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Biology Without Conservation: An Environmental Misfit and Contradiction in Terms

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CONSERVATION IN BIOLOGY AND PHYSICS

We can launch this exploration at what may seem an unpromising point: *by* distinguishing between conservation in physics and in biology. In physics, conservation is a natural law and takes place willy-nilly. In classical physics, energy is neither created nor destroyed but conserved through transformations. Likewise with matter. In relativistic physics, though the one may be transformed into the other, matter-energy is conserved in the interconversions. Likewise with spin, charge, momentum, or baryon number. Conservation in physics is an impressive feature of nature; much elegance and mathematical symmetry depend on it. In a sense, it is something humans can value; it adds aesthetic beauty to our world. But in the usual sense, when we say that values are conserved, we mean, for example, that the numerical amounts on both sides in an equation remain the same, reflecting certain automatic natural phenomena.

Sometimes in physics, statistical minima or maxima may be maintained, as when a light ray travels over the shortest path, or when a reversible system, alter fluctuation or disturbance, returns to an equilibrium. All these things happen without anyone looking out after them. A group of concerned physicists, gathered to guarantee conservation goals, would be confused.

Anticipating conservation in biology, we note that a merely physical object has nothing to conserve. Though conservation takes place during the various events that happen to a rock—being heated by the noonday sun, being eroded by the rains—the rock conserves no identity. It changes without conservation goals. An inert rock exists on its own, making no assertion over the environment and not needing it. When high waters run into a lake, the exit streams shift in flow; the lake level rises and later subsides to its former level. But the lake is conserving nothing.

CONSERVATION IN ORGANISMS

Biological organisms, by contrast, conserve an identity, an anatomy maintained over time by a functioning metabolism. They have a life, whereas physical objects do not. Organisms are self-maintaining systems; they grow and are irritable in response to stimuli. They resist dying. They reproduce. They can be healthy or diseased. They erect a careful, semipermeable boundary between themselves and the rest of nature; they assimilate environmental materials to their own needs. They gain and maintain internal order against the disordering tendencies of external nature. They keep rewinding and recomposing themselves, while inanimate objects ran down, erode, and decompose.

Life is a countercurrent to entropy, an energetic fight uphill in a world that overall moves thermodynamically downhill. Organisms suck order out of their environment; they pump out disorder. In physics entropy is not conserved; it increases. In biology organisms must locally fight this increase: a conservation of negentropy.

The constellation of these life characteristics is nowhere found outside organisms. A crystal reproduces a pattern and may restore a damaged surface; a planetary system maintains an equilibrium; a volcano may grow in countercurrent to entropy. A lenticular altocumulus cloud, formed as a standing wave over a mountain range, is steadily recomposed by input and output of airflow. But any mechanical precursors of life fail to integrate into the pattern that we call an organism. Or perhaps we should say that over evolutionary time they did, and that there emerged something greater than the physical precedents: life. The organism is vitally more than physics or chemistry.

The "genius" of life is coded into genetic sets, which are missing from minerals, volcanoes, clouds. An organism is thus a spontaneous cybernetic system, self-maintaining, sustaining and reproducing itself on the basis of information about how to make a way through the world. Some internal representation is symbolically mediated in the coded "program" held forth, in motion toward the execution of this goal, checking against performance in the world, using some sentient, perceptive, or other responsive capacities through which to compare match and mismatch. The cybernetic controlling program can reckon with vicissitudes, opportunities, and adversities that the world presents.

Causes are pervasive in physics; conservation persists through causal chains. But something more than causes, if (sometimes) less than sentience, is operating within every organism. *Information* is superintending the causes, and without this information the organism would collapse into a sand heap. This information is a modern equivalent of what Aristotle called formal and final causes; it gives the organism a *telos,* "end," a kind of (nonfelt) purpose. All this cargo is carried by the DNA, essentially a set of linguistic molecules. Humans artificially impose an alphabet on ink and paper, but living things long before were employing a natural alphabet, imposing a code on four nucleotide bases strung as cross-links on a double helix. A triplet of bases stands for one of the twenty amino acids, and thus by a serial reading of the DNA, translated by messenger RNA, a long polypeptide chain is synthesized, such that its sequential structure predetermines the bioform into which it will fold. Ever-lengthening chains, logical lines, like ever-longer sentences, are organized into genes, like paragraphs and chapters, and so the story of life is written into the genetic library.

The genetic set is thus really a *prepositional set*—to choose a deliberately provocative term—recalling that the Latin *proposition* is an assertion, a set task, a theme, a plan, a proposal, a project, as well as a cognitive statement. From this it is also a *motivational set,* unlike human written material, since these life motifs are set to drive the movement from genotypic potential to phenotypic expression. No book is self-actualizing. Given a chance, these molecules seek organic self-expression. They project a life way and claim the other as needs may be, an assertive claim. Unlike the physical rock, existing on its own and making no claims on its environment, coyotes must eat. The biological organism must claim the environment as source and sink, from which to abstract energy and materials and into which to excrete them. It "takes advantage" of its environment.

The DNA representing life is thus a *logical set,* not less than a biological set. Coding the logic of a life that is carried on not only at the molecular, genetic level but equally at the native-range, environmental, phenotypic level, organisms by a sort of symbolic logic make these molecular positions and shapes into symbols of life. The novel resourcefulness lies in the epistemic content conserved, developed, and thrown forward to make biological resources out of the physicochemical sources. An open cybernetic system, with an executive steering core, is partly a special kind of cause-and-effect system and partly something more: a historical information system discovering ends so as to make a way through the world, and a system of significances valuing operations, pursuits, resources.

Even stronger still, the genetic set is a *normative set;* it distinguishes between what *is* and what *ought to be.* The organism has a biological obligation thrust upon it. This does not mean that the organism is a moral system, for there are no moral agents in nature apart from persons. But the organism is an axiological system. The

DNA is a set of *conservation molecules.* So the organism grows, reproduces, repairs its wounds, and resists death. The physical state that the organism seeks, idealized as its programmatic form, is a valued state, The living individual, takes as a "point experience" in the interconnecting web of an ecosystem, is per se an intrinsic value. A life is defended for what it is in itself, without necessary further contributory reference—although, given the structure of all ecosystems, such lives invariably do have further contributory reference.

Warblers preserve their own kind; their program is to make more warblers; they consume (and regulate) insects and avoid raptors. They have connections in their ecosystems that go on "over their heads," but what is "in their heads" (and in their genes) is that being a warbler is a good thing. Organisms have their standards, fit into their niche though they must. They promote their own realization, at the same time that they track an environment. They have a technique, know-how. Every organism has a *good-of-its-own;* it defends its kind as a *good kin.* In that sense, to know what a kind is is also to know what a good-of-that-kind is. As soon as one knows what a yellow-rumped warbler is, one knows what a good yellow-rumped warbler is. One knows the biological identity sought and conserved.

Biology can mean two different things. It can refer to the science that humans have produced; this appears in textbooks, in theories of kin selection. Such biology goes on during laboratory exercises and field trips. This is a subjective affair in human heads. Take away humans, and biology, like the other sciences, disappears. Biology can also refer to the life metabolisms that appeared on the earth long before humans. Such biology is an objective affair out there in the world. Take away humans, and this nonhuman biology remains. Biology in the latter sense is primary, and on it biology in the former, secondary sense depends. In the primary sense, biology without conservation is impossible, a contradiction in terms, a condition that can exist in the actual world only temporarily, since it will be self-defeating and selected against. Biology without conservation is death.

Conservation in biology both is and is not a natural law. Conservation is required for survival; but, unlike physics, conservation may fail. The law of life is do or die; that disjunctive law is maintained without fail. But conservation occurs only when a bio-logic drives a will-to-live. Conservation in physics pervades the universe as natural law. Conservation in biology has to defend a local, earth-bound self-organization. This difference introduces alternatives into biology. When humans appear, this further introduces options and moral decisions. What this means for biology in the secondary, humanistic sense is a conclusion toward which we are headed.

CONSERVATION AND ELABORATION IN ECOSYSTEMS

Conservation of Spontaneous Biological Community

The conservation of biological identity within organisms is evident, the first law of life. Turning to the outside environment, however, we may be prone to think that nature conserves nothing. From the skin in, the organism is a model of conservation; all its parts are integrated into a whole with the end of conserving life against threats in the environment. From the skin out, the environment is sheer conflict, with opposing forces pressing to disintegrate the unwary life. Or, the environment is utter indifference; ecosystemic forces are nonbiotic (wind, weather, solar energy, geomorphic processes); ecosystemic materials are inert (rocks, soil particles) or dead and decaying (humus, scat).

By contrast with an organism, we may first say that ecosystems are not cybernetic systems. They involve only stochastic processes—equilibrating systems where one form of life preys on or pushes out another. All the cybernetics lies in the individual organisms; ecosystems are nothing but these organisms locked in contest with each other, placed in a setting of nonbiotic forces. This indifference and hostility of the environment is precisely why organismic conservation can fail.

Yet there is more. Is anything conserved in ecosystems? Unlike organisms, ecosystems have no control center, no genome, no brain, no self-identification. There is no *biological identity* to conserve, yet *biological community* is conserved. In fact, we find in ecosystems not only the conservation of biological processes over long periods of evolutionary time, but their elaboration and diversification. True, an ecosystem is not an organism; it has no tight, centered biological identity. It is not an individual. But, at the other extreme, an ecosystem is not a fortuitous juxtaposition of unrelated organisms. It is a web of interdependent life, with some subsystems and components more closely, others more loosely interrelated. An ecosystem is a selective system in which natural selection results in a sufficient containment for the component species. Mutations that prove beneficial (= of value for life) are selected; species that fit a niche are selected, via selection of individual organisms. All the component individuals fight for their own conservation and for that of their kind, but nothing can win except under the requirement that each winner have a satisfactory fit. Otherwise all lose; individuals die, species remain rare or go extinct.

Ecosystems yield results that go on "over the heads" of any of the component organisms. Ecosystems have no centered cybernetic control, much less do they deliberately conserve anything. Nevertheless there is the generation of an order that arises spontaneously (though systematically and inevitably) when many organic units interact, each projecting its own program. We tend to think that such order will be of low quality because it is uncentered and not purposive, without any single center of experience. But, on the contrary, such older can be of high quality just because, in result, many diverse kinds of things with their widespread skills, biological identities, and evolutionary achievements are integrated into a pluralist community.

A human culture is another example of the spontaneous generation of order, seen when language or markets arise, or when arts and sciences develop to which many performers contribute each by pressing his own career, nobody overseeing the whole. A culture would be quite poor under the tyranny of one mind; it is richer, more diverse, more complex because it integrates 100,000 minds. One person can appreciate only a fraction of the wealth of a culture. Likewise a biological community would be quite poor if restricted to the accomplishments that can be contained in a single natural kind. How much richer is the community with 10,000 species where the system is a cybernetic transformer that interweaves diverse organic achievements.

Perhaps in moving from organisms to ecosystems we have slipped back toward something like conservation in physics. Mass, energy, spin are conserved by blind laws; analogously, natural selection, conserving adapted fitness, is a blind, noncybernetic law of nature. There is nothing organismic about selection; no life is being conserved. The homeostatic forces in an ecosystem—by which, for instance, insect outbreaks are damped out, or by which succession is reset and the forest regenerated after a fire—are stochastic forces not significantly different from the homeostasis that after a flood returns a lake to its former level. The forces of conservation in physics are causal forces, and so also, one may first say, are the forces of conservation in ecosystems.

Yet the matter is not so simple. Natural selection is an odd sort of causation. It posits, first, random mutations. These random variations make a difference only as emplaced in the genetic set of an organism with a survival drive, located in an ecosystem. Natural selection, although nonconscious, is still a force that picks the few out of many options, picks the best adapted for their ecosystems, selects for biofunction. Nowhere in physics or chemistry do we meet a causal or other conservative force of this kind.

Indeed, we now find a natural pressure that favors biofunctional efficiency in community, a positive, prolife force in this respect, however groping, blind, or indifferent it may otherwise seem. There is something extraordinary, from the viewpoints of physics and chemistry, about a causality that operates statistically to select A over B because of increased adaptive fit. Physics talks of conservation in forces and fields, but biology introduces something new: the conservation of fitness in community, keyed to information about how to make a resourceful way through the world. Unlike a warbler, a rock in its environment has neither a fitness nor an ecology there.

When conservation in physics and chemistry is not inevitable (not of mass, energy, spin, etc.), what is maintained is the statistically more likely: stochastic processes that result in minima or maxima that are probable (such as the stablest geomorphic system) in a world constantly tugged toward entropy. Conservation in ecosystems can involve such stochastic elements, but there is more. In the biotic realm, the selection over time is improbable from the viewpoints of chemistry and physics, that is, the rare and less likely mutation but novel and more fit life structure, were random or even physicostatistical factors alone to govern what persists in time. The system selects for life forms that are novel in their diversity and complexity.

The conserving system generates new species, as well as conserving existing ones that remain fit in their environments, and we have nothing like this in physics and chemistry. This process too is statistical; there are fluctuations upward and downward, but it is biostatistical. Nor do we think that biostatistical conservation, because it is statistical, reveals no laws of nature.

Randomness and Evolutionary Development

Ecosystems are the least understood level of biological organization, and evolution at the systemic level is the most incomplete part of evolutionary theory. Unfortunately, biologists have little theory explaining the elaboration and development of life. John Maynard Smith, a principal theorist, says that we need "to put an arrow on evolutionary time" but we get no help from evolutionary theory. "It is in some sense true that evolution has led from the simple to the complex: procaryotes precede eucaryotes, single-celled precede many-celled organisms, taxes and kineses precede complex instinctive or learnt acts. I do not think that biology has at present anything very profound to say about this" (1972:98). "There is nothing in neo-Darwinism which enables us to predict a long-term increase in complexity" (1972:89).

Indeed, a widespread doctrine is that increasing complexity in the process is random. The evolutionary ecosystems that result on the earth, including the humans produced by them, says Stephen Jay Gould, another principal theorist, arc "chance riches" (1980). Everything is "the fragile result of an enormous concatenation of improbabilities, not the predictable product of any definite process" (1983:101-102). Jacques Monod, a Nobel laureate, insists, "Pure chance, absolutely free but blind, [is] at the very root of this stupendous edifice of evolution. . . .The tremendous journey of evolution over the past three billion years or so, the prodigious wealth of structures it has engendered, and the extraordinarily effective telenomic performances of living beings, from bacteria to man . . . [are] the product of an enormous lottery presided over by natural selection, blindly picking the rare winners from among numbers drawn at utter random" (1972:112-113, 138). Humans can value what they have received by chance, but it is hard to see how ecosystemic nature could be conserving or elaborating anything, if the outcome is all by chance.

On the other hand, equally prominent biologists think—in the phrase of Melvin Calvin, another Nobel laureate—that there is some "selectivity intrinsic in the structures" that lures the ascent of life (1975:176). Life is "a logical consequence" of natural principles (1975:169). George Wald, another Nobel laureate, says, "This universe breeds life inevitably" (1974: 9). Manfred Eigen, still another Nobel laureate, concludes "that the evolution of life . . . must be considered an *inevitable* process despite its indeterminate course" (1971:519).

L. v. Salvini-Plawen and Ernst Mayr (1977) claim that sight or photoreceptors have evolved independently at least forty times; that seems evidence of selection for perceptive complexity. It also seems plausible, in at least some lines, that other forms of sentience (hearing, smelling) will be selected for, as will locomotive ability and even intelligence—where these convey survival power. In some niches and up to the point of overspecialization, the more complex will be better able to deal with the shifting vicissitudes of a complex environment.

Even those who doubt any trend toward complexity are forced to concede a trend toward expansion, though often they do not realize that biology has hardly any more theory that explains expansion. Life might have achieved a few simple forms and stagnated. But it did not; G. G. Simpson, a paleontologist, though denying any upward trends and noticing that there are periods of contraction as well as of expansion, concluded that there is in evolution "a tendency for life to expand, to fill in all available spaces in the liveable environments, including those created by the process of that expansion itself. . . . The total number and variety of organisms existing in the world … has shown a tendency to increase markedly during the history of life" (1964:243, 341).

R. H. Whittaker, a founder of ecosystem theory, finds, despite "island" and other local saturations and equilibria, that on continental scales and for most groups "increase of species diversity . .. is a self-augmenting evolutionary process without any evident limit." There is a natural tendency toward increased "species packing" (1972:214). Aldo Leopold, a founder of conservation biology, says, "Science has given us many doubts, but it has given us at least one certainty: the trend of evolution is to elaborate and diversify the biota" (1949:216).

It is certainly true that there is randomness in evolutionary nature. But it is not random that there is diversity. Four billion species (the total number over evolutionary time) do not appear by accident. Rather, randomness is a diversity generator, mixed as this is with principles of the spontaneous generation and conservation of order. Nor is it random that there is advancement. Rather, randomness is an advancement generator, supported as advancement comes to be by trophic pyramids in which lower ways of life are also conserved. We do not wish to cast out the randomness, or the conflict, but we need to recast both in a bigger picture.

Them is a sort of pushup, lockup, ratchet effect that conserves the upstrokes and the outreaches. The accelerations and elaborations are selected for, not in the sense that all life forms are accelerated or elaborated, but in the sense that the later in time, the more accelerated the forms at the top of the trophic pyramids, and the more elaborated the multiple trophic pyramids of the earth. Some groups dead-end in extinction, but most evolve into something else. There are some wayward lines, but, through it all, there is remarkable conservation. Simpson says, "Few, if any, of the broadest and most basic types have ever become extinct. ... All main types represent abilities to follow broadly distinctive ways of life, and the earlier or lower persist along with the later and higher because these latter represent not competitors doing the same sorts of things as their lower ancestors but groups developing distinctively new ways of life" (1964:341).

Biomolecular Conservation and Species Elaboration in a Prolific System

At the molecular level, where the story taking place at the molar level is recorded, the cytochrome *c* molecule has been conserved through its modification from molds, to moths, to humans—over one and one-half billion years. Glycolysis, used in every cell and especially crucial in the blood and the brain, has been preserved since before there was oxygen in the atmosphere. Myoglobin, which evolved before hemoglobin, was both preserved as a separate molecule and transformed and modified into one of the subunits of the hemoglobin molecule. The genetic coding used for synthesizing protein molecules is at least two billion years old, conserved in essentials, modified in details. The three-letter code used now seems to have evolved from a two-letter code, both storing the information by which, in various life forms, billions of different kinds of proteins are keyed.

The difference between a handful of mineral dirt and a handful of humus lies principally in the fact that the humus—containing seeds, spores, pollen, insects, worms, invertebrates, fungi, bacteria—has a billion years of heredity in it, recorded in a trillion bits of information. A handful of mineral dust might be the same on Jupiter or Mars; the handful of humus is bound into the earth's history. It is a handful of biological conservation.

Some will say that none of this biomolecular conservation is assignable to ecosystems; it results from conservation forces inside individual organisms. Ecosystems are epiphenomena that arise when individuals interact, nothing over and above their member parts. Accordingly, conservation takes place only in organisms. Individuals defend only their own kind. What is stored in their genes is information about how to make their particular species of way through their world, nothing more.

Yet events in a community of adaptive fitness transcend any individual and species, because in addition to the conservation, coded at the genetic level and enacted at the phenotypic level, there is an elaboration of kinds in an increasingly richer and mom diverse community. The particular, individual stories recorded in the biomolecular events are substories of a bigger story. Everything is what it is in relation to other things, and the genetic stories are as much of relational roles as of individual integrities. Nature treats individuals with short lifespans. Never long conserved, they are born, hatched, sprouted, die. Even sequoia trees are ephemeral on evolutionary scales. What is longer conserved is really the species, the form of life, instantiated in individuals, transmitted through the genes, kept as long as it fits its environment.

What is still longer conserved is the biological community, in which species come and go, with the community too at length transformed over geological time through species turnover. Species increase *their kind;* but ecosystems increase *kinds,* superposing the latter increase onto the former.

Seen over such spans of time, the biomolecular conservation records this ecosystem elaboration. It is true that mutations taking place at the molecular level provide an innovative principle, the supply side of the novelty. It is equally true that, on the retention side, what gets conserved is tested at the molar level for its fit into niches in an ecosystem. And the whole ecosystem churns incessant, kaleidoscopic novelty.

When conservation Is transformed into elaboration, nature becomes liberal as well as conservative. Nature seems to make as many species as it can, to maximize species: Despite the pressures toward efficiency that constrain each kind, the overall display of kinds is profuse. This conservation and elaboration in ecosystems, like the biology in organisms, takes place prior to and independently of the human presence. The biologist finds these to be objectively satisfactory communities, that is, communities making and maintaining satisfactory places for millions of species. The ethicist, in a subjective judgment matching the objective process, finds such ecosystems to be imposing and satisfactory and wishes to conserve them. What this means for human conservation biology is, again, a conclusion toward which we are headed.

CONSERVATION IN CULTURE

Conservation of Cultural Goals

Humans are a unique species. Humans are in the world *cognitively* at linguistic, deliberative, self-conscious levels equaled by no other animals. Humans are in die world *critically,* as nothing else is. Only humans can consider, reflect upon, be right or wrong about the way they are in the world. Humans are in the world *ethically* as nothing else is. Animals are wholly absorbed into those niches in which they have such satisfactory fitness, but humans can stand apart from the world and consider themselves in relation to it. Humans espouse world views, as can nothing else; they have options in these world views. Humans are only part of the world in biological senses, but they are the only part of the world that can orient themselves with respect to a theory of it. The animal has only its own horizons; humans can have multiple, even global horizons. Animals have a habitat; but humans have a world. Humans are, in this sense, eccentric to the world, standouts in it.

This cognitive, critical, ethical importance in humans is matched by their ecosystemic unimportance. Humans have little biological role in ecosystems—in the sense that were they subtracted from oak-hickory forests, or African savannas, or Asian steppes, those ecosystems would not be negatively affected; rather they would be improved. Humans are not important as predators or prey; from an ecosystemic point of view the early humans played little role in the food chains or in regulating life cycles. They are a late addition to the systems, and their cultural activities (except perhaps for primitive tribes) only degrade the system, if considered biologically and ecologically.

Has this species without a typical role some apical role? What is the standing of those who stand on top? The most important answer is that humans are to develop *cultures;* we are set to that task by the hand and the brain, by the options we have cognitively, critically, ethically. Humans superpose culture on biology. Man is the political animal; he builds a *polis,* a city-state.

A culture too is a cybernetic system and must conserve the information by which it is maintained. In important respects, a culture is more like an ecosystem than an organism; it is decentralized and loose—a community, not an individual. In culture, however, conservation of information is not genetic but neural. Acquired, Lamarckian information can be transmitted. This takes place through the conservation of ideas, sponsored by the brain, coded into its memory circuits, selected because these ideas are in some sense culturally functional or significant. Such information can be stored in agricultural, industrial, political, scientific, artistic, and religious traditions. In literate societies such information can find its way into books.

One thing a culture must preserve is its knowledge and technology in the natural world, because a culture, by definition, rebuilds that environment. A culture cannot persist without a resource base, without resourcefulness, without behaviors toward nature that protect the culture. Humans too must play the survival game; they must capture values in nature. Humans can and ought to conserve their own (worthy) kinds of life.

If the conservation and elaboration of their cultures is the only human role, it follows that conservation goals are merely cultural attitudes, with nothing owed to biological processes beyond. It is perfectly permissible for such goals to maximize the cultures they serve. Indeed, it is pointless to do more, since there are no other values to which conservationists are obligated. True, cultures are responsible beyond themselves to other cultures, so that conservation goals will have to be negotiated interculturally. But such intercultural goals will still be nothing but cultural attitudes, although resulting from multiple cultures. All goals will maximize culture, with nature nothing but an instrument for the maximizing of culture. Goals will defend only the collective human interest.

Moral Fitness and Biological Conservation

What is the standing of those who stand on top? One answer is that one human role is to admire the ecosystems they culminate. They ought to be ideal observers, using the excellent rationality peculiar to their niche so that rationality functions as more than a survival tool for defending their cultural forms of life. Mind forms an intelligible view of the whole and conserves ideals of life in all their forms, with the ecosystemic processes that sustain these biological ideals.

Humans can begin to comprehend what comprehends them; in this lies their paradox and responsibility. Their world views may lead them to resourceful use of or responsible care for other species. Humans can be superior to nonhumans in their resource use, or in their self-actualization or cultural definitions. They can also be superior in loving nonhuman others, perhaps even as themselves. The human capacity for an overview of the whole makes us superior and imposes strange duties, those of transcending human interests and linking them up with those of the community of life on the earth. Humans can see and oversee not just their own, biological, species-specific conservation, with its emergent cultural conservation. They can see and oversee the ecosystemic conservation, diversification, and elaboration. They can admire the global story, the natural history, the biospheric conservation. Therefore, humans have a grander, more comprehensive, more responsible role.

Anything less would stunt humanity because it would not reach genuine human transcendence—a transcending overview caring for the others. Anything less would be nothing but a cultural attitude, since it failed to transcend culture and to understand the biological values, or to count morally the forms of life, that lie beyond culture.

But this requires of humans a new level of fitness. The concept of fitness is initially biological, but it can be extrapolated into morality. Appropriate conduct fits the situations encountered. In both biology and ethics, life demands suitable behavior—right actions. A black-footed ferret's behavior is *right* (or good) in its grasslands niche; a person's conduct is *right* (or good) when he or she conserves the ferret. In a way, this equivocates on terms such *as fit* and *right*. The first use means nonmorally adapted to an ecosystem; the second use counts ethically a species imperiled by human encroachment. Still, granted that animals are not reflective moral agents, the question arises as to what critical, reflective moral agency, when it occurs, contributes to human fitness? Perhaps when humans are moral in their cultural attitudes, this is functionally analogous at a higher level to the nonmoral fitness of animals in habitat. Both are questions about a life form being good-of-its-kind, good-in-its-kind-of-place, about being in a good kind of place, and these add up to the question of well-placed value.

"Every living thing," claimed Bertrand Russell, "is a sort of imperialist, seeking to transform as much of its environment as it can into itself and its seed" (1974:30). Such "self-seeking" is only part of the truth, even in the biological world. Every species, every organism is a sort of maximizer, defending its own program and seeking in reproduction to leave as many copies of itself as it can. Coyotes try to convert as much of the world as they can into coyotes; oak trees would make the forest into nothing but oaks. That is the survival of the fittest. Always replace another kind with one of your own kind—that is what the "selfish" genes say about conservation goals.

Yet that is not the whole picture. Nature has not equipped or inclined any one form to transform very much of the environment into itself and its seed. Each life form is specialized for a niche, limited to its own sector, and so woven into a web that it depends on many other species in a dynamic biomass. Animals with locomotion, especially the specialists, seek their own preferred habitats and avoid others. Plants flourish in some soils, adapted to particular moisture and light conditions, and ill fit others. Recent biology has emphasized not so much aggrandizing conquest as it has adaptedness, habitat fittedness, efficiency. If not checked from within, a species' genetic impulses are checked from without by ecosystemic forces that keep every living thing in community. Would-be imperialists cannot dominate the world; they can gain only situated environmental fitness. Would-be maximizers can be no more than optimizers. What is increased over evolutionary time is not the population of any one kind, but diversity and richness in kinds.

All this is premoral, so what are we to say when, at the top of the ecosystemic pyramid, there emerges *Homo sapiens,* so powerful and unspecialized that, culturally evolving to where humans now are, we can almost transform the earth into ourselves and our seed? Must we, should we, unleash these selfish genes to develop the last acre in our interests? Must we set conservation goals that only defend our cultural attitudes? Should we maximize our natural kind or our kind of culture? Should we capture and fill up all the niches? Always convert a nonhuman into a human, or a human resource, insofar as possible. Or does some other behavior yield a better-adapted environmental fitness?

The answer lies in nature's simultaneously equipping us with a conscience coupled with our power, neither such power nor conscience appearing in nonhuman creatures. Humans are the creatures that have evolved a conscience. This conscience can wisely direct the magnificent, fearful power of the brain and hand. Conscientious human activity ought to be a form of life that both fits and befits, however much it also elaborates and extends, what has previously, premorally been the case. An environmental ethic tries to maximize conscience in order to maximize fitness in the environment.

Taking the global view, humans will maximize not merely themselves and their cultures, but they will couple this with conserving the richness of kinds that has been achieved in ecosystems, conserved over billions of years. Humans ought to be integrated into the world ethically. Were the human species to use its conscience only to defend its own form of life, we should have the paradox that the single moral species would act only in its collective self-interest toward all the rest. There is something morally naive about an anthropocentrism that takes the human reference frame as an arbitrary, yet absolute end and conserves everything else relative to its utility.

Several billion years' worth of creative toil, several million species of teeming life have been handed over to the care of this late-coming species in which culture has flowered and morals have emerged. Ought not those of this sole moral species do something less self-interested than to count all the produce of an evolutionary ecosystem in terms of conservation goals that are merely cultural attitudes? Ought not *Homo sapiens,* if true to their specific epithet, value this host of species as something with a claim to care in its own right? Have we not a biological obligation thrust upon us?

We conclude with a return to biology, this time not as an objective process in the natural world, but as a subjective process in scientists' heads—a cultural process. This subjective side of biology, too, must be a good fit. It can first seem that humans ought to pursue biology in order to exploit nature to build culture. Like other organisms, humans conserve, and ought to conserve, only their own kind. But what kind of biology would this be? A logic of life with no love for life beyond the human scene, no will for the fauna and flora to continue for what they are in themselves? A logic of life insensitive to situated environmental fitness? A logic of life in which only humans count? A logic of life in which the conservation goals are nothing but cultural attitudes?

Nonhumans in their biology can conserve only their own kinds, but humans have a more comprehensive, moral role in their conservation of biological values. Otherwise their biology without conservation is a contradiction in terms, as well as misfit in its environment.

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