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# Scientific Collecting

Robert W. Loftin \*

Scientists often collect (kill) organisms in pursuit of human knowledge. When is such killing morally permissible? I explore this question with particular reference to ornithology and against the background of animal liberation ethics and a land ethic, especially Mary Anne Warren's account that finds the two ethics complementary. I argue that the ethical theories offered provide insufficient guidance. As a step toward the resolution of this serious problem, I offer a set of criteria to determine when collecting is morally permissible.

## I. SCIENTIFIC COLLECTING AND SCIENTIFIC KNOWLEDGE

Ornithologists often kill birds for what others deem to be trivial reasons. Is pure scientific knowledge that is unlikely to be of any practical benefit to humans a good reason to kill numerous birds? Ornithologists themselves have long been deeply divided on the issue. Can philosophers offer any help? Philosophers interested in such issues are themselves deeply divided between those who advocate an animal liberation ethic and those who follow a land ethic. Being myself both a philosopher and an ornithologist, I have faced both of these deep divisions. My search for an answer, I argue, has something to say of benefit to both the philosophical and the ornithological communities, to say nothing of the benefit to the birds themselves!

Both the ethics of animal liberation and the land ethic are appealing, but holding both simultaneously is difficult. Although both agree that nonhuman beings have intrinsic value, animal liberation theorists locate that value in individual nonhuman animals, while land ethic theorists also locate value in species populations and ecosystems. Both reject an anthropocentrism according to which all values are human values; however, what they have in common is outweighed by their seemingly intractable differences. Can the two views be reconciled? One good way to test the worth of both theories and any reconciliation of them is to examine the morality of scientific collecting.

Collecting is not one single activity. Because various purposes are accomplished by it, we need to take a closer look at the different kinds of collecting. Most ornithologists who collect are "professionals," trained scientists or wildlife

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managers. Part of their socialization into the profession consists of "collecting" (a euphemism for killing) bird for sundry scientific reasons. These are, presumably, the people who are most knowledgeable about birds, and much of this knowledge has been gained from the study of birds killed especially for this purpose.

What kind of knowledge is gained and how important is it? About one-third of all species of birds are represented in collections only by study skins. There are neither skeletons nor fluid-preserved whole specimens available anywhere in the world for anatomical or osteological studies.<sup>1</sup> There is no alternative to collecting further specimens of these species if we are ever to have knowledge about their myology or osteology. If such knowledge is important enough, past collections are insufficient and collecting must yet be done.

A good collection is necessary for the scientific pursuit of any kind of zoology. In ornithology, there must be reference specimens for the study of plumages and molts and variation within the species, alcoholic specimens for the study of anatomy, and fossil specimens to compare with modern specimens for the study of evolution. A good collection, complete, carefully documented with accurate information and meticulously curated, is at the heart of any good biology department, research station, or museum. No excuses are necessary for a good collection if one is going to do serious science. Obviously, such science requires taking the lives of many of specimens. One cannot build a good collection on road kills and natural mortality.

The good curator wants to fill the gaps in the collection, acquire new and rare specimens, and enlarge the holdings. One can never tell when one will need a specimen of a particular species. To be prepared for all professional situations, one must have at hand as complete evidence as possible, including bone, feather, muscle, nest, and egg. If one waits until one needs a specimen to acquire it, it will never be possible to get any science done. One does not expect the library to buy books only after the researcher has asked for them. One does not expect the herbarium to collect plants spasmodically, but rather systematically, and to have what is needed there already when the taxonomist comes in to work. The more complete a collection, the more information is stored there, and the more valuable it is. All this sounds right, although, as I point out below, scientific collecting, like any other kind, can sometimes become an end in itself.

Birds are collected not just to study anatomy and morphology, but also to document behavior. Birds migrate, and one of the true and interesting things that is worth knowing is how many and when. Bird migration is really a rather startling natural phenomenon. Five billion birds a year migrate in North America, each individual performing an average migration of 2,000 kilometers. Sixty-five percent of North American species migrate. Some species move in vast flocks,

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<sup>1</sup> R. L. Zusi, D. L. Wood, and M. A. Jenkinson, "Remarks on a World-Wide Inventory of Avian Anatomical Specimens," *Auk* 99 (1982): 740-57.

some alone. Some fly by night, some by day. Some follow traditional routes, apparently learned from their ancestors and handed down through generations in ways that we do not understand. Some orient by stars, some by magnetic fields; some follow the coastlines; some fly across the trackless waste of the open sea without landmarks for many hundreds of miles.

Bird migration is a marvel worth knowing about. Unfortunately, however, there are many myths about migration. These can only be dispelled by careful, systematic collecting. One thing that we have learned is that the migration of birds is not all that regular. In some years, it is early, in others late. Some individuals are earlier, some later. Some species generally migrate early, some late. Some start early and trickle through in a steady stream. Some migrations are irruptive and irregular.

Jeremy Rifkin, for example, naively accepts the well-worn myth of the swallows of Capistrano. According to this myth, the cliff swallows always return to the Mission of San Juan Capistrano on St. Joseph's Day, March 19. They supposedly arrive en masse just before dawn. Every year, the press is there for the great event and, sure enough, the birds oblige. Nevertheless, if you are there the day before, you will see just as many. March 19 is always late enough in the year that the swallows are back well before. The locals, following the folklore, usually say that a few "scouts" arrive earlier, and insist that the main body arrives promptly on St. Joseph's Day. Rifkin assumes the myth to be scientific fact. "There is much well-known and well-observed data on birds returning each year to their summer haunts on exactly the same day."<sup>2</sup> He is wrong. Scientific, systematic collecting can and has shown this myth to be false.

In studying migrations, questions about the degree of certainty and the degree of significance of particular data can arise. The scientist may be after facts about when the birds are moving about and where they are going. Can I shoot a bird just to prove that it was *there*? If I am going to prove that a bird of a certain species was at a certain place on a certain day (thus avoiding the kind of blunder Rifkin makes), I have to have some evidence that others can examine to verify this putative fact. Shooting the bird is the surest and quickest way to obtain such evidence. Some birds are quite difficult to distinguish from others. The literature is replete with cases in which someone reported a bird that was either *X* or *Y* at an interesting time or place; however, we will never know which because they look just alike and the bird was not shot. Moreover, there are frequent cases in which even the best ornithologists shot a bird because they thought it was an *X*, only to discover that it was actually a *Y*. Unless the life of the bird is sacrificed, positive identification may be impossible.

There are other ways to attempt to document the presence of a bird at a particular time and place, but none is as reliable as killing the bird. Although photographs

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<sup>2</sup> Jeremy Rifkin, *Time Wars* (New York: Henry Holt and Co., 1987), p. 213.

are sometimes adequate, they may not reveal critical details. Testimony is not evidence of the kind required because it is not verifiable, and therefore less scientific.

Even shooting the bird does not absolutely prove that it was there at such and such a place and at such and such a time. Even if I have a putative specimen in my hand, it is not sufficient proof of anything, for the label on the specimen, with the information concerning when, where, and by whom it was collected, may be incorrect. There is a specimen of the three-toed woodpecker with a label stating that it was obtained in Duval County, Florida (the Jacksonville area). Because no other such woodpecker has ever been seen in or anywhere near Jacksonville before or since, and because science attaches a good deal of importance to the coherence theory of truth, ornithologists are skeptical, and understandably.

Concerns about the reliability of the observer may rule out a specimen as evidence.<sup>3</sup> The woodpecker skin, for example, was obtained as part of a collection bought from a taxidermist some years ago, and may well be mislabeled. If so, the woodpecker died for naught. Even granting the possibility that the specimen was collected in Jacksonville, the dead bird is insufficient proof. We will never know.

Not every bird serves as useful positive evidence. In addition to mistakes in handling specimens, birds that are shot may be wasted. The shotgun often mangles the bird so badly that the specimen cannot be prepared. Or the specimen may simply not be preserved. Sometimes there are statements in the literature that a specimen was collected, but nobody knows what happened to it, where it is now, or even whether the specimen was prepared. The dead bird may well have been discarded in the way that Audubon did when he finished with his specimens. Thus, dead birds, although they may typically increase the evidence for a knowledge claim, only make it relatively more certain.

Most people don't care what birds were where or when. Nevertheless, some do care and care greatly. Professional ornithologists as well as lay ornithologists have interests that they care about that are satisfied by these dead birds, perhaps not with absolute proof, but with evidence that is stronger than the evidence that would be available if no birds had been sacrificed. Have these interests enough value to justify collecting the birds?

## II. THE INTRINSIC VALUE OF SCIENTIFIC COLLECTING

The scientific knowledge obtained by collecting has, I maintain, intrinsic value. Even if this knowledge never proves to be of any practical benefit to either humans

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<sup>3</sup> Even specimen material is no safeguard against fraud. I can point to a case that is "hushed up," but about which I know since I am an insider. A person, though not a professional ornithologist, had the legal right to collect specimens because of a loophole in the law. This person passed off specimens as having been collected at other places and times, rather than their actual collection point, thus greatly increasing their supposed importance and (temporarily) enhancing his reputation.

or to other animals (for example, in the management of the welfare of the species taken), still some things are worth knowing simply because they are true and interesting. They are facts about what is going on in the world in which we live. The kind of intrinsic value here results from discovering facts about the world and enjoying them in the experience of human beholders, who undergo desirable experiences as a result of this knowledge. I find it difficult to give a reason that justifies such a basic experience. The claim is simply that the experience itself is worthwhile in its knowledgeable correspondence with objective biology. When making a claim that something is intrinsically valuable, one does not seek contributory reasons, although one can try to elucidate the character of the experience. Some things are worth having just because they are *true* and *interesting*. Bird anatomy, morphology, physiology, behavior, and migrations are examples. Such subjects do, after all, satisfy one kind of human *interest*. (On the negative side, we are also interested in having our ignorance corrected.) The hard part, of course, is to say when it is worth the life of a bird to know some true and interesting thing.

Ornithologists, as earlier noted, puzzle over this value issue even when they delight in the factual knowledge that they obtain. Neither ornithologists nor their critics would typically address this question in terms of animal rights, and perhaps not the land ethic either, but they are not always indifferent to the lives of the birds that they sacrifice.

### III. WARREN'S WEAK RIGHTS AND LAND ETHIC

I turn next to whether ornithologists can get help from philosophers, using collecting as a real world case to test the philosophical theories. The question about the value of the scientific knowledge and the value of the birds forces us to examine the value of the ethical theories involved. One promising account is by Mary Anne Warren. She holds that animal liberation and the land ethic are both true and complementary rather than mutually exclusive. The basic insights of animal liberation are correct, but in the case of animals, their rights to life, liberty, and self-realization can be overridden more easily than in the case of humans. Moreover, they are regularly overridden by the land ethic. Rather than choosing between the two ethics, an adequate world view must include both.

In terms of her rights theory, the right to life of a human always trumps the right to life of a nonhuman animal. Moreover, it takes less-serious reasons to override an animal's right to life than a human's right because many, and most animals,

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The fraud was suspected when, skinning a bird, others noted that, contrary to the statements made by the collector, the specimen had not been freshly frozen. A desiccated condition proved that the bird had obviously been dead for some months. Further examination of the specimen revealed that it was not a member of the subspecies most likely to show up when and where the collector claimed. Under intense questioning, the perpetrator finally broke down and admitted the fraud.

"lack the cognitive equipment to value their lives in the way that humans do."<sup>4</sup> Thus, although interests are at stake in both animal and human cases, less of value is at stake with animals. Less value is at stake because animals apparently lack both the capacity to anticipate their own deaths and the capacity to project their interests into the future. As a result, their experienced value is less and, accordingly, their right to life is weaker than that of a self-conscious human. If I have to choose between the life of a normal person and a raccoon, I ought to prefer the human. Rights to life, however, are never absolute, but always relative. Even in the case of humans, the right can be overridden, as, for example, in the case of self-defense.

Another consideration is that nonhuman animals seem to lack moral autonomy or agency. They do not have the ability to comprehend and follow moral rules. Critics of animal liberation such as H. J. McCloskey and Michael Fox argue that nonhumans lack "the capacity to be critically self-aware, manipulate concepts, use a sophisticated language, reflect, plan, deliberate, choose and accept responsibility for acting."<sup>5</sup> If, in the future, we should find that some nonhumans do have those capacities, their right to life would be strengthened. Nevertheless, current evidence is that they do not, and, accordingly, they have a weaker right to life.

Warren argues that the capacity for reciprocity in human culture lies behind the strong, full, and equal rights to life that we grant to other persons. I respect your right to life because I can reasonably demand that you return the favor. This reciprocal respect is not covert speciesism analogous to the biases of the sort used for millennia to oppress women and slaves because nonhuman animals really do lack the capacity for moral autonomy and reciprocity. Women and blacks actually have such capacity, and to pretend that they do not is merely to employ a tool of oppression.

Warren's argument that animal rights are weaker is thus based on empirical claims that animals have reduced cognitive and experiential capacities compared to humans. A corollary of this position, nevertheless, is that if there are any animals that have the capacity for moral autonomy and reciprocity, then they have a right to life—correspondingly and in proportion to their possession of these experiential and cognitive capacities.

There are some human beings, for example, infants, the severely retarded, and the irreversibly comatose, that do not have these moral and experiential capacities either. Warren argues that infants have strong right to life because they are partially autonomous. While the retarded and comatose are neither partially nor potentially autonomous, they are apt to have friends, relatives, or others who care

<sup>4</sup> Mary Anne Warren, "The Rights of the Nonhuman World," in *The Animal Rights/Environmental Ethics Debate: The Environmental Perspective*, ed. Eugene C. Hargrove (Albany: SUNY Press, 1992), p. 192. Originally published in *Environmental Philosophy*, ed. Robert Elliot and Arran Gare (University Park and London: Pennsylvania State University, 1983).

<sup>5</sup> H. J. McCloskey, "Moral Rights and Animals," *Inquiry* 22 (1979): 31.

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<sup>6</sup> Warren  
<sup>7</sup> Ibid.,

about what happens to them.<sup>6</sup> Moreover, not to treat them with respect makes us all insecure, since we may one day find ourselves in such a position after losing such capacities. Warren concludes, therefore, that there are sound reasons for assigning strong rights even to human beings who lack moral autonomy.

Although Warren quite plausibly claims reduced rights for animals, she is also concerned to refute the claim that animals have no rights at all. Those who deny animals all rights will say that if animals have rights to life, then we are obligated to protect the prey against the predator. Warren replies that because animal predators are not morally autonomous, they can do no wrong (or right either). Moreover, even if predators were moral agents, they would still be justified in their predation, since they generally kill only to feed themselves, and there is no other way for them to survive. After all, it is permissible even for humans to kill and eat an animal rather than starve, and nonhuman animals are just doing the same thing.

Warren finds this weak rights approach to be fully consistent with the land ethic—including its claim that prey species are often benefited when a predator kills and devours an individual prey animal, by eliminating the weak and unfit and by curbing overpopulation. The land ethic is concerned with evaluations at the species level as well as at the individual level.

In a biotic egalitarianism, according to which all animals have a strong right to life, equal to a human's, there is still an irreconcilable gap between the two. The view that animals have weaker rights, proportionately to their experiential and cognitive capacities, provides humans with a way out:

There is no inconsistency, however, in the view that animals have a significant right to life, but one which is somewhat more easily overridden by certain kinds of utilitarian and environmental considerations than is a human right to life. On this view, it is wrong to kill animals for trivial reasons, but not wrong to do so where there is no other way of achieving a vital goal such as the preservation of a threatened species.<sup>7</sup>

Warren is aware that sometimes trade-offs can be problematic, but she does not think that they provide the basis for a real objection to her account. One objection to animal rights is that such rights complicate our own moral system by introducing insoluble dilemmas. Which is worse, to "kill and eat a dozen oysters (which are at most minimally sentient) or one (much more highly sentient) rabbit?" Some complain that there is no practical way to answer such questions of casuistry. Warren, however, reminds us that equally difficult questions arise in interhuman morality. Would it be worse to kill one child or to cause a hundred to suffer from

<sup>6</sup> Warren, "Rights of the Nonhuman World," pp. 197-98.

<sup>7</sup> *Ibid.*, pp. 201-02.



severe malnutrition? In fact, we can and do make decisions that weigh all the relevant factors.

In deciding whether to eat mollusks or mammals, a human society must consider *all* of the predictable consequences of each option, for example, their respective impacts on the ecology or the economy and not merely the individual interests of the animals involved.

Of course, other things being equal it would be morally preferable to refrain from killing *any* sentient animal. But other things are never equal.<sup>8</sup>

Thus, when we have to make trade-offs balancing multiple considerations, animal liberation can be one of these considerations.

Although I found Warren's position appealing, there is a major problem. We do not yet know whether her theoretically satisfying solution, treating the animal liberation ethic and the land ethic as complementary positions, is going to give any real guidance concerning what we ought to do in the particular case of scientific collecting. We agree readily enough that it is wrong to kill an animal for trivial reasons, but not wrong to do so when there is no other way of achieving a vital goal such as the preservation of a threatened species. However, there is a wide spectrum of reasons that could be given that range from the trivial, on the one end of the spectrum, to the vital, on the other end. What we need to know is where on the scale those reasons pass over from the trivial into the vital. What is trivial to some may be significant or even vital to others. It is this kind of problem that we face with scientific collecting.

#### IV. IS SCIENTIFIC COLLECTING JUSTIFIED?

Now that we know that a bird has a right to life, a right at once important and yet relatively weak in relation to human interests and in relation to the good of the biotic community as a whole, is killing for scientific collecting justified? The answer to this question involves, as Warren puts it, "utilitarian and environmental considerations."

Defenders count among the benefits of scientific collecting the knowledge gained, and when they count losses, they invariably couch these losses in systemic terms—that is, from the perspective of an ecosystemic land ethic. The collector claims that his or her activity has no impact on the population as a whole.<sup>9</sup> In terms of "environmental considerations," therefore, the claim is that there are positive

<sup>8</sup> Ibid., p. 200.

<sup>9</sup> We should note that it is not always true that populations and ecosystems are unaffected. The Guadalupe Caracara, a little-known bird, was found only on Guadalupe Island off the coast of Mexico. In 1900 Rollo Beck saw eleven birds on the island and shot nine of them. None have been seen alive since! This kind of collecting is obviously unjustified, whether from the perspective of a land ethic oriented toward the protection of endangered species and ecosystems or from that of an animal liberation ethic oriented toward the protection of individual animals.

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scientific benefits and no negative ecological losses. Only a minuscule number of birds are collected each year, relative to the total population. One ornithologist has stated that in terms of avian mortality, scientific collecting is just ahead of birds being accidentally killed with golf balls. Thus, if the ecosystem and species populations are not a consideration, then the decision turns on the value of the knowledge gained versus the value of the individual lives sacrificed.

On the animal rights side of the equation, in defending their collecting ornithologists typically do not mention the rights of the individual birds at all, much less ask whether these are strong or weak. It is almost as if no damage is done, unless it is to species or ecosystems. Still, many ornithologists do not particularly like to shoot birds, and, as I noted, many have misgivings about some forms of collecting. Perhaps these weak rights should be taken into consideration. If no damage is done to the species or ecosystems, then these weak rights to life are all that remain to balance against the "utilitarian considerations."

On the benefits side of the equation, we need to know the value of the scientific facts gained (technically, the "utility" of the human interests here satisfied). Perhaps these are weighty enough to justify killing the birds. Sometimes, however, some of these scientific facts may be so trivial that even the weak right to life of the nonhuman animal that is to be sacrificed may be more important. How might these rights be figured in?

It is difficult to try to say that learning something scientific about the birds, even when we have relatively strong evidence to support this belief, justifies overriding the weak right to life of a swallow or a woodpecker. For a philosopher to say that the animal has a right to life, but that it can be overridden by "certain kinds of utilitarian and environmental considerations" does not even start to draw lines that ornithologists need to draw. People are going to draw these lines at very different points on the spectrum from the trivial to the vital. Warren seems to think that these are intractable problems only because they are posed in highly abstract, unrealistic terms, removed from the context of real-life situations. This is not the case. We might say, charitably, that her theory underdetermines the decisions that we need to make. It is more accurate to say, frankly, that we do not get any guidance at all. Perhaps it is too much to expect of any ethical theory, or combination of them, that there will be clear answers to every moral ambiguity that arises. Nevertheless, it is not too much to expect that ethical theory provide a helpful orientation to our problems.

Another place that the trade-offs between scientific knowledge and sacrificed animals have been much debated is in the context of animal experimentation. Animal liberationists have mounted a telling attack on what they consider to be trivial experiments that involve the killing and intense suffering of nonhuman animals. Those scientists engaged in animal experimentation have defended their "torture" almost entirely in terms of human welfare. The claim is that these experiments are likely to prove of medical benefit to humans. Insofar as this debate also involves a public relations war, this strategy is probably a smart move on their part. If they can convince the public that these experiments are needed to

cure cancer, they will win hands down over the animal liberation advocates. Perhaps the rhetoric is true: perhaps the experiments are vital rather than trivial. Warren argues, as I have already noted, that strong human interests override weaker animal interests. Viewed in this context, animal experimentation might be justified. However, we do not get any guidance from this debate about whether collecting can be justified in order to gain *pure* scientific knowledge.

When is scientific information that satisfies human interests weighty enough to justify overriding the weak right of an animal to life? There may be no satisfactory answer to this question, for the answer may depend too much on the idiosyncratic strengths of the interests of the parties concerned. The amateur ornithologist, who is principally moved by an aesthetic appreciation of the live bird, has a gut-wrenching dislike of seeing the bird flutter and fall after the bang of the gun. He or she will never count any pure scientific knowledge as worth the life of any bird.<sup>10</sup> In contrast, to the professional ornithologist, who sees a clear need for a good collection, the knowledge gained is nearly always important enough to override an animal's weak right to life. Nevertheless, how many specimens are enough? In one sense, it might seem that only the scientist can say.

Nonetheless, scientists are human, and in this sense, with their love of pure knowledge, they may be biased to overcollection. A complete collection is important for sciences, as already noted, but then too collecting can become an end in itself. I saw this happen when I got caught in a "specimen war." I have a permit to salvage dead birds (though not to sacrifice live ones), and once I gave a salvaged specimen to a prestigious scientist. I soon heard from a competitor who wanted this prize. He demanded to know why I had not given it to him instead, providing a list of reasons why "his" collection was the appropriate place for this particular carcass! Scientists sometimes just collect to collect, although that is usually not how they see what they are doing. Nevertheless, sometimes an insightful nonscientist can see into the real motivations of scientists better than the scientists themselves.

A professional ornithologist once told me that he had most of the adult birds that occurred in the area where his university is located, and that he was trying to get specimens of all the young ones. Had I pressed him for reasons, he would have been ready enough to reply, but I could not escape feeling that his real motives were more akin to those of the stamp collector than the scientist. He was anxious for me to let him know if I came across any young birds that he did not have in "his" collection. The truth was that he was out to make "his" collection more imposing. Suffice it to say, I never did. Such collecting is trivial because it is not really serving important scientific purposes—it is merely flattering to the ego.

There is an important fact that checks the number of birds sacrificed, indepen-

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<sup>10</sup> The same bird lover may wish, inconsistently, that someone would shoot the sharp-shinned hawk that is taking the birds at the feeder or may despise the European starlings that are outcompeting the Eastern bluebirds for nest cavities, thus "robbing" the bluebirds of their homes.

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dently of how we decide the trade-off between the knowledge and the rights of birds. To prepare and curate a good collection requires an enormous investment of time, energy, and money. This investment limits collecting, often well below the numbers that scientists might otherwise desire or think justified. The size of collections is ultimately limited by the number of graduate students (or technicians) available to take care of them! These limitations at least keep the scale of the moral issue reduced. Nevertheless, a lessened capacity to kill for science's sake does not lessen the puzzlement of how much ought to be done and whether what is in fact being done is justified.

#### V. CRITERIA FOR JUSTIFIABLE COLLECTING

What is needed is a set of criteria that will determine when it is morally justifiable for a scientist to collect (kill). Such criteria are not supplied by animal liberation ethics or the land ethic, by Warren's theory that blends the two, or by the animal experimentation debate. To fill this void, I offer the following set of criteria:

(1) *Necessity*. An animal should be killed if and only if there is *no other way* to discover what we need to know.

(2) *Importance*. What we need to know is important enough to justify the sacrifice of the animal's life. The information must not be trivial.

(3) *Novelty*. This information must not be known already. The killing must not be redundant.

(4) *Least Damage*. No more killing should be done than is necessary to obtain the needed information. Overkilling is unjustifiable.

(5) *Mercy*. The killing must be quick and painless. The investigator is obligated to minimize the suffering of the animal.

(6) *Maximum Information*. The specimen must be meticulously curated and preserved. The scientist is obligated to obtain the maximum amount of information from each life sacrificed even when doing so is inconvenient. The specimen must be made available to others so that it can be studied repeatedly. It must be readily available for loan to other scientists so that they can learn from specimens already collected rather than obtaining new ones.

(7) *No Long-term Impact*. The scientist must have good reason to believe that the number of organisms collected at any particular time and place will not, in the long term, affect the total breeding population in the locale.<sup>11</sup>

<sup>11</sup> In this respect, although biological species are renewable, each geological formation is unique and irreplaceable. The National Speleological Society, for example, states that "collecting of mineral or biological material for *display* purposes, including previously broken or dead speleothems, is never justified." The NSS holds that the display of *any* formations encourages the continued taking of speleothems both by scientists and the general public. It opposes the taking of

(8) *No Jeopardy to Endangered Species*. Endangered species should not be collected under any but the most extraordinary circumstances. A collection must never jeopardize a species.

The value of specimens is real and important. I am familiar with a case in which a small collection, amassed by a rather mediocre ornithologist, was, after his death, given to an eminent ornithologist. Most of the material was commonplace. However, among the specimens, misidentified, was one that the better scientist recognized as the only evidence for the species in that state. Without the specimen, that knowledge would have been lost, irretrievably. Was it worth the life of that bird for us to know that? Although some may say no, mixing my ornithology and my philosophy, as best I am able to judge, I think so.

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broken formations because it prevents the accurate reconstruction of the natural history of the site. But even this group accepts collecting that is "professional, selective, and minimal." "NSS Policy for Cave Conservation," National Speleological Society, Cave Avenue, Huntsville, AL 35810.

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