ETHICS FOR THE ENVIRONMENT AND THE SCIENCE OF THE ENVIRONMENT

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ABSTRACT. Some philosophers have viewed environmental science as an essential resource for the development for the normative standpoints concerning humanity's relationship with nature. The paper analyses some attempts to infer ethical conclusions from the ecological science, and attempts to show serious obstacles when moral inferences are derive from ecological theories.

KEY WORDS. Evolution, environmental ethics, ecology, intrinsic value, ecosystem, biodiversity, nature, normative foundation, naturalistic fallacy.

It would seem reasonable to assume that the sciences, which explore the ways the natural world function, would have relevance for the discussion on environmental ethics. In spite of many disapproving voices, some philosophers believe that science can provide information useful to construct a modern conception of moral values relevant for our attitudes towards nature. Questions whether we can draw moral lessons from the evolutionary history of *Homo sapiens* have been as old as the theory of evolution itself and have provoked a century-old debate. Let us summarize some of the major arguments involved, since environmental ethics faces a similar challenge.

It was Darwin who in *The Descent of Man* (1871) discussed our moral capacity from the perspective of natural history. Generally speaking, our moral sense was supposed to be a natural development within the intellectual faculties of social animals: "any animal whatever, endowed with well marked social instincts, would inevitably acquire a moral sense or conscience, as soon as its intellectual powers had become as well developed, or nearly as well developed, as in man."

The story goes back to the works of ethnographers of his time, who alleged that all humans share a basic set of ethical beliefs over the continuous space and time. These thoughts, enriched by some physiological ideas

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of 'sympathy' and the concept of natural selection, resulted in a conclusion that with increased intelligence early man became capable of having certain sentiments (sympathy, fidelity, courage) which gave advantages to his group (Farber 1997).

At the same time, Herbert Spencer, convinced that the moral norms had evolved from human interactions, tried to establish what the ethical principles of the society *should* be. Less open minded than Darwin, he pretended to know what the outcome of the human evolution would be: "The ultimate man will be the one whose private requirements coincide with public views" (Spencer 1898). Duty would become pleasure and mutual aid would replace competition framed by the greatest degree of freedom possible.

The popularity of the theory of evolution did not prevent the simultaneous emergence of critical arguments. "Let us understand, once and for all, that the ethical process of society depends, not on imitating the cosmic process, still less in running away from it, but in combating it," wrote Thomas Henry Huxley in *Evolution and Ethics* in 1989.

This author went back to Hume who made the point that describing what *is* does not allow us to proscribe what *ought* to be. According to Huxley and to some recent critics of human sociobiology, natural evolution 'selects' for violence, gratuitous torture, rape, murder and every possible and even unimaginable horror. The role of law and moral norms is to try to thwart or even oppose our natural (murderous, rapacious, aggressive, etc.) instincts at every turn. Without the imposition of law, as Hobbes said, the state of nature is a war of each against all, where the life of man is mean, solitary, and short. Morality has to be spread and maintained by the cold steel of the law, and natural selection does not advance it.

As a matter of fact, professional philosophers almost unanimously dismissed evolutionary ethics. Henry Sidgwick (1876) wrote the following: "Current philosophical notions characteristic of the most recently accepted system or manner of thought in any age and country are apt to exercise over man's minds an influence which is often in inverse ratio to the clearness with which the notions themselves are conceived, and the evidence for the philosophical doctrines implied in their acceptance is examined and estimated." One can easily imagine what he would have said about some ideas that haunt environmental ethics.

G. E. Moore who first coined the catchy phrase of "naturalistic fallacy" tried to silence naturalistic ethics forever. Although John Dewey recognized the evolutionary background of moral sentiments, he strongly held that morality existed only when an individual freely choose the good. Logically enough we have to stray for a moment from the mainstream reasoning by explaining the concept of morality.

Morality, as Aristotle indicates, is strictly a personal affair. It is a matter of each person's independent judgments. We do certain things, take certain action because we own it to ourselves (it is not imposed by any external factor). Our decision draws upon the perpetual problem of the meaning of life. If the person is able to put aside any factual consideration to be guided by reasons that concern the way the life is lived, then his/her decision will be a moral one. It means that no one can speak or prescribe for others what a morally good decision is. Neither does the moral 'I must' have anything to do with concrete facts. The moral worth of an action does not refer to our wishes, wants, ends or goals; it is not to be assessed through its consequences, for they have to be unconditionally good in themselves. Kantian sense of morality requires that we do the right thing for the right reason, acting in conformity with duty for duty's sake. The way we act depends on what life we would like to live.

However, some ideas die hard. In 1975, E. O. Wilson in his classic text *Sociobiology* affirms that human behavior, human values and ethics can be understood from an evolutionary perspective. In his own words: "The time has come for ethics to be removed temporarily from the hands of the philosophers and biologicized." Wilson maintains that biology sets certain broad constraints on human nature, derived from adaptive strategies in our evolutionary past, and they are not to be ignored.

Biological evolution might be a precondition for culture, and it can possibly help us to understand the way nature evolves and functions; nonetheless, it is unable to provide the answers we seek for ethical questions. Values and their origin are deeply rooted in human cultural context. One can tell "just-so" stories to explain any trait whatsoever as "adaptive" and therefore as "genetic." Without a proper data base this is just theorizing. To show a trait as genetic one must locate the relevant genes on particular chromosomes and then prove a statistically significant covariance between those people who have the trait and those who do not, and those people who have and do not have the relevant genes at those locations. This has been done with certain genetic diseases caused by point mutations, such as Huntington's disease. However, no evidence has related genetic variance to behavior. The recent history of Germany (and this could be said of a number of historical events, such as the rise and fall of Rome, the Byzantium Empire, etc.), represents a profound change in moral behavior, from rampant Nazism to tedious political correctness. What genetic changes accompanied these transformations in morality? The arguments against the adaptive advantage of morality have been made a thousand times, but this does not prevent people from fantasizing.

ENVIRONMENTAL ETHICS AND ENVIRONMENTAL SCIENCE

It has become commonplace for those who speak and write about global environmental problems to stress the importance of values in motivating people to assume responsibility for the world around them, and so to call for a new "environmental" or "ecological" ethics. However, the concepts of "environment" and "ecology" have different, though sometimes overlapping, logic. Environment is the setting under which life takes place for people, animals and plants. It is not just a physical or biological place, but a perceptual one. It is a fusion of our consciousness, of meaning, of climatic and geological conditions, of geographical location and physical inhabitancy. It has values, hidden assumptions and myths attached to it. Environment is culturally constructed to a significant degree, yet determined by constraints that are neither deliberate nor intentional products of human activities.

Environmental ethics approaches nature with the objective to encounter the proper ways of how should we relate to it. It addresses concerns such as the respect for life, intrinsic and aesthetic values of wild places, compassion for non-human animals. It rests on our moral intuitions about the rights of persons to be free of the coercion implicit in pollution, the rights or interests of animals in not suffering at our hands, the claims of future generations to resources we expend, and the quality of life that may be attained by a commitment to conservation rather than consumption.

Ecology (from the ancient Greek words *oikos*) studies our natural *home*, including other living organisms inhabiting it and their relationships. We can scrutinize ecological knowledge in order to comprehend the relationships by which an organism is constituted within its environment. As a science of nature, ecology pursues an understanding of patterns, structures and processes within the complexity of all aspects of nature. Whatever light ecology throws on how natural systems work, its answers are non-normative. Only as a part of our knowledge and interpretation they become part of a morality. Science exposes myths and modifies obsolete interpretations by bringing in new facts or by offering a new understanding of old facts. It increases our experiences and educates us so we are able to achieve, in this case, different and more effective methods for overcoming and managing the variety of multifaceted environmental problems. The environmental sciences seem to rely primarily on observation and experiment to determine patterns of causality, in other words, what causes what. Normative concerns, such as the rights and duties we should follow toward nature and toward each other in relation to the environment are beyond an empirical science realm such as ecology. Ecologists can let us know the possible cause of extinctions of species or forest loss, and therefore recommend some method to protect them; they cannot, however, tell us that we *ought* to protect this or any other creature

or ecosystem. Ecologist Michael Rosenzweig (2001) has written: "The words 'good' and 'bad' constitute value judgments and so lie beyond the bounds of science. Were exotic species to reduce diversity by thirty percent, no ecologist could test whether that loss of species would be a bad thing."

Although environmental ethics and science of ecology share similar fields of research, even some basic concepts or assumptions, there is no pathway from ecology to ethics, culture and other humanistic concerns such as human rights, population growth, and poverty. Environmental science is not a solid rock supporting ethics; it is distressingly complex and incomplete. It does not provide a reliable set of specific ethical norms.

Furthermore, the project of inferring normative consequences from life sciences requires privileging one theory over others. Even more, none of the authors that assume that environmental ethics should have rigorously tested biophysical underpinnings on which to develop the ethical contents give compelling arguments—certainly not empirical arguments—that would justify their choice over and against the alternatives (Laplante 2004).

ENVIRONMENTAL ETHICS UNDER SCRUTINY

Environmental ethics indicates the right thing for humans to do about the natural environment. It includes a wide spectrum of ethical positions that often come in many competing forms. One guiding thread throughout the divergent positions is the commitment to the conservation of the biological community of life. As such it has set to accomplish the task of extending moral concerns beyond human interests, and to indicate ways in which we have to include other species, ecosystems and the Earth as a whole in our moral thoughts and daily practices. One of the most distinguishing features of environmental ethics has been the effort to develop a non-anthropocentric value theory that defines *good* independently of any human qualities, the *good* whose properties are found in the terrestrial non-human world. Environmental ethicists of both bio-centric and eco-centric factions try to ground definitions of intrinsic values upon empirical properties of living systems.

Many forms of ecocentrism adopt one of the most alluring forms of argument, namely an appeal to inherent or existing features of the observable world. Fox (1995) asserts holistically that given a deep enough understanding of the way things *are* one *will* naturally be inclined to care for the unfolding of the world in all its aspects. In other words, they attach the label of 'intrinsically valuable' to the living things and entities by describing their intrinsic natures, so being good in itself really means possessing these or those *constitutive properties:* the property of being aesthetically pleasing, spiritually enhancing, scientifically useful or simply creative. What kind of property we may ascribe to nature depends on our state of

mind, knowledge or ignorance, self-indulgence, and so forth. But if we try to define real *goodness* in terms of these *properties* we are facing trouble. Having *good in itself* it is not just the synonym of "having such and such properties," instead, it means having and existence that is ethically required. Ethics concerns "systems of attitudes developed particularly by interaction between people in societies" (Mackie, 1977). Non-human nature knows no human ethics, it simply exists (Eckersley, 1992). There is nothing "in the fabric of the world" that backs up and validates the subjective concern which people have about this or that: protecting the vanishing species or the wild land, or anything else you come to name. "In a natural world from which human beings were absent, no ethics, no concept of 'rights', indeed, no notion of 'intrinsic' worth could possibly exist" (Bookchin, 1994).

Now we have to hold in abeyance the above assumptions, for J. B. Callicott (1989), an eco-centrist, promotes a definition of *good* that arises from moral sentiments developed in humans over the course of evolution; sentiments which promote the survival of us, our kin, and society in general. He identifies ethics as system of values that differentiate social conduct from antisocial one, and concludes that the sentiments that promote overall community survival must define what is *good*. He assumes that intrinsic value actually reside in the natural world. Even more, he insists that modern ecology, in explaining what constitutes a biotic community reveals "new relations among objects, which, once revealed, stir our ancient centers of moral feeling." Ecology, he continues, informs us of "the existence of something which is proper object of our most fundamental moral passions. The biotic community is proper object of that passion..."

Goodness is therefore defined as an existential condition since we are supposed to favor the community to which we belong. A fact of life is that we are social species, and the task of ethics is to make our "sociality" obvious. Even so, there is a long and windy road from stating that humans are social creatures to the definition of *good*. To identify human "natural" sociality with what *good* is, becomes, to say the less, arbitrary. To identify moral sentiments in humans may presume a characteristic of *good*, yet does not define it.

NATURE ORIENTED ETHICAL SUGGESTIONS

Radical versions of non-anthropocentric ethics claim the right of every form of life to function normally in its ecosystem. Ecological egalitarianism rejects any hierarchy and calls for a 'biotic justice'. All life forms, both individuals and species, have a prima facie right to a 'fair share' of the environmental goods, including the habitats necessary for their well-being. This thesis seeks to reverse the relationship we have with the natural world, to overcome the species boundaries, and integrate the human

world into the organic life of the natural environment. Nature functions as a model of social virtue rather than a means of human comfort. O'Riordan (1982) talks of a 'natural morality' that displaces the morality derived intrinsically throughout human cultural institutions.

The anthropomorphic idea of universal moral benevolence flows directly from the images of organic interdependence. The illusion of T. Berry "requires that we submit and humbly follow the guidance of the larger community on which life depends" (Berry, 1988). These arguments are more than problematic. While nature may be nicer than the "red in tooth and claw" monster that Tennyson describes; what should compel us to hold it up as a model to follow? Nature comprises the most wonderful and dire, the beautiful and horrible, the lucky events and the catastrophes. Nature knows no compassion or justice. The disaster is no less natural than the fire that destroys the wilderness or the death of an elk killed by the wolf. These forces are the part of a whole. The cruelty of predators, the roar of the destructive wind and of the fire belong to nature. The term *nature* can be a pretext for almost any justification or argument. Still, some environmental philosophers want to see only the beauties of nature: majestic virgin forests, old beaches, mossy ponds, crystal clear lakes, and unspoiled wilderness. Ideas like holism, Nature's plan, Divine order, harmonious interrelations, "goodness" of a natural state might have advanced more environmental friendly attitudes of the general public; nevertheless, aside from being partially chosen, they often became dogmatic and paralyzed the endeavor to provide solid foundations for the environmental cause.

Holmes Rolston III believes that it is creativity of evolution that identifies goodness. He assumed that living systems are self-organizing, and that the "ecosystem generates a spontaneous order that envelopes and produces the richness, beauty, integrity, and dynamic stability of the component parts"(Rolston, 1995). As systems, ecological communities are sufficiently organized to have a "good" of their own worthy of our respect. Our responsibility is not to interfere with this self-organizing process. Quite a few philosophers went overboard with similar ideas proclaiming that an ecosystem possesses "self-identity" and therefore "significant moral interests." Lawrence E. Johnson wrote: "We may think of an ecosystem as an ongoing process taking place through a complex system of interrelationships between organisms and their non-living environment. The organisms change, and the interrelationships may vary somewhat, but there is a continuity to the ecosystem, and a center of homeostasis around which the states of the ecosystem fluctuate, which defines its self-identity" (Johnson, 1991).

Intellectual constructs such as epicycles, laws of motion or ecosystems, may either be deep truths about nature or clever delusions. One of the lessons of biology is that habitats and ecological systems are not 'real' entities. One system emerges and overlaps with another without clear boundaries. The individualistic nature of responses to the environment means that what we call an ecosystem is in fact an arbitrary subdivision of a continuous gradation of local species assemblages. In the 1920s, plant ecologist Henry Gleason argued that the community is not a well integrated entity, but a loose and shifting association of individual species, whose demographic characteristics are determined primarily by individual species responses to variable environmental conditions, rather than by interactions between species (Gleason 1926). Communities are not well-integrated units that move en masse. They are collections of organisms and species that respond individualistically to temporal variation, as they do to spatial ones. In other words, different responses to climate change can result in the disruption of normal association of plants and animals, thus changing biodiversity and altering the biological community structure. A definition of the concept *ecosystem* that allows scientists to test empirically the hypothesis that such ecosystems are organized has yet to be found. According to the Ecological Society of America, "A dung pile or a whale carcass are ecosystems as much as a watershed or a lake"(1996). Ecologists concede that "the relationship between self-organization, natural selection, and the mechanisms and assembly operators of ecology are simply unknown despite a growing theoretical effort" (Drake et al., 1999). Others assume that despite "continuous efforts, ecology has not been able to offer universal laws or precise ubiquitous principles"(Brecking and Dong 2000).

To define such concept is to select the collection of variables and natural processes, and then to limit the object under consideration. That's precisely why Mayr (1997) writes: "one still speaks of the ecosystem when referring to local association of animal and plants.(...) an ecosystem does not have the integrated unity one expects from a true system."

Because the concept *ecosystem* lacks an agreed-upon definition, there is no way to distinguish the essential or defining properties of a system from the accidental and contingent ones. We have no criterion for determining what kinds of changes destroy the system and what changes are consistent with its preservation. Indeed, ecosystems recently formed or invaded by non-native species that evolved elsewhere appear indistinguishable from heirloom systems replete with endemic organisms, as far as any observable difference in their organizational mode is concerned.

Gilbert and Owen (1990) wrote that the suggestion of any pattern or structure in ecological phenomena "is a biological epiphenomenon, a

statistical abstraction, a descriptive convention without true emergent properties but only collective ones, wholly referable in its properties to those of its constituent species, populations, and individuals." In similar terms, forest ecologist William Drury denounced the strong tendency to accept the existence of self-organizing principles as inherent in natural systems. He wrote, "I feel that ecosystems are largely extemporaneous and that most species (in what we often call a community) are superfluous to the operation of those sets of species between which we can clearly identify important interactions. Once seen, most of the interactions are simple and direct. Complexity seems to be a figment of our imaginations driven by taking the 'holistic' view" (Drury 1998).

However, we value natural formations, forests, lakes, oceans, swamps without being convinced or even interested in their organized structure. It would be misleading to suggest that any scientific assumption about ecosystems structure may justify the aesthetic judgment and moral intuition that ecosystems have a good worth protecting, and thus that demands respect.

THE AMBIGUOUS BIODIVERSITY

The question of biodiversity is one of the most significant in assessing human impact on ecosystems, consequently for environmental ethics and conservation policies. Although biodiversity ought to be thought in a number of different ways (Lovejoy 1996), the traditional and most popular use identifies it with richness in taxonomic species. There are many nuances in the debate about what constitutes biodiversity and how important biodiversity is in terms of the underlying processes that define the system (Begon et al. 1990).

There are many different *determinants* and many different *measures* of biodiversity. It can be thought at the level of species, genes, and communities and ecosystems. All the various levels can be evaluated at several different spatial and temporal scales. Given the various dimensions and multiple levels of the biological diversity, it is difficult to rely on scientific answers to determine what is ethical with respect to the protection and conservation of biological richness, and what actually we ought to do to achieve it.

The biodiversity enigma has to be understood in the context of change in natural history. In a very distant past, it was nature's spontaneous course that shaped the quantity and distribution of plants and animals. More recently, human activity, whether intentional or accidental, has come to influence the abundance, locations, and distribution of plants and animals in many ways; two of which may be the most important. In many if not most places, the majority of plants and animals are not native but have established themselves from afar in the wake of human actions.

Scientists have precisely dated evidence that Europeans began growing non-indigenous crop plants such as wheat, barley and peas in naturally forested areas about 8 000 years ago (*Scientific American*, March 2005). The central European flora has undergone an enrichment of diversity over historical time as a result of human-induced plant invasions. Britain's mammalian fauna totaling about 49 species includes some 21 introduced ones. As for depletion, the survey of England indicates that 90 percent of natural lowland forests were cleared as in 1086 AD. In New Zealand 80 percent of the original forest has been destroyed, along with approximately half the vertebrate fauna.

Human activity also increases the richness or variety of species globally by creating, though centuries of conventional breeding and more recently though advanced biotechnology, huge inventories of novel organisms. Advances in genetic engineering suggest that industry might design the greatest and weirdest variety of creatures for unintentional or deliberate introduction into natural ecosystems. These may add to the exotic organisms already there, further increasing the species richness of places.

Until we have decided how to define 'biodiversity' it would be impossible to justify nature conservation by the ecological imperatives. It has to be based on human values.

INTRINSIC VALUE AND THE MEANING OF 'NATURAL'

Those who consider that natural things (individuals or ecosystems) are ends-in-themselves and have rights, own an explanation: How are such values manifested in nature? To whom and in what sense are these entities intrinsically valuable? What it is about these things that give them such a value?

As the responses mostly revolve around the assumed *naturalness* of the living organism, species or ecosystems, the ethical questions lead to metaphysical inquires about what is *natural*. What makes a thing *natural*? Do species, ecosystems, and habitats found, say, in our backyard possess the same intrinsic value—and therefore make the same demand for respect and protection—as those found in more *natural* environments? The distinction between human-dominated and natural systems, while logically meaningful, may by now lack a significant empirical difference. Introduced species and other anthropogenic changes are likely to have thoroughly altered the "pristine ecosystems." As early as 1854, George Perkins Marsh observed that humanity had long since completely altered and interfered with the spontaneous arrangements of the organic and inorganic world.

What is the meaning of *natural* for the environmental science and environmental ethics? Much ink has been spilled in search of an answer

to this question without finding a satisfactory answer. Our essential current understanding of what is *natural* derives mostly from the romantic tradition that stresses the independence of human intrusion. This definition excludes domestic animals, farmed fish, introduced (invasive or exotic) species, all modified habitats, regulated rivers, managed forests, restored areas, and so on. They all are cultural constructs and therefore artifacts. As such they do not posses intrinsic values. However, chance factors, human influence (including species introductions) and slight climate variation can cause very substantial changes in vegetation and the associated fauna; the biodiversity for the given landscape will significantly vary from one time period to another, and no variant is necessarily more *natural* than the others.

We must add that the advances of the molecular biology now permit humans to take the power of evolution in our own hands and interfere in *natural* processes through genetic engineering. The wider world of biotechnology with its new techniques gives a huge boost to the novel possibilities in modifying plants, animals and the environment. Recombinant DNA raises all sorts of questions concerning the definition of what we can consider *natural*.

Shall we follow the position of those who saw selection as the same principle whether practiced in the wild (natural selection) or by pigeon breeders (artificial selection)? Roundup-Ready soy would be just as *natural* for Darwin as wild prairie flowers and conform to the same organizing forces or processes. Everything is equally natural that is not supernatural; therefore, the concept of natural value might apply equally to everything. Yet, this assumption could lead to the bizarre idea that all ecosystems, habitats and species are equal in intrinsic value. The concept of intrinsic value loses plausibility if it applies too broadly. If we try to protect equally every living thing, we can protect nothing.

DISMANTLING FANTASIES

A number of ethicists identify *natural* with *goodness*. Because of the surpassing influence of the idea that man is part of nature, this view is of more than passing interest. Do humans as creatures of *natural* selection have a moral obligation to follow the laws of nature? Can a *good life* be equated with a *natural life*, even if humans are embedded in cultural contexts within their respective language and history?

Even more heated has been a debate over reading our own values into nature. What moral lesson can we draw from the perception of nature's *modi operandi*? It is risky enough when applied as practical guidance to conservation practices, it is even more when used as universal principles.

If biodiversity is one such principle, do we have the responsibility to actualize its potential? Do we have to leave it alone and let it "spontaneously" or naturally transit from potency to actuality? Does it require an efficient cause or material agent? The same goes for the concepts of 'stability' and 'predictability' whose acceptance as universal values led at the natural level to the suppression of "disturbances" like fire or disease outbreaks, and at the cultural level to the imposition of one safe, rational and therefore optimal social and political model.

The few and fragile ties that exist between scientists and humanists come about in frequent confusion over the use of notions from ecological or physical science in the environmental ethics discourse. There are many different degrees of abuse of scientific concepts when translated beyond their valid domain. The writers on the subject should make clear that scientific theories, being mathematical, physical or biological (on chaos or subatomic particles) have no ethical (individual behavior towards nature) or political implications. Likewise, ecological theories can be useful tools for predicting observable phenomena, but any attempt to draw moral inferences from them is simply unjustified.

Even though we cannot rely on the natural world to shape our moral beliefs in the direction of truth, many philosophers believe that science can provide information helpful to shape human values. It can clearly be emphasize, as Aristotle noted nearly 2 500 years ago and others more recently, that responsible moral judgment must be based on fully understanding the meaning of the facts. Factual information may substantially alter our attitudes, our behavior and our values. As Ernest Mayr indicates: "An ignorance of the findings of biology is particularly damaging, whenever humanists are forced to confront such political problems as global overpopulation, (...) the depletion of non renewable resources, deleterious climatic changes, increased agricultural requirements worldwide, the destruction of natural habitats" (Mayr 1997).

Can science, that is, the factual content of science be applied to generate an ethical code? This suggestion is usually rejected because it raises the *is* to an *ought*. One of the greatest barriers for the development of a new set of values is precisely this perceived mismatch between levels. Moral inferences cannot be drawn from mere facts (norms can never be derived from empirical assertions alone), nor are facts ever loaded with prescription.

Scientific investigation of the physical world and the ethical investigation of our moral experiences, as independent inquires each has its own data domain and its own consequent autonomy, yet each has a close relation to the other as they both seek a rational motivated understanding of what is going on.

It is equally clear that only science can grasp the intricate interactions that take place in the complex system of global environment. But science alone cannot explain the inner logic of our dealing with the natural world. Although it can encourage more sensible attitudes towards nature, we need an ethical theory to account for the idea of people having moral responsibilities toward nature. Just as we cannot understand a work of art merely in terms of the characteristics and chemistry of paint, we cannot understand the functioning of the natural whole in terms of its physical, chemical and biological properties. All these characteristics require as well an explanation in terms of ethical and aesthetical values. If we follow Aristotle's idea that the end of ethics is intelligently *doing*, in order to act we have to use the knowledge environmental sciences are providing and the values environmental ethics promotes. Environmental ethics and environmental science may depend on each other as reliable allies in supporting the protection and preservation of the natural world. But as Rene Dubos (1972) once wrote: "Conservation is based on human value systems; its deepest significance is in the human situation and human heart. Saving marshlands and redwoods does not need biological justification any more than does opposing callousness and vandalism."

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