizes no sharp divide between facts and values. The pragmatic method sets out to avoid, rather than to answer, that most puzzling question in moral epistemology: can facts—the collection of data and information—fully support moral judgments? To see how to avoid this question, we need a brief history of the fact-value conundrum.

This question has been the bane of naturalists' existence since at least the middle of the eighteenth century, and it is worth taking a detour into the history of ethics to see how and why a "methodological" form of naturalism is an improvement over the old-fashioned variety. Naturalism is generally reviled, like some shady and persistent loiterer on the edge of ethics, at least partly because of a rather cavalier reference by G. E. Moore to the "naturalistic fallacy," which Moore took to be an error of reasoning. Moore, you see, was defending his own theory of value by which goodness is a nonnatural quality of objects, a quality not reducible to observable qualities. So he described proposed reductions as a fallacy, the naturalistic fallacy. Many philosophers have noted that Moore's attribution of fallacy is largely an unfounded marketing tool for Moore's own, rather eccentric theory of nonnatural value.<sup>4</sup> Surely there is no reason to tar all forms of naturalism with Moore's intellectual slur.

But I get ahead of the story, which actually starts with David Hume, the Scottish philosopher and skeptic who observed in 1739 that speakers often proceed from sentences with "the usual copulations of propositions, is and is not," to sentences "connected with an *ought* or *ought not*."<sup>5</sup> Hume proceeded: "For as this *ought* or *ought not*, expresses some new relation or affirmation, 'tis necessary that it shou'd be observ'd and explain'd; and at the same time that a reason should be given, for what seems altogether inconceivable, how this new relation can be a deduction from others, which are entirely different from it." If we wade through some of Hume's terminology about relations and concentrate on his view of the "copulation" of propositions, we can see that he is making quite a narrow point: that one cannot move by deduction from *is* statements to *ought* statements.

Hume's formulation, however, is unfortunate in another way: Hume's criticism of the move from "is" to "ought" presupposes that *is* statements and *ought* statements are sharply separable, a view that is based on Hume's metaphysical assumptions. It turns out that Hume's "insight" about what kind of deductions are legitimate, though not undermining naturalism as such, did have the more unfortunate effect of setting a precedent for empiricists who, since Hume, have generally sharpened, not softened, the linguistic divide between descriptive and prescriptive discourse.<sup>6</sup>

Hume, who may have intended a rather narrow point about logical relations among certain kinds of sentences, was understood by readers to have established that there exists a "gulf" between facts and values, between descriptive discourse and prescriptive discourse. Given the modern faith in science, and once religious bases for ethics began to fade with the secularization of modern society, it is not surprising which side of Hume's gulf has been considered the slums of the intellect. Whereas science was considered determinate, determined, predictable (at least in principle), and "objective," values, as they were severed from their traditional bases in religious faith and dogma, descended into epistemological purgatory and became expressions of, first, Hume's "sentiments" and later, according to the positivists, subjectively felt emotion. So the separation of descriptive discourse from prescriptive discourse, noted by Hume and accepted as some sort of philosophical gospel since, has gone badly for prescriptive discourse, resulting in a sort of epistemological apartheid, enforced by Hume's uncrossable gulf. The practice of normative ethics in the gulf region has become, as a result, terribly dangerous. Perhaps it's time to reconnoiter.

To use the categories of theories I introduced in section 5.2, naturalisms are epistemological theories. They are theories about how we justify and support claims with moral content. Speaking broadly and historically, theories of epistemological justification of moral norms can be placed in three categories,

corresponding to a commonsense separation of possible sources of evidence or relevant knowledge. Some positions, such as Immanuel Kant's theory of rights and individual obligations, seek to base normative judgment, including moral judgment, on reason, "practical" reason, as he said. A second position is sometimes called intuitionism. Moore—just noted because he so colorfully expressed his distaste for naturalism—is often cited as an example of this view, since his belief that the good refers to nonobservable properties apparently left him with little but "intuition" by which to apprehend it. Intuition, one might suggest, is close to what is sometimes called conscience in ordinary speech, the "still, small voice" inside, which urges one to do good. Intuitionist theories, however, do not fare well epistemologically. To what does one appeal when different individuals' consciences demand contrary actions or policies? The third possible source of evidence for moral judgment is experience, observation, science, and descriptive knowledge—the very source of information that was considered irrelevant by Moore to discovering "the Good." Let us call these three epistemological theories about the source of moral knowledge a priorism, intuitionism, and naturalism, respectively. Now in reality, all of these views exist in endless variations and combinations, but here we are interested in the big picture.

In the big picture, methodological naturalism is a form of naturalism. It asserts that the only basis for correction of inaccurate beliefs *and evaluations* is more experience, experiments with controls when possible, careful observation otherwise. Methodological naturalism advocates developing self-corrective processes in public discourse, whether scientific or evaluative. Methodological naturalism does not, however, set out on the basis of purely factual assertions to *deduce* value conclusions. By concentrating on fair political processes, rather than deductions from general principles, we believe the boat of deliberation can be both kept afloat and renewed over time. What is ironic is that contemporary empiricists have accepted Hume's caution concerning derivations of *ought* from *is* statements—and then they have taken this caution to imply that there is an unbridgeable gap between the two kinds of statements. In doing so they have overgeneralized Hume's insight and failed to observe how factual and value assertions do in fact occur within their natural habitat of public debate and discussion about what to *do*. In that habitat it is undeniable that facts and values are all jumbled together and that reasoning about what to do crisscrosses back and forth over Hume's putative gulf, sailing Neurath's boat unceasingly and gradually improving both day-to-day practice and the methods that support more rapid improvement in the future. To separate fact from value, description from prescription, is to do violence to the context in which language gains meaning. As Bernard A. O. Williams has argued, facts and values are not "separate" in ordinary discourse.

Philosophers who articulate theories about the nature of ethics and value have theorized that values are separable from facts and that factual assertions and assertions of value have a very different "logic."<sup>7</sup> But in so asserting they refer not to the real world but to a philosopher's idealization, which very likely gains meaning only in conjunction with that philosopher's theoretical stipulations. Such theorizing is sterile and circular; worse, it can dull our ear to the real resonances between facts and values in our actual, day-to-day work of deliberating about and justifying environmental policies within a pluralistic but open and experimental process. Thus it is pragmatists' aversion to sharp dichotomies and their preference to explore a theoretical question in its natural habitat of public, ordinary discourse that allow them to avoid the question, Can values be derived from facts? A better question is, What processes of deliberation are more likely to achieve a proper integration of facts and values in a community's struggle for improved environmental policies?

Pragmatists, then, avoid the issue of crossing the "fact-value gulf" by engaging in ordinary discourse, where the gulf does not exist. We need not deny that it is possible, in some idealized philosophers' language, to separate fact sentences from value sentences or to approach such a separation in laboratory contexts by conscious and artificial efforts. The relevant discourse for adaptive management is ordinary language, however, the language that communities use to deliberate and decide how to use their resources. Individuals and communities express aspirations and face problems and uncertainties in ordinary discourse. Every factual statement in that discourse also expresses values of the speaker to some degree. Our form of methodological naturalism thus avoids the question whether pure facts can imply pure values by avoiding their unnatural isolation from each other.

Following Peirce and Dewey, we declare there to be only one "logic"; it is a logic whereby assertions are challenged on the basis of broader or contrary experience. This logic functions within a diverse community of truth-seekers, who may adopt very different viewpoints about some values and some facts. They act as a community, nonetheless, when they agree to enter a process of deliberation about what to do collectively to solve social problems such as resource degradation and species extinction. We deal with pluralism, then, by adopting an open process of deliberation about action. The process is open in the sense that everyone can participate and also in the sense that no assertions, if offered as justification for what to do, can be considered immune to criticism; all assertions, whether apparently factual or reeking of values, must be open to challenge on the basis of contrary or new experience.

Pragmatists do not expect all reasons, either in science or in ethics, to come in the form of "deductions" from unquestionable facts or principles. All that is claimed by the pragmatist is that, given the right conditions and public

attitudes, the method of challenging reasons in an open, deliberative, pluralistic community will, over time, contribute to consensus. In the long run, this same method can ferret out error and decrease uncertainty, but this outcome requires a community capable of social learning. Adaptive management processes must therefore encourage open forums and community advisory committees. The epistemological emphasis, once one adopts a process orientation, shifts from deduction based on prior knowledge to creating fruitful and provocative models and explanations that work in more and more situations. These models and explanations are then, in the process advocated by pragmatists, subjected to more and more experience of more and more truth-seekers, to see if they hold up over time. In ethics, as in science, the search for justifications is always provisional, based on all kinds of current assumptions and possible biases in our viewpoints.

The question arises, of course, whether this approach does not make ethics subjective, relative, or nonrational. But this issue can be sidestepped here, with a brief explanation. In the appendix I explain in some detail the importance of an argument (originating in the writings of Pierre Duhem and restated in more modern form by W. V. O. Quine) that there can be no crucial experiments in science. Every experiment—every experience—is understood and interpreted based on background knowledge. To put the point slightly differently, we never can compare single sentences with a single experience. Language maps onto the world in clumps much larger than sentences, and indeed, once that is admitted—in a context of action—it can be shown that the relevant clump is our entire belief system. Once we reject the sharp separation of facts from values, and once we follow the pragmatists in insisting on a single process of inquiry, it is obvious that Quine's insight applies also to value assertions. Value assertions must be understood as part of a larger pattern of beliefs; they are vulnerable to experience, since individuals often reconsider their values in the face of new or unexpected experience. Value assertions, then, have the same epistemological status as do factual ones. They are both vulnerable to experience, but one cannot model the relationship between experience and changes in either factual beliefs or values as a deductive relationship. So ethics and science are on exactly the same footing. In a process of inquiry, individuals will change their beliefs or values in reaction to new experiences; understanding this reaction is ultimately a matter of psychology and sociology, not of logic. Since this reaction is not strictly speaking "logical" either in science or in ethics, we can only describe and assess the choices individuals make. Ethics, in other words, is no more subjectivist or relativist than science. All assertions must stand the test of new experience. And the best way to submit a controversial assertion to wider experience is to inject it into public debate in which people have a real stake. Public deliberation about what is

of value finds its natural habitat in discussions about what to do. Values, as they are encountered in everyday situations—such as citizens or stakeholders discussing what to do to protect an environmental asset—are expressed in ordinary language, where facts and values are never segregated.

Adaptive management and pragmatism thus suggest an alternative empiricist approach to thinking about values in pluralistic, democratic societies. By interpreting naturalism methodologically we make no claims about what “derivations,” “copulations,” or “deductions” are possible among types of sentences. A methodological naturalist focuses not on deductions of “truth,” but rather on encouraging open discussion and deliberation, on ensuring a political process that promotes public discussion and deliberation as a necessary basis for choices. Along the way, the methodological naturalist pays attention to how people learn and how consensuses are formed; the methodological naturalist also pays attention to which vocabularies resonate in public discussions and which goals can gather support in the form of broad coalitions.

For adaptive managers, the epistemological process of justifying values is very similar to Neurath's strategy. In any given situation in which action is forced, there will be some beliefs or norms that gain more acceptance than others. The pragmatic method uses the stronger “planks” as support while testing other planks and as a place to “stand” while replacing planks determined to be weak. In a situation in which action is forced and knowledge is limited, the best strategy is to learn by doing. For example, Kai Lee describes how the Northwest Planning Council, united by the objective of increasing the percentage of juvenile salmon that reach the open sea and by an agreement to achieve this goal with minimal economic disruption, undertook pilot projects and experiments to compare trucking salmon smolts, building spillways, and other methods as means to increase survival of juveniles.<sup>8</sup>

Again, Neurath's analogy helps. His epistemology does not encourage doubting every shared belief and value of the community but, rather, bringing the best science available to bear upon areas of disagreement. Public deliberation that includes expressions of values as well as discussion of science is essential to identifying disagreements that separate community members and lead them to advocate differing policies. The problem, for the adaptive manager who is advocating new policies, is not to justify all of our beliefs at once, or some of our beliefs in isolation, but to focus experience and science upon crucial disagreements in the situation at hand. Discourse does not occur discretely, in units of fact and units of value; and any attempt to represent it as such will falsify the role of language in real life. Having deserted the attempt to derive one kind of “truth,” ethical judgments, from other kinds, pure facts, we can once again resort to Neurath's strategy and apply that strategy evenhandedly to descriptive and prescriptive discourse. The strategy is to develop a suf-

ficient consensus regarding some unquestioned values, some solid and uncontroversial information, and to put these agreements to work in experimenting our way through areas of uncertainty and compromise.

Even if one abandons the search for deductive relations among atomic fact-sentences and atomic "oughts," however, it still seems reasonable to ask about the impact of experience, observation, and sensory information on our evaluations. Pragmatism accepts that our language embodies both fact and value; in any argument one can appeal to facts and to values; but if one appeals to a value, no less than if one appeals to a fact, one must stand open to challenge on the basis of new or different experiences. No principles are rated as unchallengeable within the deliberative process.

Naturalism of the methodological variety suggests new relationships between social sciences and environmental policy. Since we are setting aside ontological questions about the nature of value and right action, we can turn our attention away from trying to deduce applications of general principles, to a process in which diverse participants make claims and counterclaims. The social sciences can now become important participants in the general deliberations about what to do, by providing evidence through questionnaires, surveys, and inference from behaviors about the interests, goals, and values of the general public, as well as the more restricted group of active participants in the management process.

As noted in section 5.4, we reject the assumption that only evidence about individual, "sovereign" preferences is relevant in deciding what to do. Methodological naturalism is dynamically applied within an ongoing process of social learning. Rather than simply eliciting individual preferences in isolation from ongoing deliberation, social scientists should be actively involved in the ongoing search for coalitions and consensuses by studying actual citizens and stakeholder groups that participate in actual processes in actual situations.<sup>9</sup> Although most citizens are unwilling to invest the time and effort necessary to participate fully in processes of deliberation, model-building, criticism, revision of beliefs, and reconsiderations of values, the good news is that the decisions of participants who *do in fact* participate actively in an iterative process can be taken as an important approximation of what the whole community would decide if each member were willing to make the same investment. The stakeholder-representational process may be imperfect, but it might nevertheless—if it represents all the stakeholder groups—provide a useful proxy for the counterfactual outcome of a full-society deliberative process. Much more is said about this use of this method in sections 7.5 and 11.5, but the point is that information about the opinions of active participants should be relevant information in choosing what to do. The outcome of a complex and ongoing process of monitoring, negotiation, pilot projects,

focus groups, and revisions based on such is surely as important a piece of information for decision makers as would be the "isolated" opinions of self-interested individuals.<sup>10</sup>

This epistemological method must help us to do two things. First, it must help us, in situations where there is some agreement about the factual situation and the goals the community wants to pursue, to use these agreements to find a viable policy. Doing so will often mean seeking a policy direction that is "robust" over a wide array of values and over considerable variation in factual beliefs of participants. This task of our epistemological method is to help us to move from agreement to action, by providing a means to identify policies that are supportable by many groups with differing viewpoints and interests, and to provide guidance as to when action is justified on the basis of given agreements and compromises. If there is adequate trust among parties to allow experimentation, the promise of such probes to reduce uncertainty and inform future actions should encourage support for pilot projects and other limited actions. This epistemological task, which we can call the problem of legitimating action, requires a method that leads to robust policies, allowing us, when we are operating in the action phase, to progress from real agreements about the situation and preferred goals to actions that are justified in a particular situation. They are justified in the sense that a group of participants with diverse backgrounds, with some shared beliefs and goals, and with some disagreements can reasonably support a particular policy as an improvement over the status quo.<sup>11</sup>

Our epistemological method must also allow us, especially when we move into the reflective phase, to survey a larger range of experience and to criticize, revise, and reform our preferences and value positions. We need to be able to sustain an ongoing public dialogue that allows us to question values, even ones that are widely held, and to support a process of social learning in which members of communities, upon seeing the consequences of acting in pursuit of particular values, may come to question and revise some of the values they have been acting upon.

Both of these tasks, as noted, are in one sense more epistemological than moral. The shift to an active, experimental science of management encourages us to *justify policies*, not to argue about the correctness of general theories of value. This does not, of course, preclude hard debate about values, because citizens' values will be a major part of any justification for a proposed or opposed policy. Any value that is cited in favor of a proposed policy is open to challenge, so values will often be at the center of disagreement and deliberation. But what we have learned is that there is no point in discussing whether "pure values" can be supported by "pure facts"; there are neither. The question is whether this policy can be supported given the mix of beliefs and values ex-

emplified in the community. What we seek is a method-guided process that will allow us both to act reasonably in the face of day-to-day challenges and to engage, in the longer run, in an ongoing process of identifying weak elements—whether factual or normative—in our current belief structure, undertaking steps to repair or replace those weak elements.

To apply this method in an adaptive management process, one would ensure that all stakeholders in decisions have a voice and that they are free to challenge any of the beliefs and evaluative statements that are given to explain and justify environmental policies. Only in such an inclusive community of inquirers are we justified in accepting unquestioned assumptions as even a temporary basis for cooperation and community action. If one hopes to create a practical epistemology of environmental values, one would also empower these stakeholders, either by providing them public funding or by giving them a voice in the choice of research topics undertaken with public funds, to seek evidence that might contradict assertions made in support of policies. If there is a lot at stake in a decision—if important social and community values are affected—and if participants have the means, they will root out errors and expose short-sighted and selfish goals as a part of an ongoing and iterative public discourse. Of course this result will not emerge from just *any* process: the process must treat all participants and their opinions with respect, and the process must be directed at truth-seeking, not be subverted to serve the interest of power or of any exclusive subset of the community.

Our methodological form of naturalism has the advantage that it focuses, at least initially, on *political procedures*, procedures designed to arrive at acceptable policies even in the face of diverse belief systems, perspectives, interests, and values distributed in various combinations in the population. The procedural approach tries to encourage wise action, based on current agreements and coalitions, even as the process of reason-giving, deliberation, and justification proceeds. That the process of seeking better policies is ongoing takes the pressure off getting “the right answer” or “the right evaluation” and allows discourse to proceed at the reflective level while agreed-upon actions probe possible system behaviors, with monitoring to reduce uncertainty and in some cases to provide new evidence that will support changes in policy direction.

The point, in my view, is not to seek as many facts and generalizations as possible and try to *derive* from them conclusions about what to do; instead, scientific models and understandings shift and reset the context in which environmental problems are conceptualized and discussed. Facts, I will argue in the next section, can cause us to reframe value questions in crucial ways. This does not mean that value questions get resolved by accumulating facts—there is no “entailment” of values by facts—but facts can alter the way we see a

situation, changing the rational, factual, and moral considerations that are considered relevant, revealing new areas of moral responsibility. Facts, I will argue, have a very special role in place-based, committed, democratic deliberation; facts can disturb comfortable assumptions and cause us to ask new and disturbing questions.

So it is useful to recognize that the relationship between factual information and evaluations shifts according to the context. In a settled situation in which management goals are well agreed upon, facts and science tend to dominate, because there is apparently a working consensus about goals, and science is employed to determine what is possible and necessary given certain goals. But when values become controversial, facts come under scrutiny not only for their truth but also for their applicability and importance in a given situation. If, for example, a forested community agrees that it should pursue maximum sustainable timber harvest from the forests in the region, there is a whole set of scientific information and research that will help them do this. But if the community becomes divided about values and factions come out in support of competing and conflicting values such as managing the forests to protect biodiversity, or traditional landscape features, or whatever, then we can expect very different science to become relevant, as well as very different forms of uncertainty. In such situations of ferment, a new perspective, a new way of looking at the world, sometimes emerges. These shifts in perspective can lead to a process in which values and evaluations are recontextualized and reconsidered.

### 6.3 Re-modeling Nature: Learning to Think like a Mountain

According to the strategy of methodological naturalism just advocated, we ought not to expect science to provide a "justification" of our moral inclinations in terms of "hard facts"; indeed, the idea that science provides value-neutral, "pure" facts that should be privileged as the basis for value assertions or policy recommendations is at best an artificiality. In the rough-and-tumble of policy discussion, facts and values are all jumbled together and the lines of justification in public deliberations constantly crisscross the artificial divide between facts and values.

Nevertheless, as students of the policy process, especially in the reflective phase of our discussions, we may find it both useful and important to temporarily separate out bodies of information generated by the various special sciences and consider this information as distinct as possible from the push-and-pull of public values and interests. In this context we can recognize a difference between a careful presentation of data gathered by a limnologist on the response of a lake to surges of excess nutrification and the testimonial of a

long-time resident of the lake area who, with tears in her eyes, expresses her dismay at the losses of water clarity that have occurred over the years. Our ability to see this difference—and a universal recognition among adaptive managers that it is important to have "objective" science as a basis for policy—leaves us with an important question not resolved by our rejection of the doctrine that there is a logical gulf between descriptions and prescriptions. We still want to know whether and how breakthroughs and advances in science affect human values and evaluations. We cannot sufficiently separate factual assertions from the values they implicitly embody to study logical relations among pure facts and pure values. We have just learned that this interaction is not well captured as a deduction or any other "logical" operation. It is nevertheless undeniable that exposure to new facts and information, when integrated into ordinary discourse and animated by values and normative concerns, can lead to a revision of our moral beliefs. To understand this phenomenon, it turns out that we must look at experiences of individuals who have reacted creatively to factual information.

One way to explore the phenomenon is to recount a few anecdotes regarding conservationists of yore. Let us start with John Muir, whose life was changed—according to his own account—by an encounter with a rare orchid in the remote forests of Canada. It was the height of the Civil War, and Muir (a pacifist) was sojourning in the Canadian woods, ostensibly gathering botanical samples, because he (mistakenly) thought he was being sought by the authorities for draft evasion. Muir came upon a specimen of the rare and beautiful orchid *Calypso borealis* in the trackless and remote woods and sat down beside the plant and cried with joy.<sup>12</sup> Decades later, Muir described this experience (along with meeting Emerson much later) as one of the two most important experiences of his life. Muir saw a rare orchid but interpreted its location in the wilderness as establishing that God's beauty was not distributed for maximal enjoyment of humans. This recognition dislodged just enough religious orthodoxy to allow Muir to see the orchid as a fellow traveler and to begin a process that led to Muir's adopting pantheism and, at least in his private thoughts, a nonanthropocentric ethic. A botanical observation caused Muir to reframe his thoughts about humans and nature and eventually caused him to significantly adjust his moral beliefs.

What is important here is that the observation had more of a psychologically catalytic effect than a "logical" effect. Sure, we could split hairs and try to separate the "observation" from the interpretation and the act of creative transformation it catalyzed in Muir's understanding. But this would surely do violence to the holistic experience Muir described. The experience was more than the imaging of the flower; Muir's lifelong passion for collecting botanical samples, mixed together with his feelings of isolation and alienation from

human society, created a context ripe for a creative restructuring of Muir's theoretical and perceptual experience that day. All of this was part of the experience; further, the experience continued as an important determinant of Muir's future. The encounter with the flower was enriched and given new meaning throughout Muir's life as he rearranged his thinking about creation. By the time he was jotting notes in his journal while walking from Kentucky to Florida several years later, Muir was attributing rights to alligators, bears, and rattlesnakes. Muir's rich and creative voyage was neither a matter of "pure" observation nor a moral conversion in any simple sense. An observation, in a particular context, caused Muir to place that momentary observation within a new intellectual firmament; it was more of a transformation of experience than of changing value theories. Most importantly, it was not a deduction or a conscious reevaluation; it was simply an experience that took on deeper and deeper meaning as Muir's beliefs and evaluations changed around it. This basic perceptual shift of course opened new paths of thought for Muir's scientific interest in ecology and also led to a deep moral reevaluation, an embrace of pantheism, and a robust nonanthropocentrism. My point is that the "key log" that led to these subsequent changes was a shift in perception—Muir saw the orchid in a new way, as existing independently of his motives and motives of his kind. Once he had seen the orchid in this new way, he was able, over the next few years, to root out more dogma and eventually articulate an inclusive philosophy of pantheism, complete with batteries of rights for all of God's creatures, and especially plants.

Let us look at another case, briefly. Thoreau, in the puzzling and sometimes jarring chapter of *Walden* called "Higher Laws," lays out his philosophy of humans and their place in nature. After stating that he loves "the wild not less than the good," and endorsing hunting as an experience necessary for young men to thoughtfully enter the realm of manhood, Thoreau begins a paragraph with the phrase "It is a significant fact that . . ." Thoreau's reasoning in that paragraph meshes nicely with Muir's in his botanical experience, although the style is far different and the experience is zoological. Thoreau reports the "significant fact," drawn from an entomological textbook, that butterflies and other species of insects, when they pass from a larval stage to a later winged stage of life, eat much less in the latter, "perfect" state. Thoreau goes on to explicitly discuss how the maturation of a society, maturation beyond what he called a "savage" state, is tied essentially to a change in perception, a change in which the individual comes to experience nature not as mere material for consumption and use, but as emblematic of a higher life of freedom from physical demands. Thoreau treats the fact that the butterfly gains flight and freedom by transcending its heavy animal body as an inspiring metaphor for human transcendence of a consumerist lifestyle: "The gross

feeder is a man in the larva state; and there are whole nations . . . , without fancy or imagination, whose vast abdomens betray them."<sup>13</sup>

Again, as in Muir's case, we encounter a normative insight, one that captures the essence of the self-transformation that Thoreau set out to describe in his famous metaphorical "year" at Walden Pond. Here Thoreau uses a generalization from a textbook as his starting point; but he often compared direct experiences of animals with human action and behavior. Again, Thoreau's insight is presented not as a deduction from some general or self-evident truth, but as an insight suggested by an analogy from nature, an insight that is given life by drawing out the elements of the analogy. Thoreau is trying to encourage moral change by describing experiences and making generalizations from experience; he does not operate in terms of premises deduced from foundational moral principles. He rather redirects moral attention by citing facts that suggest analogies to human experience and behavior. In this way he uses information and analogy to recontextualize moral decisions.

Finally, in perhaps the most important recontextualization in the history of environmental thought, already cited in this book, we return again to Aldo Leopold's simile of thinking like a mountain—the conceptual leap by which the observant Leopold reconfigured the spatiotemporal landscape on which he had experimented with his wolf removal policy. As usual, Leopold was onto something profound, and we should pay attention.

Many readers of the essay "Thinking like a Mountain" have concentrated on Leopold's poetic and moving description of the "green fire" dying in the eyes of the old she-wolf: "I realized then, and have known ever since, that there was something new to me in those eyes—something known only to her and to the mountain."<sup>14</sup> In the face of such poetic power, it is natural for the reader to pick up on the empathy Leopold felt for the dying animal. A careful reading, however, carries one far beyond the sentiment in Leopold's poetic expression. Near the beginning of the essay, its governing idea is stated: "Only the mountain has lived long enough to listen objectively to the howl of a wolf." The wisdom Leopold saw in the old wolf's eyes is given operational meaning in the next paragraph when Leopold describes his observations, apparently years later, of the scientifically evident effects of his wolf eradication program. Leopold does not respond to the death of the wolf by exploring the animal rights or animal welfare implications of hunting. No, he interprets the death of the individual wolf as symbolic of the degradation of the ecological systems that covered the mountains of the southwest territories. However moved he was by the green fire dying, Leopold's deepest concerns are directed at the observable changes he sees on the landscape. Leopold is using the death of an old wolf to symbolize the disappearance of a species from the ecological systems of the Southwest, and he begins to see that those changes bring any-

thing but a "hunter's paradise." The loss of wolves from the mountain is important because, in Leopold's personification of the mountain without wolves, the mountain must "live in mortal fear of its deer."<sup>15</sup> His analysis drives him to the conclusion that, as a conservation manager, he must manage the mountain, not single species, and that although the system has considerable resilience, violence of increasing pace and scale threaten that resilience. Having moved from wolf to mountain by analogy, Leopold expresses concern for the "health" and the "integrity" of ecological communities that change at the pace and on the scale of ecological change. As noted, the theme of the little essay is time.

In mentioning time and duration, Leopold was referring to "Marshland Elegy," another essay in *A Sand County Almanac*, where he carefully identifies three scales of time.<sup>16</sup> He differentiates human, experiential time from what can be called "ecological" time and "geologic" time. Human, experiential time is illustrated at the beginning of the essay as the narrator tells of the arrival of cranes at a crane marsh; Leopold accentuates the "slowness" with which we experience time when we are waiting for something—pots to boil or cranes to land in the marsh. Ecological time, the second temporal scale of interest, is determined by the pace of colonizations of plants and animals, by the forces of competition among species, and by the development of symbioses and predatory relationships. Changes on these scales, which range from decades to a millennium or so, modify landscapes and form the habitats that animals, including humans, live within. Geologic time, sometimes called "deep time" today, refers to the slow processes by which the physical features of a landscape are shaped. Leopold's point in the essay on the crane marsh is that humans must recognize that they have now gained the power to be the dominant force in changes on larger scales, that we ignore long-term consequences of our actions at great risk, and that the use of our technological power greatly expands our responsibilities as actors in a multigenerational drama. That is the lesson to be drawn from Leopold's famous insight that he had erred in removing wolves from the wilderness—he failed to think about the long-term ecological impacts of his action. He wanted a large deer herd for hunters, but when evaluated over a longer period of time, his actions failed. Learning to think like a mountain is to expand one's temporal consciousness to see humans as actors not just on a short-term economic stage, but also as increasingly dominant actors on the ecological scale, capable of changing not just the actors on the stage but also the very stage itself. Thus Leopold recognized that in accelerating ecological change by removing species, for example, we can also impact geologic formations—such as mountains—by increasing erosion. He was warning that with new and powerful technologies, and with ever-grander dreams of human dominion, we are in danger of destroying (or at least dimin-

ishing and uglifying) the very habitat that, having slowly evolved, supports us and is, to us, a beautiful home. The most central insight of Leopold's simile, then, is an insight about the importance of scale, both temporal and spatial, in our thinking about environmental management.

What these three examples—from Muir, Thoreau, and Leopold—have in common is a mental transformation that is triggered by a meaningful experience. For each man, an encounter with new information—or, one might also say, a newly meaningful encounter with available but hitherto overlooked information—reconfigures the architecture of the mental model by which he relates humans and nature. Factual information, in these cases, creates a new perspective, reframes a question, causes a reconceptualization on such a basic level that worldviews are altered and a new perspective emerges. Such a re-framing can lead, as in Muir's case, to an associated change in values and attitudes, but the path from perceptual reconfiguration to moral implications may be quite indirect and may not resemble a deductive relationship between factual and evaluative sentences. Indeed, the relationship may appear almost magical; its mysterious nature, however, does not detract from its importance in understanding how facts and values affect each other in real-world situations.

The importance of these experiences, both to the individuals who had and recounted them and as meaningful symbols of environmentalism, lies mainly in the way they encourage a change in perception or focus. Most environmental ethicists, I think, have been too quick to emphasize the moral aspects of such experiences, especially as they bear upon moral theory. In each of these cases, although moral concern is evoked, the intellectual and emotional transformation involved has more to do with rethinking the human place in things than with a change of values. What does this generalization tell us about how to better understand environmental values and evaluation? One thing it does is to call into question the general strategy of extensionism, as pursued by environmental ethicists and as described in chapter 5.

Much of the writing of environmental ethicists is premised on the assumption that modern societies damage nature because such societies believe a false theory of values, the theory that all and only humans have intrinsic value. In challenging this false theory, environmental ethicists, at first, formed intellectual alliances with animal liberationists, arguing against anthropocentrism and in favor of a countertheory, that at least some parts of nature, such as animals, have intrinsic value. In an important 1980 essay, my friend and philosophical raconteur J. Baird Callicott pointed out that since animal liberationists had concentrated on individual domestic animals, such an assimilation of environmental goals to those of animal welfarists or animal rightists would not support many of the key goals of environmentalists, who seemed

more concerned with ecosystems and wild species.<sup>17</sup> He proposed as an alternative that one could follow Aldo Leopold and become a "holist" by attributing intrinsic value to ecological systems ("the land community"), concluding that the struggle to settle upon a new theory of value for environmentalists is "a triangular affair." Animal liberationists occupy a corner of the triangle, as do of course traditional anthropocentrists; but one must also consider holism to be a possible basis for a new environmental ethic.

Perhaps most readers, like myself, were so impressed with the plausibility of the argument that the affair was indeed triangular, that they were slow to recognize that Callicott had described not a triangle but a truncated rectangle. To see this, consider a little diagram (fig. 6.1) that I put on the blackboard on the first day of every course I teach in environmental ethics:

For those beginning to study the field of environmental ethics, my diagram helps to sort authors they are reading into categories according to the moral basis on which they support their views, and it helps to define the major fault lines dividing the ethical terrain. It turns out that as we progress through a standard anthology, we read a number of authors who can be placed in categories IA, IB, and IIB. And of course these three categories fit perfectly with the three corners of Callicott's triangle. Category IA corresponds to the "standard ethical position" (what Callicott called "moral humanism"), un-

	A Anthropocentrism	B Nonanthropocentrism
I Individualism	anthropocentric individualists <i>traditional ethics and mainstream economics</i>	nonanthropocentric individualists <i>animal liberationists</i>
II Holism	anthropocentric holists <i>E.g., Leopold and Norton</i>	nonanthropocentric holists <i>E.g., Callicott</i>

Figure 6.1 Two intersecting distinctions in environmental ethics

questioned at least since the Enlightenment, that all and only human individuals have moral standing. Category IB is represented by animal liberationists (Callicott called them "humane moralists"), who extend moral standing to individual animals, attributing rights or legitimate moral interests to them, or at least to those animals above some level of complexity. The ethically holistic position, IIB, which considers species and ecosystems to have moral standing, was attributed to Leopold and unabashedly advocated by Callicott himself. Position IIA seemed impossible to Callicott because of his commitment to monism: if wholes are valued, then they must be valued *in opposition* to human individual goods (IIB) or else one must choose an individualist position. But Leopold, by identifying a plurality of values distributed over different landscape scales, could embrace IIA, the view that we should value *both* humans and ecological wholes.

Callicott, assuming that the antidote to environmental destruction must be found in a new moral theory that spreads intrinsic value more widely through the community (extensionism), says, "the good of the community as a whole, serves as a standard for the assessment of the relative value and relative ordering of its constitutive parts and therefore provides a means of adjudicating the often mutually contradictory demands of the parts considered separately for equal consideration." The holistic nonanthropocentrist, such as Leopold and himself, Callicott said, "locates ultimate value in the biotic community and assigns differential moral value to the constitutive individuals relatively to that standard." According to this view, the worth of individuals of all species is a function of their rarity and their contribution to the system. Callicott recognized that this ethic would be "somewhat foreign to modern systems of ethical theory" but did not shrink from applying the holistic value scheme to humans, who, he allows, have become ecological liabilities because of their large populations. Applying the holistic ethic, Callicott concludes that, correcting for the weight of the organisms, the human population should be "roughly twice that of bears."<sup>18</sup>

Because he had framed the question as one of determining who or what has "moral considerability," Callicott formulated the moral problem as one in which humans, being so numerous and so resource-hungry, neglect other moral entities in nature that have not been afforded fair access to resources according to the traditional, anthropocentric theories of ethics of the Enlightenment. To balance this situation, and to operationalize the idea of moral considerability for nature, Callicott simply attributed moral standing to natural communities and wild species, elevating them to the role of justified competitors for the bounties of nature. Thus, he implied that, once Western civilization had followed Leopold and adopted a holistic nonanthropocentric ethic—an act he described as similar to attributing intrinsic value to one's

child—ecological wholes would be treated as legitimate claimants on available resources.<sup>19</sup> This view seems to place humans in competition with nature itself. If humans are using more than their share of resources and ecosystems are suffering for this excess, then human populations must be curtailed and human consumption minimized to reestablish a balance among individual and holistic competitors for nature's resources.

Since this essay was published in the early 1980s, Callicott has been forced to back off considerably from this strongly holistic viewpoint, because it was quickly pointed out that in such a value scheme, interests of individuals, whether human or nonhuman, would regularly be sacrificed for the good of systems and species. Given that humans are neither rare biologically nor, apparently, necessary ecologically, Callicott's reasoning seemed to point toward grimly misanthropic policies. Tom Regan, for example, accused Callicott and (assuming Callicott had correctly interpreted Leopold's holistic tendencies) Leopold of "environmental fascism."<sup>20</sup> Callicott quickly retreated to a weaker form of holism whereby ecosystems and species could have legitimate claims and interests, but since the obligations to the land community were "layered upon" obligations to family and other humans, those obligations could not override the more intimate and prior obligations to family, clan, or humanity generally.<sup>21</sup> In this way Callicott backed off from ever favoring whole systems over individuals when conflicts arise among them, by subordinating holistic ecological entities to human individuals; his revised position amounts to a form of human favoritism under the label of nonanthropocentrism. What has gone wrong here?

First, notice that a central dilemma is created by the way Callicott formulates the moral issue. Because he assumes that human destruction of nature is caused by humans living according to a false belief that all nonhumans lack intrinsic value, he challenges this theoretical belief, thereby leveling the playing field by attributing such value to nonhumans. Correctly perceiving that Leopold, a hunter and a naturalist, was more interested in the perpetuation of ecosystems and species than of individuals, Callicott thus found a third corner of the theoretical rectangle, distinct from the moral individualism of both moral humanism and humane moralism, by attributing such value to ecological wholes, including the "land community." But this problem formulation, and Callicott's response to it, confronted him with a nasty dilemma. Either he could treat the intrinsic value of ecosystems and species as similar to, and commensurate with, the good of human individuals—as would be suggested by his analogical use of familial love and caring as his interpretation of intrinsic value attributions—or he could treat the intrinsic value of ecosystems and species as representing a new kind of intrinsic value that is not commensurate with the intrinsic value we regularly attribute to human individuals. Neither

horn of the dilemma, it turns out, is tenable. If Callicott assumes parity among individual and holistic intrinsic values, he seems committed to adjudicating the competition between humans and ecosystems by noting that humans, with exponentially growing populations, must be denied their previously unchallenged rights to consume resources. Individual interests, whether human or nonhuman, will thus be vulnerable to being overridden by fair demands of ecosystems for resources. Once the fascistic tendencies of this solution to the moral dilemma were pointed out, however, Callicott quickly retreated to the other horn of the dilemma, suggesting that the claims of nature and the claims of individuals exist in different realms of concentric obligations. Familial and tribal responsibilities, as well as later commitments to the intrinsic value of all humanity, are thus rendered incommensurable; the needs of ecosystems, no matter how much rarer they are than humans, cannot trump obligations based on human relationships. But this resolution of the problem either provides us no basis for decision when wholes are threatened (because the decision requires comparing incommensurables), or else it simply reinstates human-centered ethics disguised behind a myth that prior human recognition of familial and personal obligations establishes their moral priority.

What has gone wrong is that Callicott undertook to extend our moral commitments and obligations before he had reconfigured our perceptual world. Neglecting the central insight of Leopold's simile of thinking like a mountain—the necessary reconfiguration of the world into multiple scales—Callicott tried to solve the moral dilemma of humans versus nature on a single scale. He did not begin by correcting the short-term bias of most human thought and concern and then reconceive the problem of valuing humans and nature within a complex, multiscalar system. Learning to think like a mountain is, first of all, a perceptual shift that may prepare the way for new moral thinking, but only after the moral question has been reinterpreted within a multiscalar world. In this new world, value exists on multiple levels and unfolds over different horizons because it is enmeshed in different dynamics. Many of these dynamics may be of interest to humans, but since the dynamics are independent of each other—because they exist on different scales—we should not be tempted to see their demands as in direct competition with each other. We thereby avoid Callicott's dilemma. The consumptive values of human individuals exist on a short-term economic scale and are associated with a relatively rapid, individualistic, economically organized dynamic, whereas human concern for ecosystems and species ("the mountain") unfolds in the multigenerational frame of ecological change.

For more than a decade Callicott has championed monism, arguing that a pluralistic theory of environmental values will necessarily lead to unacceptable relativism with respect to moral claims regarding others. If he were to

give up monism and his insistence that a single theory must encompass all human value, he would see that there are multiple types of human value, that these values emerge on different scales of the system of interactions between humans and nature, and that individual values exist on different scales than do multigenerational, communal values. This separation of values onto different scales reduces direct competition between them, since different dynamics will be associated with their production. More importantly, locating individual and multigenerational values on different scales of the system would allow Callicott to avoid the debilitating dilemma he faces in his account of environmental values. He could avoid the apparent implication of a monistic holism, that one must choose between environmental fascism (if values of wholes override values of individuals) or a collapse into individualism and anthropocentrism (if obligations to individuals, especially to human individuals, override the values of wholes). Such an approach responds to the apparently unavoidable pluralism of any "model" for facing wicked problems, and it would embody Leopold's call for thinking like a mountain within the scale-sensitive, multiscalar, open, self-organizing systems of nature. Next I explore how such an operationalization might be accomplished and reflect on the possibility of linking human, scaled values with the dynamics of a describable physical system.

#### 6.4 Hierarchy Theory and Multiscalar Management

We can see the more positive implications of Leopold's important simile by considering again the three central principles of adaptive management, as introduced in chapter 3. These axioms are the endorsement of an experiential, experimental approach to management; a statement that natural systems, as managed, are multiscalar; and a statement that all observation, measurement, and activity are experienced from some identifiable point in a larger, dynamic system. We noted that the first principle stands as the defining characteristic of adaptive management; and we have just now noted that Leopold, more than today's adaptive managers, realized that evaluations as well as descriptions must be tested experimentally. The second two principles, of multidimensionality and internal location of observers, embody an ecological theory called hierarchy theory (HT), which has been introduced into ecology as a way of relating processes that occur on different scales.<sup>22</sup> Adaptive managers have incorporated the basic axioms of HT into their principles, providing themselves with a schematic treatment of space-time relations. We might say, then, that the first principle provides the motivation for modeling natural interactions, whereas the other two principles (HT) provide the "architecture" of

a set of models that we expect to be useful in management situations. Holling, for example, expresses HT as follows: "The landscape is structured hierarchically by a small number of structuring processes into a small number of levels, each characterized by a distinct scale of 'architectural' texture and of temporal speed of variables."<sup>23</sup>

Throughout the last half of the twentieth century, ecologists—who were often perplexed by stability and change and how to measure it—became increasingly aware of and vocal about the important role that scale plays in ecological science.<sup>24</sup> Whether one describes a system as stable, cyclical, or chaotic has a lot to do with the scale on which one probes the system. Even more basically, ecologists were constantly reminded that when different ecologists study similar systems on different scales, they report different dynamics and emphasize different relationships. So the field of ecology desperately needed a way to organize complex space-time relationships, and hierarchy theory, the structure of which was borrowed from general systems theory, was developed to respond to these problems. Speaking technically, hierarchical models are specifically those models that are structured by two defining assumptions: (1) all observation and measurement must be taken from somewhere within the complex, dynamic system that forms an "environment," and (2) smaller subsystems change at a faster rate than do the larger, encompassing systems that form their environment. HT can thus be understood as providing a collection of models, designed to organize space-time relationships in a multiscalar, complex ecological system. In these models, objects appear on one level as agents, but when viewed at a higher level of the hierarchy, they join with other objects, constituting a collective "agent" that acts in a larger dynamic.<sup>25</sup>

Functionally, the axioms limit the types of models we consider and thus give shape to the world we experience. Methodologically, we can use hierarchical models to organize information about the physical world onto three scales. The "focal" scale is the level of system that is being studied. From any given focal scale, it is possible to move down to level  $-1$ , where one observes component elements of the focal level. Observations and explanations on the  $-1$  scale track the mechanisms and dynamics driving activities on the focal level. If, however, one wishes to understand the context in which the focal-level dynamic functions—the constraints placed on the focal dynamic by the larger, slower-changing environment—one looks at the focal dynamic as one element in the larger dynamic at level  $+1$ . Axiom 2 should be interpreted as saying that if two dynamics exist on neighboring levels or scales of a system, then they differ by an order of magnitude. For example, the dynamic driving the birth and death of individual animals must be such that multiple genera-

tions of births and deaths will occur in the process driving the larger, contextual environment—the level + 1.

Ideas similar to HT had been kicked around in graduate seminars and in discussions of ecological structure for decades, but the first fairly formal treatment of the subject was published by T. F. H. Allen and Thomas B. Starr in 1982; a subsequent book was published in 1986.<sup>26</sup> The somewhat abstract speculations of theorists were then given more empirical content with the development of hierarchical patch dynamics as a working hypothesis about landscape constitution and change over multiple scales of time and space, and now a considerable bibliography exists on the subject of hierarchical organization in ecosystemic studies.<sup>27</sup>

What strikes me especially is how similar HT is, in its basic insights and supporting intuitions, to Leopold's simile of thinking like a mountain.<sup>28</sup> Leopold's analysis of his actions (the campaign he waged to destroy wolf and mountain lion populations) and their outcome (starving deer and degraded vegetation) was a practically useful exemplar of the kind of model HT proposes. To think like a mountain, he had, first, to locate himself on the mountain, observing the mountain from within its context, a context that is constrained on all sides by dynamics unfolding on multiple scales. Human management choices and affected dynamics were taken to set the focal level of Leopold's observations.

From that focal level, Leopold could either look downward in the hierarchy, analyzing the mechanisms and motives of individual interactions of deer, wolves, and hunters, or he could look upward and explore the constraints affecting the viability of his management choices. Within this framework of analysis, Leopold recognized that his original evaluation of the situation, which presupposed a relatively stable system that would not be permanently altered by the severe action of eradicating all wolves and most mountain lions, focused only on the short-term relationship that created a temporary increase in deer populations and greater opportunities for hunters. For Leopold, learning to think like a mountain was to recognize the importance of multiple temporal scales and the associated hidden dynamics that drive them. These normally slow-scale ecological dynamics, if accelerated by violent and pervasive changes to the landscape, can create havoc with established evolutionary opportunities and constraints and threaten the society with extinction. A society, in Hadley's words, has found the "truth" if its cultures are adapted to the physical system in which its members live. But Leopold discovered that success on short-term economic scales, especially when associated with "violent," technologically supported tactics, can set in motion destabilizing ecological processes and threaten the contextual processes that support individual uses of the environment.

Hierarchy theory, if built into an activist, adaptive management system, then, provides a Darwinian unification of Hadley's model for cultural/societal competition and evolution with Leopold's ecological insight about wolf management. He uses similar reasoning to determine that the grazing culture in the Southwest was, despite economic growth, failing as a long-term adaptation. The people who transplanted the European grazing culture did not have the "truth" about the new context in which they were acting so confidently. They did not have the cultural practices and adaptations that had been honed by generations in that place by previous, indigenous cultures. Whereas Hadley had assumed that capitalism and boosterism, combined with technological growth and development, would work everywhere to the same advantage they had in Europe, Leopold relied on his horseback observations to show that the transplanted European culture—perhaps because its values were inappropriate in a new ecological context—was racing toward its destruction. Most people in the transplanted culture had not lived through a hundred-year drought. Leopold's careful ecological observations convinced him that in the longer run, over multiple generations, the imported, growth-oriented system was not well adapted to the arid Southwest, with its periodic droughts. And Leopold realized that wolves are key players in a slower dynamic, a dynamic that trims the deer herd to fit the vegetative cover of the mountain.

So thinking like a mountain can be seen as an exemplary model of multiscale relationships and how they affect—and are affected by—our decisions. This model involved viewing a multiscalar system from the perspective of an actor inside it and anticipated the spatiotemporal insights of the HT axioms. Further, Leopold recognized that his original evaluation of the policy of wolf eradication took into account only its impacts on hunters' short-term welfare, a too-short scale of time to see important impacts. He learned that total removal of wolves exerted too violent an impact on the system; in the long run, the result was starving deer, stunted vegetation, and erosion of the mountainsides. Surely, it was a satisfying intellectual bonus to Leopold that this physical model dovetailed perfectly with the Hadleian model of Darwinian historical selection of cultures that are well adapted to their habitat.

Leopold had, then, a fairly complete—if metaphorical—characterization of the set of models we today call hierarchical models. He clearly saw that such models were important for monitoring and management because they could help him to organize data and analyze what was going on at different temporal horizons, in more subtle and slower-changing dynamics.

As noted, Leopold was considerably more advanced than today's ecologists and adaptive managers in one important respect. He saw that the reasoning that compelled him to pay attention to multiple dynamics operating on different scales if he wanted to predict impacts of his activities applied also to

any attempts he might make to intelligently evaluate those impacts. Evaluations, no less than models of the physical relationships, had to be made from within the system, including an accounting of unintended consequences of our probings and our actions on larger-scale systems that support further, and future, productivity.

When Callicott interpreted Leopold as an extensionist and a moral holist (square IIIB in fig. 6.1), he missed Leopold's most important discovery, the recognition that we act, learn, and evaluate within a multiscalar world. Leopold's greatest contribution is not in musings about extending moral considerability but in reconstituting the perceptual field of environmental managers. He transformed that world into the world of an adaptive manager, measuring, testing, and evaluating from within a complex, dynamic system as a guide to adjusting our behavior. Leopold first recognized that managers cannot view species and ecosystems as simple, "external" objects because the manager is also an actor on the same stage with individuals, species, and ecosystems; the manager necessarily participates on all these levels and scales, having impacts on multiple dynamics that will play out over different time horizons. Since he was, first of all, a manager, Leopold's choices—as well as the observations and evaluations that drive those choices—are necessarily human-centered. In this perspectival sense, Leopold's new model was most basically anthropocentric. It models human decisions based on human perceptions and evaluations. Once one's perceptual world is thus reconfigured, it would be a simple confusion to extend this type of value to ecosystems as objects in competition with humans for resources, as Callicott does.

So we should, I conclude, place Leopold in box IIA, outside Callicott's triangle, and consider Leopold to be an anthropocentric holist. This category is open to him because, contra Callicott, he was a pluralist, recognizing different values emerging at different scales of a complex system. By reconfiguring the world we humans live and act within, Leopold was able to appreciate the full implications, including value implications, of living within a complex, dynamic system spread outward from our own experiential perspective, but spread out also across multiple scales of space and time. Within this newly configured, experientially constituted universe, it is possible to ask how humans do or can value ecosystems and communities and perhaps to conclude that humans value them noninstrumentally. But this is a statement about human values and does not entail human-independent values "discovered" in nature. Ecosystems, in Leopold's new universe of experience, cannot be independent centers of values that compete with human values; ecosystems rather are experienced, and evaluated, from within a multiscaled and open system in which humans are embedded. Humans, therefore, observe and evaluate changes on multiple scales and thus human values cannot be treated "monis-

tically"—as expressions of a single type of value that is scale-independent. If Callicott had seen that Leopold's reconsideration of how to evaluate human-induced change was logically subsequent to a reconfiguration of his perceptual world, he would never have been tempted to put the interests of ecosystems in competition, on the same level, with individual, human goods; and he could have thus avoided his dilemma forcing a choice between environmental fascism and a green light to degrade nature.

By reconstituting our perception of natural systems as multiscalar, Leopold encouraged a pluralistic approach to evaluation, an approach according to which humans may, and eventually must, evaluate changes that emerge on multiple scales, including both the scale of individual economic activity and community-wide, multigenerational scales. By placing all of these evaluations within a reconfigured perceptual field, however, Leopold also eliminated appeal to values that transcend human experience. He was, in this sense, unquestionably an anthropocentrist. Evaluation, as well as our observations, must be made within our experience, once it is reconfigured to allow us to think (including to evaluate) like a mountain. As such, values, no less than our factual conjectures, must stand before the tribunal of experience. Leopold, like Dewey, recognized that there could not be separate logics for scientific predictions on the one hand and evaluation on the other. Choices of what to monitor, on what scale, with what instruments simply cannot be separated from questions of what is valuable and which dynamics are important because of their impacts on social values. Scale thus becomes a crucial aspect of this complex of understanding and evaluation.

Leopold began to restudy deer-wolf relationships because of a double failure. First, his implicit prediction that the deer population could be held in check by hunters proved false. Second, however, there was a catastrophic failure in achieving his social goal; that is, a social disvalue was caused by the interruption of the traditional deer-wolf-hunter-vegetation complex. By the late 1920s Leopold was recommending reduction of wolf populations but maintenance of smaller populations in wilderness areas. Manipulations of hunting regulations, he said, "are a crude instrument and usually kill either too many deer or too few. The wolf is by comparison a precision instrument; he regulates not only the number, but the distribution, of deer."<sup>29</sup> By the mid-1930s Leopold had become an advocate for predator protection, especially in wilderness areas. What is interesting is that way back in the teen years he had formed a simplistic hypothesis, that wolves and mountain lions limited deer availability for hunters. He formed an objective, to extirpate the large predators from the Southwest. He succeeded in his goal, at least with respect to wolves, while driving mountain lion populations to ecologically insignificant levels.

Reflecting years later, Leopold did not like the outcome of his "experiment." One thing he learned was how values and facts become all jumbled together in environmental management decisions. Hierarchy theory provides a useful framework to encourage consideration of management actions on the larger-scaled and slower-changing systems. But one can never eliminate the crucial role that values play in directing our attention toward certain dynamics and away from other dynamics.

Leopold came to believe that human values themselves are scaled, that human values unfold over different horizons and that a reasonable assessment of any policy must first identify values and goals that may emerge over longer periods of time, according to slower and more subtle dynamics. Leopold's emphasis on economic values caused him to pay attention to shorter-scaled physical dynamics. If one were to emphasize long-term values, such emphasis might encourage study of longer-term dynamics, for example erosion and siltation of streams. Choosing important dynamics to study and choosing which values to protect stand in a chicken-and-egg relationship. Importance cannot be judged on purely scientific grounds, so if one has no idea what values to protect, one cannot determine which dynamics to monitor, what to study, and what indicators to emphasize in setting management goals. There are so many natural dynamics and so many possible ways to model them, that failure to focus on a few key dynamics will create a situation of such great uncertainty that management decisions will be impossible. Conversely, to talk about environmental values in universal terms, not based on any specific, local models of actual natural dynamics, will not result in progress toward locally chosen indicators and management goals. Discussions of social values must inform decisions regarding what to monitor and what models should be constructed; meanwhile, information about natural dynamics and likely impacts on them by human activities must inform and shape our understanding of what we value.

Before closing this discussion and moving forward to consider how members of a diverse society, expressing multiple values associated with multiple scales, can move toward cooperative behavior, we must clear up two important ambiguities that result if we follow Leopold in thinking like a mountain. First, we must inquire as to the logical and epistemological status of the hierarchies we posit and use to organize our perception and understanding of the world we encounter and act within. This is an issue that Leopold (who, after all, simply offered a provocative simile) never answered, or even addressed. Second, we must ask whether, after adopting Leopold's reconfigured world of managerial perception, we can make any sense at all of claims that nonhuman objects in nature can "have" intrinsic (inherent) value.

What then is the logical and epistemological status of the scalar specifica-

tions for a particular ecological hierarchy? We can mention three possible interpretations. (1) The hierarchical organizational structures are an essential element of human understanding; all knowledge of nature must necessarily be expressed in hierarchically ordered systems. (2) Hierarchical organization is inherent in all ecological systems; every correct empirically descriptive model of ecological systems must exhibit hierarchical structure. (3) Hierarchical models, because they provide a series of useful conventions for organizing complex space-time relations in complex, dynamic ecological systems, are useful for a variety of descriptive, explanatory, and management purposes.

Of these explanations, we can eliminate the first interpretation out of hand. On this interpretation, we would be allowing *a priori* knowledge to place restrictions on what can be observed, a position we have rejected in favor of a more pragmatic, experience-based approach. Worse, the explanation seems false on its face—there are many alternative models that are not hierarchical and that are clearly useful in some circumstances. The second interpretation, however, may well be true. For example, C. S. Holling advances evidence that the size distribution of organisms in an environment does not vary continuously, but rather organisms exist in “clumps” of possible body sizes. Holling suggests the following hypothesis, which he calls the “Textural-Discontinuity Hypothesis”: “Animals should demonstrate the existence of a hierarchical structure and of the discontinuous texture of the landscape they inhabit by having a discontinuous distribution of their sizes, searching scales, and behavioral choices. Landscapes with different hierarchical structures should have corresponding differences in the clumps identified by such a bioassay.”<sup>30</sup> In other words, the body size of animals is expressive of the organizational structure of their habitats. Since humans are animals, and Holling’s hypothesis suggests that body size is constrained by system structure, one might infer that there is an important empirical relationship between humans and the structure of the environments in which they survive. Holling builds on this idea, arguing that for each species, and given the body size of organisms of the species, there will be a “natural” microscale, mesoscale, and macroscale built into our landscapes. The microscale refers to the mechanisms on which individuals depend within the dynamic of a particular environment, the mesoscale is the scale on which populations must successfully negotiate a niche that allows them to reproduce and maintain relatively stable populations, and the natural macroscale refers to the dynamics of geomorphology, affecting topography, hydrology, and so on. According to Holling, then, the three-scale structure embodied in HT can be applied to environmental structure encountered by all animal species, and the body sizes of species are adapted to structural aspects of the environment on these three levels. This hypothesis is really just a more technical statement of the temporal-scale

model of individual time, ecological time, and evolutionary or geologic time that Leopold sketched in "Marshland Elegy," as noted above.

Whether Holling's empirically based speculations are true or not, I do not think it is necessary to rest our admonitions to think like a mountain, a stream, or a wetland on such an empirical hypothesis. Leopold's admonition, we must always remember, was offered in a *management* context; so even if there are natural gaps and "lumps" in the systems we observe, our choices of models will be affected as much by our goals, values, and concerns as by purely physical structures in our environment. We therefore follow Allen and his colleagues, who describe the choice of hierarchies as "utilitarian" in nature, treating these hierarchies as pragmatic choices about how best to make sense of our experiences.<sup>31</sup> But we differ from these authors, who apparently think of the choice of hierarchies as a matter of choosing the best constructs for the purpose of *pure physical descriptions* of the system in question. Since I doubt that there is such a thing as pure description, and since, following Leopold, we are addressing the problem within an activist, management context, it is clear that our values as well as our observations will affect our choices regarding the constitution of hierarchies by which to organize and understand our perceptions. This viewpoint, then, brings us back to conventionalism and linguistic tolerance as advocated by Rudolf Carnap, by pragmatists, and by students of the pragmatics of language and communication, as discussed in the appendix. According to this view, we develop physical models and theoretical languages as useful tools for understanding experience, and we try to improve these models even as we use them to inform our interactions with nature. Carnap's principle of tolerance simply applies the experimental method to the use of models and languages in active situations.

If this strategy seems to point us toward subjectivism and the development of models that serve special interests, we turn to Peirce and the constraints set by the needs of community, by the need to communicate even with those who have opposed interests. A community committed to acting cooperatively will, in its deliberations and struggles to communicate, test various languages and vocabularies. If one purpose of models and languages is to encourage cooperative behaviors, then our linguistic conventions must also be tested against experience in public discourse, and they must be refined and improved through the processes of communication and deliberation. On Neurath's boat, *all* beliefs, including beliefs about how to configure our experience into useful hierarchical structures for understanding and managing the environment, are open to revision in the face of new, especially practical experience. The necessity of communication for cooperative behavior can thus be the engine that drives new conceptualizations and new and more useful models of environmental problems.

With this clarification made, we can now address the question that has been central to so much writing in environmental ethics: do any nonhuman elements of nature have intrinsic value? Our interpretation of Leopold's thinking-like-a-mountain simile, when coupled with our rejection of all *a priori* sources of knowledge, leads us to reject any claims of intrinsic value that exists *independent* of human perception. Such values would be, essentially, "intuitions"; they would, to use Moore's phrase, refer to "non-natural qualities." But such values violate the pragmatists' insistence that all of our beliefs be open to challenge on the basis of experience. However, if we next ask, Do human individuals ever value nature intrinsically? we can quickly answer that they do. Placing value on things independently of their immediate, selfish uses is certainly one of the several ways humans evaluate changes in the natural systems that form their habitats. Such experiences are part of the raw material from which we must construct our holistic approach to understanding and evaluating changes in natural systems. But such assertions of value should not be treated, following Callicott, as values that may conflict with, and must be balanced against, opposed human values. They *are* human values. If there is a conflict among human individual interests, human communal interests, and human sentiments of altruism—as there always is—the conflict occurs within human understanding and evaluation. Failures to protect things we value intrinsically is a human failure to be measured in human terms, and if such failures leave us perplexed, the place to look for enlightenment is in improved ways to scale and integrate human values, rather than in an attempt to adjudicate conflicts between one set of values defined as humans claims on nature and another defined as nature's claims on humans. If we accept re-modeling of nature to insert humans within a multiscaled system, the conflict disappears. Individuals suffer economic losses and gains; but damages to the "mountain"—the ecological context of the human activity in question—emerge on a multigenerational scale and have effects at the community level. Here, the "good" is multi-generational and not commensurate with individual human economic "good."

As a pluralist, I believe that assertions of noninstrumental value in nature should be taken seriously in our search for a coherent and comprehensive theory of environmental value. If such values are included as an important type of value in our comprehensive theory of evaluation, we should not forget that such values are highly theory-dependent; they have no theory-independent existence as trumps or counterweights to human values. We recognize multiple types and expressions of human values, but since these are associated with different scales and different dynamics, one need not choose between honoring other humans and honoring ecosystems. An adequate theory of environmental value must make a place for all human values, instrumental and noninstrumental; it must also—and this is the hard part—provide a way to

reconcile or fairly balance competing human interests. Although we are far from having such a theory, Leopold taught us that such a theory will be possible only if we reconfigure our world and reorganize our experience. If we can begin to judge proposed actions and policies for their economic impacts and also for their ecological and evolutionary impacts, we will, in effect, be associating different *human* values with multiple dynamics of natural systems. A good policy is one that has positive impacts on all levels. It is *not* the one that does the best when measured against a short-term economic criterion. Leopold's insight, then, shows us how to array human values on multiple scales and to avoid Callicott's false dilemma, which puts human interests in conflict with nature's interests on a single scale.

We can now summarize the key idea suggested by Leopold's analysis of his wolf-eradication policy: It is useful to perceive human choosers as embedded in a hierarchical system and to see that the human values delivered by that system emerge on different scales of space and time. Once values are so sorted, it may be possible to associate these variables with natural dynamics essential to their continuation. Viewed in this way, thinking like a mountain is thinking about human values as time-sensitive and as produced by specific processes and dynamics that unfold on identifiable scales. These relationships are shown in figure 6.2. The first level of the hierarchy, with the shortest temporal horizon, corresponds to economically based decisions, the horizons of which are bounded by the horizon of individuals' economic concerns. The second level of the spatiotemporal hierarchy is especially important because it is the level at which humans shape their own culture and multigenerational community through individual and cooperative acts that, at the same time, impact the landscape in which they will make future decisions. This is the level on which a human cultural unit, a population or a human community, interacts with the other species that form with it a larger ecological community, or place. We might say that on this level communities articulate their long-term aspirations regarding what kind of society they will be and how that society will express itself on the landscape. I believe it is a shift to this expanded level—the level at which a community's aspirations inspire them to undertake preventive and restorative ecological practices—that Leopold refers to as "thinking like a mountain."

On this interpretation, then, Leopold advocates using hierarchical models, models that are sensitive to differences of temporal and physical scale to analyze both the impacts and the associated values that affect managerial decisions. This approach views natural systems from a human perspective, inside-out, as open systems embedded in larger systems that change much more slowly. Because humans are placed as actors in such an open system, it is not necessary to posit new entities such as "whole ecosystems" that must be

Temporal Horizon of Concern	Time Scales	Temporal Dynamics in Nature
Individual and economic	0 - 5 years	Human economies
Community intergenerational bequests	Up to 200 years	Ecological dynamics and interaction of species in communities
Species survival and our genetic successors	Indefinite time	Global physical systems

Figure 6.2 Correlation of human concerns and natural system dynamics on different temporal scales (from B. G. Norton, "Ecological Integrity and Social Values: At What Scale?" *Ecosystem Health* 1 [1995]: 239)

accorded moral standing. Open systems, with larger systems placing constraints on their constituents, exercise control from above. When human actions cause, or are expected to cause, these normally fast-changing variables to accelerate, they alter—often for the worse—the mix of options and constraints that will exist in the future. Such aggregated actions are maladaptive at the intergenerational scale.

What Leopold learned from his ill-fated experiment in wolf eradication was that scale counts; important human values will be missed—and destroyed—if we confine our concern to short-term considerations and impacts of our policies on economic individuals. Ecological systems, human value systems, and social, managerial systems are all complex. The best way to deal with these layers of complexity is by developing and refining hierarchical, space- and time-relative models of human actions affecting natural systems, on the one hand, and corresponding hierarchical systems that track human values and the impacts of landscape change on those values, on the other.