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The Evolution of Altruism and its Significance for Environmental Ethics

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ABSTRACT

This paper examines the significance of scientific research into the evolution of altruism for environmental ethics through an analysis of recent debates over William Hamilton's theory of inclusive fitness. I argue that recent debates over how to explain altruism have become particularly charged with ideological weight because they are seen to have some consequence for how we understand the human moral project, especially with regard to non-human life. I show this by analyzing the place of evolutionary theory in the work of environmental ethicists and finally by drawing some conclusions about the extent to which these debates, and evolutionary research into behavior more generally, are and are not significant for environmental ethics. In particular, I argue that the most important issues at stake for environmental ethicists concerns the conditions under which altruistic forms of behavior can thrive and the degree to which we consider intensive forms of altruism to be unstable and anomalous, or rather stable and predictable outcomes of social evolution given favorable conditions.*

I. Introduction

An important question for scientists investigating the evolution of behavior is how and why altruistic forms of behavior evolve whereby an actor provides aid to another organism. Thus, the question of how and why some significant proportion of *homo sapiens*—at certain times and in certain places—develops the form of altruism that is involved in beneficence toward non-human life falls within its purview. In phrasing the question this way in terms of "how" and "why" such concern emerges, it is subject to the forms of explanation that scientists have developed to understand the evolution of behavior generally. However, the dominant scientific explanation of the evolution of altruism, William Hamilton's theory of inclusive fitness, has recently come under criticism from those who offer a different interpretation of the conditions under which altruism can and does evolve, and even of what altruism is. The aim of this paper is to address the question of whether environmental ethicists have any stake in recent debates over place of

William Hamilton's theory of inclusive fitness in the study of social evolution.

I address these broad issues here in a few stages. First, I explain why altruism has presented a puzzle in evolutionary biology. Next, I present broadly some of the key criticisms that have emerged over the last eight years over William Hamilton's theory of inclusive fitness.[1] While these debates are technical and restricted by scientists to the question of what the best explanation is given the evidence, they have become charged with extra-scientific valence and interest from philosophers, ethicists, and even religious thinkers. This is because these debates raise the question of how biologists interpret altruistic motivation and thus of what constraints and possibilities exist in nature for the emergence of different forms of altruism. After presenting these debates, I examine how both secular and religious approaches in environmental ethics have positioned themselves with respect to the lessons of evolutionary approaches to behavior. Ultimately, I argue that the fact that humans are capable of, and on occasion exercise, a motivation to act for the welfare of other species is confounding to the forms of evolutionary explanation debated by critics and defenders of Hamilton. Addressing these topics ultimately requires us to make theoretical decisions about the relation between humans and other animals, between science and ethics, and about the difference between cultural evolution and biological evolution that are not at all settled by the sciences. Moreover, these topics raise questions about the relationship between the natural and the normative that are meta-ethical and metaphysical. Thus, the question of the significance of the evolution of altruism for environmental ethics brings us into an arena in which both scientists and philosophers together face important and unresolved puzzles.

II. Evolutionary Approaches to Altruism

An opening remark from a recent article on altruism in evolutionary biology judges that "[a]pparently altruistic behavior is the central puzzle that motivates the study of social behavior."[2] The fact that altruism is a, and even *the*, core puzzle and motivator for scientific inquiry into social behavior is of course itself of interest. One reason this is the case may be that selfless and self-sacrificial action is simply a remarkable phenomenon to us humans, one that excites feelings of respect and awe like those Immanuel Kant referred to as specifically moral feelings. But, of course, the reason for puzzlement about altruism in the study of evolution is not how heroic and inspiring altruistic action can appear, but rather that altruism does not seem to fit easily within our current scientific picture of how evolution works. It arises from the fact that the Darwinian view of evolution as a "struggle for life" introduces an apparent tension between our notion of how different forms of life evolve and our aims as ethical agents whose range of motivations seem to include the welfare of others. The aim of this section is to explain why altruism is genuinely puzzling from an evolutionary perspective and to introduce the general framework of evolutionary approaches to behavior. I highlight here that although scientific research is focused on the best and most general explanations of observed behavioral patterns in the living world, research on altruism is entangled with a host of "extra-scientific" concerns over what altruism is, and just how far altruism can go.

Evolutionary biologists want to explain behavior, and in doing so they take themselves to be explaining *how* and *why* animals and humans do what they do. In evolutionary explanation, the *how* and *why* questions have very particular meanings and very particular forms that appropriate answers can take. Niko Tinbergen, the famous Dutch ethologist who worked on birds

and bees laid the groundwork in the 1960s for how evolutionary biologists still approach the explanation of any and all traits.[3] He argued that when biologists ask *how* and *why* any trait evolves, they are asking one of "four questions":

(1) ONTOGENY: How and when does the trait emerge in the life-history of the individual?
(2) PHYLOGENY: How and when does the trait emerge in the history of an evolving species?
(3) PROXIMATE CAUSATION (or MECHANISM): How does the trait work? What biological processes and mechanisms underpin it and make it possible?
(4) ULTIMATE CAUSATION (or ADAPTIVE VALUE): How does the trait in question help an organism survive and reproduce?

The first question of ontogeny is a question for developmental biology and developmental psychology. Let us take the example of the meerkats of the Kalahari Desert of Southern Africa, whose system of cooperative breeding has been the focus of much scientific interest and study given the many forms of apparent altruism displayed by meerkats. Examples include baby-sitting unrelated newborns while others in the group forage for food; finding and offering food to "pups" that are often unrelated; defending others who encounter danger; and "sentinel" duty watching for predators while others forage and making an alarm call to alert others to danger. If we ask Tinbergen's first question, we are interested in when individual meerkats begin to display cooperative traits like these in the duration of their individual life-cycles. Or, in the case of human altruism, when do humans start to perform cooperative or altruistic behaviors? Developmental psychologists have argued on the basis of experiments with infants that already at 6 months

human infants appear to prefer puppets who are "helpers" and "sharers" in a play by choosing them to play with after observing their behavior.[4] Infants are thus thought to exhibit some pre-rational preference in favor of helping others that emerges very early and, so, is thought to have deeper roots in heritable biological dispositions that are not culturally or socially conditioned.

Of course, one might object straight-away here that non-human animals like meerkats may do things that benefit others, but is this *altruism*? Perhaps because meerkats do not appear to act with an understanding of what they are doing, or to act for reasons, one might think that their behavior is only instinctive and not yet *ethical*. However, even though philosophers have insisted that human altruism takes the form of *psychological* altruism that is intentionally "other-directed," while non-human altruism is *biological* and defined by costs and benefits to the transmission of genes (not by intentions), this sharp division between human and animal behavior does not render the evolutionary perspective on human altruism fruitless for humans. Indeed, crucial to the evolutionary perspective on human*, psychological* altruism—as apparently already nascently present in the preferences of infants—is that human altruism involves pre-rational dispositions that have an evolutionary history that pre-dates and underpins self-conscious intentions and elaborated moral systems. Indeed, leading evolutionary accounts of human altruism hold that *psychological* altruism is not *biologically* altruistic because there are genetic benefits that individuals can gain by establishing cooperative groups and engaging in collective action that requires the display of mutual concern.[5] Thus, human actions that are directed to benefit others, like the meerkat behaviors described above, are seen to be comprehensible according to principles of social evolution, even if they involve forms of self-understanding that are absent in meerkat behavior. We will come back to these issues in section

IV below.

Tinbergen's second question of phylogeny is a genuinely *evolutionary* question because it recognizes that traits have a natural history through which they emerged. It asks us to recognize that traits arose initially and spread, and to inquire into the conditions that were present at decisive points and that enabled this to happen in the history of a lineage. This question recognizes that evolution had to get from A to B and here we want to know the steps that it took to get from one state to another. So, for example, when did the system of cooperative breeding that meerkats display evolve? What were the social systems of ancestral species like, and in what way might cooperative breeding have been advantageous in relation to these previous systems given the particular challenges that the natural and social environment posed for meerkats? These are question that scientists have generated very compelling answers to that point to features of natural and social ecology that lead species down a path toward more or less cooperation.[6]

The third question of proximate causation asks us, essentially, about how an organism works. For example, what genetic structures, hormones, and/or processes in the brain might be make cooperative and altruistic behaviors possible? In the case of meerkats, what genetic or other biological processes affect whether they behave cooperatively or not? What stimuli or situations in the social or natural environment, if any, occasion altruistic forms of behavior? There is much that is known and also that is still unknown about these "proximate" causes, but at least it is clear what evolutionary biologists are looking for.

The fourth and final question of adaptive value asks what *purpose* the trait serves, and evolution biologists often refer to this as "ultimate" explanation. This is a controversial question

in discussions of biological explanation because it appears to be *teleological*. That is, it tells us that traits serve purposes for the organisms that have them and it explains traits by telling us what they are *for*. While debates over teleology in biology fill journals, it is minimally acceptable to say that evolutionary biologists accept and endorse the idea that the evolutionary process licenses a limited form of teleological explanation that need not carry much metaphysical baggage. This is because natural selection is responsive to the past history of effects that traits have for the survival and reproduction of organisms who possess them. That is, traits do not first come into existence *in order to* aid the organism in its "struggle for life"—this would be the problematic form of teleology that biologists avoid because it appears to imply that there is a mysterious disposition or "directed" bias on the part of the underlying events of mutation, reproduction, and inheritance that generate traits that are beneficial to the organisms that have them. There is of course debate about whether or not mutation can be directed, and about what this might mean, but I will leave it to the side since it would require its own lengthy analysis.[7] Nevertheless, once traits do come into existence, they key point is that they will spread if they contribute to an organism's survival and reproductive success and they will vanish if they do not. Our understanding of evolution tells us that if organisms with particular traits do not manage to survive and reproduce successfully, we will not find them in nature at all; if we do find traits existing, they must either be neutral or they must serve some adaptive purpose for the organism. Of course, a valid answer to the fourth question is that traits do not serve any adaptive function, they can be "by-products" or effects of genetic drift rather than selection. Yet, the main point here is that, for example in the case of meerkats, we can ask what altruism is *for*, what it contributes to fulfilling an organism's aims of survival and reproduction and, especially, how it

affects future evolutionary outcomes.

The reason altruistic behavior has been a topic of fascination in the study of evolution ever since Darwin is that the answer to Tinbergen's questions of phylogeny and adaptive value are not obvious. How can the heritable trait of altruism spread if, by definition, it involves a cost to the actor's reproductive success and it benefits the recipient? Wouldn't altruistic traits always spread less successfully than the disposition to receive help but not pay it in return? Second, what can altruism be *for* if it does not benefit the individual who behaves in this way? Can it genuinely be *for* the sake of others, or for the group? The puzzle here is both about the so-called "mechanism" by which altruism spreads if altruists do not themselves reproduce, and about how altruism can be thought to serve an adaptive *purpose* that is not *for* the altruistic organism.

III. Debating Altruism and its Origins

While these are the puzzling aspects of altruism from an evolutionary perspective, it is largely accepted that question of how and why altruism evolves was solved long-ago in the 1960s by William Hamilton. Nonetheless, a divisive debate was sparked in the field evolutionary biology in 2010 thanks to a paper published in the high-profile scientific journal *Nature* on the evolution of worker sterility in insect societies.[8] Worker sterility in insect societies is one of the paradigmatic examples of what scientists call *biological* altruism: behavior by which an individual sacrifices its own reproductive success and helps another.[9] In eusocial societies, individuals do not reproduce on their own (and often lack the biological capacity to reproduce on their own), instead aiding others and the reproduction of the queen of the colony. Martin Nowak, Corina Tarnita, and E.O. Wilson criticized William Hamilton's theory of inclusive fitness as the solution

to how and why this biological altruism evolves. The controversy over the paper's criticisms is still on-going and discussions of the paper often generate strong reactions from defenders who see it as flawed. The fact that Nowak, Tarnita, and Wilson's paper received a critical reply in the same journal that was signed by 137 evolutionary biologists certainly says something about the nerve that it struck.[10] Moreover, E.O. Wilson was once a high-profile defender of Hamilton's theory, so his rejection of it added to the dramatic effect of this paper. While the disagreement between different sides in the debate often focuses solely on the question of whether individuals must be highly related (most commonly by sharing a recent ancestor) in order for altruism to evolve, it has also raised questions about the conceptual framework of research into social evolution. Furthermore, it has also fueled some debate that is meta-ethical, and even metaphysical.

William Hamilton argued that to understand the evolution of altruism—which we recall is behavior that is costly to the actor's net lifetime reproductive success but beneficial for the recipient—we need to understand that traits can spread *directly* through an individual's own reproduction, but in a social context they can also spread *indirectly* through the reproduction of others with whom an individual acts if they share those same traits.[11] So, if altruists help other altruists, the costs of altruism to the actor could be counteracted by so-called "indirect" benefits that relatives who share the trait will gain. Hamilton formalized this insight in the mathematical formalization called "Hamilton's Rule," which tells us that altruism can spread if the costs of helping others to the actor's direct production of offspring are outweighed by benefits to relatives ($rb-c>0$). The key prediction yielded by Hamilton's work is that when we observe costly forms of helping behavior that do not appear to benefit the helper, we should also find that this

costly help is bestowed on a relative. Hamilton thus revealed a mechanism and causal pathway through which altruistic traits that were costly (again in evolutionary terms of decreasing the helper's direct production of offspring) could nonetheless spread and achieve stability. Moreover, if this is the case, then the evolutionary principle of the "survival of the fittest" should be amended as follows: instead of predicting that natural selection would result in individuals who act solely "as if" to maximize their own individual fitness in the "struggle for life" in competition with others, Hamilton's theory predicts that individuals are maximizing their *inclusive* fitness, which means that natural selection will favor those individuals who help themselves and those who share their genes.

A crucial aspect of Hamilton's principle of inclusive fitness, just as the principle of fitness *simpliciter*, is that it was seen to justify an "optimization" framework for interpreting behaviors themselves and the effects of natural selection on behavior.[12] Just as rational choice theory led economists to explain human decisions by the expected utility that individuals aimed to maximize, many scientists studying animal behavior have come to regard natural selection as having optimizing effect on the traits of organisms over time.[13] This licenses an analogy that views organisms as maximizing agents, the "maximizing-agent analogy," where what organisms are aiming to maximize is their inclusive fitness.[14] Inclusive fitness thus explains behavior by telling us what, in the most general sense, living things are after and what they are "trying" to achieve (this "trying" is not meant, of course, to require that organisms act *intentionally*, but only that actions that evolve through selection will be in conformity with the maximization of the individual's inclusive fitness). A key value of Hamilton's innovation was to develop a new value of fitness that could incorporate dramatic example like worker sterility under such a maximizing-

agent approach.

Through methods of phylogenetic reconstruction, in which relationships of ancestry between species can be traced, scientists have gathered empirical support for Hamilton's explanation. Known as the "monogamy hypothesis," it is argued that intensely cooperative societies such as eusocial insects, or the meerkats, did indeed evolve out of conditions in which monogamy first evolved.[15] Monogamy led to groups that were composed mainly of relatives, and this allowed altruistic forms of behavior to spread through the "indirect" success that altruistic genes had in this context. Thus, the evolutionary pathway to the success of altruistic forms of behavior appears to begin with a state in which conditions of ecology, such as availability of food sources or predation, make it better for individuals not to disperse and leave their natal group, and these groups then become composed of highly related individuals. The level of group relatedness then allows for behaviors that have only "indirect" success to outcompete purely selfish ones. The fact that phylogenetic reconstructions show that ancestral species of cooperatively breeding mammals, birds, and even insects tend to be monogamous has been used as empirical evidence proving Hamilton's theory that altruism requires high levels of relatedness between individuals in order to evolve.[16] But the crucial point is that Hamilton made it possible to explain apparently selfless acts that organisms can be observed performing while maintaining a conception of individual behavior as adaptive for the spread of *the actor's* heritable traits. Helping others was, then, just another way of achieving selfish aims.

Nowak et. al.'s criticism of Hamilton's theory built upon an approach to the evolution of social behavior that also drew on game theory. Yet, in a more recent paper than the original article in *Nature* that initiated the debate, Nowak and his colleagues write that "fitness

maximization does not apply to social behavior, whereby organisms affect each other's fitness."[17] Nowak argues that "selfish gene" view and Hamilton's inclusive fitness framework depict the evolutionary consequences of an individual's behavior as purely under the control of the actor. But once individuals begin interacting with one another in complex and deeply mutually interdependent ways, such that the behavior of many others will influence the outcome of any other individual's behavior, patterns can emerge in which this will cease to be the case. Thus, forms of altruism can arise that are not subject to Hamilton's Rule or the notion of groups as composed of individual agents maximizing their own genetic self-interests. Instead, the evolution of cooperative and altruistic social behavior is better thought of through emergent "synergistic effects" that occur when individuals with different behavioral tendencies interact with one another.[18]

This of course introduces a new way of thinking about individual fitness in the context of interacting communities and highly socially integrated living systems, and it shows that there is more than one kind of fitness—even more than the two kinds of direct fitness and indirect fitness that compose Hamilton's *inclusive* fitness. For example, there can also be the fitness of communities and populations that make sense of what behaviors evolve successfully. Nowak calls his mathematical approach an "evolutionary dynamics" approach, which conceives and explains social evolution without Hamilton's Rule, the need for the concept of relatedness, or the notion of inclusive fitness. Nowak's view of eusociality was presaged by a key claim in his textbook on the conceptual and mathematical foundations of evolutionary dynamics: "Evolutionary game theory does not rely on rationality."[19]

In terms of the explanation of insect sterility, and biological altruism more generally,

Nowak's papers urge evolutionary biologists to give up the view that individual behavior is best made sense of in terms of individuals behaving in a biologically rational manner by pursuing their maximal inclusive fitness, or even from the perspective of the acting individual at all. Indeed, he and his colleagues argue that there is no completely general or universal "maximization principle" that describes what natural selection favors, and so no criterion of rationality that can be drawn from the core Darwinian notion that traits associated with the highest reproductive success will spread.[20] Worker sterility is precisely an example of the mistaken assumption that natural selection can only favor strategies that make sense from the individual's perspective. Through the Prisoner's Dilemma and other thought experiments, game theory originally told us that, contrary to expectations of traditional economic theory, when faced with dilemmas in which individuals have to make choices whose outcome will depend on the choices of other individuals, cooperation can beat competition and individual strategies can appear that no longer act according to assumptions of crude individual self-interest. Taken in the context of evolution and ecology, Nowak and his colleagues argue that natural selection can favor individuals who do not pursue their own maximal advantage. Thus, even if the *methodological* individualism of the Hamiltonian approach can be a useful heuristic for biologists studying behavior, it is important that it not become an ontological doctrine defining what can evolve.

Empirical support for Nowak's approach has been taken from study of the evolution of eusociality in insects and from fascinating literature on the "major transitions" in evolution.[21] These are transitions in which formerly autonomous biological entities come together to form a new inter- and co-dependent biological unit—for example, in the evolution of prokaryotic to eukaryotic cells through the "swallowing" of formerly independent mitochondria, which then

became organelles of new cellular individuals. Evolutionary biologists John Maynard Smith and Eörs Szathmáry argue that each of these has involved a situation in which individualistic strategies have been sacrificed to the long-term benefit of the group, which ironically through the integration of its parts becomes a new individual.[22] Multi-cellular organisms should be viewed as cooperatively integrated societies for which these individualistic assumptions fail to hold and, so, cooperative and altruistic forms of behavior appear to be just as fundamental and pervasive a factor in the evolution of behavior, even in the very possibility and composition of the biological world, as competition. If we leave behind the perspective of the individual, the living world and its evolution take on a whole new meaning. Acting in a way that benefits another, even to the extent that the individual's maximal self-interest is no longer driving the evolutionary dynamics, has been indispensable for the complex life-forms as we know them to have evolved.

There are a number of methodological differences with regard to the formal mathematical tools needed to explain behavior that underlying these two positions. However, it is clear that some differences are also philosophical. First, there is a difference between the definition of an individual as a "maximizing agent" that guides the Hamiltonian approach and a critique of methodological individualism in the approach of Nowak and his colleagues. The former view groups as collections of individuals maximizing the spread of their heritable traits, the latter argue that individual behavior cannot be understood outside of the context of what others are doing and that assumptions about maximization are frequently violated when complex forms of synergy and mutual inter-dependence arise. This difference leads to a philosophical difference in the interpretation of altruistic behavior. The former interprets helping others in terms of a selfish individual strategy; it is only possible when there are mutual benefits or when

there is relatedness. The latter opens that individuals can subordinate their own maximal gain to the benefit of others.

The reasons why this debate has resonated with "extra-scientific" questions of ethics, meaning, and value may already be clear. Each position leads to a different hermeneutic of social life, a different interpretation of what nature means for human self-understanding and for the interpretation of social behavior. The choice of a mathematical method may be a purely pragmatic or technical issue within the sciences, aimed at the most general and simplest explanations given the data. But the choice between an individualistic and an altruistic interpretation of evolutionary outcomes also carries real existential weight for our understanding of what social life is and of what forms of it are possible in nature—both in human societies and beyond. Debates over individualism and communitarianism in political philosophy predate these evolutionary debates and yet revolve around the same core issue of whether or not human communities are collections of individuals pursuing their self-interest, or individuals are best understood as parts of larger, supra-individual communities. This issue of social ontology matters for how ideals of individual freedom and equality are defined and negotiated for social animals like ourselves and for the political ideals that we find to harmonize with our nature needs and wants. And, so, the hermeneutical lens through which the evolutionary sciences interpret social behavior, and in particular the relationship between individuals and groups, matters for how we settle such debates. Moreover, whether or not scientists see altruism as a genuine phenomenon, or as a manipulative guise for advancing self-interest, also matters for how we interpret human moral motivations and norms. In the following section, I reflect on how these different views of social evolution might impact the place of evolution in ethical thinking about non-human life.

III. Environmental Ethics, Religion, and Evolution

Environmental ethics as a field is concerned broadly with human impact on non-human life and on the wider natural systems that sustain life. This involves drawing on major philosophical moral theories, whether utilitarian, Kantian, virtue ethicist, or also traditions of religious ethics to understand how care for the non-human world fits in with our ideas about what ethics is about, what our reasons for such care are, and how humans fit into nature as agents capable of and motivated to engage in this action. But environmental ethics is also special because none of the dominant religious traditions and very few of the major philosophical moral theories were developed during times when the question of human impact on the environment was as pressing, and as vital, as it is today. And, so, environmental ethics asks us to engage in constructive dialogue with our ethical, philosophical, and religious traditions in a way that helps us face distinctly recent problems—some scarcely half a century old—that have been made possible in many estimations by the very advances in scientific understanding and technology that are also understood to be the greatest triumphs of modern culture. It invites us to reflect on the psychological question of why we care, on the normative question of why we *should* care, and on what specific kinds of action our ethical commitments call on us to take for the sake of other forms of life. Environmental ethicists thus ask us to sometimes radically revise our notions of rationality and self-interest, to reimagine our uses of technology, and to alter our notions of what social and human progress consists in. Moreover, religious traditions have resurfaced next to secular approaches as constructive resources especially in the discourse of environmental ethics because ethical regard for the non-human world appears to involve the notion of a source of value external to the human will, an intrinsic value to nature *in itself* and not just a value *for*

us.

For example, Lynn White Jr.'s famous article from 1967, "The Historical Roots of Our Ecological Crisis," brought a core one of the most common issues raised in debates in environmental ethics today.[23] White was a cultural historian, so the publication of his article in the journal *Science* attests to the fact that the concerns it raised crossed over the "two cultures." White argued that the root cause of destructive modern practices was the *instrumental* relationship that had developed between humans and the non-human world. That is, nature was thought to be of significance to humans only as a means for fulfilling their needs. Moreover, White wrote: "What people do about their ecology depends on what they think about themselves in relation to things around them. Human ecology is deeply conditioned by beliefs about our nature and destiny—that is, by religion."[24] White argued that the instrumental attitude to nature in the modern West had its roots in the religious heritage of Western Europe, particularly in medieval Christianity and its interpretation of command of Genesis 1:28 to "be fruitful and multiply, and fill the earth and subdue it: and have dominion over the fish of the sea and over the birds of the air and over every living thing that moves upon the earth." Moreover, he argued that this attitude of dominion was still embedded tacitly in a fusion of modern science and technology that had largely left Christianity behind. Secular culture thus continued to bear traces of the theological tradition out of which it emerged. So, he concluded: "we shall continue to have a worsening ecologic crisis until we reject the Christian axiom that nature has no reason for existence save to serve man."[25] A key point of White's argument, whether we accept its particulars or not, is that what we believe "comprehensively" (or metaphysically) about ourselves and about nature *matters* for how we act. And the key notion that we need to embrace,

according to White, is that nature has its own intrinsic value, independent of our interests as individuals or as a species.

Not all ethicists working on environmental issues see religion as the problem. Some scholars have turned to Native American religions as a resource for thinking about the non-human world as sacred and to be revered and protected; Buddhist thinkers have drawn on the notion of compassion towards all beings to show that care for non-human life is an integral part of the path toward enlightenment; and less conventional eco-spiritualities like deep ecology and philosophies of wilderness that harken back to Henry David Thoreau all taken different routes to combating the same underlying problem: the instrumentalist stance toward non-human life. Even White himself urged that the Christian tradition contained resources to combat this instrumentalism within itself. In the conclusion of his famous paper, he turned to the figure of St. Francis of Assisi, who was said to commune with animals as if with peers, to point to a moral exemplar within the Christian tradition for extending ethical regard to non-humans. The call from many Christian ethicists today who support environmentalist values echoes this move toward highlighting the more ecologically conscious elements of the tradition. Bill McKibben, for example, argues that the moral of the Genesis story is not that humans have dominion over other creatures, but that humans have a responsibility *for* and *to* the rest of nature that no other animal has. This unique ethical responsibility is captured in the notion of Christian stewardship. For McKibben, Christianity teaches that what humans were put on earth to do, the vocation of humanity, was to care for creation.[26]

These re-readings and appropriations of religious traditions for facing our current ecological condition all appear to be predicated on what White Jr. noticed about the demands of

developing an ethical awareness of and care for the non-human environment. The solution is that humans develop moral respect for and recognition of the *intrinsic value* of non-human life. While various moral theories of course differ, sometimes dramatically, and some are secular and others religious, in each case the call seems to be fairly consistent: modern culture must move away from a so-called "anthropocentric" picture of the relationship between humans and the rest of nature in which human interests—conceived of in terms of an instrumental rationality—are privileged and towards a more "biocentric," or even (in the case of the monotheisms) "theocentric" vision of the place of human life in the wider world.

Now let me turn to evolution and its place in some classic examples of environmentalist thought that also defend these core claims. One prominent environmental ethicist who reflects on evolution is Aldo Leopold, a pioneer of American environmentalism and conservationism. Leopold's famous "Land-Ethic" defends the value of non-human life within a dramatic vision of what evolution tells us about the human relationship to the rest of nature. Leopold writes that "we can only be ethical in relation to something we can see, feel, understand, love or otherwise have faith in."[27] This claim is key, because it suggests something about the moral psychology involved in the valuing of nature. Leopold suggests that the capacity to care about the well-being of non-human life at this affective level of "love," and even reverence, is a presupposition of environmental ethics. Moreover, it is a necessary condition for the possibility of realizing a more ethically acceptable relationship between humans and the rest of nature. Leopold wrote further that "a land ethic changes the role of *Homo Sapiens* from conqueror of the land-community to plain member and citizen of it" and that "the extension of ethics [to non-human life] so far studied by philosophers, is actually a process in ecological evolution."[28] This notion of human

ethical concern for the rest of nature emerging out basic evolutionary tendencies appears in stark tension, of course, with the Hamiltonian picture presented in previous section.

Changing our ethical relation to the non-human world, or rather creating this relation, Leopold urges, requires that we change our idea of what nature is: it is a *community* and a "biotic pyramid" in which humans are a part of a greater whole with which they share inter-dependency and even *kinship* with other forms of life.[29] In Leopold's story, our understanding of evolution plays a constructive ethical role because it allows humans to see themselves as creative citizens taking part in the construction of a greater and more unified organic whole—in which humans are deeply related and entangled with the lives of other species. This notion of *relatedness* is of course very different from the genetic relatedness of Hamilton. Yet the process of generating more integrated and altruistic communities was, for Leopold, *in line* with a basic creative power manifested in the evolutionary process itself. It was part of human recognition of its inter-dependence with the rest of life, its dependence on and participation in a biotic community that extended deep into evolutionary history.

Another perspective on the role biological evolution in environmental ethics occurs in the work of the utilitarian Peter Singer. Singer famously rejected "speciesism" in his influential book on animal rights, *Animal Liberation*, thus concurring with the consensus that I have been outlining here that recognition of the moral status of non-human life is a requirement of morality.[30] Yet Singer argues that we ought to extend altruistic regard to other animals on the basis of their sentience and the utilitarian principle that moral actions are those that maximize aggregate happiness and reduce pain and suffering. This does not require that we cultivate love, sympathy, or respect as Leopold calls for, or commune lovingly with animals as in St. Francis. If the very

idea of morality is to act for the sake of a maximal increase in aggregate happiness and reduction in pain and suffering, it is simply irrational not to recognize that this requirement extends to all other sentient beings that experience suffering, regardless of whether we feel so inclined or not. Singer thus implicitly leans on the rationalist principle that the source of ethical norms is a principle of reason, and not what our given affective sympathies, or "loves," incline us to do. That is, we can become motivated, and ought to become motivated, to act for the sake of the maximal well-being of sentient life simply by our recognition of morality itself as a supreme, normative principle of practical reasoning. In the contemporary movement of "effective altruism" that Singer plays a role in, rationality is called upon to defend the aim of maximizing welfare and maximally reducing suffering wherever we reasonably conclude that it begins and ends, and also to determine the most effective means that we can take to this end. Of course, how altruism as a normative principle of rationality is possible, and how it emerges within the context of evolution, is not something that Singer explains.

In his book *The Darwinian Left*, further Singer discusses the role of evolutionary biology in ethics.[31] He turns to evolution for an empirically and scientifically grounded account of human nature that justifies the conviction that we can come to be motivated to do what our moral rationality commands. He argues that the lesson of evolutionary biology is that selfishness is a core part of human nature, but so is the tendency to cooperate. This natural tendency to cooperate with others provides the bridge between our selfish psychological tendencies and the rational, normative principle of ethics. Yet even though selfishness and cooperation may be both be "natural," Singer insists on caution against the "naturalistic fallacy" that the natural is the standard of the moral. The fact that some pattern of behavior can evolve or has evolved is not a

reason to count it as "good" or "bad." But, as it so happens, nature has indeed made it possible for us to realize what we rationally recognize is morally required.

The "naturalistic fallacy," which haunts work in environmental ethics because this principle of much 20th century meta-ethics suggests that we cannot get from facts and descriptions about what living things are and what they do to conclusions about their ethical value, whether intrinsic or instrumental. This transition leaps from the "is" to the "ought" in a way that David Hume warned us against long ago (and G.E Moore and Kantians have echoed since). Moreover, Singer's approach to evolution shows that this fallacy serves as a crucial logical bulwark *against* the evolutionary picture of behavior. Singer is more interested in the fact that ethics gives us principles for acting against aspects of our nature that are immoral or a-moral than in showing that genuinely normative ethical values have their sources in nature. Disagreements over the naturalistic fallacy of course constitute a core area of philosophical debate over the implications of evolution for ethics in general, and environmental ethics in particular. In Leopold, we have a thinker for whom the extension of ethical concern to non-human life recapitulates a more fundamental creative dynamic found in the evolutionary process as a whole; in Singer we have a thinker for whom evolution is only important to the extent that it shows cooperative behavior to be possible, and thus assures us that it is possible for humans to become motivated to do what the normative principle of ethics requires us to do.

Finally, the famous and influential essay by the biologist Garrett Hardin in the evolutionary "tragedy of the commons," which appeared in the journal *Science* in 1967, presents yet another attempt to relate evolution to the task and problems of environmental ethics.[32] This essay also illustrates how ethical responses to the human impact on the rest of nature cross the

boundaries between the "two cultures." Hardin argues, in the spirit of Malthus' influence on Darwin, that the primary problem that evolution poses for the human species is that of overpopulation. Since natural selection favors those traits that maximize reproductive success, every species will necessarily push the carrying capacity of its environment until natural forces of selection like resource scarcity bring it back to a stable, equilibrium state. He identifies the problem of overpopulation as a "tragedy of the commons" because while it is in each individual's interest to reproduce maximally, if all acted in this way the environment would become unlivable for the population as a whole. Solving the problem of human impact on the environment, then, essentially means solving a tragedy of the commons. Central to Hardin's argument is that the tragedy of the commons is not a "technical" problem with a technical solution, it is rather a moral problem the solution of which can only lie in the self-conscious regulation of human behavior.[33] Hardin himself adopts the utilitarian notion that ethics is about increasing aggregate welfare and decreasing suffering. The solution to Hardin's problem thus presupposes a human capacity for moral agency, for regulating our conduct according to values beyond those that even he sees as those underlying self-interest. Yet Hardin does not discuss the question of whether humans could become motivated to regulate their behavior in this way, that is whether they could be motivated to benefit other organisms by anything other than their own self-preservation. In his picture, the prospects for overcoming the tragedy are not good, as it is built into the very laws of natural selection.

This brief and selective discussion of thinkers and themes in environmental ethics has aimed to highlight a few issues. The first is that while secular and religious ethical frameworks have converged on the notion that developing an environmental ethics starts with rejecting an

"instrumental" relationship to the rest of nature, they differ in their accounts of how such a change could be possible. For Leopold, extending ethical concern to other species and even to the land itself is seen as a product of the basic creative tendency of the evolutionary process, it is a natural development of our nature and our potential as cooperative social animals. For Singer, this extension is simply an application of the basic principle of ethics to maximize the greatest good for the greatest number and to minimize suffering. Environmental ethics does not require any metaphysical presuppositions about intrinsic values in nature, it simply requires a logical extension of the constitutive principle of utilitarian moral reasoning, which is itself inborn in the human moral sense. This moral sense itself could be thought of in terms of the evolution of *psychological* altruism as mentioned in the first section, namely, as something that arises due to the mutual benefits generated by cooperative action. If evolution helps us understand anything about environmental ethics, it is that we should expect the extension of moral concern to be difficult to motivate for humans who are naturally disposed to be selfish given that the benefits of such behavior to *us* are even more indirect. We shouldn't expect such motivation to spread very widely, perhaps only among those who are at one extreme end of the altruism spectrum, but it shouldn't be impossible given that we are cooperative and social animals. Finally, Hardin regards evolution as presenting humans with a fundamental moral dilemma, that of the tragedy of the commons. For Hardin, we do not need to value non-human life for its own sake, we simply need to recognize that our impact on non-human life will ultimately impact us. For him, the problem is produce by the exponential increase of the human population, and its solution lies primarily in the possibility that individuals will self-consciously control their breeding for the sake of the good of humanity as a whole.

Evolution obviously plays a quite different role in the work of each of these thinkers. For Leopold, human evolution was depicted as naturally and creatively tending toward the extension of moral concern to an ever-greater sphere of living beings. This extension, moreover, was a product of the more general tendency in evolution towards constructing greater cooperative unities out of autonomous entities—much like in the picture of the "major transitions" cited earlier. Leopold's conception of evolution is thus metaphysically loaded, and so is his notion of what the extension of ethical concern to means. In Singer, these more speculative and metaphysical elements are absent. Evolution is the foundation of basic human drives and psychological tendencies, but it is not directed toward the extension of these to ever greater spheres. There need be no natural tendency in evolution toward more cooperation or more selfishness in order to understand the possibility for humans to value non-human life. Finally, in Hardin the control of human impact on the environment is ultimately a problem of self-preservation and the foresight needed to avoid a tragic source of suffering that is produced by the basic reproductive dynamics that operate throughout the evolutionary process.

IV. The Evolution of Altruism and its Significance for Environmental Ethics

As we saw in the first and second sections, debates over the evolution of altruism have raised questions about how the sciences interpret what altruism is, what they are asking when they inquire into "how" and "why" it can evolve, and what its overall place is in nature—i.e., is it an anomaly? Or, is it common? Is it indeed "ultimately" directed towards the benefit of the actor? Should it be explained through an individual maximization-principle? In the third section, we saw a few ways of incorporating evolutionary theory into environmental ethics. In particular, the

basic problem of environmental ethicists was identified as that of motivating a non-instrumentalist and non-"anthropocentric" set of ethical values that do not understand the valuing of non-human life in terms of the service of human needs and interests. Nor were human needs and interests understood to constitute the normative ground of this value, expect perhaps in Hardin's view of the "tragedy of the commons," though he does not directly address where the normativity of valuing non-human life comes from. There are of course environmental ethicists who do not talk about evolution at all, but the weakness of this is that it fails to address genuine evolutionary insights and questions regarding the sources, possibilities, and limitations of the ethical capacities that environmental ethicists aim to speak to and draw upon.

The key issue of mutual concern that ties the scientific debates over the correct explanation of altruism and environmental ethics is that our interpretation of the nature and extent of altruistic behavior appears to be at stake in the debates over Hamilton's theory. If Lynn White Jr. traced the origin of the instrumental relationship to nature in Western culture to medieval Christianity, then the view of organisms as maximizers of the spread of their heritable traits dates those origins as far back as the beginning of life itself. In the notion of organisms as maximizers of a genetic self-interest we might recognize the instrumental conception of rationality and "anthropocentrism" that environmental ethicists have struggled against, but in this case, it is characterized as a general rule of what can and does evolve. We might think, then, that the picture of Darwinian evolution is in tension with the capacities of ethical agency that those involved in environmental ethics aim to draw upon and to shape if the Hamiltonian picture is exhaustive. This picture of conflict between evolutionary dynamics and environmentalist values seems to reinforce Garrett Hardin's conclusion in his famous invocation of the inevitable

evolutionary "tragedy of the commons" that evolutionary "programming" and ethical sensibilities toward non-human life are fundamentally in conflict. Even though Singer defends a normative principle of altruistic morality that extends to other sentient creatures, it is far from clear how the evolutionary tendencies toward cooperation that he leans on to understand human moral motivation are supposed to be enough to make possible the forms of altruism that Singer regards as ethically normative. Even if the normativity of the principle of utility is granted, it is far from clear in Singer's picture how a moral motivation that transcends even the bounds of the species is to counteract the deep-seated evolutionary and psychological drives towards individual genetic advantage. From both of these perspective, the notion that humans can acquire strong motivations, "strong evaluations" as the philosopher Charles Taylor calls them, to make sacrifices for the sake of the well-being of other species or even develop a "Land Ethic" might appear next to inclusive fitness explanations of altruism as a naive illusion or at best a statistical anomaly—part of the inevitable variation and "noise" of a chaotic biological world rather than the "signal" of its underlying structure and of the direction of selection.[34] If Hamilton's theory predicts that costly helping directed at the well-being of another is only likely to arise among relatives, then the idea that it could arise between species where there is no instrumental biological benefit to the actor appears hopeless. If we have this picture of how ethical capacities are constrained by biological and evolutionary processes, then the arguments of Nowak and his colleagues to the effect that we do not need to think of altruism as constrained by relatedness, or of behavior in general as necessarily conforming to general maximization principle defined in terms of an individual's genes, can come to appear as something of a life-raft. It salvages the possibility and plausibility of more extensive forms of altruistic motivation

from what appears as hopelessly naïveté in the face of the cold, hard facts of natural selection amidst the "struggle for life."

Of course, even evolutionary biologists, when pressed about how the framework of maximization can be justified, often remark that it is merely a heuristic tool useful for making testable predictions.[35] It does not characterize the nature of behavior but simply makes testable predictions about what behaviors to expect, statistically, under different conditions. Yet, the talk of selfish maximization in biology thus runs into the same problems as the talk of the maximization of utility in economics. These are offered as tools whose scientific purpose is to make empirically testable predictions that can, of course, be shown to be false. But these methodological principles often covertly take on the role of *normative* criteria that define what behaviors essentially are, and even which ones count as "rational." They define a currency for what counts as in "our" biological interests or what the interests of other organisms are. So, Nowak's rejection of the maximization (or optimization) framework appears to be highly significant for preventing this slide from the descriptive to the prescriptive. It also appears significant for rejecting the restrictive assumptions about what forms of altruism are possible that are built into predictions based on inclusive fitness theory.

One might be tempted to go even further. The perspective of Nowak et. al. 2010 on eusocial insects appears to provide us with a scientifically grounded perspective on social evolution in which Aldo Leopold's thought that the extension of ecological concern to non-humans is an instance of a fundamental and general dynamics of the evolutionary process appears a genuine, plausible picture of how such motivation fits within larger evolutionary patterns. This not only combats the image of fundamentally "selfish genes," it offers a story in

which extending the sphere of non-instrumental, moral concern to non-humans is a natural "extension of ecological evolution," in-line with the processes that have generated complex forms of life themselves. Indeed, contemporary religious thinkers have turned to Nowak's work on cooperation for a redemptive vision of evolutionary dynamics, one in which selfless forms of behavior have had a creative and driving role in the processes that have made life possible.[36]

These considerations suggest that environmental ethicists do indeed have some stake in these scientific debates and would do well to engage with them. But what choice do environmental ethicists who combat the "instrumentalist stance" face here? Is it scientifically permissible to celebrate Nowak's critique despite its many detractors in the scientific community? Or should they remain neutral? Should environmental ethicists draw wider consequences than even Nowak et. al. in order to combat an instrumentalist view of human rationality and redeem the possibility of and possible widening scope of a human response to nature as *intrinsically* valuable?

The fact that the above debates over the explanation of how and why altruism evolves is on-going, and often so heated, and that it appears to have real implications for pressing questions of cultural meaning and value, makes the results exciting. I think environmental ethicists should care what the evolutionary sciences tell us about the sources and scope of moral motivation, and they clearly have a stake in whether or not we view altruism towards non-human life as a kind of aberration and behavioral anomaly—something expected statistically in a fraction of the population thanks to natural variation in altruistic tendencies—or as a perfectly plausible extension and realization of human ethical potential. Nowak's critique of the Hamiltonian framework makes the latter view more plausible and gives it scientific foundations. However,

there are also both scientific and philosophical reasons why any eagerness with which ethicists or religious thinkers approach these debates should be tempered.

Let me begin with the scientific reasons. First, while the evolutionary dynamics approach to altruism offered by Nowak and colleagues does not require the assumption of high-relatedness or kin-selection, it is still an explanation that treats altruism as a genetically "hard-wired" trait like eye-color. This debate thus does not take into account the ways in which even biologists today are challenging purely genetic approaches to behavior through the study of plasticity, epigenetics, niche construction, and—most importantly for environmental ethics—the "second inheritance system" of culture.[37] These processes emphasize the fact that cultural transmission through social learning need not follow the same patterns as biologically determined mechanisms of transmission, and it can lead to unexpected phenotypic outcomes. The recognition of transmission of traits through social learning processes in which information like social norms, values, and even religions makes altruism that exceeds even the boundaries of the species plausible in a way that Nowak et. al.'s critique of kin-selection still does not. The push in evolutionary theory to acknowledge cultural transmission shows that we need to think more about how cultural evolution differs and interacts with principles of biological evolution like natural selection, and how this can generate new ethical possibilities that break with patterns found in species without such dramatic forms of cultural inheritance. It also shows that when we address the question of how capacities evident in environmental ethics could have evolved, the current frameworks from the study of biological evolution are insufficient. Together with other examples of human altruism, altruism towards non-humans is a behavioral phenomenon that is not yet explained by principles of biology. Thus, the question of "how" and "why"

environmentalist ethics could evolve points to areas where the sciences, philosophy, the humanities, and the social sciences need to come together to reflect on what the human capacities for ethical agency are and what processes shape their potential realizations.

It is also important to stress that this debate arose specifically in response to the explanation of insect societies, and in particular the evolution of a sterile worker caste in eusocial insects. It thus raised the question of the difference between dramatic examples of *biological* altruism like this, in which an actor sacrifices its own production of offspring to help another, and the capacities for *psychological* altruism that are possible in humans (and perhaps other primates), in which an actor is *motivated* by the desire to benefit another. As mentioned above, leading evolutionary accounts of *psychological* altruism in humans hold that the disposition to help others even in costly ways can have direct fitness benefits because they motivating mutually beneficial collective actions and alliances.[38] This is essentially a form of generalized reciprocity where collectives develop in which the costs that individuals pay are generally off-set by the benefits of group membership and cooperation, but it is not necessarily tied to relatedness or kin-selection. Thus, *psychological* altruism may not be a form of *biological* altruism at all because no fitness costs are incurred. Nonetheless, this account of the evolution of *psychological* altruism as tied to evolutionary benefits of group behavior still leaves the emergence of altruism directed towards other species under-explained.

The distinction between *biological* and *psychological* altruism does not do enough to show the differences between human ethical capacities and the helping behavior of other animals. While insects and meerkats may behave altruistically in that they act for the benefit of others, it might be challenged that this is not yet *ethical* behavior, which involves values that

what we are protecting, benefiting, or conserving that go beyond gene-transmission. Even if *psychological* altruism can emerge through the biological benefits of collective action, a lot of what humans do does not have anything to do with leaving future offspring. This includes the protection and conservation of all sorts of values—aesthetic, political, religious, and even scientific—and it certainly includes the conservation of the vast array of flora and fauna that have been generated by evolution.[39] The question of how ethical concern that transcends evolutionary interests could emerge shows that there is still a "puzzle" of how and why such altruism emerges that remains to be solved.

In sum, neither side in these debates over the evolution of altruism do much to help frame the right questions with regard to "how" or "why" such non-genetically motivated forms of ethical agency evolve, but they do influence whether or not scientists and others think of these forms of behavior as a kind of anomaly, a late-coming "crust" on top on a basically selfish core of evolved tendencies, or whether or not even what has preceded human evolution contains proto-forms that presage self-transcendence like this.[40] Again, I think the perspective of Nowak and his colleagues does more to help scientists recognize and accept the possibility and "naturalness" of such forms of agency and moral motivation that involve self-transcendence. Thus, there is an important sense in which the scientific theory we adopt does have implications for the cultural meaning that we give to altruism, and the ways in which we shape its future realization. The view of environmental ethics as a perfectly possible and plausible realization of human ethical capacities, one capable to becoming widespread given the right social and cultural reinforcement, can also reinforce the moral hope for an altruistic motivation that transcends genetic interest to become more than an anomaly that only grips those on the extreme end of

biological variation in altruistic tendencies—i.e. something for natural moral heroes and not for the masses.

There are thus scientific and philosophical reasons to be skeptical about the significance of these debates for how we *explain* the character and emergence of altruistic concern for non-human life in the human species. Yet there are also philosophical reasons to be hesitant that arise from the difference between natural scientific explanation and normative ethical theory.[41] The understanding of how altruism evolves, of course, does not give us insight into what—if anything—grounds the *normativity* of altruistic action, for the benefit of humans or for non-human forms of life. This meta-ethical and metaphysical topics regarding what value is are not strictly scientific in the sense that theoretical and empirical research into the causes and consequences of evolution underdetermines the answers to them. In other words, there are many mutually incompatible positions with regard to the nature and possibility of moral norms cannot be adjudicated on the basis of scientific methods or on what we currently understand from evolutionary research alone.

For example, with regard to the role of evolution in debates over the normativity of environmental ethics, it has been argued that the findings of evolutionary biology (or the cognitive neurosciences) ought to undermine, "debunk," or give us reasons to revise, our normative ethical commitments.[42] On the one hand, if we think that the normativity humans ascribe to altruism is just a so-called "trait" that has been favored by natural selection due to its effects on fitness, then perhaps we shouldn't think of altruism as normative at all, but rather only as an instrumental biological trait that it serves this aim. On the other hand, ethical norms and values, and in this case those constitutive of environmental ethics, might be explained simply our

capacity to recognize and respond to values that are simply *there* in the world, ones that inhere in the reality of non-human lives that we respond and "pick up" through the exercise of our ethical and rational capacities.[43] We must ask how such a form of altruistic responsiveness is made possible by evolutionary, neurological, and cultural processes involved in the successful evolution of human altruistic traits, but the fact that it is *impossible* or "simply" an instrument for spreading our genes is not a result of scientific research.

My aim here has not been to argue for any specific meta-ethical or metaphysical view in relation to our scientific understanding of evolution. My more modest aim is simply to insist that none of the underlying, essentially philosophical, issues about the status of environmental ethics within our understanding of evolution will or can be resolved by the forms of explanation at stake in scientific debates over the evolution of altruism alone. To give an adequate account of the evolution of environmental ethics requires philosophical debate over what ethical agency consists in, and this is an issue both for meta-ethics and for the metaphysics of biology and evolution. How we tell the story of the evolution of environmentalist values—as a mixture perhaps of biological evolution, cultural evolution, and self-critical moral intelligence—thus remains a fertile and open area of inquiry whose impact both for questions about the normativity of the value of non-human life and the possibility to be motivated to act on its behalf remain largely unsolved. As a scientific problem, it requires the full range of the natural sciences, social sciences, humanities, and even philosophy. As a philosophical problem, it requires decisions about the relationship between facts and values, "is's" and "'ought's," so that we can understand how the motivation to care for non-human lives is possible in nature and why it is morally demanded of us. Nonetheless, the insistence on the difference between normative inquiry and

natural-scientific inquiry into the principles of evolution ought not to be taken to mean that evolution is of no significance to environmental ethics. It may not be of significance in terms of grounding or justifying the normativity of ethical values toward non-human life, but it is of course of significance for understanding the social, environmental, and biological conditions under which values that may be regarded as ethically normative can come to be recognized as such and acted upon.

V. Conclusion

The aim of this paper has been to analyze how scientists discuss and debate the evolution of altruism and to defend claims about the significance of these debates for environmental ethics. I have focused, in particular, on questions about ethical concern for non-human life, in large part because this possibility of an animal developing this kind of concern is the starkest example of a forms of altruism that still remains puzzling despite over a century of progress since Darwin in the explanation of social behavior. The forms that concern for the human impact on nature takes is a topic that spans the sciences, philosophy, and the humanities, and explaining this concern requires that the guiding questions of different explanatory frameworks and the basic assumptions about what explanation consists in be exposed and analyzed.

The different positions on Hamilton's work and the three examples of divergent approaches to evolution within the work of environmental ethicists show that questions about how altruism evolves and what forms it can take are still open. Moreover, they are exciting because they force philosophical decisions, ones that effect whether we are optimistic or pessimistic about the moral project of changing human attitudes and behavior with respect to

impact on the rest of nature. Do we see the development of a consciousness of non-human life as possessing intrinsic value as an "extension of ecological evolution"? As the rational consequences of a common moral sense? As a fundamentally tragic scenario generated by inexorable laws of evolutionary dynamics? These different views, and the metaphysical and meta-ethical assumptions that they contain about of the place of ethical concern in nature, are underdetermined by the results of scientific discussions of altruism. And yet, it is an undeniable empirical fact that in many areas of human culture, ethical respect for non-human lives has evolved and may even spread further now than at any time in the past. Does work on the evolution of altruism give us cause for optimism that it can spread further, and take on more intensive forms? Or pessimism that it is ultimately doomed by a more deeply rooted of selfishness? These questions about moral possibility are what make work on the evolution of altruism especially significant for environmental ethics, and they are far from solved.

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[41] William J. FitzPatrick, "Human Altruism, Evolution and Moral Philosophy," *Royal Society Open Science* 4, no. 8 (2017): 170441.

[42] See Sharon Street, “A Darwinian Dilemma for Realist Theories of Value,” *Philosophical Studies* 127, no.1 (2006): 109-166.

[43] FitzPatrick, "Human Altruism, Evolution and Moral Philosophy," 2017. See also Micah Lott, “Must Realists be Skeptics? An Aristotelian Reply to a Darwinian Dilemma,” *Philosophical Studies* 175, no. 1 (2018): 71-96.