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12

Naturalizing Values: Organisms and Species

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In this essay, Rolston examines the fact/value problem as it applies to nature. He argues that values are

objective in nature, and that just as philosophers are naturalizing ethics, epistemology, and metaphysics, they should naturalize values.

In an age of naturalism, philosophers seem as yet unable to naturalize values. They are naturalizing ethics, epistemology, and metaphysics. They have connected human ethical behavior to Darwinian reciprocity, kin selection, genetic fitness, and so on. They analyze human capacities for epistemology with care to notice how our human perceptions, our sense organs, have an evolutionary history. Our mind and its cognitive capacities are pragmatic ways of functioning in the world. They interpret ideologies and metaphysical views as means of coping, worldviews that enable humans in their societies to cohere and to outcompete other societies. Ethics, epistemology, and metaphysics are survival tools, whatever else they may also become.

But philosophers are slow to naturalize axiology. If they do, they try to demonstrate the biological roots of human values. They show that our values root in our biological needs—for food, shelter, security, resources, self-defense, offspring, stability, and status in our societies. Beyond that, philosophers do not naturalize values in any deeper sense. They cannot disconnect nature from humans so that anything else in nature can have any intrinsic value on its own. That is disconcerting. Nature comes to have value only when humans take it up into their experience. This, they may think, is a naturalized account of value; but, I shall argue here, such analysis has not yet come within reach of a biologically based account of values. Somewhat curiously, the more obvious kind of naturalizing—showing that our values are framed by our evolutionary embodiment in the world—blinds us to the deeper kind of naturalizing—recognizing an evolutionary world in which values, some of which we. share, are pervasively embodied in the nonhuman world.

The debate is complex and multi-leveled. We touch the nerve of it here by focusing on value as this is present in living organisms and their species lines. Let's start by looking over the shoulders of some recent scientists and their discoveries.

1. Dragonflies, Leaf Stomata, Bacterial Clocks, and Genomes

Studies of dragonflies in the Carboniferous show that their wings "are proving to be spectacular examples of microengineering" giving them "the agile, versatile flight necessary to catch prey in flight." They are "adapted for high-performance flight" (Wootton et al., 1998). "To execute these aerobatic maneuvers, the insects come equipped with highly engineered wings that automatically change their flight shape in response to airflow, putting the designers of the latest jet fighters to shame" (Vogel, 1998). Dragonflies have to change their wing shape in flight without benefit of muscles (as in birds and bats), so they use a flexible aerofoil with veins that enables the wing surface to twist in direct response to aerodynamic loading when suddenly changing directions or shifting from upstroke to downstroke. A hind-wing base mechanism is especially impressive in the way it mixes flexibility and rigidity. "The 'smart' wing-base mechanism is best interpreted as an elegant means of maintaining downstroke efficiency in the presence of these adaptations to improve upstroke usefulness" (Wootton et al., 1998).

Botanists report studies in what they call "a plant's dilemma." Plants need to photosynthesize to gain energy from the sun, which requires access to carbon dioxide in the atmosphere. They also need to conserve water, vital to their metabolism, and access to atmosphere which evaporates water. This forces a trade-off in leaves between too much and too little exposure to atmosphere. The problem is solved by stomata on the undersides of leaves, which can open and close, letting in or shutting out the air. "The stomatal aperture is controlled by osmotic adjustment in the surrounding cells. In a sophisticated regulatory mechanism, light, the carbon dioxide required for photosynthesis, and the water status of the plant are integrated to regulate stomatal aperture for optimization of the plant's growth and performance" (Grill and Ziegler, 1998). The details of such "plant strategies" vary in different species but are quite complex, integrating multiple environmental and metabolic variables—water availability, drought, heat, cold, sunlight, water stress, and energy needs in the plant—sophisticated solutions to the plant's dilemma.

Even the cyanobacteria, blue-green algae, which are relatively primitive single-celled organisms, can track day and night with molecular clocks built with a genetic oscillator rather similar to those in more advanced organisms. Discovering this, Marcia Barinaga says. "Keeping track of day-night cycles is apparently so essential, perhaps because it helps organisms prepare for the special physiological needs they will have at various times during the daily cycle, that clocks seem to have arisen multiple times, recreating the same design each time" (1998).

Reporting a June 1998 conference on "Molecular Strategies in Evolution," geneticists have found so many examples of "how the genome readies itself for evolution" that they are making a "paradigm shift." Abandoning the idea that genetic mutation is entirely blind and random, and that genetic errors are suppressed to minimize change, geneticists are impressed with the innovative, creative capacities in the genome. These "new findings are persuading them that the most successful genomes may be those that have evolved to be able to change quickly and substantially if necessary" (Pennisi, 1998). Genes do this by using transposons—

gene segments, mobile elements—that they can use rapidly to alter DNA and the resulting protein structures and metabolisms in time of stress. "Chance favors the prepared genome," says Lynn Caporale, a biotechnology geneticist. James Shapiro, a bacterial geneticist at the University of Chicago, comments: "The capability of cells has gone far beyond what we had imagined." "Cells engineer their own genomes" (quoted in Pennisi, 1998).

The genome in vertebrates, for example, has evolved quite successful capacities to resist diseases. Transposons turn out to be especially useful in the acquired immune system, which is not present in invertebrates, but which was discovered and elaborated in vertebrates. "The immune system is a wonderful example of how a mobile piece of DNA can have an astounding impact on evolution," says David Schatz of Yale University (quoted in Pennisi, 1998). Innate immunity, which is present in vertebrates, is coded in the genes and "remembers" what has happened in the organism's evo-. lutionary past. But acquired immunity "remembers" what has come along during the organism's biographical past. An organism gets the disease; then its body remembers, forms antigens, and does not get the disease a second time.

One has to use language with care; we should guard against overly cognitive language. But scientists do have to describe what is going on; and there is a kind of acquired learning in immunity, mechanical though the system also is. Immunologists use a term here that philosophers will find revealing. When stem cells from the bone marrow mature in the thymus (T cells), this is called "thymic education" (Abbas et al., 1991, p. 169). Once such an educated T cell meets an alien microbe, it not only triggers defenses, it triggers a memory. What immunologists call "memory cells" are made; these are both long-lived and reproduce themselves, so that acquired immunity can continue for decades, even a lifetime. The body can remember what sorts of organisms it has met before and be ready for their return. From a philosophical perspective, we may wish to be circumspect about "memory" cells, as we are about "remembering"; and yet the vocabulary is widespread in immunology and seems equally legitimate, say, to the use of "memory" in computer science. Additionally, in organisms—as it is not in computers—this is vital to life. Such capacity is much smarter than mere genetics; the body has defensive capacities far in excess of anything that could have been coded for in the genes.

The immune system has a complex task. A host of metabolically and structurally different cells have to be choreographed in organic unity. Further, invader cells, myriads of kinds of them, and insider cells gone wrong in many different ways—all these must be seen and eliminated. This has to be done at microscopic and molecular ranges with careful regulation, which involves complement molecules that work in a cascade reaction—15-20 different molecules, and 10 or more inhibitors, a total of some 30-40 molecules. Such a cascade might seem overly complex, but it is really a sophisticated form of regulation; there are amplification circuits and stabilizing loops, shut-down provisions and backup pathways. This is, of course, a causal system, but it is more than that; the system is protecting an organismic self.

Complement can be quite destructive and that is a good thing when it provides immunity for the organism, but it is also a bad thing if it goes out of control. So complement requires tight, fail-safe regulation. Immunologists use here the language of a fine-tuned mechanism: "Because of these regulatory mechanisms, a delicate balance of activation and inhibition of the complement cascades is achieved which prevents damage to autologous [self] cells and tissues but promotes the effective destruction of foreign organisms" (Abbas et al., 1991, p. 268). "The consequences of complement activation are so significant and potentially dangerous that the system must be very carefully regulated" (Tizard, 1992, p. 200). Some threats and achievements here seem to be "significant," "dangerous," "effective," and "damaging"; something vital is at stake.

Can you see that philosophers, looking over the shoulders of these scientists with their descriptions of what is going on, have some value questions to ask? The immune system is a sophisticated means of preserving biological identity at a high level of idiographic organismic diversity. All this is going on spontaneously, autonomously, without any animal awareness, much less any humans thinking about it.

There is praise for those dragonfly wings in the Carboniferous, coming from the scientists who study them. What is a philosopher to say? "Well, those are interesting wings to the scientists who study them, but they were of no value to the dragonflies." That seems implausible. Perhaps one can go part way and say: "Well, those wings did have value to the individual dragonflies who owned them. Instrumentally, the dragonflies found them useful. But a dragonfly is incapable of intrinsically valuing anything. Much less do these, wings represent anything of value to the species line. Similar engineering features persist, Wootton and his associates add, in present-day dragonflies, living 320 million years later than the fossil dragonflies they studied in Argentina. That does sound like something that has been useful for quite a long time. Could that be of value to the species line?

The repeated discovery of molecular docks in those cyanobacteria is important in fulfilling the organisms' "needs," and that seems pretty much fact of the matter. After that, do we want to insist that nevertheless this has no "value" to these organisms or their species lines, who have several times discovered how these internal docks, similarly "designed," increase their adapted fit?

Studying those immune systems, a cell biologist finds

something "wonderful." But, you will insist, this is only "wonderful" when cell biologists get there to wonder about it. Perhaps nothing is "astounding" until a human being comes around to be astounded. We do not think that the genomes are astounded. Still, the biological achievements are there long before we get let in on them. Set aside the wonder. In the objective facts—leaf stom- ata, genome evolution, bacterial clocks—is there anything there of value?

2. Anthropic Valuers and Their Values

Most philosophers insist there is not. Values in nature are always "anthropocentric," human-centered, or at least "anthropogenic" (generated by humans). Bryan G. Norton concludes: "Moralists among environmental ethicists have erred in looking for a value in living things that is *independent* of human valuing. They have therefore forgotten a most elementary point about valuing anything. Valuing always occurs from the viewpoint of a conscious valuer.... Only the humans are valuing agents" (1991, p. 251). Norton, of course, believes in an objective world that he is anxious to conserve. Walking along a beach, he values, for example, the sand dollars *(Mellita quinquiesperforata)* he finds there. He has respect for life (1991, pp. 3-13). He chose a sand dollar to picture on the cover of his book. Such encounters make him a better person, give him an enlarged sense of his place in the world, and increase his wonder over the world he lives in. So he celebrates "the character-building transformative value of interactions with nature:" (1987, pp. 10-11). He gets a lot of good out of respecting sand dollars.

But Norton does not want any epistemological "foundationalism" or "metaphysical realism,'" as though humans (whether scientists or philosophers) could actually know anything out there in nature independently of ourselves, much less that there are values intrinsic to some of these nonhuman organisms out there. There is no getting out of our epistemological bondage, no getting past "interactions"; it is naive for humans to claim to know objective value in sand dollars. Norton regrets that I, when I claim to know more than "interactions," have fallen into the "devastating legacy" of "outmoded" Cartesian dualism, "a bewitchment of ossified language" (1992, pp. 216-218, p. 224).

J. Baird Callicott, equally zealous for the conservation of nature, is equally clear about our unique human valueability. All intrinsic value attached to nature is "grounded in human feelings" but is "projected" onto the natural object that "excites" the value. "Intrinsic value ultimately depends upon human valuers." "Value depends upon human sentiments" (1984, p. 305). We humans can and ought *place* such value on natural things, at times, but there is no value already *in place* before we come. Intrinsic value is our construct, interactively with nature, but not something discovered which was there before we came. "There can be no value apart from an evaluator, ... all value is as it were in the eye of the beholder [and] ... therefore, is humanly dependent" (1989, p. 26). Such value is "anthropogenic" (1992, p. 132).

> The *source* of all value is human consciousness, but it by no means follows that the *locus* of all value is consciousness itself.... An intrinsically valuable thing on this reading is valuable *for* its own sake, *for* itself, but it is not valuable *in* itself, that is, completely independently of any consciousness, since no value can, in principle, ... be altogether independent of a valuing consciousness. ... Value is, as it were, projected onto natural objects or events by the subjective feelings of observers. If all consciousness were annihilated at a stroke, there would be no good and evil, no beauty and ugliness, no right and wrong; only impassive phenomena would remain. (1989, pp. 133-134, 147)

What that means, of course, is that the dragonfly wings were no "good" to them, or at least of no. "value" to them. Though insects, sand dollars, bacteria, and plants may engineer their own genomes, there is nothing valuable about any of these activities, much less right or beautiful. Take our evaluating consciousness away, and there remain only impassive phenomena.

These philosophers have to conclude so because according to classical value theory only humans produce value; wild nature is intrinsically valueless. That seems to be a metaphysical claim in Callicott. We can know what is there without us: impassive phenomena; we can know what is not there: intrinsic value. Or if not so ontological this is at least an epistemological claim, as with Norton: we are unable to know what is there without us. All we can know is that some things in nature, before we get there, have the potential to be evaluated by humans. We know this because if and when we humans appear. we may incline, sometimes, to value nature in noninstrumental ways, as when we project intrinsic value onto sequoia trees while hiking through the forest, or have transformative experiences encountering sand dollars on a beach.

The best we can do is to give a dispositional twist to value. To say that *n* is valuable means that *n* (some object in nature) is able to be valued, if and when human valuers, H's (some Humans), come along, although *n* has these properties whether or not humans arrive. The object plays its necessary part, though this is not sufficient without the subject. Nature contains "a range of *potential* values in nature actualizable upon interaction with consciousness" (Callicott, 1992, p. 129). By this account there is no actual value ownership autonomous to the dragonflies, bacteria, plants, or genome lines—none at least that we can know about. When cellular biologists arrive with their wonder and resolve to admire and perhaps also to conserve these things, there is value ignition. Intrinsic value in the realized sense

emerges relationally with the appearance of the subject-generator. This is something like opening the door of a refrigerator, when things previously in the dark light up. But axiologically speaking, nature is always in the dark—unless and until humans come.

Perhaps you can begin to see why I am disconcerted that philosophers can be so naturalistic one moment and so separatist the next. Naturalists wish to claim that we humans are not metaphysically different from the rest of nature, whether in substance or process. Human activities and those in wild nature are equally natural. Humans are completely natural in their physiologies and in their evolutionary histories. We are a part of nature and not apart from nature. Still, they still practice value apartheid. They resolutely find humans quite axiologically different, with this unique valuing capacity. That does set us apart from the rest of nature.

At the same time that they set us humans apart so surely, they may also find us so epistemologically ignorant that we cannot really know what we might share with the nonhuman lives we encounter. In these values that arise when we interact with nature we are unable to discover anything more than these values that arise within us, based on some potential nature has for us. But humans are sealed off from making any further claims about the objective world. This too is value apartheid.

The anthropogenic view values nature only in association with human participation. This leaves us with an uneasy concern that, however generously we may come to care for some nonhuman others, since it is only *we* who can place value anywhere, since it is only our own values that we can attend to .or know about, humans really do remain at the center of concern. Their concern is central to having any value at all. Their concern is all that matters, and it is not always going to be easy to get up concern for animals, plants, species, or ecosystems that really don't matter in themselves, not at least so far as anybody knows.

We are likely to be concerned only if they matter to and for us, and that is going to place humans right back at the center. Nature is actually valuable only when it pleases us, as well as serves us. That seems to be the ultimate truth, even though we penultimately have placed intrinsic value on nature, and take our pleasure enjoying these natural things for what they are in themselves. Without us there is no such pleasure taken in anything. What is value-able, able to value things, is people; nature is able to be valued only if there are such able people there to do such valuing. Nature is not value-able able—to generate values--on its own, nor do plants and animals have any such value-ability.

3. Sentient Valuers and Their Values

Peter Singer offers a more expansive account. It is not just humans but the higher animals that can value. We have to move from an anthropocentric to a "sentiocentric" view. Or, better, *hom* an anthropogenic to a "sentiogenic" view. (Please pardon the nonce words). Animals can value on their own, provided that they have preferences that can be satisfied or frustrated. A mother free-tailed bat, a mammal like ourselves, can, using sonar, wend her way out of Bracken Cave, in Texas, in total darkness, catch SOQ-1000 insects each hour on the wing, and return to find and nurse her own young. That gives evidence of bat-valuing; she values the insects and the pup.

Now, it seems absurd to say that there are no valuers until humans arrive. There is no better evidence of non-human values and valuers than spontaneous wildlife, born free and on its own. Animals hunt and howl; find shelter; seek out their habitats and mates; care for their young; flee hom threats; grow hungry, thirsty, hot, tired, excited, sleepy. They suffer injury and lick their wounds. Here we are quite convinced that value is nonanthropogenic,: to say nothing of anthropocentric.

These wild animals defend thefr own lives because they have a good of their own. There is somebody there behind the fur or feathers. Our gaze is returned by an animal that itself has a concerned oudook. Here is value right before our eyes, right behind those eyes. Animals are valueable, able to value things in their world. But we may still want to say that value exists only where a subject has an object of interest. Callicott modifies his position and says that value is not always "anthropogenic"; it may sometimes be "vertebragenic, since nonhuman animals, all vertebrates at the very least, are conscious and therefore may be said, in the widest sense of the term, to value things" (1992, pp. 132, 138).1

Well, that's a help, since at least the fellow vertebrates share in our ability to value things. They value things instrumentally, no doubt, since they seek other animals, plants, and insects for food. They value water to drink, dens for shelter, and so on.

Do they value anything intrinsically? Callicott does not address this question, but perhaps he would say (and I would agree) that a vertebrate animal values its own life intrinsically. The deer defends its life as' a good of its own. Such life is valued without further contributory reference, even if wolves in turn make use of deer for food. Perhaps the mother wolf can value her young intrinsically, since she puts herself at risk to bear young. Perhaps, unawares, she values the ongoing species line.

Nevertheless, for both Singer and Callicott, when we run out of psychological experience, value is over. Callicott's vertebragenic value still leaves most of the world valueless, since the vertebrates are only about *4* percent of the described species. Indeed, since the numbers of individuals in vertebrate species is typically much lower than the numbers of individuals in invertebrate or plant species, real valuers form only some minuscule fraction of the living organisms on Earth. Nearly every-

thing on Earth is still quite valueless, unless and until these humans come along and place intrinsic value there. As Callicott insists, until humans do this, "there simply is no inherent or intrinsic value in nature" (1989, p. 160). Singer is more generous than Callicott to the invertebrates. Still he claims that we must stop "somewhere between a shrimp and an oyster" (1990, p.174). Beyond that, he insists, "there is nothing to be taken into account" (1990, p. 8). With Singer, too, most of the biological world has yet to be taken into account.

Moving any further is impossible on a sentience-based theory. Value, like a tickle or remorse, must be felt to be there. Its *esse* is *percipi.* Nonsensed value is nonsense. Only beings with "insides" to them have value. There is no unexperienced value, no value without an experiencing valuer. According to the classical paradigm, so long dominant that to Norton and Callicott it seems elementary, there is no value without an experiencing valuer, just as there are no thoughts without. a thinker, no percepts without a perceiver, no deeds without a doer, no targets without an aimer. Valuing is felt preferring by human choosers. Extending this paradigm, sentient animals may also value. Nothing else.

But the problem with the "no value without a valuer" axiom is that it is too subjectivist; it looks for some center of value located in a subjective self. And we nowhere wish to deny that such valuers are sufficient for value. But that is not the whole account of value. Perhaps there can be no doing science without a scientist, no religion without a believer, no tickle without somebody tickled. But there can be law without a lawgiver, history without a historian; there is biology without biologists, physics without physicists, creativity without creators, achievement without conscious achievers—and value without experiencing valuers.

A sentient valuer is not necessary for value. Another way is for there to be a value-generating system able to generate value, such as a plant or a genome. If you like, that is another meaning of value-er; any *x* is a valuer if *x* is value-able, able to produce values.

No, comes the protest, naturalizing value has to be kept close in to our human embodiment. We simply do not have the cognitive capacities to know all this about other valuers out there. Metaphysics, epistemology, and ethics can and ought to be naturalized, but that does not mean there are any metaphysicians, epistemologists, or ethicists among the dragonflies, the bacteria, or the plants; we only mean that when humans do these activities, they do so using their naturally evolved capacities. Similarly with axiology, which can and ought to be naturalized, that is interpreted in terms of our naturally evolved capacities. But there are no philosophical axiologists in wild nature, any more than there are metaphysicians, epistemologists, or ethicists.

Maybe we can extend feelings into the higher animals, because evolution does teach their kinship with us. So vertebragenic axiology is a possibility. We can and ought to defer to animals who are close enough kin to us to share some of our cognitive and perceptual abilities. Beyond that, value is over.

Social philosophers are likely to be quite sure about this, and quite uncomfortable with the idea of natural values apart from human persons in their society. Milton Rokeach defines a value this way: "I consider a value to be a type of belief, centrally located within one's belief system, about how one ought or ought not to behave, or about some end-state of existence worth or not worth obtaining... These belief systems are culturally constructed and transmitted; they are personally endorsed, enjoyed, and critiqued. Values have to be thought about, chosen from among options, persistently held, and to satisfy felt preferences (Rokeach, 1968, p. 124). If so, ipso facto, there are none in mere organisms which have no such capacities. So much for the dragonflies and their wings, sand dollars, plants with their leaf stomata, bacteria with their docks, and those genomes getting ready for evolution.

4. Organisms and Their Biocentric Values

Maybe the problem is that we have let ourselves get imprisoned in our own felt experiences. There is an epistemological problem, but look at it another way. We do have blinders on, psychological and philosophical blinders, that leave us unable to detect anything but experientially based valuers and their felt values. So we are unable to accept a biologically based value account that is otherwise staring us in the face. Let's take another look at organisms and their biocentric values, focusing on plants, to make sure we are not hoping for minimal neural experience.

A plant is not an experiencing subject, but neither is it an inanimate object, like a stone. Nor is it a geomorphological process, like a river. Plants are quite alive. Plants, like all other organisms, are self-actualizing. Plants are unified entities of the botanical though not of the zoological kind; that is, they are not unitary organisms highly integrated with centered neural control, but they are modular organisms, with a meristem that can repeatedly and indefinitely produce new vegetative modules, additional stem nodes, and leaves when there is available space and resources, as well as new reproductive modules, fruits, and seeds.

Plants repair injuries and move water, nutrients, and photosynthate from cell to cell; they store sugars; they make tannin and other toxins and regulate their levels in defense against grazers; they make nectars and emit pheromones to influence the behavior of pollinating insects and the responses of other plants; they emit allelopathic agents to suppress invaders; they make thorns, trap insects, and so on. They can reject genetically incompatible grafts. They have engineered those remarkable stomata.

A plant is a spontaneous, self-maintaining system, sustaining and reproducing itself, executing its program, making a way through the world, checking against performance by means of responsive capacities with which to measure success. Something more than merely physical causes, even when less than sentience, is operating within every organism. There is *information* superintending the causes; without it the organism would collapse into a sand heap. The information is used to preserve the plant identity. This information is recorded in the genes, and such information, unlike matter and energy, can be created and destroyed. That is what worries environmentalists about extinction, for example. In such information lies the secret of life.

Values are like color, the traditionalists say. Both arise in interaction. Trees are no more valuable than they are green on their own. This account seems plausible if one is asking about certain kinds of values, such as the fall colors we enjoy. But consider rather the information that makes photosynthesis possible. Photosynthesis is rather more objective than greenness. What is good for a tree (nitrogen, carbon dioxide, water) is observer-independent. But is not the good of the tree (whether it is injured or healthy) equally observer-independent? The tree's coping based on DNA coding is quite objective (even if, no doubt, there is some observer construction in the theories and instruments by which all this is known). The sequoia tree has, after all, been there two thousand years, whether or not any green-experiencing humans were around. *Sequoia sempervirens,* the species line, has been around several million years, with each of its individual sequoia trees defending a good of their kind.

The tree is value-able ("able-to-value") itself. If we cannot say this, then we will have to ask, as an open question, "Well, the tree has a good of its own, but is there anything of value to it?" "This tree was injured when the elk rubbed its velvet off its antlers, and the tannin secreted there is killing the invading bacteria. But is this valuable to the tree?" Botanists say that the tree is irritable in the biological sense; it responds with the repair of injury. Such capacities can be "vital." These are observations of value in nature with just as much certainty as they are biological facts; that is what they are: facts about value relationships in nature.

We are really quite certain that organisms use their resources, and one is overinstructed in philosophy who denies that such resources are of value to organisms instrumentally. But then, why is the tree not defending its own life just as much fact of the matter as its use of nitrogen and photosynthesis to do so?

But nothing "matters" to a tree; a plant is without minimally sentient awareness—so Callicott, Norton, and Singer protest. By contrast, things do matter to a vertebrate. True, things do not matter *to* trees; still, a great deal matters *for* them. We ask, of a failing tree, What's the matter *with* that tree? If it is lacking sunshine and soil nutrients, and we arrange for these, we say, The tree is benefiting from them; and *benefit* is—everywhere else we encounter it—a value word. Every organism has a *good-of-its-kind;* it defends its own kind as a *good kind.* In this sense, the genome is a set of conservation molecules. To say that the plant has a good of its own seems the plain fact of the matter. The flexible wings did "matter" to the Carboniferous dragonflies. Being prepared for rapid evolution under stress does "matter" to species lines. Biologists regularly speak of the "selective value" or "adaptive value" of generic variations (Ayala, 1982, p. 88; Tamarin, 1996, p. 558). Plant activities have "survival value," such as the seeds they disperse or the thorns they make.

Natural selection picks out whatever traits an organism has that are valuable to it, relative to its survival. When natural selection has been at work gathering these traits into an organism, that organism is able to value on the basis of those traits. It is a valuing organism, even if the organism is not a sentient valuer, much less a vertebrate, much less a human evaluator. And those traits, though picked out by natural selection, are innate in the organism. It is difficult to dissociate the idea of value from natural selection.

Any sentigenic, psychogenic, vertebragenic, or anthropogenic theory of value has got to argue away all such natural selection as not dealing with "real" value at all, but mere function. Those arguments are, in the end, more likely to be stipulations than real arguments. If you stipulate that valuing must be felt valuing, that there must be some subject of a life, then trees are not able to value, their leaves and thorns are no good to them, and that is so by your definition. But we wish to examine whether that definition, faced with the facts of biology, is plausible. The sentientist definition covers correctly but narrowly certain kinds of higher animal valuing—namely, that done by humans and their vertebrate relatives—and omits all the rest.

5. Smart Genes, Intelligent Species

These organisms are found in species lines, and next we must evaluate species lines and the genetic creativity that makes speciation possible. As noticed earlier, contemporary geneticists are insisting that thinking of this process as being entirely "blind" misperceives it.[2] Genes have substantial solution-generating capacities. Though not deliberated in the conscious sense, the process is cognitive, somewhat like computers, which, likewise without felt experience, can run problem-solving programs. For these genes in organisms, much is vital, as nothing is in a computer. The genome, getting ready to evolve, has a vast array of sophisticated enzymes to cut, splice, digest, rearrange, mutate, reiterate, edit, correct, translocate, invert, and truncate particular gene sequences. There is much redundancy

(multiple and variant copies of a gene in multigene families) that shields the species from accidental loss of a beneficial gene, provides flexibility—both overlapping backup and unique detail—on which these enzymes can work.

John H. Campbell, a molecular geneticist, writes, "Cells are richly provided with special enzymes to tamper with DNA structure," enzymes that biologists are extracting and using for genetic engineering. But this "engineering" is already going on in spontaneous nature:

> Gene-processing enzymes also engineer comparable changes in genes in vivo. . . . We have discovered enzymes and enzyme pathways for almost every conceivable change in the structure of genes. The scope for self-engineering of multigene families seems to be limited only by the ingenuity of control systems for regulating these pathways. (1983, pp. 408-409)

These pathways may have "governors" that are "extraordinarily sophisticated." "Self-governed genes are 'smart' machines in the current vernacular sense. Smart genes suggest smart cells and smart evolution. It is the promise of radically new genetic and evolutionary principles that are motivating today's study ... " (1983, pp. 410, 414).

In a study of whether species as historical lines can be considered "intelligent," Jonathan Schull concludes:

> Plant and animal species are information-processing entities of such complexity, integration, and adaptive competence that it may be scientifically fruitful to consider them intelligent. . . . Plant and animal species process information via multiple nested levels of variation and selection in a manner that is surprisingly similar to what must go on in intelligent animals. As biological entities, and as processors of information, plant and animal species are no less complicated than, say, monkeys. Their adaptive achievements (the brilliant design and exquisite production of biological organisms) are no less impressive, and certainly rival those of the animal and electronic systems to which the term "intelligence" is routinely (and perhaps validly) applied today. (1990, p. 63)

Analogies with artificial intelligence in computers are particularly striking. Such cognitive processing is not conscious, but that does not mean it is not intelligent, where there are clever means of problem solving in a phyletic lineage. Schull continues:

> Gene pools in evolving populations acquire, store, transmit, transform, and use vast amounts of fitness-relative information. . . . The information-processing capacities of these massively parallel distributed processing systems surpasses that of even the most sophisticated man-made systems. . . . It seems likely that an evolving species is a better simulation of "real" intelligence than even the best computer program likely to be produced by cognitive scientists for many years. (1990, pp. 64, 74)

The result, according to David S. Thaler, is "the evolution of genetic intelligence" (1994). So it seems that if we recognize that there are smart computers, we must also recognize that there are even smarter genes. Smarter, and more vital.

Leslie E. Orgel, summarizing the origin of life on Earth, says "Life emerged only after self-reproducing molecules appeared. . . . Such molecules yielded a biology based on ribonucleic acids. The RNA system then invented proteins. As the RNA system evolved, proteins became the main workers in cells, and DNA became the prime repository of genetic information." "The emergence of catalytic RNA was a crucial early step" (1994, p. 4). That is interesting, because here is "a crucial early step" among Callicott's mere "impassive phenomena."

Not only does such problem solving take place early on, and continuously thereafter, but the genes, over the millennia, get better at it. Past achievements are recapitulated in the present, with variations; and these results get tested today and then folded into the future. Christopher Wills concludes

> There is an accumulated wisdom of the genes that actually makes them better at evolving (and sometimes makes them better at not evolving) than were the genes of our distant ancestors.... This wisdom consists both of the ways that genes have become organized in the course of evolution and the ways in which the factors that change the genes have actually become better at their task. (1989, pp. 6-8)

At least we seem to be getting better and better impassive phenomena.

Donald J. Cram, accepting the Nobel prize for his work deciphering how complex and unique biological molecules recognize each other and interlock, concludes: "Few scientists acquainted with the chemistry of biological systems at the molecular level can avoid being inspired. Evolution has produced chemical compounds that are exquisitely organized to accomplish the most complicated and delicate of tasks." Organic chemists can hardly "dream of designing and synthesizing" such "marvels" (1988, p. 760). Marvels they may be, but not until we get there, Norton must say, and experience their "transformative value."

Talk of a genetic "strategy" has become commonplace among biologists, not thereby implying consciousness, but strongly suggesting a problem-solving skill. A marine snail has evolved a "strategy for rapid immobilization of prey" and can "capture prey with remarkable efficiency and speed" (Teriau et al., 1998). Well, maybe "strategy" is a metaphor, but what the facts that underlie the metaphor still force is the question whether these snails "know how" to capture the fish they catch. And this is only one instance of information pervasively present as needed for an organism's competence in its ecological niche. All biology is cybernetic; the information storage in DNA, the know-how for life, is the principal difference between biology and chemistry or physics.

Is a philosopher still going to insist: Well, all this inventiveness, strategy, remarkable efficiency, wisdom of the genes, exquisite organization to accomplish delicate tasks, and crucial discoveries in evolution to the contrary, there is nothing of value here? Maybe it is time to face up to a crisis?

6. An Epistemic Crisis? An Axiological Crisis?

The cell biologists, we were saying, have been finding something "wonderful" in genome strategies, but it did seem that this was only "wonderful" when cell biologists got there to wonder about it. Or at least that nothing was "astounding" until a human being came around to be astounded. We do not think that the genomes have a sense of wonder or are astounded. Still, the biological achievements are there long before we get let in on them. Facing up to these facts, which are quite as certain as that we humans are valuers in the world, it can seem "astounding" arrogance to say that, in our ignorance of these events, before we arrived there was nothing of value there.

No, my critics will reply. Rolston has not yet faced up to his epistemological naivete; he persists in his ontological realism, unaware of how contemporary philosophy has made any scientific knowing of any objective nature out there impossible, much less any realism about natural values. Rolston needs to get his Cartesian epistemology and metaphysics naturalized. He will have to realize how scientists are exporting human experiences and overlaying nature with them when they set up these frameworks of understanding. We need to recognize the, metaphors we are projecting onto nature—not so much to strip them all away and see nature without metaphor, as to realize that all of our knowing of nature is metaphorical. That will take care of his plant "dilemmas," of things that "matter" to plants, of genome "engineering," and dragonfly "strategies." Whatever values Rolston is finding in nature are being projected there by these metaphors. He is not naturalizing values at all.

I agree that sometimes we do need to strip off the metaphors that scientists may use. When the comet Shoemaker-Levy crashed into Jupiter in July 1994, astronomers watched with interest; some of them even got ecstatic about the size of the explosive impact. Was this event of any value, or disvalue? Let us grant that nothing matters to Jupiter, nothing matters on Jupiter. The swirls in the planetary winds were disrupted by this outside comet crashing in, but the fierce winds soon mixed up the debris and the flow patterns, after about a month, returned to their pre-impact formations, the effect of the gigantic impact fading. A headline in *Science* put it this way: ..A Giant Licks Its Wounds" (Kerr, 1994). John Hogan in *Scientific American* noted that scientists were interested in watching "how bruises left by Shoemaker-Levy disperse" (Horgan, 1994). "Wounds" and "bruises" are only journalistic metaphor, even in science journals, when applied to Jupiter. The excited scientists were observing impassive phenomena.

But what do we say when a wolf, injured in a territorial fight, licks its wounds and limps from a bruised leg? Is that still journalistic metaphor? Or that the elk, rubbing the velvet off its anders, has "bruised" the tree, and that the tannin is secreted to protect this "injury"? Hard-nosed functionalists can no doubt strip away ideas such as "getting ready," "being prepared," also words such as "engineer" and "information," if such words require conscious deliberation. But even after this stripping down, there remains something here that demands value language. Maybe you can sanitize the language if you have strong enough detergent. But you well may be washing out something important that is going on. In a Darwinian world, where survival is ever at stake, the question of value has a way of dirtying up the cleanest humanistic value theory.

We philosophers may protest that we know how to use words with precision, and scientists can be rather careless with them. That is what has dirtied up otherwise perfectly good value theory. Though unsophisticated biologists have used "value" regarding plants, careful analysis will put that kind of "value" in scare quotes. This so-called value is not a value, really, not one of interest to philosophers because it is not a value with interest in itself. Even if we found such interest·taking value, as we do in the higher animals, we humans would still have to evaluate any such animal values before we knew whether any "real" values were present.

True, the female wolf takes an interest in the deer she slays and the pups she feeds. So one can say, biologically speaking, that she values the deer and her pups. But we do not yet know whether there is any "philosophical" value here. There could in fact be disvalue—a big bad killer wolf, rearing more such killers in the world. Jack the Ripper was a good killer, good of his kind, but a very bad person in the world. We humans have to evaluate what is going on out there, before we can say whether there is any positive value there.

Otherwise we will commit the naturalistic fallacy. We find what biologically *is* in nature and conclude that something valuable is there, something which we may say we *ought* to protect. Considered as normative organismic systems organisms might have goods of their kind and still they might be bad kinds taken for what they are in themselves, or considered in the roles they play. There is a radical gap between finding that these organisms and species have goods of their kinds and in concluding, in a philosophical worldview, that these are good kinds. The gap is between finding animals and plants that have values defended on their own, a biological description, and finding that these animals and plants have intrinsic value worthy of philosophical consideration, which ought to

be preserved. That latter step requires philosophical analysis past any biological description.

Man is the measure of things, said Protagoras. Humans are the measurers, the valuers of things, even when we measure what they are in themselves. So humans are the only evaluators who can reflect about what is going on at this global scale, who can deliberate about what they ought to do conserving it. When humans do this, they must set up the scales; and humans are the measurers of things. Animals, organisms, species, ecosystems, Earth cannot teach us how to do this evaluating. Perhaps not, but still they can and do display what it is that is to be evaluated. The axiological scales we construct do not constitute the value any more than the scientific scales we erect create what we thereby measure.

What are we evaluating? Among much else, we are appraising organisms in species lines with their adaptive fits. In this evaluation, we do consider our options, and adopt attitudes toward nature with conscious reflection (such as whether we choose and why to save endangered species) that may result in the values we humans choose. But in the biological world which we have under consideration, such capacities drop out. The plants and animals are not so capable. But that does not mean that value disappears, only that it shifts to the biological level.

An organism cannot survive without situated environmental fitness. There organisms do mostly unconsciously (and sometimes consciously) defend their lives and their kinds. Might they be bad kinds? The cautious philosophical critic will say that, even though an organism evolves to have a situated environmental fitness, not all such situations are necessarily good arrangements; some can be clumsy or bad. They could involve bad organisms in bad evolutionary patterns—perhaps those efficient and venomous snails, destroying those fish, or dragonflies so efficient in flight that they devastate their prey and upset previously stable ecosystems. Perhaps, at times. But with rare exceptions, organisms are well adapted to the niches they fill, and remain so as the coevolutionary process goes on. By natural selection their ecosystemic roles must mesh with the kinds of goods to which they are genetically programmed. At least we ought to put the burden of proof on a human evaluator to say why any natural kind is a bad kind and ought not to call forth admiring respect.

The world is a field of the contest of values. We can hardly deny that, even if we suppose that those are bad snails killing those fish, or that pest insects come along, eat plant leaves, and capture the stored energy that plants would have otherwise used to preserve their own good kinds. When we recognize how the ecosystem is a perpetual contest of goods in dialectic and exchange, it will become difficult to say that all or even any of the organisms in it are bad kinds, ill-situated in their niches. The misfits are extinct, or soon will be. Rather it seems that many of them, maybe even all of them, will have to be respected for the skills and achievements by which they survive over the millennia. At least we will have to recognize the possibility of intrinsic value in nature, and it will seem arrogant to retreat into a human-centered environmental ethics. This is true no matter bow much the anti-foundationalists and the anti-realists protest that we humans cannot know enough about what these animals and plants are like in themselves to escape our own blinders.

Does it not rather seem that when we are describing what benefits the dragonflies or the snails, the plants with their leaf stomata, or the bacteria with their clocks, such value is pretty much fact of the matter, If we refuse to recognize such values as objectively there, have we committed some fallacy? Rather, the danger is the other way round. We commit the subjectivist fallacy if we think all values lie in subjective experience, and, worse still, the anthropocentrist fallacy if we think all values lie in human options and preferences. These plants and animals do not make man the measure of things at all.

Humans are not so much lighting up value in a merely potentially valuable world, as they are psychologically joining ongoing planetary natural history in which there is value wherever there is positive creativity. While such creativity can be present in subjects with their interests and preferences, it can also be present objectively in living organisms with their lives defended, and in species that defend an identity over time, and in systems that are self-organizing and that project storied achievements. The valuing human subject in an otherwise valueless world is an insufficient premise for the experienced conclusions of those who value natural history.

Conversion to a biological and geological view seems truer to world experience and more logically compelling. This too is a perspective, but ecologically better informed; we know our place on a home planet, which is not only our home but that for five or ten million other species. From this more objective viewpoint, there is something subjective, something philosophically naive, and even something hazardous in a time of ecological crisis, about living in a reference frame where one species takes itself as absolute and values every thing else in nature relative to its potential to produce value for itself.

Notes

1. Callicott recognized this possibility from the start, despite his insistence that humans project all the value present in nature (1989, p. 26).
2. See further analysis and sources in Rolston, 1999, pp. 23-37.

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Study Questions

1. What does Rolston mean by *naturalizing value?* How does he make a case for this thesis?
2. What is Rolston's objection to subjectivism in values, the idea that all values arise by sentient beings' valuing objects? In another place he calls this the refrigerator-light theory of values. The refrigerator light does not come on until someone opens the door. Similarly, the subjectivist says that values only come into existence when humans or conscious valuers value states of affairs.
3. Discuss the arguments for and against the thesis that nature has objective value—that is, it has value whether or not conscious beings value nature.