Toward the Moral Considerability of Species and Ecosystems

Lawrence E. Johnson*

I develop the thesis that species and ecosystems are living entities with morally significant interests in their own right and defend it against leading objections. Contrary to certain claims, it is possible to individuate such entities sufficiently well. Indeed, there is a sense in which such entities define their own nature. I also consider and reject the argument that species and ecosystems cannot have interests or even traits in their own right because evolution does not proceed on that level. Although evolution proceeds on the level of the genotype, those selected are able to cooperate in entities of various higher orders—including species and ecosystems. Having their own nature and interests, species and ecosystems can meaningfully be said to have moral standing.

INTRODUCTION

Of considerable importance to our environmental ethics, and a matter of much debate, is the moral status of species and ecosystems, and perhaps that of certain other wholes. Of related importance is the question of what such things *are*. I take a fairly strong line on these matters. I maintain that species and ecosystems (and certain other things, for that matter) are entities, that they have interests—and, moreover, that those interests and all interests, are morally significant. I do not discuss this last claim here, though I do argue for it elsewhere.[1] Here I concentrate on the claims that they are entities and that they have interests. I have also argued in favor of those claims elsewhere, in connection with species.[2] Here I propose to develop these claims further, and to extend them to include ecosystems as well. I defend these claims against objections that such beings cannot have identity or interests because evolution does not proceed on that level. My purpose, however, is not primarily to refute these objections, but rather, more positively, to try to clarify what my claims mean and what their

* Philosophy Discipline, School of Humanities, The Flinders University of South Australia, P.O. Box 2100, Adelaide, South Australia 5001. Johnson is the author of *A Morally Deep World: An Essay in Moral Considerability and Environmental Ethics* (New York: Cambridge University Press, 1991).

[1] In Lawrence E. Johnson, *A Morally Deep World* (Canberra: Australian National University, 1987), and in the later and much improved *A Morally Deep World: An Essay in Moral Considerability and Environmental Ethics* (New York: Cambridge University Press, 1991).

[2] Lawrence E. Johnson, "Humanity, Holism and Environmental Ethics " *Environmental Ethics* 5 (1983): 345-54.

truth amounts to. To do this adequately, I examine not only what species and ecosystems are, but also what it means to say that such things count as entities and have interests. These questions cannot be fully separated. To ask what a species or an ecosystem is, we must ask whether they are entities of some sort. Yet we cannot begin by first asking what an entity is. That would be impossibly general. Rather we must ask what it might mean to say that a species, or an ecosystem, is an entity, and then determine whether it is possible for things of that sort to have interests.

SPECIES AS ENTITIES

Let us begin by asking what it is for a species to be an entity. While doing so, we glance sideways at such questions as what it means for an individual organism, a lichen, a slime mold, an ecosystem, or Gaia to be an entity. In a sense, such questions can easily be answered: everything is a thing. While obvious, and indeed true, such an answer is trivial. There are lots of ways of being something. For each thing, we must ask what sort of thing is *that* thing. In particular, we must sharpen the focus on what it is we are trying to figure out, and what problems we are trying to solve, when we try to figure out whether species are entities.

Presumably we can all agree that individual organisms are unproblematically entities. The standard view has been that species are collections of individual organisms. But collections of what sort? Traditionally, it was held to be a class of relevantly similar organisms. One problem with this position, however, is that it is not always easy (or even possible) to find some feature which they all have in common and which distinguishes them from members of other species. If we are dealing with a species that is distinct and fairly uniform, it may be possible to define a class of relevantly similar individuals—though it does not thereby follow that this would be the best approach to understanding such a species. If we are dealing with a species that has a wide degree of variation, or even different forms or life stages, there may be no feature whatever that they all have in common.

The closest alternative is to try to conceive of a species as being a class tied together by some scheme of so-called "family resemblances." This approach can be made to work, to a point, and it works better than the preceding scheme. Nevertheless, we no longer have *the* characteristic of a species. Moreover, one has a sense that the family-resemblance scheme for the species is stitched together after the fact. Instead of the species being what it is because it has certain characteristics, a scheme of characteristics is settled upon describing what the species happens to be. What, then, if anything at all, is a species?

The problem is further complicated by the fact that unlike most classes we cannot just give a particular species an ostensive definition. We cannot just say hat it is a class composed of that, that, . . . and that, for the simple reason that the membership of the species is continuously changing. The species *Homo sapiens*, for example, has a differing membership every time someone is born or dies. Classes aren't supposed to change membership like that. Indeed, if a class is defined by what its membership is, it *cannot* change membership at all while still being that class. Yet a species may, over the years, come to have an entirely different membership while remaining, at least pretty much, the same species. Some species may remain the same, as much as we can tell, for thousands or even millions of years. Others may change much more rapidly. All species, nevertheless, do change over time, and this fact is another problem for the claim that species are classes of some sort. Species change. They evolve. They sometimes branch into two or more species. Most eventually become extinct. Classes don't do things like that. Actually, classes don't *do* anything. Thus, whatever species are, they evidently aren't classes, at least not according to anything like the standard conception of what a class is. Anyone who wanted to insist that they are classes would have to invent some radically new conception.

What species are, or are not, is currently a matter of considerable debate among biologists and those concerned with the philosophy of biology. These days, most thinking about species is in terms of their evolutionary role, shaped by their environment and formed on the basis of—indeed, formed as articulations of—their evolving genetic lineages. In a sense, a limited one, of course, organisms are viewed as DNA's way of making more DNA. Perhaps the boldest suggestion is the proposal that species are entities in their own right, that they are, in a manner of speaking, "super organisms." The idea is that a species is a genetic lineage, a whole ongoing biological life process. Unlike a great many other entities, though not unlike all of them, a species-entity spans a number of spatially separate individuals. Still, through internal and external factors, this genetic lineage maintains itself in its environment as a fairly cohesive entity. When a species branches off from its ancestral species, it assumes its own identity as a separate entity.

Conceptions of species as entities there is more than one such conception—have historically been associated with "punctuated-equilibria" views about evolution, and the first major expression of a species as entity was put forward in association with such a theory. According to the punctuated-equilibrium theory, species stay more or less the same until, relatively suddenly (by evolutionary time scales), a new one springs up, one having its own identity.

Theories toward the sudden-leaps end of the spectrum tend to be more receptive to the species-as-entities conception because they view often species as having separate identities. More gradualistic theories portray species as blending into one another, creating a host of messy questions about where to draw the line, thereby discouraging the idea that species are entities in their own right. This difficulty is summarized as follows by Richard Dawkins, a gradualist who denies that species are entities:

> [T]he punctuationists . . . make a big point of treating 'the species' as a real 'entity'. To a non-punctuationist, 'the species' is definable only because the awkward intermediates are dead. An extreme anti-punctuationist, taking a long view of the entirety of evolution history, cannot see 'the species' as a discrete entity at all. He can see only a smeary continuum. On his view a species never has a clearly defined beginning, and it only sometimes has a clearly defined end (extinction); often a species does not end decisively but turns gradually into a new species. A punctuationist, on the other hand, sees a species as coming into existence at a particular time (strictly there is a transition period with a duration of tens of thousands of years, but this duration is short by geological standards). Moreover, he sees a species as having a definite, or at least rapidly accomplished, end, not a gradual fading into a new species. Since most of the life of a species, on the punctuationist view, is spent in unchanging stasis, and since a species has a discrete beginning and end, it follows that, to a punctuationist, a species can be said to have a definite, measurable 'life span'. The non-punctuationist would not see a species as having a 'life span' like an individual organism. The extreme punctuationist sees 'the species' as a discrete entity that really deserves its own name. The extreme anti-punctuationist sees 'the species' as an arbitrary stretch of continuously flowing river, with no particular reason to draw lines delimiting its beginning and end.[3]

The problem of where to draw the line is not the only difficulty that can be raised against the idea that species are entities, and we shall consider others in due course. It is, nonetheless, a problem of considerable importance, a problem which must be faced up to, and one which gives us a good place to start.

WHERE DO YOU DRAW THE LINE?

If the difficulty—more like impossibility—of drawing precise lines *did* exclude the possibility of species being viewed as entities, then we would just have to abandon the idea. This would be so even if we adopted a punctuationist account, for on any form of punctuationism (short of a theory of special creation) there would still be a transitional period when the nature and boundaries of the species were indeterminate. That it was a relatively short period of indeterminacy would logically be beside the point. To the very limited extent to which I am entitled to have a view on such a subject, I am inclined toward gradualism. Nevertheless, I maintain that a resolution of that issue does not mandate or preclude any conclusion on the issue of whether species are entities.

I argue that it is possible to get around the line-drawing problem while still maintaining that species are entities in a meaningful and worthwhile sense. Whether they truly are entities is a further question, independent of the question

---

[3] Richard Dawkins, *The Blind Watchmaker* (Harlow. England: Longmans, 1986), p. 264.

of boundaries. First, however, we must attend to the conceptual problem of whether entities need precise boundary lines. I argue that sharp boundaries for entities are only conceptual conveniences, and not ontological necessities.

The easiest way to demonstrate that determinate boundaries are not necessary in order to be an entity is to take a look at a counterexample. Consider the planet Jupiter. We cannot use its surface as a boundary for the simple reason that it doesn't have one. Although the core of the planet is surrounded by liquids and gases, which are part of the planet, they do not have any precise boundaries or termination. They just get thinner as they get further from the center, until eventually there is not quite empty space. We can define some boundary to suit ourselves, but that is one which we have formulated, not one which is inherently real. Yet Jupiter undoubtedly is an entity.

Jupiter, however, is not an entity that is very similar to a living being. Let us turn to an example which is closer at hand, individual organisms. Although it's easy to think that an organism is a determinate entity—one with a definite beginning and end in time, filling a particular volume of space, and having its own particular identity, it is not really all that clear-cut. Individual organisms are a bit fuzzy around the edges, with a fuzziness that may be instructive as we think about species. To start with, the conception of an individual does not take place at a specific moment, but is a process that goes on for as much as twenty-four hours, without having an exact beginning. Neither is death something which happens at a precise moment, as current controversies make clear. Some vital functions continue longer than others. (Indeed, certain life processes, such as the growth of hair, continue for a very long time after other life processes have ceased.) Finding boundaries becomes even more difficult, and arbitrary, when we take into account the fact that the zygotes sometimes split into twins, or when we stop to think about cloning. Even spatial location is somewhat imprecise, given that our life processes do not precisely begin and end with our skin (which itself is not a precise boundary). Moreover, our location, size, shape, and just about everything about us undergoes radical changes during our lifetime. Even so, an organism undeniably is something. But what, if anything, gives that something its identity?

It might be suggested that there is something to which we can point as giving identity to individual organisms: genes—or, more accurately, genotypes. A genotype persists whatever changes an organism undergoes. Still, while there is something fairly definite to which we can point in the case of an individual organism, it is less than clear that what we are thereby pointing to is the organism's identity. What an organism *is* is not entirely determined by its genes, as genes may be manifested in different ways (or not at all) according to environmental circumstances. Genetically identical individuals may differ quite markedly. (In the case of a person, we might at least raise the further complication of whether the person's genotype plus phenotype define his or her identity.

A person, after all, is formed through experiences, decisions, value choices, etc. For our example we would do better to stick to less developed organisms, where the idea of a determinate *thing* is less obviously out of place.)

What an organism is is consistent with its genes, obviously, and with its environment, but it is not entirely determined by either. Its identity is shaped by its genes and its history in that environment—and certainly its identity is not just the sum of its physical characteristics at a particular moment in time. A living being is better thought of as a process, a life process, than as a thing. In that respect it is like a wave moving across water—which is not just an object made out of water, having a particular shape, position, volume, and mass—and is understood as an ongoing process, with a past as well as a present, moving through time into the future. Characteristically, a living being is a process which hangs together. It maintains itself in a fluctuating environment which, unless countered, would soon terminate it. This is generally true of living entities, and it is true of species and ecosystems.

Living things are peculiar in that they go against the universal long-term trend toward increased entropy—doing so through systematic means of self-maintenance. As Sayre puts it: "The typifying mark of a living system . . . appears to be its persistent state of low entropy, sustained by metabolic processes for accumulating energy, and maintained in equilibrium with its environment by homeostatic feedback processes."[4] That is not all there is to it, however, not by any means, for a refrigerator with a thermostat meets Sayre's characterization; yet it is not alive. What is it about life that makes the difference? Of critical importance, I think, is the fact that a living being, unlike other beings, has its own integrated wholeness. It has *organic unity,* by which I mean that its character is an integrated expression of its subsidiary systems. The various means by which your body controls its temperature—via the sweat glands and respiratory and circulatory systems, etc.—are integral features of your system (you) as a whole. In contrast, the thermostat is really an add-on to the rest of the refrigerator, not essentially a feature of it. Neither is the preferred temperature range an essential feature. The right temperature for your refrigerator is determined not by the inherent character of the refrigerator, but by your own objectives. Indeed, a refrigerator is given its identity as a *refrigerator* only through our interests in it. In contrast, the right body temperature for you is not determined from the outside, nor even by your own choices, but, literally, by every fibre of your being. A living being has *self-identity* in that what it is and what serves to maintain it are determined by its own nature. All of a living being defines its favored states, what its central range of homeostasis is, and the life

[4] Kenneth M. Sayre, *Cybernetics and the Philosophy of Mind* (New York: Humanities, 1976), p. 71.

processes of the being as a whole are integrated toward maintaining them. Accordingly, that which serves to maintain its viability is in the interests of a living being.

SPECIES AND INTERESTS

Species and ecosystems, I suggest, must be understood as living entities in their own right. Not only do they meet Sayre's characterization, but they also have organic unity and self-identity. They are integrated beings, determining their own character and acting so as to maintain it. Species and ecosystems thereby not only have character but interests in their own right. A species or ecosystem has an interest in whatever contributes to its ongoing viability—to whatever contributes to that living system maintaining itself. These are claims that I must defend in the face of challenges.

It has been claimed to the contrary that species and ecosystems do not have character or interests at all—*not in their own right.* In this section, I consider this counterclaim in connection with species in response to a particular objection raised by Dawkins. In the next section, I go on to an examination of ecosystems.

Dawkins argues that species cannot have traits in their own right, and therefore cannot have interests in their own right, because traits cannot be selected for at the species level. Evolution proceeds on the level of individuals, not on the level of species. He writes:

> Species don't have eyes and hearts; the individuals in them do. If a species goes extinct because of poor eyesight, this presumably means that every individual in the species died because of poor eyesight. Quality of eyesight is a property of individual animals. What kinds of traits can *species* be said to have? The answer must be traits that affect the survival and reproduction of the species, in ways that cannot be reduced to the sum of their effects on individual survival and reproduction.... But this is pretty unconvincing. It is hard to think of reasons why species survivability should be decoupled from the sum of the survivabilities of the individual members of the species.[5]

Of course, neither Dawkins nor anyone else denies that species have characteristics. They clearly do in some sense—but Dawkins holds that they do only in a sense which defines the characteristics of a species directly in terms of the characteristics of its individual species members. The duckbilled platypus species is characterized by its famous facial feature because its individual species members each possess one. According to Dawkins, it is impossible for a characteristic to pertain to a species in its own right unless evolution proceeds on

[5] Dawkins, *Blind Watchmakers,* pp. 266-67.

the species level. He argues at some length that it does not and cannot. Whether or not evolution proceeds on the level of species, however, is not an issue which needs to be debated in this connection. Even if we agree with Dawkins that evolution cannot proceed on that level—and it might well be that it cannot—it may still be that a species can have characteristics, in particular, interests, in its own right. After some preliminary remarks, I provide examples of such characteristics.

Dawkins tells us that a trait on the species level must be one that affects the survival and reproduction of the species, but cannot be reduced to its effects on individual survival and reproduction. He maintains that these things cannot be decoupled, and draws the conclusion that there are no traits on the species level. I deny the soundness of this argument, for it is by no means necessary to deny that positive effects for the species can be reduced to positive effects for the individual. Genes are manifested in individual organisms and it is through them that selection takes place. A trait on the species level would be manifested through individual organisms, but would not be the sum of the traits of the individual organisms. Presumably (unless there were selection on the species level) a trait would have to be selected for because its manifestation in an individual organism tended to be beneficial to that organism's reproduction, the means by which the genes for that trait are proliferated. Though selected for through individuals, it could still be a trait of a species as a whole, and not just a summation of the traits of individual organisms. By way of comparison, the properties of a glacier or river are not the summed properties of individual water molecules, much less atoms, although glacial or riverine properties might theoretically be reducible to those of molecules or atoms. Whether or not their properties are reducible—I remain neutral on the question of emergent properties—glaciers have properties of a different sort which are not just those of individual molecules multiplied by large numbers.

There are examples of traits of species as wholes that are not the summation of the traits of individuals. The trait of having genetic diversity provides a case in point. It would be absurd to say that individual organisms have genetic diversity in the sense that species do, though individual organisms might instantiate that diversity. Genetic diversity is important to the long-term welfare of many bisexual species, which accordingly have an interest in maintaining it. In their breeding arrangements and in their internal chemistry, bisexual species go to quite some lengths to maintain their genetic diversity. In the past it has been in the interests of individual organisms to have the traits by means of which genetic diversity is maintained, although on the level of individuals the interests were different interests in different traits. While genetic diversity is manifested through and selected for through individual organisms, the diversity that is beneficial to the species as a whole is by no means a matter of the aggregated interests of individual organisms. Once we recognize that a species is not a collection of individuals but a living system, an ongoing life process in its own right, it is easier to see it as having character and interests in its own right.

Still, it could be asked persistently, how can selection for traits on the individual level yield traits on the species level? As Dawkins and all other biologists are quite well aware, natural selection is not just a matter of some genes beating other genes in competition. Things are much more complex. All of the surrounding environment, genetic and nongenetic, has to be considered. Fundamentally, evolutionary selection takes place at the level of the gene. Yet it is through the manifestation of the gene that selection takes place, and genes are manifested in individual organisms *interacting with their environment.*

Genes evolve in the presence of other genes and are frequently influenced by the presence of other genes, often mutually. Genes are selected for the most part according to how well they get along with (the manifestations of) other genes—be they other genes in the same organism, or in other organisms of the same species, or elsewhere in the environment. Species and ecosystems are loaded with genes which manifest themselves in such a way as to fit in with other genes in other beings of various sorts. If not precisely cooperation, it is still a matter of interacting so as to maintain a viable balance. Genes—or, more accurately, genotypes—are selected positively when their manifestation in the organism is such as to lend itself to the replication of genes of that sort, and they are selected against when the opposite is true. The sort of manifestation that is favorable to the genotype may or may not be conducive to the further existence of the organism. It may save the organism's life or, as in the case of the stinging response of bees, it may cost the organism its life. Again, manifestations that are very favorable for genotypes, such as those for sexually attractive characteristics, may not affect the organism's continued existence one way or another. Genotypes manifest themselves in individual organisms in particular environments and it is what happens there that determines what gets selected for or against. Genotypes tend to be selected for, and so to proliferate, when they tend toward manifestation in viable individuals, viable species, and viable ecosystems.

Other examples of genes interacting, and species having interests, are to be found in cases in which certain species have an interest in being preyed upon. In the absence of predators removing the old, the ill, the defective, and the supernumerary, things can go quite badly for some species. Among many examples, that of the Kaibab deer and the mountain lions is a famous case in point. It proved to be a major disaster for the deer species when its perennial predator was removed. It is not in the interest of any individual deer to be killed by a mountain lion. At most, it might be in the interests of one deer for some other deer to be removed from competition. Nevertheless, the good of the species is not to be determined by adding up how much certain individual deer are benefited and others injured. Indeed, often the individuals most affected are those indeterminate beings who do not yet exist—which certainly turned out to be the case on the Kaibab plateau. Computing the effects on individual existent deer (or other organisms) would be difficult if not impossible, but the disastrous effect on the deer species and on the whole ecosystem on the Kaibab plateau was quite unambiguous.

ECOSYSTEMS AND INTERESTS

Distinct from the question of whether species are entities, with interests, though not entirely independent of it, is the question of whether ecosystems are entities and have interests. I maintain that ecosystems are not just aggregations of plants and animals occurring in the same area. Rather, they are living systems with their own organic unity and self-identity, having and acting so as to maintain their own character. Accordingly, I maintain that they have an interest in whatever is conducive to their viability. It seems evident to me that the entire ecosystem of the Kaibab plateau, and not just the deer, had an interest in those mountain lions, and that the interest was not just the summed interest of the individual organisms. We might also note that analogous to the interest that the deer had in being preyed upon is the interest certain ecosystems have in being subject to periodic fires, an interest that is also distinct from those of individual organisms.

This line of reasoning is resisted by Harley Cahen, who tells us:

> 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.... 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. 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 systematic goal.[6]

Following Larry Wright,[7] he goes on to take the line that "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."[8] I feel more than a little apprehen-

[6] Harley Cahen, "Against the Moral Considerability of Ecosystems," *Environtnental Ethics* 10 (1988): 203, 207.

[7] Larry Wright, "Explanation and Teleology," *Philosophy of Science* 29 (1972): 204-18.

[8] Cahen, "Against the Moral Considerabilitv of Ecosystems," pp. 207-08.

sive about the term *goal*, as I suspect that things which I would wish to avoid might be packed into it. Instead of using such a term, I prefer to discuss these matters in terms of a living system maintaining its identity, unity, or center of homeostasis, or something along those lines. However, let us ask whether an ecosystem's tendency to maintain itself in the face of disruptive influences or fluctuations in its environment is to be understood as being, so to speak, goaldirected. Do some things go on in an ecosystem *because* their going on serves to maintain the ecosystem?

Cahen argues that the tendency of an ecosystem to maintain itself is to be understood as the incidental effect, or byproduct of the system's component parts. He writes:

> . . . 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." . . . Certain forms of trophic structure typically enhance community stability, . . . but trophic structure does not take on particular form because that form enhances stability.
>
> 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....
>
> 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.[9]

He then goes on to discuss group selection and community selection, arguing that because evolution does not work in this way, ecosystems are not goal-directed, and therefore do not have interests. Given that moral considerability is tied to interests, it is supposed to follow that ecosystems are not morally considerable in their own right.

Cahen's argument that ecosystems lack interests (in their own right) is somewhat different from Dawkins' argument that species lack interests (in their own right). He does not base his argument on any claim that they lack interests (on that level) because they lack characteristics (on that level). Rather, he claims that ecosystems lack interests because they are not goaldirected. Like Dawkins, nevertheless, he maintains that they lack the necessary prerequisite for having interests because they could not have been evolutionarily selected to have the

[9] Ibid., pp. 210-11.

prerequisite. Both Dawkins and Cahen argue for their respective conclusions on the grounds that natural selection does not proceed on the level at which they deny there are interests or the prerequisites of interests. Concerning this point, accordingly, my response to Cahen is in large part similar to my response to Dawkins.

Of course, I quite agree with Cahen that moral considerability is tied to interests, and that to be morally considerable in their own right, ecosystems must have interests in their own right. I maintain, however, that ecosystems do have interests. They do have—if not goals—at least centers of homeostasis around which their lives fluctuate, and which are central to their identity. It is in their interests to maintain their life processes within at least a broad equilibrium around those centers of homeostasis, thereby maintaining their viability. It is not because they are *goals* that maintaining these centers of homeostasis is important. That way of putting it is much too anthropocentric, or at least anthropomorphic, in its inspiration (and in my view it is mistaken even in the case of humans). Maintaining these centers of homeostasis is important to the ecosystem, is in its interest, because doing so serves to maintain its viability.

That an ecosystem maintains itself is not, I believe, just a happy accident resulting from individual organisms doing their own thing. Although they certainly do do their own thing, it does not at all follow that the contribution which they thereby make to the ecosystem's maintaining itself is not a reason why those individual organisms do as they do. That it is characteristic of them to do as they do—indeed, that they are there and so able to do it—cannot just be dismissed as an extraneous byproduct. It may well be that they are there, and are as they are, as a result of natural selection because they contribute to the wellbeing of the ecosystem. It may be that conditions are such that individuals or, more properly, genotypes, are favored because their contributions to the wellbeing of the ecosystem contribute to their own selective advantage. There is no need at all to invoke group or community selection.

Individuals can contribute, non-accidentally, to the well-being of ecosystems analogously as cells contribute, non-accidentally, to the well-being of whole organisms. This point, as Cahen notes, is the basis for an objection to his own position. Unfortunately, however, his handling of this objection is quite seriously misdirected. He dismisses the objection on the grounds that evolutionary selection proceeds on the level of individuals. That being so, he argues, cells will be constituted so as to contribute to the well-being of the organism. Since evolution proceeds on the level of the individual, he argues, there is no reason for individuals to contribute, except accidentally, to the well-being of anything else. The fundamental flaw in Cahen's argument is that evolution, as we have already noted, does not—except derivatively—proceed on the level of the individual organism. Rather, it proceeds directly on the genotypic level. Genotypes, nevertheless, find expression on many levels, including thoseof cells, individual organisms,species, and ecosystems. If a genotype is to have any but a brief future, it had better fit in with other genotypes that make those things viable.

As Cahen notes, if the individual organism is to survive it has to have cells that can function and cooperate for the sake of the individual. To this requirement we might add that the cells, to survive, had better form a viable organism (if they are to form an organism at all). It is also true that in order to survive cells and individual organisms need to be in an environment that can maintain the conditions for their survival. For all these reasons, there is evolutionary pressure for genotypes to fit in functionally with other genotypes around them—be they in the same organism, or elsewhere in their environment. Examples of genotypes responding to and cooperating with genotypes in other organisms, including organisms of very different kinds, are too numerous to mention and are familiar to anyone aware that bees pollinate flowers. By the same token, ecosystems need viable cells, viable organisms, and, for that matter, viable species in order to carry on. Neither genes nor genotypes have any of these things as *goals*, of course. Nevertheless, genotypes are selected to mesh with a lot of other genotypes and the world in general, maintaining viable cells, organisms, species, and ecosystems, and thereby themselves.

In this paper, I have argued that the interaction of genes or genotypes with the environment and the manifestation of this interaction at all higher levels makes it possible not only for individual organisms, but also species and ecosystems properly to be considered living entities in their own right, which therefore can also have interests in their own right. This status is not affected by the fact that evolutionary selection does not directly proceed on those levels. Though indirectly, species and ecosystems have evolved in such a way that their life processes tend to maintain the viability of the whole. Their interests suffer to the extent that their life processes are unable to do so. Because of these interests, it is possible for species and ecosystems meaningfully to be said to have moral standing.