

THE ADMINISTRATION OF THE UNIVERSE

by Kirtley F. Mather

To the best of my recollection, I first heard this astute rubric from the lips of T. C. Chamberlin during the academic year 1909–10. He was then the senior professor of geology in the University of Chicago, and I was a first-year graduate student in his department. Although in his sixty-seventh year, he was still eight years away from retirement as a member of the faculty. The one formal course of instruction he offered was entitled “Principles of Geology.” In it he discussed whatever geological problem, ranging from the origin of the earth through mountain-making forces to the causes of glacial climates, was currently engaging his research-oriented mind. It was, in fact, a course of study of T. C. Chamberlin, an opportunity to gain insight concerning the workings of his mind, to observe how he communicated his ideas to others, and, most important, to become intimately acquainted with the personality of a great “scholar, teacher, and gentleman,” as his students labeled him. I audited his course that first year in the graduate school, took it for credit the next year, and audited it again in 1914–15, when I returned to Chicago to complete the requirements for the Ph.D. degree, after three years of teaching at the University of Arkansas. Thus, I heard those words drop casually from his lips at least a dozen times, and thus I came at last to some comprehension of their meaning in his vocabulary.

For Chamberlin then, and now for me, “the administration of the universe” is a perfectly valid scientific term. Like many another such term, it is coined to reveal some significant knowledge and conceal a considerable amount of ignorance. It simply affirms that the universe is under some kind of administrative regulation, whatever the administrative power may be. It implies only one thing about the nature of the administration: that it is unitary; “administration,” not “administrations.” Significantly, administration is not spelled with a capital A

Kirtley F. Mather is professor emeritus of geology at Harvard University. This paper is a revision of his “Purpose and Geological Life Development” given at the 1962 summer conference of the Institute on Religion in an Age of Science.

in ordinary usage, nor is there any suggestion that "Administrator" is an appropriate synonym.

I do not know whether T. C. Chamberlin was the first to express this concept in precisely these words, but the general idea thus conveyed in specific terms is of course an ancient one. It is glimpsed in the thinking of the patriarchal sages of the sixth and fifth centuries B.C., who affirmed, as in the first chapter of the Book of Genesis, that the same power that orders the stars in their courses is also responsible for the presence of man on the earth. It resounds in some of the most majestic verses in the Book of Psalms and is essentially the basis for the philosophical perplexities of Job. It is implicit in all of the far-ranging discussions of "natural law," the "laws of nature," and "the order of nature" that have enlivened intelligent discourse throughout many centuries. A universe in which all processes of change operate in accordance with discernible (or potentially discernible) regulations must be subject to some kind of administration.

THE WORLD IS LAWFULLY REGULATED

The evidence that we live in a world of law and order is much more abundantly available to modern man and more authoritatively convincing than ever before. For geologists, the verdict was rendered early in the nineteenth century. In 1795, James Hutton had asserted in his *Theory of the Earth* that in any attempt to explain geological phenomena, "chaos and confusion are not to be introduced into the order of nature." Rather, the processes of change now modifying the earth have been operating uniformly throughout its entire history. Even though changes during the lifetime of any one observer may seem slight, when they continue for long periods of time they are sufficient to explain all that we see. Some of Hutton's contemporaries refused to accept this idea (which seems so reasonable to most of us today), and for a few decades serious controversies persisted between "uniformitarians" and "catastrophists." The truth is, of course, that some of the uniformly operating geologic agents, like the waves and currents of the sea or the rivers and glaciers of the lands, can be observed at work at any time and in many places, whereas others, like the movements in the earth's crust that cause earthquakes or the eruptions of molten rock that produce volcanoes, are spasmodic in time and confined to relatively few localities. Long intervals of quiescence or impotence extend between shorter episodes of sometimes catastrophic violence. And what shall we say about such rare events as the impact of the extraterrestrial body that produced Meteor Crater in Arizona about two thousand years ago?

Although the catastrophists might seem to have a point there, we uniformitarians insist that even impact craters come within the "order of nature."

It was Charles Darwin in 1859 who made it possible for biologists similarly to become "uniformitarians." Since his day, the discovery of the principles of heredity, the genetic code, the laws of metabolism, the regulatory functions of endocrine glands, etc., have made it evident that the biological world is just as truly a world of law and order as is the physical world. The evolution of plants and animals, including for many of them cultural as well as anatomical development, is a creative process operating in accordance with administrative directives amenable to rational analysis.

Research in the broad areas encompassed by the physical and chemical sciences has contributed immeasurably to human efficiency and comfort in recent years. That research is predicated on the proposition that the transformations of matter and energy with which physicists and chemists are concerned take place in accordance with rules and regulations which can be expounded as "laws of nature." One of the most impressive demonstrations that this proposition is valid is found in the "periodic table of the elements" depicted on the charts now on display in almost every secondary school as well as in all colleges and universities the world around. It is a convincing assembly of credible evidence that the physical universe is organized in conformity with administrative regulations.

The order of the elements in the periodic table is not to be confused with the orderly sequence of letters in the alphabet, although the student may be asked to memorize each at different stages in his academic career. The alphabet was arranged for the convenience of men and is a result of enduring custom and continuing agreement. It is man-made, whereas the periodic table was discovered by men. Hydrogen is element number one because the nucleus of a hydrogen atom contains one proton and there is one electron in the space surrounding the nucleus within that atom. Helium is element number two because the helium atom has two protons and two electrons; lithium is number three because its atoms contain three protons and three electrons. And so on through the entire sequence, past uranium, with its ninety-two protons and ninety-two electrons, to the man-produced elements numbered ninety-three to one hundred and two. The numerical arrangement is inherent in the nature of matter, made known by scientific research.

The mathematical elegance of the periodic table becomes even more impressive when the several hundred isotopes of the elements, now

known, are inserted into it. There is evidently some kind of quantitative relation between the number of protons and neutrons in the atomic nucleus and the number of isotopes of the particular element under investigation. The regulations are such as to set definite limits to the variations in "mass number" permissible in nature. Add to all this the exquisite precision with which the atoms are now known to change by radioactive "decay" or by high-energy "bombardment," and the evidence is conclusive: the material universe is regulated by administrative directive.

There is, to be sure, a large factor of random activity or apparent lawlessness in the individual behavior of such subatomic entities as electrons, mesons, and positrons. The Heisenberg principle of uncertainty comes immediately to mind. It is not yet known—and may never be known—whether this is due to an actual absence of any regulation that might determine such behavior or to the inability of the human mind to discover the pertinent regulation, concealed as it might always be by the obscurity inherent in the limitations of sense perception and epistemology. In either event, it would suggest a characteristic of permissiveness pertaining to the congeries of natural laws that generally seem profoundly obdurate. Be that as it may, whenever and wherever the subatomic entities are organized to form atoms, they display meticulous obedience to regulations that are being spelled out with ever-increasing exactness by the physicists and chemists of today.

It is also true that many—perhaps most—of the "laws of nature" are statistical laws governing the behavior of aggregates of many individuals, each of which seems to act at random. The regulations pertaining to gases and those set forth in explaining the principles of genetics are good examples. But statistical laws are no less binding; they, like other rational manifestations of the manifold transformations of matter and energy, tell us much about the nature of the administration of the universe.

Basic in the world-view of modern science and the operational research of many scientists today are the fields of force potential. Best known of these are the gravitational, the geomagnetic, and the electromagnetic fields. The gravitational field is at least a partial answer to the question that Newton left unanswered. The various members of the solar system, for example, appear to be free in empty space; there are no mechanical or material connections between them. How then can each exert a force on the others? Such action at a distance is an essential property of this field, revealing itself as it does in the regulations pertaining to inertia, momentum, and acceleration.

The presence and directives of the geomagnetic field explain the otherwise incomprehensible behavior of the compass needle, one end of which "seeks" the north magnetic pole unless deterred by local magnetic impulses. It too is characterized by action at a distance; an airborne magnetometer operates as uniformly as an earthbound one. Or to go even farther afield, its presence and power account for the trapping of ions in the Van Allen belts around the earth.

Similarly, the electromagnetic field explains other kinds of action at a distance, such as that involved in electrostatic charges, electromotive force, and the organization of electrons in the various "shells" within atoms. Some of the distances are minuscule; others are seemingly infinite. The contemporary concept of this field, for example, goes far toward resolving the ancient paradox concerning the nature of light—whether it is a stream of discrete particles or a sequence of wave motions.

A fourth field of force potential is even now beginning to be recognized. There seems to be a nuclear force field, sovereign within atomic nuclei and responsible for the organization of nucleons to produce ultrafine-scale systems having various degrees of stability, related in part to the complexity of their construction. Doubtless this field will soon be described with greater precision and clarity.

LAWFUL ORDERING OF SYSTEMS OF LIFE

Other fields than these four are almost certain to be discovered in the near future. The recognition of one such appears to be just around the corner. Much significant research is now directed toward the discovery of the processes whereby living cells may have evolved from antecedent inorganic chemical compounds in the sterile environment of the lifeless earth far back in Precambrian time, two or three billion years ago. Macromolecules, similar in composition, form, and structure to certain of the macromolecules essential to the life processes of now-living creatures, have been produced in the laboratory by purely chemical synthesis of inorganic substances catalyzed by electrical discharges. But, as George Gaylord Simpson points out:

If evolution is to occur and organisms are to progress and diversify, still more is necessary. Living things must be capable of acquiring new information, of alteration in their stored information, and of its combination into new but still integrated genetic systems. Indeed it now seems that these processes, summed up as mutation, recombination, and selection, must already be involved in order to get from the stage of loose macromolecules to that of true organisms, or cellular systems. There must be some kind of feedback and encoding leading to increased and diversified adaptation of the nascent organisms

to the available environment. Basically such adaptation is the ability to reproduce and maintain or increase continuous populations of individuals by acquiring, converting, and organizing materials and energy available from existing environments. These processes of adaptation in populations are decidedly different in degree from any involved in the prior inorganic synthesis of macromolecules. They also seem to be different in kind, but that is partly a matter of definition and is also obscured by the fact that they must have arisen gradually on the basis of properties already present in the organic precursors. In any case, something new has definitely been added in these stages of the origin of life.¹

Dr. Simpson goes on to indicate that he does "not mean to say that material causality has been left behind or that some mysterious vitalistic element has been breathed into the evolving systems. All must still be proceeding without violation of physical and chemical principles. Those principles must, however, now be acting in different ways because they are now involved in holistic, organic, increasingly complex, multimolecular systems that transcend simple chemical bonding." It is entirely possible, and it seems to me highly probable, that this "acting in different ways" is the response to the directives inherent in an organic field of force potential, the effects of which become apparent, in comparison with those of the electromagnetic field, only when the "simple chemical bonding" has produced a physico-chemical system of requisite complexity. Such an organic force field would be no more mysterious *au fond* than any of the fields of force potential the presence of which seems to have been firmly established in the physical sciences. Its presence may only be tentatively postulated at present, but as the concepts of field theory spread from the physical sciences into the life sciences, we may expect a reasonably accurate and precise description of it in the near future.

Such a description will presumably go far toward solving one of the obdurate problems inherent in our present knowledge of the process of organic evolution. Geneticists report authoritatively that the mechanisms of heredity—the mutations and recombinations of genes—operate in a seemingly random manner. They guarantee that offspring will be different in greater or lesser degree from their parents, but the differences may be "for better" or "for worse." Yet the record of geologic life development indicates unmistakably that the process of organic evolution produced progressively more capable creatures as it operated in the sequence of time. By what right or virtue has environmental selection decreed that evolution should be progressive? Presumably the directives implicit in the organic field of force potential are such as to account for this remarkable achievement.

This characteristic of causality, thus attributed to the postulated organic force field, is wholly in keeping with the characteristics of the better-known fields of force potential recognized in the physical sciences. They unmistakably display causality, in contrast to the material objects perceived directly by the human senses. The gravitational, electromagnetic, and nuclear fields are also universal, if not infinite. The relatively simple systems of the binary stars are gravitationally controlled in precisely the same manner as the more numerous members of the solar system; the stars in distant galaxies are subject to the same gravitational regulations as those in our Milky Way. The atoms and molecules identified spectroscopically in the most distant stars are identical with those with which we are more familiar in, on, and near the earth. These fields, moreover, are durable, if not eternal. No matter what may have been the detailed origin of stars and solar systems several billion years ago, they must have been operating then as now. If the postulated organic field is demonstrated to be real, it too will presumably display these essential characteristics of the known fields.

All of which brings to mind the cryptic statement of the first-century Jewish scholar, recorded as the first verse of the Gospel according to John in the Christian Bible: "In the beginning was the Word, and the Word was with God, and the Word was God." Many and long have been the discussions among theologians, philosophers, and semanticians concerning the meaning of the Greek *logos*, translated thus as "word." Goethe, for example, suggested in *Faust* three other German words as substitutes for *Wort*, and they have been translated variously as "mind," "power," "force," "deed," and "act." It will therefore not add much more to the confusion if I suggest a rendering of the passage that might be better comprehended by a modern scientist: In the beginning were the fields, and the fields pertained to the administration of the universe; indeed, the fields *were* the administration of the universe.

POSTULATING THE EMERGENCE OF A SPIRITUAL FIELD OF FORCE IN NATURE

But the fields thus far mentioned by no means cover the full range of administrative enterprise. Whatever the directives in the organic field of force potential may prove to be, they must account for the emergence of human nature from the antecedent animal nature of man's progenitors. It is customary nowadays to draw a distinction between the biologic or organic evolution and the cultural or social evolution of mankind. A part of man's cultural evolution may appropriately be designated his spiritual evolution. This involves the qualitative, rather than

the quantitative, aspects of human development, the intrinsically non-measurable factors in the life of man rather than those that are measurable, "values" rather than "objects."

Although much of human nature indicates merely a great difference in degree between man and other creatures, certain features of man's behavioral patterns seem truly to represent significant differences in kind. Men sometimes engage in abstract thinking, such as the construction of a system of non-Euclidean geometry or the postulation of a field of force potential—a kind of conceptual ratiocination in which there is no suggestion that any other creature has ever engaged. Equally distinctive is the awareness of aesthetic values which some men display. No other creature ever pauses on the hilltop to admire the view or looks with ardent appreciation at "the beauty of the sunset or the glory of the dawn." The creation of works of art—paintings, sculpture, music, poetry, architecture, etc.—the intrinsic value of which is dependent on or enhanced by their beauty, is a uniquely distinctive occupation of human beings. Man far transcends his animal cousins in his response to aesthetic inspiration.

Something similar may be said about man's awareness of ethical principles. The moral and ethical standards of modern man, with their codification in ecclesiastical and civil laws, have apparently evolved from the tribal taboos of primitive races and these in turn from the customs or instincts of "territoriality" and "pecking order" implicit in "the law of the jungle." If so, there must be something inherent in the process of natural selection that tends toward this kind of response at various stages of evolutionary development in diverse periods of geologic time and under widely varying environmental conditions. One is reminded of the characteristics of durability, universality, and causality attributed to the well-known fields of force potential.

The awareness of ethical and moral principles, with its concomitant sense of personal responsibility, displayed in the behavior of many human beings certainly differs greatly in degree from that detected in the study of subhuman social groups. It probably also differs in kind. Willingness to lay down one's life, if need be, for an abstract idea or unselfish ideal is on a different level from that on which a creature risks its life to perpetuate the existence of its offspring or its own companions. Man's spiritual aspirations are a part of the broadly inclusive process of organic evolution; they, too, must be accounted for. Have they not emerged also under the aegis of natural selection?

To paraphrase Dr. Simpson's sagacious commentary on the creation of the first living cells from inorganic antecedents in Precambrian time,

something new has definitely been added in the successive stages of the origin and evolution of mankind during late Tertiary and Quaternary time. All must still be proceeding without violation of physical, chemical, and biological principles. Those principles must, however, now be acting in different ways because they are involved in the behavior and aspirations of creatures whose cerebral equipment and psychic potentialities make possible the consciousness of non-material factors in their environment. It is impeccably logical, and it seems to me quite necessary, to infer that this "acting in different ways" is due to the directives in a spiritual field of force potential, analogous to the force fields already identified and like them contributing to the total administrative enterprise.

Like the force fields made known by the physical sciences, this postulated spiritual field would be universal (virtually infinite) and enduring (practically eternal) and would display the attribute of causality. It, too, must be intelligible by reason of its intrinsic consistency and discoverable by means of the responses made to its directives. These responses, however, cannot be measured in terms of space and time; they can be evaluated only in qualitative rather than quantitative terms. Moreover, this field, like the better-known ones, would be bipolar. Analogous to the up or down, out or in, of the gravitational field and the positive or negative of the electromagnetic field is the beautiful or ugly, the ennobling or debasing, the lovely or hateful, the right or wrong, the good or evil, the amity or enmity, of the spiritual field.

THE HARMONY AMONG THE DIFFERENT FORCE FIELDS AND THE TWO SOURCES OF INFORMATION ABOUT THEM

All the fields, generally accepted or tentatively postulated, seem to be operating harmoniously within the framework of space and time. Each is sovereign in its own domain and over its appropriate subjects. Their completely integrated directives are the various aspects of the administration of the law-abiding universe. They constitute the real environment within which mankind must live.²

If this analysis is valid, it follows that the directives of the various fields, made known by observable responses to them, provide trustworthy information concerning the nature of the administration of the universe. Some of the information thus gained pertains to the administrative regulations for the measurable transformations and transactions of matter and energy. This is scientific knowledge; it is "in the public domain"; it may be considered knowledge *about* the administration of the universe. In contrast, some of the information thus gained pertains

to the administrative provisions responsible for the aesthetic and ethical elements in the universe. This is spiritual knowledge; it is "in the private domain"; it may be considered knowledge of the administration of the universe. The distinction is analogous to that between a connoisseur's report concerning a painting, with its description of dimensions, genre, media, and other factual data, and his evaluation of it based fundamentally on his personal response to what he sees.

On both counts, it is clearly evident that the administrative enterprise has been oriented overwhelmingly toward the orderly organization of systems and the integration of systems in supersystems. Electrons, protons, and neutrons are organized to make atoms, many atoms are organized into molecules, some of the molecules are organized as crystals in the rocks of the earth's crust and others are organized to form living cells, some of the cells are organized to produce the multicellular plants and animals, and some of the more complexly structured animals are organized in societies running the gamut from hives of bees and hills of ants to schools of fish, herds of elephants, packs of wolves, prides of lions, troops of chimpanzees, and communities of men. The trend toward orderly organization is universal; it characterizes the directives in each of the fields of force potential; it reveals an essential attribute of the administration of the universe.

The record of geologic life development can at best be only fragmentary, and many pieces of the jigsaw puzzle still await discovery, but enough is now known about it to permit some rational generalizations concerning the way the processes of natural selection have operated under the aegis of the organic field of force potential. Improvements in organic structures and behavior patterns have come as a result of experimentation, with its concomitant trial and error. Available raw materials, no matter how inadequate they might seem in retrospect, are used with exquisite ingenuity to produce remarkable results. (The development of air-breathing amphibians from ancestral "lungfish" is an illustration of this point.) But the results have not always been of the "onward and upward" variety. One-celled protozoans have continued to exist successfully from Precambrian times to the present day; in certain lines of descent—among the arthropods, for example—there has been definite retrogression rather than progress. To put it in biblical terminology, "many are called, but few are chosen."

PERMISSIVENESS IN THE ORDERING OF LIFE AND
CLUES TO PURPOSE

The suggestion of permissiveness in the force potential of the organic field implicit in my use of "directives" rather than "regulations" in

referring to its administrative characteristics is of special significance in any inquiry concerning a possible "purpose of life." Obviously it has been the "purpose" of every species of animal or plant at every place or time to maintain the existence of its kind of life just as long as possible. The achievement of that immediate (local and temporary) goal by the more complexly organized animals involves a learning process or something closely akin to it. The distinctions drawn between instinctive behavior and learned behavior blur toward disappearance when dealing with the responses of intelligent creatures to the directives of the organic and spiritual fields. Learning by experience, with its frequent failures and occasional successes, seems to have played a prominent role in determining the survival of many kinds of life.

But the administrative directive toward orderly organization of increasingly complex systems transcends the urge for survival. The trend of geologic life development has been not only toward creatures with more complicated anatomy and greater awareness of the various constituents of their environment but also toward firmer organizations of individuals in groups composed of many members of the same species. A colony of corals is not a social organization, although coral colonies have existed for at least four hundred fifty million years, from early Paleozoic time to the present. Among them there is no mutual aid in time of adversity or co-ordinated activity in quest of food, no assignment of individuals for specific tasks essential to the welfare of the entire group. In contrast, the organization of societies of individuals, characterized by these behavior patterns, increased in firmness among insects and mammals during the Cenozoic era, which began about seventy million years ago.

Two diverging trends appear in the historical record of social evolution. One is toward a "closed society," such as that found in the social insects, evidence for whose existence dates from nearly a hundred million years ago in the Cretaceous Period. That type of social organization seems to have culminated with certain species of ants, termites, and bees that have persisted practically unchanged since Late Miocene or Early Pliocene time, ten or fifteen million years ago. If mere continuity of existence is the ultimate goal of life, those species have such a start on man that he can never hope to catch up. But I do not think he really wants to. Their perfectly co-ordinated group activity is the result of regimentation: once a worker bee is born, a worker bee it will remain throughout its entire life; once a warrior ant, always a warrior ant. The other trend in social evolution is toward a "free society." Co-ordination of individual activities is a result of co-operation, not of coercion. Each

ZYGON

member of such a society is integrated within its supersystem, not as a cog in a well-meshed, intricate mechanical device, but retaining autonomy, integrity, and freedom to decide whether or not, and how, to participate in contemplated enterprises. This type of orderly social organization is what Abraham Lincoln must have had in mind when he spoke of "government of the people, by the people, and for the people." The historical record of the evolution of *Homo sapiens* and his ancestral lineage over the last several hundred thousand years, including the last few centuries, shows unmistakable progress toward an orderly organization of that kind. This may well prove to be one of the most important elements in the "purpose of life," one of the most significant clues to the nature of the administration of the universe.

Of all terrestrial creatures—the only creatures we know anything about—man is best qualified to proceed further in this direction. He possesses the necessary intellectual equipment and the requisite organs of sense perception; he is becoming increasingly aware of the importance of aesthetic and ethical aspirations in his daily life; his social consciousness is more widely spread and has a deeper hold in modern times than ever before. Thanks to modern science and technology it is now possible to envision an orderly organization of human society embracing all people everywhere, regardless of color, race, or present economic status. All this may well be in accordance with the presumed directives in the postulated organic and spiritual fields and thus be a part of the administrative enterprise. It must not be overlooked, however, that the "model" of the administration of the universe I am presenting here includes a potent element of permissiveness. As I read the record of life development, I deduce that evolution has never guaranteed success to the creatures involved in its processes; it has only offered opportunities for improvement. Like the dinosaurs at the close of Mesozoic time, mankind *could* go out into oblivion.

TASKS FOR THEOLOGY

In such a moment of gloom it is customary to turn to religion for solace, and it is high time that I bring the theologians into my picture. Assuming that some of them might accept this interpretation of the nature of the administration as valid, although necessarily incomplete, there are many questions of a theological nature that should be asked. Most basic, for theologians of every faith, is this one: Is it true that the administrative regulations and directives favor men who "do justly, love mercy, and walk humbly with their God"? For the scientist per se, the last part of that biblical quotation might be translated to read: "and

live in accordance with their highest ideals." His answer would be that, if you are referring to the survival value of that kind of man in comparison with other kinds of men, as you seem to be doing, we simply do not know. The experiment is in process. Perhaps in another thousand years or so, an affirmative or negative answer can be given. But the theologian cannot wait, partly because he is at least as much concerned with the quality of life of men now living as with the longevity of the species. His answer will be based not only on his knowledge *about* the administrative enterprise but also on his knowledge *of* the administrative power. As I have said before, this kind of knowledge is personal, "subjective," not "in the public domain." It leads to faith. That faith, however, must be thoroughly consistent with all that is known *about* the administration of the universe if the theologian wants to share his faith with others, especially so in this time of "widening spread and deepening hold of scientific habits of mind."

Much the same applies to the basic question for the Christian theologian: Are the directives of the administrative fields of force potential such as to justify the statements that Jesus is believed to have made concerning the "Heavenly Father" and his attitude toward men? Scientific knowledge about the nature of the administration of the universe may well be extrapolated to something closely akin to the theologian's "God of law," but what about the "God of love"? Something may be made of the survival value of mutual aid and hearty co-operation that appears along the path of life, especially in the evolutionary trend toward modern man, but the concern must be predominantly with the directives attributed to the spiritual field of force potential. Knowledge *of* this phase of the administrative enterprise is far more significant than knowledge *about* it. Perhaps Jesus had more of that kind of knowledge than anyone else.

NOTES

1. George Gaylord Simpson, "The Non-Prevalence of Humanoids," *Science*, CXLIII (1964), 769-75; also chap. xiii in *This View of Life* (New York: Harcourt, Brace & World, 1964).

2. Cf. F. L. Kunz, "The Reality of the Non-Material," *Main Currents in Modern Thought*, XX (1963), 33-42.