

A theology of the Earth

essay by RENE DUBOS
woodcuts by WALTER FERRO

HOW DRAB AND GRAY, unappealing and insignificant, this planet would be without the radiance of life.

The Earth is one of the nine planets in the solar system, third in distance from the sun, fifth in size, and with a radius of less than four thousand miles—a mere speck in space. Judged in these terms, it is a trivial astronomical object, one of the smallest among the celestial bodies that gravitate through the limitless universe. But while the physical measurements worked out by astronomers give a quantitative picture, they do not give a true picture because they do not take biological characteristics into consideration.

The German philosopher Georg Wilhelm Hegel pointed out more than a century ago that *Richtigkeit*, correctness, is not the same thing as *Wahrheit*, the truth. It is correct to define the Earth by quantitative studies, but the more interesting and significant truth about it transcends measurements concerning its size, motions, and place in the cosmos. The Earth is unique in the solar system because it possesses qualities derived from the myriad forms of life it harbors. Being a living organism, it is more varied, more changeable, more unpredictable than inanimate matter, and also more delicate.

The early aviators, flying at relatively low altitudes and low speeds, had the opportunity to discern the bones of the Earth beneath its covering of living flesh. They could recognize that the covering of vegetation is in many places so tenuous as to appear like a little moss in the crevices, which could readily be destroyed. But they realized also that this covering, thin and fragile as it is, creates the green of the forest, the brilliance of flowers, the varieties of blue in atmosphere and ocean, and most remarkably the phosphorescence of human thought.

It was worth the many billions of dollars spent on the manned space program to obtain further evidence that the Earth is unique by virtue of the sensuous appeal it derives from its green and blue mantle, and the intellectual vibration it derives from man. The Apollo missions may not

have yet discovered much of theoretical interest and practical importance concerning outer space, but they have enabled us to see with our own eyes that the surface of the moon is pockmarked, dusty, gray, and drab. The photographs taken from the Mariner spacecrafts have furthermore destroyed any illusion about the existence of Martians and their canals. The soft glow of the moon and the exciting redness of Mars are not attributes inherent in these lifeless bodies but the qualities bestowed on them by human eyes, looking at them through the atmosphere of the Earth. In contrast, the accounts of the astronauts have helped us to experience on a cosmic scale how colorful, warm, inviting, and diversified the Earth is against the bleakness and coldness of outer space. These qualities originate exclusively from the activities of living things.



All ancient civilizations have expressed, each in its own way, wonderment at the beauty of the Earth. Aristotle tried to imagine how men who had spent all their lives under luxurious conditions but in caves would respond when given for the first time the chance to behold sky, clouds, and seas. Surely, he writes, "These men would think that gods exist and that all the marvels of the world are their handicrafts." One of the least attractive aspects of technological civilization is a progressive loss in this concern for the beauty of the Earth. Scientists, as men, have as much natural appreciation for the sensual qualities of the Earth as other men. In their professional capacity, however, they tend to be less charmed by the uniqueness of the planet than by the fact that it moves through space according to the same physical laws that govern other planets. It is not unlikely that this downgrading of the Earth to the level of a minor celestial object has played some part in the devaluation of nature and of human life. And yet the Earth transcended the nature of a mere astronomical object when it began to harbor life, more than three billion years ago. The visual evidence provided

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by space travel now gives larger significance to Aristotle's image. Although the Earth is but a tiny island in the midst of vast reaches of alien space, it derives distinction from being a magic garden occupied by myriads of different living things that have prepared the way for self-reflecting human beings.



When the Earth was formed from the sun about four and a half billion years ago, the atmosphere consisted chiefly of gases, including hydrogen, ammonia, and methane, but no free oxygen; the burning surface was exposed to fierce ultraviolet radiation and had no water. Such an environment was obviously incompatible with the existence of any form of life, let alone human life.

The various other planets of the solar system had at first a structure not unlike that of the Earth. They underwent profound changes with different courses and at different rates, depending upon their relative size and position with regard to the sun. But only on Earth did these changes result in conditions that eventually permitted the emergence of life.

During the first two billion years of the Earth's existence, hydrogen progressively escaped from the atmosphere, carbon dioxide and water were released from the crust through intense volcanic activity; some of the chemical ingredients now present in all living cells were produced by solar radiation acting on the components of the primordial atmosphere. By the end of that period, the oceans had been formed, and sugars, purines, pyrimidines, amino acids, and other organic substances produced from the atmosphere's components by the solar irradiation had begun to accumulate in the surface waters. And then, by unknown processes, self-reproducing protoplasm became organized from these simple organic materials. Life had begun, and from then on living things increased in complexity and diversity through evolutionary processes. Eventually, the Earth's atmosphere came to consist chiefly of nitrogen gas, to which was added the free oxygen released from carbon dioxide by the photosynthetic activities of primitive organisms.

It is probable that for an immense period of time, life could exist only beneath the ocean's surface, where it could be protected against excessive ultraviolet radiation emanating from the sun. As the water was rich in nutrients, one may assume that once life had started, oceans soon teemed with primitive organisms. Progressively, these organisms evolved into more complex forms as the conditions changed. What is certain in any case is that blue-green algae very similar to the ones that exist now have been found in Precambrian deposits that are two billion years old. Such algae have been and remain to this day among the most effective producers of the oxygen that is essential for the existence of animals and men.

Life as we know it has thus emerged and evolved in response to the consecutive occurrence of a multiplicity of different conditions: certain gases escaped from the

primordial atmosphere; they were replaced by a nitrogen-oxygen mixture; liquid water accumulated on the land surface; and a proper temperature range came to prevail. While it is certain that the Earth is the only part of the solar system to have achieved this state of compatibility with life, similar conditions may exist elsewhere in the cosmos. This, however, is a matter for speculation, unsupported by factual knowledge.

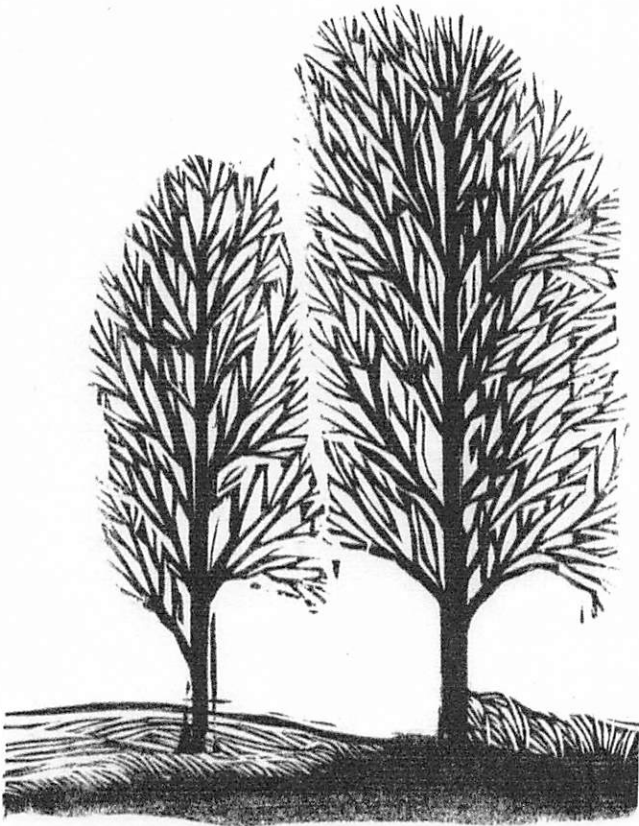
The emergence of life requires such an extraordinary combination of circumstances that it constitutes an event with a very low order of probability—so low indeed that it may have occurred only once. Certain scientists, however, believe that since there may be many planets in other systems which have had an evolutionary development similar to that of the Earth, life must have emerged repeatedly. According to them, "We are not alone" in space. Whether this is true, one must agree with the physicist and theologian William Pollard of Oak Ridge Associated University that there may not be

... another place like the Earth within a thousand light years of us. If so, the Earth with its vistas of breathtaking beauty, its azure seas, beaches, mighty mountains, and soft blanket of forest and steppe is a veritable wonderland in the universe. It is a gem of rare and magic beauty hung in a trackless space filled with lethal radiations and accompanied in its journey by sister planets which are either viciously hot or dreadfully cold, arid, and lifeless chunks of raw rock. Earth is choice, precious, and sacred beyond all comparison or measure.

The adjective "sacred" may be surprising in a description of the characteristics of this planet, and yet it expresses an attitude that has deep roots in the human past and



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still persists. The very fact that the word "desecration" is commonly used to lament the damage men are causing to the environment indicates that many of us have a feeling that the Earth has sanctity, that man's relation to it has a sacred quality.



In common usage, the meaning of the word "nature" is extremely limited. It does not refer to the Earth as shaped by cosmic forces, but almost exclusively to the living forms on which men depend and to the Earth's atmosphere and surface, which are the creations of life. The interdependence between man and the other forms of life is so complete that the word nature usually has biological connotations, even when referring to inanimate substances. In practice, we do not live *on* the planet Earth but *with* the life it harbors and *within* the environment that life creates.

For example, the oxygen we breathe is a product of life. It was first released into the atmosphere in a free form by primitive organisms that lived more than two billion years ago. It is still being produced by most members of the plant kingdom, by the microscopic algae of ocean plankton as well as by the most gigantic trees. Microbes and plants are thus absolutely necessary for the existence of animals and men, not only because they produce food but also because they literally create a breathable atmosphere.

Like the atmosphere, the present surface of the Earth is also a creation of life. Everywhere, under natural conditions, the topsoil is alive with insects, grubs, earthworms, and microbes, which find shelter in it, feed from it, and in so doing transform it chemically and physically. This is true whether the soil supports forests, prairies, tundras,

grasslands, farmlands, gardens, or parks. Organic gardeners have legitimate scientific reasons to claim that earthworms contribute as much as fertilizers to the fertility of the soil. In fact, the microbial forms of life that are invisible to the naked eye are at least as important as earthworms and insects. Every speck of humus contains billions of living microbes belonging to countless different varieties, each specialized in the decomposition and transformation of one or another type of organic debris derived from animals, plants, or other microbes. The expert can often detect the activities of microbes in the soil simply by handling and smelling it when warm and humid weather increases the intensity of microbial life. Surprising as it may seem, soil microbes account for a large percentage of the total mass of the living stuff of the Earth.

Experience shows that under usual conditions the remnants of animals and plants do not accumulate in nature. Very rapidly they are consumed by microbes and thereby taken through a chain of chemical alterations that breaks them down step by step into simpler and simpler compounds. The microbes themselves eventually die, and their bodies are also transformed by microbial action. In this manner the constituents of all living things are returned to nature after death. Reduced to simpler forms, they are available for the creation of new microbial and plant life, which is eventually consumed by animals and men. Microbes thus constitute indispensable links in the chain that binds inanimate matter to life.

The eternal movement from life to dead organic substances, then to microbial bodies, and finally to simple chemical molecules that are converted back into plant and



animal life again, is a physical manifestation of the myth of eternal return. During the late Roman Republic, the Epicurean philosopher Lucretius untiringly reiterated in his poem *De Rerum Natura* (*On the Nature of Things*) that nothing arises except as a result of the death of something else, that nature remains always young and whole in spite of death at work everywhere, and that all living forms are but transient aspects of a permanent substance. It is literally true that all things come from dust and to dust return, but to a dust eternally fertile. Throughout the living world and particularly in the soil, all organisms constantly enact the famous phrase of Lucretius' poem: "Like runners in a race, they hand on the torch of life."

The soil is thus a truly living organism because its chemical composition and its texture at each particular site are constantly regenerated from the primeval rock by the activities of living things. Every site, furthermore, accommodates a multiplicity of different kinds of organisms, each of which occupies a localized, special niche that it modifies to a form even more suitable for its needs. Social bees have an environment that differs from that of solitary bees living in the very same field, in part because the two do not use the same kind of resources, and even more because the social bees create their own microclimate inside the beehive. The soil under an oak forest differs from what would have developed in the same rock forma-

tion under a pine forest, because these two species of trees have different root systems. As pine needles accumulate, furthermore, they produce a surface layer different from the humus into which oak leaves are transformed when they die and decompose. In addition, the quality of light under an oak tree is different from what it is under a pine tree. All living things thus create microenvironments that enrich the diversity of the Earth's surface.

In nature, most changes elicited by the interplay between a particular species of organism and its total environment are in the long run beneficial to both. The changes that result from these reciprocal effects account for the immense diversity of places and living things on Earth. They also explain the exquisite fitness and interdependence between all aspects of creation so commonly encountered in undisturbed environments.

Fitness and interdependence, however, are not static properties. Slowly, but inexorably, all aspects of the Earth are changing, and this requires of living things that they also change in order to maintain their compatibility with environmental conditions. The ability to evolve is therefore an essential attribute of life; evolutionary changes constantly alter the manifestations of fitness and interdependence. These changes, furthermore, progressively result in the production of new forms of life from old forms, thus increasing in a continuous manner the diversity of biological systems and of their activities. Diversity accounts in large part for the self-repairing processes that tend to occur spontaneously when accidents disturb the natural order of things—hence the adaptability and resilience of the living Earth. It accounts also for the adaptability, resilience, and richness of human life.

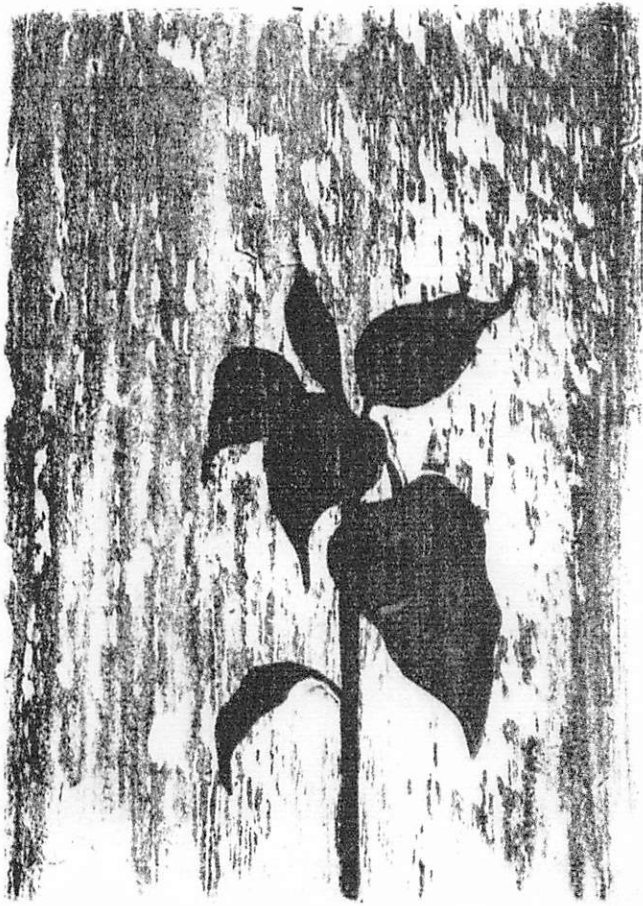


When man emerged in his present biological form during the Stone Age, he must have been fitted for the conditions prevailing around him. Since fitness in the biological sense implies suitable interrelationships between the organism and the total environment, there is scientific justification for claiming, as did the Harvard physiologist L. J. Henderson in *The Fitness of the Environment*, that the environment was ready for man when he appeared on Earth. Half a century earlier, Walt Whitman had concerned himself with a similar problem, but from the point of view of the poet and humanist; for him the "primal sanities" of nature were the qualities of the Earth that make for a rich human life.

Whitman's "primal sanities" and Henderson's "fitness" refer to the conditions under which man evolved and to which his biological constitution is still adapted. But while man's biological nature has remained much the same since the Stone Age, his surroundings and ways of life have changed profoundly. Civilization is often in conflict with "primal sanities" and "fitness," as evidenced by the present ecological crisis. This conflict accounts for the unfortunate fact that the science of human ecology, which should be concerned with all aspects of the relationships between man and the rest of creation, has come to be identified almost exclusively with the problems of disease and alienation resulting from environmental insults. Yet there is much more to human ecology than this one-sided view of the relationships between man and the external world.

Man is still of the Earth, earthy. The Earth is literally





our mother, not only because we depend on her for nurture and shelter but even more because the human species has been shaped by her in the womb of evolution. Each person, furthermore, is conditioned by the stimuli he receives from nature during his own existence.

If men were to colonize the moon or Mars—with abundant supplies of oxygen, water, and food, as well as adequate protection against heat, cold, and radiation—they would not long retain their humanness, because they would be deprived of those stimuli that only Earth can provide. Similarly, we shall progressively lose our humanness even on Earth if we continue to pour filth into the atmosphere, to befoul soil, lakes, and rivers; to disfigure landscapes with junkpiles; to destroy the wild plants and animals that do not contribute to monetary values, and thus to transform the globe into an environment alien to our evolutionary past. The quality of human life is inextricably interwoven with the kinds and variety of stimuli man receives from the Earth and the life it harbors, because human nature is shaped biologically and mentally by external nature.

Admittedly, certain human populations have functioned successfully and developed worthwhile cultures in forbidding environments, such as the frozen tundras or the Sahara. But even the most desolate parts of the Arctic or the Sahara offer a much wider range of sensations than does the moon. Eskimo life derives exciting drama from ice, snow, and water, from spectacular seasonal changes, and from the migration of caribou and other animals. The nomadic Tuareg have to cope with blinding and burning sand, but they also experience the delights of oases. Being

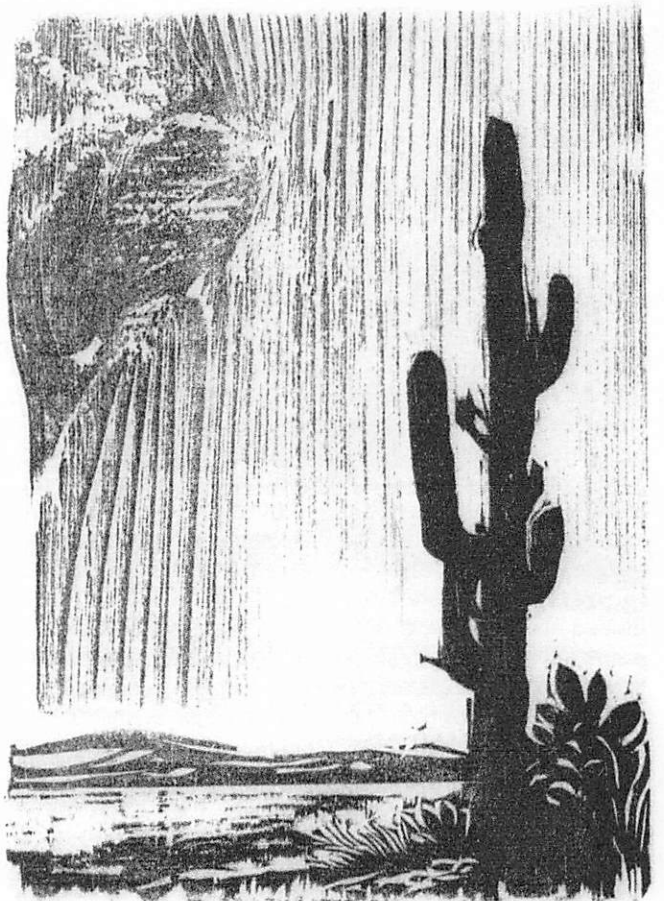
exposed to a variety of environmental stresses and having to function among them is far different from living in a spacesuit or a confining space capsule, however large it may be, in which all aspects of the environment are controlled and extraneous stimuli are almost completely eliminated.

Participation in nature's endless changes provides vital contact with the cosmic forces, which is essential for sanity. In *The Desert Year*, the American drama critic turned naturalist Joseph Wood Krutch pointed out that normal human beings are not likely to fare well in areas lacking visible forms of life. For example, they rarely elect to stay long in the deserts of the American Southwest, as if this kind of scenery, magnificent as it is, were fundamentally alien to mankind.

Wherever, as in this region of wind-eroded stone, living things are no longer common enough or conspicuous enough to seem more than trivial accidents, man feels something like terror . . . This is a country where the inanimate dominates and in which not only man but the very plants themselves seem intruders. We may look at it as we look at the moon, but we feel rejected. It is neither for us nor for our kind.

Men seek contact with other living things probably because our own species has evolved in constant association with them and has retained from the evolutionary past a biological need for this association.

Human nature has been so deeply influenced by the conditions under which it evolved that the mind is in some ways like a mirror of the cosmos. Some of the early Church fathers had a vision of this relationship, as illustrated by Origen's exhortation to man: "Thou art a second world



in miniature, the sun and the moon are within thee, and also the stars." More than a thousand years later, the British biologist Sir Julian Huxley reformulated Origen's thought in modern terms and enlarged it to include his own concepts of psychosocial evolution:

The human type became a microcosm which, through its capacity for self-awareness, was able to incorporate increasing amounts of the macrocosm into itself, to organize them in new and richer ways, and then with their aid to exert new and more powerful influences on the macrocosm.

Sir Julian's statement implies two different but complementary attitudes toward the Earth. The fact that man incorporates part of the universe in his being provides a scientific basis for the feeling of reverence toward the Earth. But the fact that he can act on the external world often makes him behave as if he were foreign to the Earth and her master—an attitude that has become almost universal during the past two centuries.

The phrase "conquest of nature" is certainly one of the most objectionable and misleading expressions of Western languages. It reflects the illusion that all natural forces can be entirely controlled, and it expresses the criminal conceit that nature is to be considered primarily as a source of raw materials and energy for human purposes. This view of man's relationship to nature is philosophically untenable and destructive. A relationship to the Earth based only on its use for economic enrichment is bound to result not only in its degradation but also in the devaluation of human life. This is a perversion that, if not soon corrected, will become a fatal disease of technological societies.



The gods of early man were intimately connected with the Earth, and belief in them generated veneration and respect for it. But respect does not imply a passive attitude; early man obviously manipulated the Earth and used its resources. Primitive religion was always linked with magic, which was an attempt to manage nature and life through the occult influences that were assumed to lurk in the invisible world. There is a fundamental difference between religion and magic. In the words of the Polish-born American anthropologist Bronislaw Malinowski, "Religion refers to the fundamental issues of human life, while magic turns round specific concrete and detailed problems." Our salvation depends upon our ability to create a religion of nature and a substitute for magic suited to the needs and knowledge of modern man.

The problems of poverty, disease, and environmental decay cannot be solved merely by the use of more and more scientific technology. Technological fixes usually turn out to be a jumble of procedures that have unpredictable consequences and are often in conflict with natural forces. Indeed, technological magic is not much better than primitive magic in dealing with the fundamental issues of human existence, and in addition, it is much more destructive. In contrast, better knowledge of man's relationships to the Earth may enable us to be even more protective of the natural world than were our primitive forebears; informed reason is likely to be a better guide for the management of nature than was superstition or fear. We do know scientifically that the part of the Earth on which we live is not dead material but a complex living



organism with which we are interdependent; we also know that we have already used a large percentage of the resources that have accumulated in the course of its past. The supply of natural resources, in fact, presents a situation in which the practical selfish interests of mankind are best served by an ethical attitude.

For most of its geological history, the Earth had no stores of fossil fuels or concentrated mineral ores. These materials, which are the lifeblood of modern technology, accumulated slowly during millions upon millions of years; their supply will not be renewed once they have been exhausted. They must therefore be husbanded with care—for immediate reasons and also for the sake of the future. The natural resources that we now gouge out of the Earth so thoughtlessly and recklessly certainly should not be squandered by a few generations of greedy men.

From the beginning of time and all over the world, man's relationship to nature has transcended the simple direct experience of objective reality. Primitive people are inclined to endow creatures, places, and even objects with mysterious powers; they see gods or goddesses everywhere. Eventually, man came to believe that the appearances of reality were the local or specialized expressions of a universal force; from belief in gods he moved up to belief in God. Both polytheism and monotheism are losing their ancient power in the modern world, and for this reason it is commonly assumed that the present age is irreligious. But we may instead be moving to a higher level of religion. Science is at present evolving from the description of concrete objects and events to the study of relationships as observed in complex systems. We may be about to recapture an experience of harmony, an intimation of the divine, from our scientific knowledge of the processes through which the Earth became prepared for

human life and the mechanisms through which man relates to the universe as a whole. A truly ecological view of the world has religious overtones.



The Earth, as I have said, came to constitute a home suitable for man only after it had become a living organism. The sensuous qualities of its blue atmosphere and green mantle are not inherent in its physical nature; they are the creations of the countless microbes, plants, and animals that it has nurtured and that have transformed its drab inanimate matter into a colorful living substance. Men can exist, function, enjoy the universe, and dream dreams only because the various forms of life have created and continue to maintain the very special environmental conditions that set the Earth apart from other planets and generate its fitness for life—for life in general and for human life in particular.

Man is dependent on other living things and like them must be adapted to his surroundings in order to achieve biological and mental health. Human ecology, however, involves more than interdependence and fitness as these are usually conceived. Human beings are influenced not only by the natural forces of their environment but also and probably even more by the social and psychological surroundings they select or create. Indeed, what they become is largely determined by the quality of their experiences. Henry Beston wrote in *The Outermost House*:

Nature is part of our humanity, and without some awareness and experience of that divine mystery man ceases to be man. When the Pleiades, and the wind in the grass, are no longer a part of the human spirit, a part of very flesh and bone, man becomes, as it were, a kind of cosmic outlaw, having neither the completeness and integrity of the animal nor the birthright of a true humanity.

These words convey one aspect of the ecological attitude that must be cultivated to develop a scientific theology of the Earth.

But there are other aspects, based on the fact that man is rarely a passive witness of natural events. He manipulates the world around him and thus sets in motion forces that shape his environment, his life, and his civilizations. In this sense, man makes himself, and the quality of his achievements reflects his visions and aspirations. Human ecology naturally operates within the laws of nature, but it is always influenced by conscious choices and anticipations of the future.

The relationships that link mankind to other living organisms and to the Earth's physical forces thus pertain to science but also transcend science. They involve a deep sense of engagement with nature and with all processes central to life. They generate a spirit of sacredness and of overriding ecological wisdom which is so universal and timeless that it was incorporated in most ancient cultures. One can recognize the manifestations of this sacredness and wisdom in many archaic myths and ceremonials, in the rites of preclassical Greeks, in Sung landscape paintings, in the agricultural practices of preindustrial peoples. One can read it in Marcus Aurelius' statement that "all living things are interwoven each with the other; the tie is sacred, and nothing, or next to nothing, is alien to ought else." In our time, the philosophical writings of Alfred North Whitehead have reintroduced in a highly intellec-

tualized form the practical and poetical quality of ecological thought.

Human ecology inevitably considers relationships within systems from the point of view of man's privileged place in nature. Placing man at the pinnacle of creation seems at first sight incompatible with orthodox ecological teachings. Professional ecologists, indeed, are prone to resent the disturbing influence of human intervention in natural systems. If properly conceived, however, anthropocentrism is an attitude very different from the crude belief that man is the only value to be considered in managing the world and that the rest of nature can be thoughtlessly sacrificed to his welfare and whims. An enlightened anthropocentrism acknowledges that, in the long run, the world's good always coincides with man's own most meaningful good. Man can manipulate nature to his best interests only if he first loves her for her own sake.

While the living Earth still nurtures and shapes man, he now possesses the power to change it and to determine its fate, thereby determining his own fate. Earth and man are thus two complementary components of a system, which might be called cybernetic, since each shapes the other in a continuous act of creation. The Biblical injunction that man was put in the Garden of Eden "to dress it and to keep it" (Genesis 2:15) is an early warning that we are responsible for our environment. To strive for environmental quality might be considered as an eleventh commandment, concerned of course with the external world, but also encompassing the quality of life. An ethical attitude in the scientific study of nature readily leads to a theology of the Earth. ■

