

Against the Moral Considerability of Ecosystems

Harley Cahen

I

If natural areas had no value at all for human beings, would we still have a duty to preserve them? Some preservationists think that we would. Aldo Leopold, for instance, argues brilliantly for the cultural and psychological value of wilderness; yet he insists that even “enlightened” self-interest is not enough.¹ According to Leopold, an “ecological conscience” recognizes “obligations to land.”² The ecological conscience sees that preservation is a good thing in itself – something we have a *prima facie* duty to promote – apart from any contribution it makes to human welfare. For convenience, let us call this conviction the *preservationist intuition*.³

I share this intuition. Can we justify it? I see at least four plausible strategies. We might, first, appeal to the intrinsic value of natural ecosystems.⁴ A second strategy relies on the interests of the individual creatures that are inevitably harmed when we disturb an ecosystem.⁵ A third possibility is a virtue-based approach. Perhaps what offends us – as preservationists – is that anyone who would damage an ecosystem for inadequate reasons falls short of our “ideals of human excellence.”⁶ Each of these three strategies has something to recommend it. But none captures the element of the preservationist intuition that involves a feeling of obligation to “land.” This suggests a fourth strategy, the appeal to what Kenneth Goodpaster calls *moral considerability*. This strategy represents an

ecosystem as something that has interests of its own, and thus can directly be victimized or benefited by our actions.⁷ If ecosystems do have interests of their own, perhaps we owe it to them to consider those interests in our moral deliberations. This fourth strategy is the one that I wish to call into question.

There is a fifth strategy – an appeal to the moral right of a natural ecosystem to be left alone. This strategy is similar to the fourth one but may be distinct. Rights, some would say, automatically “trump” other kinds of moral claim.⁸ If so, an appeal to ecosystem rights would be much stronger than an appeal to moral considerability. (Too strong, I suspect: I find it best to regard talk of the rights of nonhumans as an enthusiastic way of asserting moral considerability.⁹) We can leave this question open, though, for if they are trumps, moral rights have at least this much in common with moral considerability: they both presuppose interests.

I contend that ecosystems cannot be morally considerable because they do not have interests – not even in the broad sense in which we commonly say that plants and other nonsentient organisms “have interests.” The best we can do on behalf of plant interests, I believe, is the argument from *goal-directedness*. Nonsentient organisms – those not capable of consciously taking an interest in anything – have interests (and thus are candidates for moral considerability) in achieving their biological goals. Should ecosystems, too, turn out to be goal-

directed, they would be candidates for moral considerability.¹⁰

Although the argument from goal-directedness fails, we should not dismiss the argument too hastily. Some ecosystems are strikingly stable and resilient. They definitely have a goal-directed look. Yet there are reasons to doubt whether this apparent goal-directedness is genuine. The key is to distinguish the goals of a system's behavior from other outcomes that are merely behavioral *byproducts*. Armed with this distinction, we can see that the conditions for genuine goal-directedness are tougher than environmental ethicists typically realize. Ecosystems seem unlikely to qualify.

In sections two and three of this paper I define *moral considerability* and distinguish it from other ways that something can matter morally. In section four I establish that goal-directedness plays a key role in arguments for the considerability of plants and other nonsentient organisms. In sections five and six I argue that this appeal to goal-directedness is plausible as long as we keep the goal/byproduct distinction in mind. In sections seven through nine, I argue that ecology and evolutionary biology cast serious doubt on the possibility that ecosystems are genuinely goal-directed.

II

The literature of environmental ethics is full of appeals to the interests of ecosystems. Consider Aldo Leopold's famous remark: "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."¹¹ Is Leopold suggesting that the biotic community has an interest in its own integrity and stability? Some commentators interpret his remark this way. James Heffernan, for instance, defends Leopold by insisting that "even ecosystems . . . are things that have interests and hence, may be benefited or harmed."¹² Holmes Rolston, III likewise would found an "ecological ethic" upon the obligation to promote "ecosystemic interests."¹³

More often the appeal to ecosystem interests is implicit. Consider John Rodman, criticizing animal liberationists such as Peter Singer for drawing the moral considerability boundary to include only sentient beings. Rodman complains: "The moral atomism that focuses on individual

animals . . . does not seem well adapted to coping with ecological systems."¹⁴ Why is "atomism" inadequate? Because, Rodman explains, an ecological community as a whole has a good of its own, a "welfare":

I need only to stand in the midst of clear-cut forest, a strip-mined hillside, a defoliated jungle, or a dammed canyon to feel uneasy with assumptions that could yield the conclusion that no human action can make any difference to the welfare of anything but sentient animals.¹⁵

Of course, Rodman believes that individual plants and nonsentient animals are morally considerable, too. That is reason enough for him to feel uneasy with Singer's assumptions. It cannot be his only reason, however, for it would leave him as guilty of moral atomism as Singer. Whose *welfare* could Rodman have in mind? The welfare, I take it, of the communities themselves.¹⁶

III

Moral considerability is a potentially confusing term. Let me clarify and defend my use of it. I take moral considerability to be the moral status x has if, and only if (a) x has interests (a good of its own), (b) it would be prima facie wrong to frustrate x 's interests (to harm x), and (c) the wrongness of frustrating x 's interests is direct – that is, does not depend on how the interests of any other being are affected. It is the concern with interests that distinguishes moral considerability from the other varieties of moral status upon which the preservationist intuition might possibly be based.

Goodpaster plainly means to restrict moral considerability to beings with *interests*. In his first paper on moral considerability he explains that life is the "key" to moral considerability because living things have interests; this, he points out, is what makes them "capable of being beneficiaries."¹⁷ Goodpaster makes a point of agreeing with Joel Feinberg about what Feinberg calls "mere things." "Mere things," Goodpaster says, are not candidates for moral considerability because they are "incapable of being benefited or harmed – they have no 'well-being' to be sought or acknowledged."¹⁸ That is why he insists that

“*x*’s being a living being” is not only sufficient for moral considerability but is also *necessary*.¹⁹

In Goodpaster’s subsequent work, he characterizes the entire biosphere as a “bearer of value.”²⁰ Yet he does not appear to have changed his understanding of the requirements for moral considerability. “The biosystem as a whole” is considerable, he says. Why? Because it is, in effect, an “organism” – “an integrated, self-sustaining unity which puts solar energy to work in the service of growth and maintenance.”²¹ Goodpaster’s focus remains on interests and he expresses his confidence that the “biosystem as a whole” has them.²²

Some philosophers speak of moral considerability but do not associate it with interests at all. Andrew Brennan, for instance, asserts that natural objects such as ecosystems, mountains, deserts, the air, rocky crests, and rivers may have this moral status though they have no interests and thus can be harmed only “metaphorically.” This is no longer moral considerability as I understand it.²³

Other philosophers equate moral considerability with intrinsic value, holding that both equally presuppose interests. Robin Attfield, for instance, writes, “I follow Goodpaster in holding that things which lack a good of their own cannot be morally considerable . . . or have intrinsic value.”²⁴ J. Baird Callicott attributes to Goodpaster the view that because “life is intrinsically valuable . . . all living beings should be granted moral considerability.”²⁵ As Callicott sums up his own view:

If the self is intrinsically valuable, then nature is intrinsically valuable. If it is rational for me to act in my own best interest, and I and nature are one, then it is rational for me to act in the best interests of nature.²⁶

The association of intrinsic value with interests seems odd to me. Many readers will suppose that “mere things” – things which have no interests, no good of their own – might conceivably be intrinsically valuable. As Eric Katz puts it, “many natural entities worth preserving [i.e., valuable in their own right] are not clearly the possessors of interests.”²⁷

Is this just a quibble about words? I think not. We have more than one paradigm of moral relevance, and it makes a difference which one we adopt as the model for our ethical thinking about ecosystems. If we aim to justify preservation by appeal to the intrinsic value of natural ecosystems,

our arguments must build on the way ecosystems resemble other things that we preserve for their intrinsic *value*. Moral considerability is another matter. To ground the preservationist intuition upon the *interests* of ecosystems, we have to look for an analogy between ecosystems and beings that clearly have interests. Given that ecosystems are not sentient, the most promising models are plants and other nonsentient organisms.²⁸

IV

Some ethicists would object that we cannot even get this argument for ecosystems off the ground – it is absurd, they would say, to think that plants could be morally considerable. Such a dismissal of plants, however, is too quick, for it ignores goal-directedness. Peter Singer, for instance, regards *rocks* as representative of all nonsentient beings. “A stone,” he says, “does not have interests because it cannot suffer. Nothing that we can do to it could possibly make any difference to its welfare.” He therefore boldly concludes: “If a being is not capable of suffering, or of experiencing enjoyment or happiness, there is nothing to be taken into account.”²⁹

Although sentience may turn out, after all, to be necessary for moral considerability, this just cannot be as obvious as Singer assumes. There is a world of difference between plants and rocks. Surely there might be something to “take into account” even in the absence of sentience. All we need, as Bryan Norton observes, is something appropriately analogous to sentience. Norton rejects the possibility of ecosystem “rights” because “collectives such as mountain ranges, species, and ecosystems have no significant analogues to human sentience on which to base assignments of interests.” Since collectives lack any analogue to sentience, he reasons, “the whole enterprise of assigning interests [to them] becomes virtually arbitrary.”³⁰ Norton reaches this conclusion too quickly, as I argue below, but he makes two crucial points. First, we can plausibly attribute moral considerability to *x* only when we have a nonarbitrary way of identifying *x*’s interests. Second, this project does not require actual sentience. It is plain enough that plants, for instance, have interests in a straightforward sense, though they feel nothing.³¹ Paul Taylor puts it this way:

Trees have no knowledge or feelings. Yet it is undoubtedly the case that trees can be harmed or benefited by our actions. We can crush their roots by running a bulldozer too close to them. We can see to it that they get adequate nourishment and moisture. . . . It is the good of trees themselves that is thereby affected.³²

In general, Taylor explains, “the good of an individual nonhuman organism [consists in] the full development of its biological powers.” Every organism is “a being whose standpoint we can take in making judgments about what events in the world are good or evil.”³³

Let us grant, in spite of Singer and his allies, that there is something about trees that we might intelligibly “take into account” for moral purposes. Can we be more specific? What is it that plants have and rocks do not? The obvious, but unilluminating answer is “life.” Just what is it about being alive that makes plants candidates for moral considerability?

Goal-directedness is the key. Taylor, for instance, describes organisms as “teleological centers of life.”³⁴ Goodpaster points to plants’ “tendencies [to] maintain and heal themselves” and locates the “core of moral concern” in “respect for self-sustaining organization and integration.”³⁵ Attfield writes of a tree’s “latent tendencies, direction of growth and natural fulfillment.”³⁶ Jay Kantor bases his defense of plant interests on their “self-regulating and homeostatic functions.”³⁷ Rodman condemns actions that impose our will upon “natural entities that have their own internal structures, needs, and potentialities,” potentialities that are actively “striving to actualize themselves.”³⁸ Finally, James K. Mish’alani points to each living thing’s *self-ameliorative competence*: “that is, a power for coordinated movement towards favorable states, a capacity to adjust to its circumstances in a manner to enhance its survival and natural growth.”³⁹

The goal-directedness of living things gives us a plausible and nonarbitrary standard upon which to “base assignments of interests.” If ecosystems, though not sentient, are goal-directed, then we may (without absurdity) attribute interests to them, too. Goodpaster is right: there is no *a priori* reason to think that “the universe of moral considerability [must] map neatly onto our medium-sized framework of organisms.”⁴⁰ Of course, we must not get carried away with this line of think-

ing. Goal-directedness is certainly not sufficient for moral considerability. One problem is that some machines are goal-directed – e.g., guided missiles, thermostatic heating systems, chess-playing computers, and “The Terminator.”⁴¹ The defender of moral considerability for plants must distinguish plants, morally, from goal-directed but inanimate objects.⁴² Still, the possession of goals is what makes the notion of a plant’s “standpoint” intelligible. Can we locate an ecosystem’s standpoint by understanding its goals? Not if it doesn’t have any goals.

V

We often know goal-directedness when we see it. The analysis of goal-directedness is, however, a terribly unsettled subject in the philosophy of science.⁴³ In light of this unsettledness, one must be cautious. Here are three claims. First, the attribution of goal-directedness to organisms can be scientifically and philosophically respectable – even when the organisms in question are nonsentient. Teleology talk need not be vitalistic, anthropomorphic, or rooted in obsolete Aristotelian biology or physics. It does not imply “backward causation.” Nor need it run afoul of the “missing goal-object” problem.⁴⁴

Second, some of these respectable accounts of goal-directedness are useful for the environmental ethicist. They enable us to resist crude versions of the common slippery-slope argument against the moral considerability of plants and other nonsentient living things. Once we admit nonsentient beings into the moral considerability club, how can we bar the door to ordinary inanimate objects? Porches, paintings, automobiles, garbage dumps, buildings, and other ordinary objects are allegedly lurking just outside, waiting for us to admit plants.⁴⁵ Goal-directedness can keep them out.

Third, we ought to recognize a distinction between goals and behavioral byproducts. A defensible conception of goal-directedness must distinguish true goals from outcomes that a system achieves incidentally. Ecosystem resilience and stability look like goals, but this appearance may deceive us. An ecosystem property such as stability might turn out to be just a byproduct, the incidental result of individual activities aimed exclusively at the individuals’ own goals.

I shall discuss two of the main approaches to understanding goal-directedness. The approaches

differ in important ways. I favor the second, but either will do for my purposes. The first approach is propounded by Ernest Nagel (among many others). Nagel holds that a system is goal-directed when it can reach (or remain in) some particular state by means of behavior that is sufficiently *persistent* and *plastic*.⁴⁶ Persistence refers to the system's ability to "compensate" for interfering factors that would otherwise take the system away from its goal.⁴⁷ Plasticity refers to the system's ability to reach the same outcome in a variety of ways.⁴⁸

Nagel assumes that this approach will count all living things as goal-directed. It seems to.⁴⁹ There are problems, to be sure. Chief among these is the danger that it will include some behavior that plainly is not goal-directed – the movement of a pendulum, for instance, or the behavior of a buffered chemical solution.⁵⁰ Nagel, however, shows that with some plausible tinkering – mainly, by adding a third condition that he calls "orthogonality" – we can deal with these counterexamples.⁵¹

The second approach, pioneered by Charles Taylor, insists that goal-directed behavior "[really does] occur 'for the sake of' the state of affairs which follows."⁵² Subsequent philosophers have developed this basic insight in various ways.

An especially influential exponent of Taylor's approach is Larry Wright. Taylor's considered formulation of his insight requires that the behavior in question be both necessary and sufficient for the goal. Wright finds this unsatisfactory – too generous in some ways and too strict in others.⁵³ He suggests what he calls an "etioloical" account, one that focuses on the causal background of the behavior in question. A system is goal-directed, Wright contends, only if it behaves as it does just because that is the type of behavior that tends to bring about that type of goal. Formally, behavior *B* occurs for the sake of goal-state *G* if "(i) *B* tends to bring about *G*," and "(ii) *B* occurs because (i.e. is brought about by the fact that) it tends to bring about *G*."⁵⁴ The key condition is (ii). Some machines, say guided missiles, meet it, for a machine may *B* because it is designed to *B*, and it may be designed to *B*, in turn, because *B* tends to bring about some *G* desired by the designer. Organisms meet it, too, because of the way that natural selection operates. The fitness of an organism usually depends on how appropriate its behavior is – that is, the extent to which it does the sort of thing (say, *B*) that tends to help that kind of organism survive and reproduce. If the disposition to *B* is heritable,

organisms whose tendency to *B* helps make them fit will leave descendants that tend to *B*. Those descendants are disposed to *B*, then, in part because *B* is an appropriate type of behavior.⁵⁵

Some people emphatically do not find Wright's approach respectable. He has, for example, recently been accused of "misrepresenting" natural selection as a teleological process in the old-fashioned (and discredited) sense according to which nature selects with certain outcomes in mind.⁵⁶ This charge, however, misses the mark, for there is nothing wrong with Wright's understanding of natural selection.⁵⁷ In addition, Wright has also dealt effectively with other, better-founded criticisms that need not be discussed here.⁵⁸

Wright's development of Taylor's insight is the best approach for my purposes because alternative versions of Taylor's approach are not as good for sustaining attributions of goal-directedness to plants and lower animals.⁵⁹ With regard specifically to the slippery slope and the alleged "needs" of paintings and porches, Nagel's approach seems good enough, for these objects do not act persistently or plastically toward any result that we could seriously be tempted to call a goal. With Wright's criteria, however, we sidestep questions of degree that can plague Nagel. Consider my car, which responds to the upstate New York environment by rusting. The car rusts in spite of my efforts to stop it, and it would rust even if I tried much harder. Eventually it will fall apart. Does this unpleasantly persistent behavior count as goal-directed? A dedicated slippery-sloper might suggest that the car has the goal of rusting, a "need" to rust. Both Nagel and Wright can resist this suggestion, but Nagel would have a tougher time due to the vagueness of his persistence and plasticity conditions. Wright would simply check the behavior's etiology. My car, we may safely say, does not rust because rusting tends to cause cars to fall apart. It rusts because rust is just what happens when steel meets moisture and road salt. The car's behavior fails Wright's condition (ii).

We can imagine an etiology that would make my car's rusting genuinely goal-directed. Assume that car designers know how to make sturdy rust-free cars. Suppose, however, that they greedily conspire to build cars that are susceptible to rust in order to force people to buy new cars more frequently. We would then be unable fully to understand my car's rusting as a purely chemical

process, for – on the conspiracy theory of rust – my car would be rusting (in part) because rusting tends to cause cars to fall apart.

Now, what about ecosystems? I concede that the heralded stability and resilience of some ecological systems make them *prima facie* goal-directed. When such an ecosystem is perturbed in any one of various ways, it bounces back. The members of the ecosystem do just what is necessary (within limits) to restore the system to equilibrium.⁶⁰ But are they cooperating in order to restore equilibrium? That is surely imaginable. On the other hand, each creature might instead be “doing its own thing,” with the fortunate but incidental result that the ecosystem remains stable. If this is correct, then we are dealing with a behavioral byproduct, not a systemic goal.

The goal/byproduct distinction is well entrenched in the literature on natural selection and biological adaptation. Let me illustrate this distinction with an example from George Williams. Williams asks us to consider the behavior of a panic-stricken crowd rushing from a burning theater. A biologist newly arrived from Mars, he suggests, might be impressed by

[the group’s] rapid ‘response’ to the stimulus of fire. It went rapidly from a widely dispersed distribution to the formation of dense aggregates that very effectively sealed off the exits.⁶¹

If the crowd clogs the exits in spite of strenuous crowd-control efforts, would our Martian be entitled to report that he had observed a crowd that was goal-directed toward self-destruction via the sealing off of the exits? Of course not. We know that the clogging of the exits is just incidental. The people are trying to get out. The crowd clogs the exits in spite of the dreadful consequences.

Any theory of goal-directedness ought to be able to avoid the Martian’s conclusion. Wright’s theory does that easily via condition (ii): *G* can be a goal of behavior *B* only if *B* occurs *because* it tends to bring about *G*. If *G* plays no explanatory role it cannot be a genuine goal.⁶²

Nagel’s account also permits us to distinguish goal from byproduct. The persistence condition does the work here. There is no reason to think that the theater crowd’s behavior is truly persistent toward clogging the exits. If there were more exits,

or larger exits, the people would have escaped smoothly. We may be sure that the crowd would not compensate for greater ease of exit by modifying its behavior in order to achieve clogging.

VI

If the idea that organisms have morally considerable “interests” seems plausible, it must, I think, be because organisms are genuinely goal-directed. When Taylor, for instance, characterizes a tree’s good as “the full realization of its biological powers,” we know what he means. We naturally assume that *powers* does not refer to everything that can happen to a tree – disease, say, or stunting from lack of nutrients. The tree’s powers are the capabilities that the tree exercises in the service of its goals of growth, survival, and reproduction. We certify that those are the tree’s goals, in turn, by employing criteria such as Wright’s or Nagel’s.

Should we find moral significance in an organism’s goals? Perhaps not. We may coherently admit that plants have goals, yet deny that we have duties to them. Still, there is a tempting analogy between the goal-directed behavior of organisms and the intentional behavior of humans. Recall the rhetorical role that the notion of natural “striving” plays in Paul Taylor’s argument for an ethic of respect for nature.⁶³ Recall Katz’s choice of the term *autonomy* to characterize an organism’s capacity for independent pursuit of its own interests.⁶⁴ Indeed the word *interests* itself conveys the flavor of intention.⁶⁵ This flavor lends persuasiveness to arguments such as Taylor’s.

Let us, in any event, grant that to have natural goals is to have morally considerable interests. Where does this leave behavioral byproducts? It leaves them where they were – morally irrelevant. We need a nonarbitrary standard for deciding which states of affairs are good ones from the organism’s own “standpoint.” Sentience gives us such a standard by way of the organism’s own preferences (which we are capable of discovering in various ways). By analogy, a nonsentient organism’s biological goals – its “preferred” states – can do the same thing. But is there any reason at all for supposing that either mere natural tendencies or behavioral byproducts give rise to interests? I think not. Why, from a given system’s “standpoint,” should it matter whether some natural

tendency, unconnected (except incidentally) to the system's goals, plays itself out?

Consider John Rodman's account of why it is wrong to dam a wild river. Rodman emphasizes that the river "struggles" against the dam "like an instinct struggles against inhibition."⁶⁶ One might be tempted to say that this way of talking is unnecessary, that every natural tendency is morally privileged. Such a claim, however, is implausible. What leads Rodman to talk of instinct and struggle is, I take it, the notion that the river actually has goals and would be frustrated, by the dam, in its pursuit of them.

I do not expect this example to be convincing. To see clearly that mere tendencies are in themselves morally irrelevant, we should consider something really drastic – like *death*. Usually, death is something that just happens – by accident, by disease, or simply when the body wears out. Organisms tend to die, but they do not ordinarily aim to die. As Jonathan Bennett puts it: "Every animal is tremendously plastic in respect of becoming dead: throw up what obstacles you may, and death will still be achieved. Yet animals seldom have their deaths as a goal."⁶⁷

Consider a salmon of a species whose members routinely die after spawning. Even here death seems unlikely to be the organism's goal. The salmon dies because the arduous upstream journey has worn it out. If it could spawn without dying, it would do so. Once in a while that actually happens. When it does, do we say (without further evidence) that the salmon has been frustrated in its efforts to die after spawning? No. We would say that the salmon has managed to spawn without having had the misfortune to die.

Behavioral byproducts, like mere tendencies, seem not to generate anything we can comfortably call "interests." The salmon example illustrates this, if we interpret the death of the adult as a byproduct of its spawning. Williams' theater example illustrates it, too. It would be truly bizarre to suggest that the panicky crowd has an interest in being trapped and incinerated.

Although there is much more that needs to be said about whether the argument from goal-directedness can establish the moral considerability of plants, let us go ahead and accept plant moral considerability. But does ecosystem moral considerability follow? No, an obstacle remains: the goal/byproduct distinction. We still need to determine whether stability (or any other property) of an

ecosystem is a genuine goal of the whole system rather than merely a byproduct of self-serving individual behavior.

VII

Donald Worster has written in his history of ecological ideas that "More often than not, the ecological text [holistic environmentalists] know and cite is either of their own writing or a pastiche from older, superseded models. Few appreciate that the science they are eagerly pursuing took another fork back yonder up the road."⁶⁸ Orthodox ecology, Worster says, has abandoned the "organismic" view of ecosystems and adopted a fundamentally individualistic one.⁶⁹ Robert M. May represents this individualistic orthodoxy. Of course, says May, there are "patterns at the level of ecological systems." He insists that these patterns do not represent goals. They are entirely explicable in terms of "the interplay of biological relations that act to confer specific advantages or disadvantages on individual organisms."⁷⁰

What then are we to make of ecosystem stability and resilience? If May is right, the tendency of an ecosystem to bounce back after a disturbance is merely the net result of self-serving responses by individual organisms. We need not view stability as a system "goal." We may not even be entitled to do so. As Robert Ricklefs explains:

The ability of the community to resist change [is] the sum of the individual properties of component populations. . . . Relationships between predators and prey, and between competitors, can affect the inherent stability of the community, but trophic structure does not evolve to enhance community stability.⁷¹

Certain forms of trophic structure typically enhance community stability, Ricklefs agrees, but trophic structure does not take on particular form because that form enhances stability.⁷²

Someone might be tempted to conclude that my own argument undermines the moral considerability of organisms. Organisms, after all, consist of cells. The cells have goals of their own. Does my individualism require us to regard the behavior of organisms as merely a byproduct of the selfish behavior of cells? It does not. Cells do have their own goals, but these goals are largely subordinated

to the organism's goals, because natural selection selects *bodies*, not cells. If the cells do not cooperate for the body's sake, the body dies and the cells die, too. That, very roughly, is how natural selection coordinates the body's activities.⁷³ Selection tends to eliminate individuals that are not good at the survival "game" (taking kin selection into account). Eventually this process leaves us with organisms that are good at it, and these organisms are goal-directed toward those states of affairs that have in the past made them winners.

So much for organisms. A familiar process – ordinary, individualistic natural selection – ensures that they are goal-directed. Is there a process that could account for goal-directedness in ecosystems? The only candidate I know of for this job is group selection operating at the community level.⁷⁴

VIII

Does group selection have a part to play in the full explanation of the behavior of species populations or ecosystems? I hold that the answer is no. Now this may seem hard to believe. "Ecosystem behavior," you might counter, "is just too well coordinated for stability to be an accident." To undermine this intuition, let us consider a description of a simple situation in which there is a result that we could construe as "good for the group," but which is strictly speaking a byproduct of self-serving individual action, and then a second situation, a more complicated one, in which an extremely stable group property is, again, a byproduct.⁷⁵

Consider any single-species population. Suppose that some individuals (call them the A-individuals) run into a stretch of bad luck and consequently fail to reproduce. Their failure to reproduce reduces the intensity of competition. This (other things being equal) permits other members of the population (the B-individuals) to reproduce more effectively than they otherwise would have. Should we regard this population as a goal-directed whole, answering a threat to its survival by redirecting its reproductive effort? Of course not. Williams explains the general difficulty in this way:

Certainly species survival is one result of reproduction. This fact, however, does not constitute evidence that species survival is a function of reproduction. If reproduction is

entirely explainable on the basis of adaptation for individual genetic survival, species survival would have to be considered merely an incidental effect.⁷⁶

There is no reason to think of the B-individuals' increased reproductive success as "compensating" for the failure of the A-individuals. In fact, each of the B-individuals has simply taken advantage of the A-individuals' failure. The net result is survival of the group, to be sure, but a postulated goal of group survival has no explanatory role to play.

Let us now consider a more difficult and controversial example, the clutch size in birds, long a bone of contention between group selectionists and Neo-Darwinians. Clutch size in some species of birds is remarkably constant; certain species of plover, for instance, almost always lay four eggs. If an egg is removed from the plover's nest, the bird lays a replacement, bringing the number back up to four. That is not so strange, in itself; yet it shows that the plover is physiologically able to lay more than four eggs. Why should it lay only four to start with?

Perhaps this is a sign of group selection at work, favoring a population of birds in which individual birds restrain themselves for the good of their group. V. C. Wynne-Edwards, the dean of group selectionism, would say so. Consider what Wynne-Edwards says about "reproductive rate":

If intraspecific selection was all in favor of the individual, there would be an overwhelming premium on higher and ever higher individual fecundity, provided it resulted in a greater posterity than one's fellows. Manifestly this does not happen in practice; in fact, the reproductive rate in many species . . . is varied according to the current needs of the population.⁷⁷

If this group-selectionist account is correct, then the plover population's behavior is goal-directed, even by Wright's criteria, for the individual birds are laying exactly four fertilized eggs just because of the consequences this activity has – that is, just because their self-restraint meets the "current needs of the population" – and we are entitled to speak of the group's goal of maintaining a certain specified average clutch size.

There is, however, an alternative account, an individualistic Neo-Darwinian explanation. Each

individual bird seeks to maximize its own inclusive fitness. If laying more than four eggs were a sound strategy for the individual, then that is the strategy it would pursue. Chances are, however, that if a pair of plovers divide their parental energy and attention among five offspring instead of four, fewer of the offspring will survive than if the parents had been conservative. “Exactly four eggs” is a sound strategy from the standpoint of each individual. Seen in this way, it does not represent individual self-restraint for the good of the group. There is no group goal.⁷⁸

Evolutionary biologists are by and large skeptical about group selection. For one thing, the argument for group selection in nature is essentially negative: as Wynne-Edwards puts it, group selection simply *must* occur, since normal natural selection would not be “at all effective” in generating “the kind of social adaptations . . . in which the interests of the individual are actually submerged or subordinated to those of the community as a whole.”⁷⁹ This negative argument for group selection is undermined when we discover plausible individualistic explanations – when, as in the clutch size case, we find that the interests of the individual are not “submerged” at all. Williams and others, including Richard Dawkins, have shown that we do not need group selection to explain any of the phenomena upon which Wynne-Edwards builds his case.⁸⁰

Worster is correct about which fork ecology has taken. To be sure, a number of theorists have shown how something they label “group selection” could occur under the right circumstances.⁸¹ These particular theories, however, insofar as they are extensions of kin selection, are fundamentally “individualistic,” and are not much like the theories that earlier advocates of group selection had hoped for.⁸² We have little or no reason to believe that evolution by group selection, as traditionally conceived, is significant in nature.⁸³

IX

When we turn from group selection operating on single-species populations to community selection, the result is much the same. According to Robert May, for instance:

Natural selection acts almost invariably on individuals or on groups of related individuals. Populations, much less communities of interacting populations, cannot be regarded as units subject to Darwinian evolution.⁸⁴

This view has been seconded by Elliott Sober. “Darwinism,” Sober asserts, “is a profoundly individualistic doctrine”:

[It] rejects the idea that species, communities, and ecosystems have adaptations that exist for their own benefit. These higher-level entities are not conceptualized as goal-directed systems; what properties of organization they possess are viewed as artifacts of processes operating at lower levels of organization.⁸⁵

To be fair, I should report Robert McIntosh’s recent lament that “organismic ecology is alive and well.” McIntosh worries that parts of the ecosystem-as-organism view survive in “systems” ecology.⁸⁶ John L. Harper shares this worry and he warns against “one of the dangers of the systems approach to community productivity” – namely, the temptation to “treat the behavior that [one] discovers as something that can be interpreted *as if* community function is organized.” Harper insists that we must resist this temptation: “What we see as the organized behavior of systems is the result of the fate of individuals. Evolution is about individuals and their descendants.”⁸⁷

Some systems ecologists contend that ecosystems have some “organismic” features while conceding that “natural selection operates only on a community’s constituent populations, not on the community as a whole.”⁸⁸ These sources, as I read them, hold small comfort for the advocate of ecosystem interests. They support at best an analogy that is too weakly organismic to generate ecosystem goals.⁸⁹

Obviously there is room for rebuttal here. Still, this testimony suggests the scorn with which ecologists and evolutionary biologists typically regard group selection.⁹⁰ Could anything else cause individuals to cooperate for the sake of ecosystem goals? I know of no plausible candidates. If the verdict against group selection stands up, I see no way to justify ecosystem moral considerability with the argument from goal-directedness.

X

Earlier I mentioned several distinct strategies for justifying what I call the “preservationist intuition” – intrinsic value, the good of individual plants and animals, and ideals of human excellence. Any of these might be enough. Still, we may find ourselves tempted to believe that whole ecosystems have interests and are therefore morally considerable. This avenue, however, is not promising. Genuine goal-directedness is a step – an essential step – toward moral considerability. It makes sense (as I have argued) to claim that plants and other nonsentient organisms are morally considerable – but only because those beings’ own biological goals provide a nonarbitrary standard for our judgments about their welfare. Were ecosystems genuinely goal-directed, we could try for the next step.⁹¹

Some ecosystems do indeed appear to have goals – stability, for example. There is a complication, however. Mere behavioral byproducts, which are outcomes of no moral significance, can look deceptively like goals. Moreover, on what I take to be our best current ecological and evolutionary understanding, the goal-directed appearance of ecosystems is in fact deceptive. Stability and other ecosystem properties are byproducts, not goals. Ecosystem interests are, I conclude, a shaky foundation for the preservationist intuition.

Notes

- 1 Aldo Leopold, *A Sand County Almanac: With Essays on Conservation from Round River* (New York: Ballantine, 1966), p. 244. He characterizes economic arguments for preservation as “subterfuges,” invented to justify what we know we should do on other grounds (p. 247). He also describes “despoliation of land” as “not only inexpedient but wrong” (p. 239).
- 2 *Ibid.*, p. 245.
- 3 Eric Katz expresses the preservationist intuition clearly in “Utilitarianism and Preservation,” *Environmental Ethics* 1 (1979): 357–64. The “danger” posed by an ethic based exclusively on human interests, Katz says, is that it “can support a policy of preservation only on a contingent basis” (p. 362).
- 4 See, e.g., Holmes Rolston, III, “Are Values in Nature Subjective or Objective?” *Environmental Ethics* 4 (1982): 125–51 and Peter Miller, “Value as Richness: Toward a Value Theory for the Expanded Natural-

ism in Environmental Ethics,” *Environmental Ethics* 4 (1982): 101–14. Bryan Norton worries, properly, that there are “questionable ontological commitments involved in attributing intrinsic value to nature.” “Environmental Ethics and Weak Anthropocentrism,” *Environmental Ethics* 6 (1984): 147–8. Some who argue for the “intrinsic value” of nature might be happy with something less worrisome, ontologically – namely, what C. I. Lewis calls “inherent value.” See Lewis, *An Analysis of Knowledge and Valuation* (La Salle, Ill.: Open Court, 1946), pp. 382–92. The problem with this strategy is that aesthetic and other kinds of inherent value, though objective, are fundamentally anthropocentric. See Rolston, “Are Values in Nature Subjective or Objective?” p. 151, and Robin Attfield, *The Ethics of Environmental Concern* (New York: Columbia University Press, 1983), pp. 151–2. These waters are very muddy, and J. Baird Callicott has lately stirred them up some more by defining inherent value in a way that is explicitly at odds with Lewis’s conception. “Intrinsic Value, Quantum Theory, and Environmental Ethics,” *Environmental Ethics* 7 (1985): 262.

- 5 See Paul W. Taylor, *Respect for Nature: A Theory of Environmental Ethics* (Princeton: Princeton University Press, 1986), pp. 70–1. Taylor makes it clear that when he speaks of the “good of a whole biotic community,” he does not imagine that the community – as a whole – has a good of its own. The community’s good is, he says, a “statistical concept” compounded out of the interests of the individual creatures that comprise the community.
- 6 See Thomas E. Hill, Jr., “Ideals of Human Excellence and Preserving Natural Environments,” *Environmental Ethics* 5 (1983): 211–24. See also Bryan G. Norton, “Environmental Ethics and Weak Anthropocentrism,” *Environmental Ethics* 6 (1984): 131–48. If the “excellence” in question is the ability to recognize intrinsic (or even inherent) value when one encounters it, then this strategy turns out to be a variant of the first one.
- 7 Goodpaster coined the term *moral considerability* in “On Being Morally Considerable,” *Journal of Philosophy* 75 (1978): 308–25. When I speak of an organism’s interests I do not mean to imply anything about its state of mind – or even that it has a mind. Throughout this paper I use the terms *interests* and *good of one’s own* interchangeably. I recognize that there are good reasons not to equate these terms (see Taylor, *Respect for Nature*, pp. 62–8), but even Taylor concedes that it is “convenient” (pp. 270–1) to speak of whatever furthers a being’s good as also promoting its interests. I find it convenient too.
- 8 See, for example, Ronald Dworkin, *Taking Rights Seriously* (Cambridge, Mass.: Harvard University Press, 1978).

- 9 According to Joel Feinberg, rights talk is merely a way of referring to *valid claims*. On this view, having rights is equivalent to being morally considerable. See Feinberg, "The Nature and Value of Rights," *Journal of Value Inquiry* 4 (1971): 263–77 and "The Rights of Animals and Unborn Generations," in *Philosophy and Environmental Crisis*, ed. William T. Blackstone (Athens: University of Georgia Press, 1974).
- 10 I classify all beings that have interests as "candidates" for moral considerability. If my analysis of organismic interests is correct, then having interests is only the first step to moral considerability.
- 11 Leopold, *Sand County Almanac*, p. 262.
- 12 James D. Heffernan, "The Land Ethic: A Critical Appraisal," *Environmental Ethics* 4 (1982): 242. On balance I think Heffernan is right: Leopold is asserting moral considerability for ecosystems. In that case, Heffernan's point is well-taken: an ecosystem must be seen as the sort of entity that we can not only damage (i.e., put in a state of diminished value or impaired usefulness), but also *harm* (i.e., make worse off from the standpoint of its own interests).
- 13 Holmes Rolston, III, "Is There an Ecological Ethic?" *Ethics* 85 (1975): 106. Rolston no longer speaks in these terms, though his talk of "projects" suggests that something like an appeal to goal-directedness is still at work. See "Are Values in Nature Subjective or Objective?" pp. 146–7, where Rolston speaks of achievements that "do not have wills or interests," but do have "headings, trajectories, traits, successions, which give them a tectonic integrity." More recently still, even while conceding that "ecologists... have doubted whether ecosystems exist as anything over their component parts," and agreeing that in ecosystems there are "no policy makers, no social wills, no goals," Rolston is still drawn to speak, tentatively, of "the good of the system" and to claim that "a spontaneous ecosystem is typically healthy." "Valuing Wildlands," *Environmental Ethics* 7 (1985): 26, 30.
- 14 John Rodman, "The Liberation of Nature?" *Inquiry* 20 (1977): 89.
- 15 *Ibid.* See also Rodman's description of a river as a "victim" of a dam (pp. 114–15). A hillside (or even a river) is not likely to be a complete ecosystem, of course. My arguments apply equally, I think, to ecosystems and to ecological communities.
- 16 Here are two more examples of the sort of language that raises my suspicions. (1) "Deep ecologists" Bill Devall and George Sessions, in "The Development of Natural Resources and the Integrity of Nature," assert that when "humans have distressed an ecosystem," we are obliged to make "reparations" (*Environmental Ethics* 6 [1984]: 305, 312). (2) J. Baird Callicott denies that he wishes to extend "moral considerability" to "inanimate entities such as oceans, lakes, mountains, forests, and wetlands"; yet he refers to the "well-being of the biotic community, the biosphere as a whole," and employs "the good of the community as a whole" as a standard for the assessment of the relative value... of its constitutive parts" ("Animal Liberation: A Triangular Affair," *Environmental Ethics* 2 [1980]: 337, 324–5).
- 17 Goodpaster, "On Being Morally Considerable," pp. 323, 319.
- 18 *Ibid.*, p. 318. Feinberg's remarks on "mere things" are in "The Rights of Animals and Unborn Generations," pp. 49–50.
- 19 Goodpaster, "On Being Morally Considerable," p. 313.
- 20 Kenneth E. Goodpaster, "From Egoism to Environmentalism," in *Ethics and Problems of the 21st Century*, ed. Goodpaster and Sayre (Notre Dame: Notre Dame University Press, 1979), p. 30.
- 21 *Ibid.*, pp. 32, 35, n. 25. Here he picks up a suggestion that he had already made in "On Being Morally Considerable," pp. 310, 323.
- 22 Goodpaster now rejects "generalizations of egoism" that extend moral concern to a class of beneficiaries that includes "forests, lakes, rivers, air and land" ("From Egoism to Environmentalism," p. 28). Moral considerability for ecosystems is in the same "egoistic" spirit, I suppose. Goodpaster prefers to speak of "bearers of value," a term that de-emphasizes the possession of interests. Yet this talk is misleading. It can only obscure Goodpaster's assumptions about what makes the biosphere considerable – including its capacity for "successful self-protection" (p. 32).
- 23 Andrew Brennan, "The Moral Standing of Natural Objects," *Environmental Ethics* 6 (1984): 53, 49, 51. Brennan uses the term *moral standing*, which he introduces as a synonym for moral considerability (p. 37). I am not attacking the substance of Brennan's view here; I am objecting to his claim to be explicating Goodpaster's concept (p. 35). Brennan has severed moral considerability completely from the notion that Goodpaster finds crucial – that of being a potential beneficiary. I believe that Goodpaster would not recognize the concept after this surgery.
- 24 Attfield, *The Ethics of Environmental Concern*, p. 149. See also p. 159.
- 25 Callicott, "Intrinsic Value, Quantum Theory," p. 258.
- 26 *Ibid.*, p. 275.
- 27 Eric Katz, "Organism, Community, and the 'Substitution Problem,'" *Environmental Ethics* 7 (1985): 243. Oddly, Katz goes on to associate intrinsic value with "autonomy," which he in turn locates (p. 246) in the fact that "natural individuals... pursue their own *interests* while serving roles in the community."
- 28 Leaving aside Callicott's argument for nature as one's "extended self."

- 29 Peter Singer, *Animal Liberation* (New York: Avon Books, 1975), p. 8. Singer repeats this section verbatim in *Practical Ethics* (Cambridge: Cambridge University Press, 1979), p. 50. The leap is surprisingly common. See, e.g., William Frankena, "Ethics and the Environment," in *Ethics and Problems of the 21st Century*, p. 11, and G. J. Warnock, *The Object of Morality* (London: Methuen & Co., 1971), p. 151. Scott Lehmann judges this to be "the standard view among moral philosophers" and rests his case against the "rights" of wilderness areas on the premise that "only subjects of experience can be harmed or benefited" ("Do Wildernesses Have Rights?" *Environmental Ethics* 3 [1981]: 136–8).
- 30 Norton, "Environmental Ethics and Nonhuman Rights," p. 35.
- 31 Devastating critiques of claims to have demonstrated plant sentience include Arthur Galston "The Unscientific Method," *Natural History*, March 1974, and Arthur W. Galston and Clifford L. Slayman, "The Not-So-Secret Life of Plants," *American Scientist* 67 (1979): 337–44.
- 32 Paul Taylor, "The Ethics of Respect for Nature," *Environmental Ethics* 3 (1981): 200. Taylor has reiterated this in *Respect for Nature*.
- 33 *Ibid.*, p. 199.
- 34 *Ibid.*, pp. 210–11.
- 35 Goodpaster, "On Being Morally Considerable," pp. 319, 323.
- 36 Robin Attfield, "The Good of Trees," *Journal of Value Inquiry* 15 (1981): 37. See also Attfield, *The Ethics of Environmental Concern*, pp. 140–65.
- 37 Jay Kantor, "The 'Interests' of Natural Objects," *Environmental Ethics* 2 (1980): 169.
- 38 Rodman, "The Liberation of Nature?" pp. 100, 117.
- 39 James K. Mish'alani, "The Limits of Moral Community and the Limits of Moral Thought," *Journal of Value Inquiry* 16 (1982): 138.
- 40 Goodpaster, "On Being Morally Considerable," p. 323.
- 41 Goodpaster correctly describes the idea that a house's porch has interests as "simply incoherent" ("On Stopping at Everything: A Reply to W. M. Hunt," *Environmental Ethics* 2 [1980]: 282). We cannot dismiss the machines in my list so easily.
- 42 Mish'alani and Taylor recognize this, but I find their solutions unpersuasive. They seem to imply (implausibly) that if we humans should turn out to be the artifacts of a Creator, we should cease to regard ourselves as morally considerable. Taylor, *Respect for Nature*, p. 124 and Mish'alani, "Limits of Moral Community," p. 139.
- 43 Even so, it is surprising that environmental ethicists have not looked more often to the philosophy of science literature. Brennan is an exception. See "Moral Standing of Natural Objects," pp. 41–4. (Taylor mentions, in passing, that a philosophical literature about goal-directedness exists, but he does not make much use of it. [*Respect for Nature*, p. 122, n. 8].)
- 44 The problem of the "missing goal-object" is that behavior may be directed at a goal that happens to be unattainable or even nonexistent. This fact seems fatal for accounts of goal-directedness in terms of feedback. See Israel Scheffler, *The Anatomy of Inquiry* (New York: Alfred A. Knopf, 1963), pp. 112–16. These worries, nevertheless, still trouble many. It is for this reason that William C. Wimsatt insists, defensively, that "teleology, properly so-called, does have a respectable role in the scientific characterization of non-cognitive systems" ("Teleology and the Logical Structure of Function Statements," *Studies in the History and Philosophy of Science* 3 [1972]: 80). Wimsatt maintains that he is innocent of anthropomorphism (p. 65). See also Michael Ruse, *The Philosophy of Biology* (London: Hutchinson, 1973), pp. 174–6.
- 45 W. Murray Hunt claims that a porch's "needs" (e.g., to be painted) are as evident as a lawn's need to be watered ("Are Mere Things Morally Considerable?" *Environmental Ethics* 2 [1980]: 59–66). R. G. Frey asserts that a Rembrandt painting has interests in every sense in which a dog has them, in *Interests and Rights: The Case Against Animals* (Oxford: Clarendon Press, 1980), p. 79. Elliott Sober claims that he cannot see how the needs of plants can be plausibly distinguished from the needs of "automobiles, garbage dumps, and buildings." "Philosophical Problems of Environmentalism," in *The Preservation of Species*, ed. Bryan G. Norton (Princeton, New Jersey: Princeton University Press, 1986), p. 184.
- 46 Ernest Nagel, *The Structure of Science* (Indianapolis: Hackett, 1961), pp. 398–421 and "Teleology Revisited," in *Teleology Revisited and Other Essays in the Philosophy and History of Science* (New York: Columbia University Press, 1979). See also Richard Braithwaite, *Scientific Explanation* (Cambridge: Cambridge University Press, 1953), pp. 319–41 and Ruse, *Philosophy of Biology*, pp. 174–96.
- 47 Nagel says that persistence is "the continued maintenance of the system in its goal-directed behavior, by changes occurring in the system that compensate for any disturbances... which, were there no compensating changes... would prevent the realization of the goal" ("Teleology Revisited," p. 286).
- 48 In Nagel's words: "the goal... can generally be reached by the system following alternate paths or starting from different initial positions" (*Ibid.*). See also Braithwaite, *Scientific Explanation*, pp. 329–34. Braithwaite conducts his analysis entirely in terms of plasticity.
- 49 Nagel also seems to believe, though, that mechanistic accounts of behavior, when they become available, automatically drive out teleological accounts

- (“Teleology Revisited,” pp. 289–90). He doesn’t say whether he thinks we have successful mechanistic accounts of plant behavior yet.
- 50 For other problems, see Wimsatt, “Teleology,” p. 26, David Hull, *Philosophy of Biological Science* (Englewood Cliffs, NJ: Prentice-Hall, 1974), pp. 107–9, and Larry Wright, “The Case Against Teleological Reductionism,” *British Journal for the Philosophy of Science* 19 (1968): 211–23.
- 51 Nagel, *Structure of Science*, pp. 418–21, and “Teleology Revisited,” pp. 287–90.
- 52 Charles Taylor, *The Explanation of Behavior* (London: Routledge and Kegan Paul, 1964), p. 5.
- 53 Larry Wright, “Explanation and Teleology,” *Philosophy of Science* 29 (1972): 204–18. One problem especially relevant to my thesis here is that, as Wright points out, Taylor’s formulation admits “all sorts of bizarre accidents into the category of goal-directed activity” (p. 209).
- 54 *Ibid.*, p. 211. This formulation obviously fails in the case of intentional but misguided action unless we understand “tends to bring about *G*” as “tends under normal circumstances to bring about *G*.” If I submit a paper to a defunct journal, that may not tend to bring about the goal of having my paper published, but my behavior is clearly goal-directed. I have submitted the paper in order to have it published.
- 55 This “because” applies, as Wright acknowledges, in a rather “involved” way. It applies, nevertheless. See “Explanation and Teleology,” pp. 216–17.
- 56 Kristen Shrader-Frechette, “Organismic Biology and Ecosystems Ecology: Description or Explanation?” in *Current Issues in Teleology*, ed. Nicholas Rescher (Lanham, MD.: University Press of America, 1986), pp. 84–5, n. 28.
- 57 See Larry Wright, “Functions,” *Philosophical Review* 82 (1973): 139–68, esp. 159–64.
- 58 See, for example, Andrew Woodfield, *Teleology* (Cambridge: Cambridge University Press, 1976), pp. 83–8, and Arthur Minton, “Wright and Taylor: Empiricist Teleology,” *Philosophy of Science* 42 (1975): 299. Wright defends himself in “The Ins and Outs of Teleology: A Critical Examination of Woodfield,” *Inquiry* 21 (1978): 233–45.
- 59 Jonathan Bennett, for instance, in *Linguistic Behavior* (Cambridge: Cambridge University Press, 1976), pp. 36–81. Bennett introduces the concept of “registration” and says that a system (*S*) is goal-directed toward *B* when it does *B* because it registers that it is in a situation where *B* will bring about *G*. This analysis does not immediately exclude plants. The question, as Bennett sees it (p. 79), is whether the behavior of plants has a “unitary” mechanistic explanation. Because phototropism in green plants is “controlled by one unitary mechanism,” he refuses to count it as a goal-directed behavior.
- 60 For a sound discussion of ecosystem stability see John Lemons, “Cooperation and Stability as a Basis for Environmental Ethics,” *Environmental Ethics* 3 (1981): 219–30.
- 61 George Williams, *Adaptation and Natural Selection: A Critique of Some Current Evolutionary Thought* (Princeton: Princeton University Press, 1966), pp. 210–11. We can, by the way, imagine a system that is goal-directed toward self-destruction. Wimsatt describes a “suicide machine” in “Teleology,” pp. 20–2.
- 62 Wright is keen on distinguishing goals from byproducts, though not in precisely those terms. “Teleological behavior is not simply appropriate behavior,” he insists, “it is appropriate behavior with a certain etiology” (“Explanation and Teleology,” p. 215). Byproducts result, after all, from behavior that is appropriate in a trivial sense – appropriate for producing those byproducts. Bennett, too, has a good discussion of “fraudulent” attributions of goal-directedness (*Linguistic Behavior*, pp. 75–7).
- 63 Taylor, “Respect for Nature,” p. 210.
- 64 See note 27 above. See also Heffernan, “The Land Ethic,” p. 242.
- 65 General treatments of teleology often point this out. In *Linguistic Behavior*, Jonathan Bennett treats human intention as a special case of goal-directedness. Andrew Woodfield reverses the analysis, claiming that attributions of goal-directedness to nonsentient things such as plants and machines are extensions of the “core concept” of having an “intentional” object of desire (*Teleology*, pp. 164–6, 201–2).
- 66 Rodman, “Liberation of Nature?” p. 115.
- 67 Bennett, *Linguistic Behavior*, p. 45.
- 68 Donald Worster, *Nature’s Economy: A History of Ecological Ideas* (Cambridge: Cambridge University Press, 1985), pp. 332–3.
- 69 Here is an “organismic” characterization of ecosystems from an ecology text popular throughout the 1950s: “The community maintains a certain balance, establishes a biotic border, and has a certain unity paralleling the dynamic equilibrium and organization of other living systems. Natural selection operates upon the whole interspecies system, resulting in a slow evolution of adaptive integration and balance. Division of labor, integration and homeostasis characterize the organism... The interspecies system has also evolved these characteristics of the organism and may thus be called an ecological supraorganism.” W. A. Allee et al., *Principles of Animal Ecology* (Philadelphia: W. B. Saunders, 1949), p. 728.
- 70 Robert M. May, “The Evolution of Ecological Systems,” *Scientific American*, September 1987, p. 161. This sort of individualism by no means excludes altruism. Many individual organisms aim to some extent at the survival of their kin.

- 71 Robert E. Ricklefs, *The Economy of Nature* (Portland, Oreg.: Chiron Press, 1976), p. 355.
- 72 See also J. Engelberg and L. L. Boyarsky, "The Noncybernetic Nature of Ecosystems," *The American Naturalist* 114 (1979): 317–24. "That a system is stable, that it can resist perturbations, is not a sign that it is cybernetic." Engelberg and Boyarsky's main point is that ecosystems lack the "global information networks" that integrate the parts of goal-directed systems such as organisms.
- 73 See, for logic similar to mine, Elliott Sober's treatment of "selfish DNA" in *The Nature of Selection: Evolutionary Theory in Philosophical Focus* (Cambridge, Mass.: MIT Press, 1984), pp. 305–14.
- 74 I agree with William Wimsatt, who suggests that "all teleological phenomena are ultimately to be explained in terms of selection processes" ("Teleology," p. 15). David Hull criticizes Wimsatt (unsuccessfully, I think) in *Philosophy of Biological Science*, p. 113.
- 75 Both of my examples concern single-species populations. I picked them for their simplicity. They make a point that seems to hold, a fortiori, for ecosystems and communities as well.
- 76 Williams, *Adaptation and Natural Selection*, p. 160. See also pp. 107–8. Jan Narveson also makes this point, observing that as long as some people have children for selfish reasons, then the race is "perpetuated willy-nilly" whether or not anyone has children in order to perpetuate the race. Narveson, "On the Survival of Humankind," in *Environmental Philosophy*, ed. Robert Elliot and Arran Gare (St. Lucia: University of Queensland Press, 1983), pp. 51–2.
- 77 V. C. Wynne-Edwards, *Animal Dispersion in Relation to Social Behavior* (New York: Hafner, 1962), p. 19. See pp. 484–90.
- 78 David Lack offers evidence that (other things being equal) larger-than-normal clutches typically reduce the number of surviving offspring per nest. David Lack, *The Natural Regulation of Animal Numbers* (Oxford: Clarendon Press, 1954), pp. 21–32, and *Population Studies of Birds* (Oxford: Clarendon Press, 1966), pp. 3–7 and throughout. Reducing the number of eggs does not sufficiently improve each offspring's chances to make that a worthwhile strategy, either. Michael Ruse claims (*The Philosophy of Biology*, pp. 179–81) that the tendency of a bird population toward laying clutches of a particular size is goal-directed behavior even though (he assumes) it isn't a result of group selection. He thinks he is using Nagel's conception of goal-directedness. The problem, I suspect, is that he does not subject the population's behavior to a robust version of the persistence test. It is not clear that Ruse can get the right answer even in the theater-crowd case.
- 79 Wynne-Edwards, *Animal Dispersion*, p. 18.
- 80 Richard Dawkins, *The Selfish Gene* (Oxford: Oxford University Press, 1976), esp. chaps. 5–7. See, for example, Dawkins' explanation of how sterile castes have evolved in the social insects. Compare Wynne-Edwards' view that it is *inconceivable* that sterile castes could have evolved except where "selection had promoted the interests of the social group, as an evolutionary unit in its own right" (*Animal Dispersion*, p. 19).
- 81 See, e.g., David Sloan Wilson, *The Natural Selection of Populations and Communities* (Menlo Park, Calif.: Benjamin/Cummings, 1980) and Michael Gilpin, *Group Selection in Predator-Prey Communities* (Princeton: Princeton University Press, 1975).
- 82 John Cassidy, "Philosophical Aspects of Group Selection," *Philosophy of Science* 45 (1978): 575–94. See also Sober, *The Nature of Selection*, pp. 255–66, 314–68.
- 83 Some parasites may be an exception. See Peter W. Price, *Evolutionary Biology of Parasites* (Princeton: Princeton University Press, 1980). I am not sure, either, exactly what to say about cases of exceedingly close symbiosis, as in lichens.
- 84 Robert M. May, "The Evolution of Ecological Systems," *Scientific American*, September 1978, p. 161.
- 85 Sober, "Philosophical Problems for Environmentalism," p. 185. The upshot? "An environmentalism based on the idea that the ecosystem is directed toward stability and diversity," he says, "must find its foundation elsewhere." Thus Sober has anticipated the central theme of my argument, though in my opinion he is much too quick to draw this conclusion.
- 86 Robert McIntosh, "The Background and Some Current Problems of Theoretical Ecology," in *Conceptual Issues in Ecology*, ed. Esa Saarinen (Dordrecht, Holland: D. Reidel, 1982), p. 10. The context makes it clear that McIntosh finds this survival lamentable.
- 87 John L. Harper, "Terrestrial Ecology," in *Changing Scenes in the Natural Sciences, 1776–1976* ed. Clyde E. Goulden (Philadelphia: Academy of Natural Sciences, 1977), pp. 148–9 (emphasis added).
- 88 See J. L. Richardson, "The Organismic Community: Resilience of an Embattled Ecological Concept," *Bioscience*, July 1980, pp. 465–71. See also R. V. O'Neill et al., *A Hierarchical Concept of Ecosystems* (Princeton: Princeton University Press, 1986), pp. 37–54.
- 89 See, e.g., Richardson's discussion of "keystone" species.
- 90 Could my dismissal of group selection be too hasty? A referee points out that group selection is "not a scientific joke like 'Creation Science'." True enough. One respected ecologist who assumes group selection at the community level is Eugene Odum. See *Funda-*

mentals of Ecology, 3rd ed. (Philadelphia: W. B. Saunders, 1971), pp. 251–75. See also M. J. Dunbar, “The Evolution of Stability in Marine Environments: Natural Selection at the Level of the Ecosystem,” *American Naturalist* 94 (1960): 129–36. Nevertheless, Wynne-Edwards (whom the referee mentions favorably) has something in common with Creation scientists I have read – he carefully ignores the explanations that his opponents offer. See, for example, Lack’s annoyed reply to Wynne-Edwards in *Population Studies*, pp. 299–312.

91 The next step – to ecosystem moral considerability – might not be as tempting as some have thought. It tends to devalue the individual, perhaps too much. See Katz’s criticism of Callicott’s ethical holism in “Organism, Community, and the ‘Substitution Problem’.” See also H. J. McCloskey criticism of holistic political philosophies in “The State as an Organism, as a Person, and as an End in Itself,” *Philosophical Review* 72 (1963): 306–26.