PROCESS AND PURPOSE

TOWARD A PHILOSOPHY OF LIFE

by Kenneth Cauthen

The picture of the cosmos which emerges from the contemporary sciences is that of an evolutionary process, immense in both its temporal and spatial dimensions, which has gradually elaborated itself into billions of galaxies moving away from each other in such a way as to constitute an expanding universe.[1] On one planet circling around a star in one of these galaxies there has evolved a wide variety of living forms issuing at one level in the emergence of man, a self-conscious being who asks questions about the origin, meaning, and destiny of his existence and of all existence. This system of which we are a minute part has been described by some scientists as beginning in an explosion between ten and fifteen billion years ago and is pictured as apparently headed toward an ultimate "heat death." However, no one knows now, and men may never know, the truth about ultimate beginnings or endings. Indeed, it is impossible to know whether there are unknowable realities which are associated with that part of the total process with which we are involved at this moment.[2] All we can do is reason on the basis of whatever sampling of the process we can make, given the limitations of our particular knowing apparatus.

Nevertheless, we can say that we stand in need of some principles sufficient to account for the fact that from some primordial "stuff" there has emerged over vast periods of time that hierarchy of beings and processes now in evidence. What is really going on in our midst that is responsible for bringing into existence this complex world in which we have awakened? What powers are at work, and what purposes, if any, are there which can account for this cosmic progression from hydrogen to *Homo sapiens*? Three interlocking and overlapping phases may be distinguished: cosmic evolution, the development of matter from the "beginning" until the emergence of the first living

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thing; biological evolution, dealing with the story of life from its earliest and its primitive forms to man; and cultural evolution, the elaboration of the distinctive human sphere of history and culture. These three form a pyramid, with the human realm or homosphere at the top but blending into the whole realm of living beings or the biosphere (Teilhard de Chardin), which in turn merges into the primordial and universal background of inorganic nature as a whole, the cosmosphere.[3] This pyramid in which what is ontologically superior develops temporally later constitutes the sample of reality available to us on our planet. From it we must get whatever clues there are to the nature of the whole in which we exist. That there has been an evolutionary process which has progressed from atom to Adam seems to be scientifically the fact, although the mechanisms of this development are not fully known. The metaphysical and theological interpretation of this scientific picture is the difficult but crucial task which must be attempted.

In order that the reader be aware of the case that is being made, the thesis of the article may be stated at the beginning.[4] The world that science presents for our belief is purposeful and full of meaning. Scientific knowledge and metaphysical intuition can best be synthesized if the cosmos is regarded as a value-creating system of structured processes capable of self-transcendence. This statement combines and holds as equally important an axiological and an ontological principle. Put together, these two principles indicate that the world is made up of, or at least contains, societies and series of events whose inner meaning is the drive toward the realization of experienced good. These processes in their objective manifestation are analyzable into mutually supporting activities and patterns interconnected in such a way as to constitute a unitary whole.

There is, in short, a drive in things, a creativity at the base of the evolutionary process which produces the new, the different, and, occasionally, the better. That there has been an advance in the universe in these billions of years in the movement from simple hydrogen to complex *Homo sapiens* seems obvious. This creativity is characteristic of the cosmos as a whole and is at work in the cells and societies which make it up. Advance is measured objectively or externally by increasing complexity of structure which makes possible novel functions, and subjectively or internally by increasing capacity for satisfaction felt in the presence of good being achieved. Let it be said at once that it is not necessary or even possible to say that the purpose of the universe has been to produce man, as though there were some predetermined goal

working itself out. However, it can be said that man is the highest, most advanced product of evolution because the organization of his body and brain is such that he is capable of more complex and intense enjoyments than any other creature known to us. He alone apparently is self-conscious in such a way as to raise the question of the meaning of his existence and to celebrate and symbolize in word and deed the awareness that it is good to be.

Reality in this view is a dynamic social process,[5] a unity of a plurality of cells and societies. Concrete actuality consists of events best understood as units (or at least potential units) of experiencing. This in turn implies that there is an inner and an outer aspect to these events which, though constituting one reality, can be viewed in two ways. Viewed from within, the cosmos is a value-creating system, a complex of aims at the enjoyment of being. Viewed from without, the world is a system of structured processes. Permeating the whole and its parts is the creative drive toward novel and advanced forms of achievement. The key category in this perspective is organism (Whitehead)[6] or life (Tillich).[7] Organism expresses the dynamic unity of a whole consisting of mutually interacting and supporting parts characteristic of a living, purposive being. Life stresses activity and the drive toward fulfilment. As Tillich uses the term, life suggests the movement toward attainment, the achievement of victory in spite of obstacles. In its most general sense, it refers to "the process in which potential being becomes actual being."[8] In every case, "life" is a term which stands in a dialectical relationship with its opposite, death. I shall use the terms "organism" or "life" interchangeably to describe a basic category which provides what may be the most useful clue available to the nature of the evolutionary process.

There are four fundamental interlocking and overlapping characteristics of life which should be noted: (1) self-creation or development, the drive toward realization of the potentiality of a given organism attained by appropriating relevant aspects of the environment into a structure which serves its own ends; (2) self-preservation, the activities of the organism which protect against threatened destruction; (3) self-transcendence, the drive beyond any present state of the organism to create and perpetuate the actuality or improve the quality of the living organism (the development and preservation of life from moment to moment, reproduction, mutation, and the elaboration of a novel form, etc.);[9] and (4) self-enjoyment, the satisfaction internally felt to accompany the fulfilment of the aims of the organism to create, preserve, and transcend itself. It will be noted that in every case death follows life and

is its constant threat. The definitions given above arise immediately out of an examination of life as it is given in those living organisms studied by the biological sciences. However, the suggestion that is being put forward tentatively is that the dialectic between life and death and the four characteristics of life, when appropriately expanded and qualified, apply to every finite organism.

It will be noted that Tillich, like Whitehead and Teilhard de Chardin, believes in the interconnectedness of things and speaks of "the principle of the multidimensional unity of life."[10] This means that self-transcendence applies to some degree to all life. However, as one moves from the dimension of the inorganic to the dimension of the organic, and finally to the dimension of man and history, it is evident that the more profound forms of self-transcendence become increasingly applicable. My own view would be that non-organic entities, such as stones and typewriters, are capable of only mere persistence or mere change. Self-transcendence in this sense becomes trivial. However, beyond that, all organic events beginning with the primordial space-time matrix itself as it elaborates itself into organized energy in the emerging hierarchical forms of life illustrate in increasingly complex ways the reality of self-transcendence. Only the emergence of man's body and brain and his function as spirit giving rise to forms of morality, culture, and religion exemplify the fullest extent of the total range of meanings attributed here to the concept. The basic meaning taken from the middle range of organic beings is set forth succinctly in these words of Tillich: "The dynamic character of being implies the tendency of everything to transcend itself and to create new forms."[11] Given this primary understanding, the concept of self-transcendence can be modified to apply appropriately in a descending fashion to animals, plants, and so on, to the basic physical stuff from which all else proceeds. Likewise, it can be expanded to apply appropriately to man with respect to his transcendence of sub-human nature by virtue of his spiritual capacities. So conceived, the concept is fundamental for the understanding of the dynamic, creative nature of life and of the nisus toward new forms of order underlying the fact of emergent evolution. The world is made up of structured processes. The inner reality of these structured processes is life. Life, by nature, is self-transcending, although every new push forward is characterized by ambiguity and threatened by death.

Put so briefly and abstractly, such a view must of necessity lack all the qualifications which a complete analysis would require. Four issues are of such significance that brief comment is essential.

1. The second law of thermodynamics, even if true of the system to which we belong, does not contradict the affirmation that the cosmos is a value-creating process. At most, it confirms the generalization that life always stands in a dialectical relationship with death. Moreover, it may be that we live in a pulsating universe in which a new epoch of cosmic life may emerge from and beyond the death of the present one.[12] In any case, whether or not the universe is temporally or otherwise finite, there is now going on a process in which life and the experience of value are real.

2. There is no intent to deny the reality of evil, pain, discord, conflict, and suffering in the world. All is not harmony, unity, and fulfilment. The drive toward creation, preservation, and transcendence is frequently frustrated. Evil may be defined as any impairment of the proper functioning of the value-creating system of structured processes which leads to the fulfilment of organisms. The possibility of evil is unavoidable, given the nature of finite being, since the processes which produce enjoyment can be disrupted. The very conditions which produce good when fulfilled are those which produce evil when not properly met. There is no way, under these circumstances, to have good without having the possibility of evil. There are many varieties of evil,[13] but basically it is an accompaniment of the plurality and relative autonomy of the series and societies of occurrences composing the world. The accidental or deliberate destructive interaction of some chain of events with the life processes and value-seeking activities of organisms is to be expected.

3. There are some non-teleological events and some non-organic beings in the world, and the interaction between the teleological processes of organisms and the purely mechanical functioning of mere things is highly complex.

4. There are some entities characterized by sheer externality or objective thereness; that is, they have no internal life or subjective aspect. Examples are any machine or man-made object and gross collections of parts which have no organic unity, such as a stone, a mountain, a pile of sand, or an exploding volcano. The relations between such objects are purely mechanical and external, even though these gross objects may be composed of organisms. One consequence of this analysis is the recognition that the interpretation of organic teleology in terms of cybernetics is inadequate, even though there may be parallels between the mechanisms involved in self-correcting, "goal-directed" machines and those found in organisms.[14]

A Metaphysics Informed by Science

With this brief account before us, attention must now be given to the methods and sources which yielded this account of a purposeful cosmos activated as a whole and in its parts by a nisus toward self-transcendence. The claim made earlier was that this view of the world consisted of a synthesis of scientific knowledge and metaphysical intuition. A more precise statement would be that the perspective being defended here is the expression of a metaphysical intuition which correlates an understanding of the scientific picture of the world with insights derived from an analysis of the duality of human existence with its external bodily aspect and its internal mental aspect. In combination, this yields a view of the world as being made up of, or at least containing, acts of experiencing which have an objective manifestation as structured processes and a subjective dimension in terms of an experience of satisfaction accompanying the fulfilment of the life functions of self-creation, self-preservation, and self-transcendence. Life or organism, then, becomes the "root metaphor" (Pepper) or perspectival intuition which provides the fundamental clue to the understanding of what is concretely real.

The methodological principle here is that scientific knowledge involves an abstraction from the total concrete reality of events. To be more specific, science yields a perspective on the observable processes of the world but provides no direct insight into the inner experiences of organisms. Whitehead expresses this point as follows:

> Science can find no individual enjoyment in nature: Science can find no aim in nature: Science can find no creativity in nature; it finds mere rules of succession. These negations are true of Natural Science. They are inherent in its methodology. The reason for this blindness of Physical Science lies in the fact that such Science only deals with half the evidence provided by human experience.[15]

The eminent biologist Sewall Wright shares this view of the nature of scientific knowledge. He writes:

> Science deliberately accepts a rigorous limitation of its activities to the description of the external aspect of events. In carrying out this program, the scientist should not, however, deceive himself or others into thinking that he is giving an account of all of reality. The unique inner creative aspect of every event escapes him.[16]

This recognition of this limitation of the perspective which science is able to provide leads to the affirmation that scientific knowledge needs to be correlated with insights derived from the human experience of

what it is to be. Our own inner awareness is evidence that there is more to us than bodily behavior and observable structures. An adequate metaphysical vision must take into account both the inner and the outer aspects of our own existence. Moreover, if *Homo sapiens* is the most advanced creation of the cosmic process, it seems reasonable to look at man's own being for the most profound clues to the nature of the whole of reality.

As Ian Barbour has pointed out,[17] there are striking resemblances between Whitehead and Teilhard de Chardin at many of these points. Consciousness in man is directly intuited and cannot be denied. Teilhard believes that all reality is interconnected in such a way that there is a continuity which runs through the whole evolutionary process, although he recognizes that there are critical points marking the difference between matter, life, and thought. By analogy, then, we must assume that the duality between body and mind which we know directly in ourselves runs throughout nature.

> This is enough to ensure that, in one degree or another, this "interior" should obtrude itself as existing everywhere in nature from all time. Since the stuff of the universe has an inner aspect at one point in itself, there is necessarily a *double aspect* to *its structure,* that is to say in every region of space and time —in the same way, for instance, as it is granular: *coextensive with their Without, there is a Within to things.*[18]

I am convinced by the lines of reasoning followed by Whitehead and by Teilhard and am prepared to affirm that the one reality of organic events has both an outer structure which can be studied scientifically and an inner psychic reality which can only be experienced directly from the inside. When followed through, this leads to a form of panpsychicism which asserts that the duality between the inner and the outer, the within and the without, which we experience directly as being true of ourselves is characteristic of the whole range of organisms from the lowest to the highest.

Since the concept of satisfaction becomes so vague as we approach the lower limits of the animal spectrum and becomes humanly incomprehensible below the level of biologically defined life, there are strong and compelling reasons for admitting that it may well be that below a certain point inner experience simply does not exist. We cannot know for sure, but it may be that a certain complexity of organization is required for even the minimal amount of internal awareness to be possible. There may be a discontinuity between biological life and nonliving matter corresponding to the disjunction between the human capacity for self-consciousness, rational thought, and symbolic com-

munication and the capabilities of the higher animals. In this case, we could speak only of a potentiality for inner experience below primitive forms of animal existence. This is the position taken by Tillich:

> Here again, the distinction of the potential from the actual provides the solution: potentially, self-awareness is present in every dimension; actually, it can appear only under the dimension of animal being. The attempt to pursue self-awareness back into the vegetable dimension can be neither rejected nor accepted, since it can in no way be verified, whether by intuitive participation or by reflexive analogy to expressions similar to those man finds in himself. Under these circumstances, it seems wiser to restrict the assumption of inner awareness to those realms in which it can be made highly probable, at least in terms of analogy, and emotionally certain in terms of participation—most obviously in the higher animals.[19]

In the light of these considerations, the question of the lower limits of the capacity for awareness must be left open.

Whatever be the situation with regard to inner awareness, there are some senses in which it is useful, even necessary, to employ the category of life in an analogical fashion right on down into the primordial matrix of space-time itself, despite the vagueness which attaches itself to any such attempt. This is certainly true of the widest meaning of life as the process by which the potential becomes actual. Moreover, it seems to be the case that space-time is characterized by an inherent, incessant activity which, by successive enfoldment or pleating, gradually elaborates itself into knots of matter or organized energy. There appears to be a nisus toward self-transcendence at the very base of physical reality, as disclosed by present-day physics. Thus, I find tremendous intuitive suggestiveness in Samuel Alexander's statement that "time is the mind of space."[20] The supposition that, at the primordial level, time is to space what, at the human level, mind is to body is at best obscure and must be regarded in a highly analogical way. Nevertheless, it is a way of providing a principle of unity which can be correlated with our own human experience of what it is to be. Moreover, this affirmation offers insight into what seems to be the observed fact that from the primordial matrix of space-time there has emerged a hierarchy of valuing, experiencing beings whose own duality at the level of biological life may provide a clue to the nature of all reality.

Let us turn now to a consideration of the axiological principle that the cosmos is a value-creating process. The most satisfying explanations are in terms of value and purpose, and the category of life provides a self-justifying interpretation of existence. As Whitehead has argued,

> . . . a dead nature can give no reasons. All ultimate reasons are in terms of aim at value. A dead nature aims at nothing. It is the essence of life that it exists for its own sake, as the intrinsic reaping of value.[21]

> At the base of our existence is the sense of worth. . . . It is the sense of existence for its own sake, of existence which is its own justification, of existence with its own character.[22]

The point is that, if existence is life, then no further justification is needed other than to say it is good to be. The cosmos, then, is value-creating insofar as it creates life, which includes the capacity to enjoy the fact of being. An organism aims at value in terms of creating, preserving, perpetuating, and transcending itself, and the fulfilment of these aims, at least at the higher levels, is felt as satisfaction.

It is a basic intuition of human experience that it is good to be. Wherever we can observe life, this intuition seems to be confirmed. In short, the basic claim being made here is that to speak of the universe as purposive is to refer to its value-creating function of giving rise to life, which is an end in itself in that it is good to be an organism capable of enjoying existence.

While it cannot be claimed that the contemporary scientific picture demands the vision of reality adumbrated above, the assertion is being made that it can be sustained by present-day scientific knowledge. The remainder of the paper will attempt to test this view in a more direct encounter with the empirical sciences. Particular attenton will be devoted to the philosophical implications of physics and the understanding of evolution which informs biology.

The Unity and Genesis of the Cosmos

The overarching principle of present-day physics[23] seems to be that space, time, matter, and energy are not independent elements but are defined and exist in terms of each other. Together they make up one complex continuum. Within this field the parts affect the whole, and the whole affects the parts. Hence, one must speak of a total system of mutually interdependent factors. Space and time are no longer regarded as absolutes existing prior to and functioning as homogeneous containers of matter in motion. Rather, they are seen as one interdependent matrix or space-time whole, an unbroken web made up of systems of interrelated activities. Matter is not conceived of as tiny bits of impenetrable stuff moving in space but as a series of events in which any given unit or mass is resolvable into nothing other than subordinate chains of activity. There are, then, no "things moving" but only occurrences, that is, particular organizations of energy into determinate patterns. Moreover, matter is not, strictly speaking, a set of happenings within space but, rather, is constituted by a local contortion or condensation or pleating of a region of space. What we must think of is a series of interdependent, interrelated systems of vibratory activity,

that is, events constituted by and constituting distortions of the space-time continuum. The physical world is a unified field of activities, a whole made up of mutually interacting systems and subsystems of pulsating energy. In this conception, events require both a minimum of time and a minimum of space; that is, "there is no nature at an instant."[24] Moreover, the nature of the physical world is such that it is permeated by a dynamic tendency toward complexification or enfoldment upon itself in ways which progressively give rise to more complicated forms of organization—atoms, molecules, stars, galaxies, planets, living organisms, and man. Finally, the cosmos seems to curve back upon itself so as to constitute a finite but unbounded, self-contained whole which is expanding. However, this expansion apparently cannot be thought of as a movement into some kind of pre-existing emptiness but only as a modification in the curvature or world lines of the space-time continuum. This is obviously a conception which cannot be pictured in terms of three-dimensional Euclidian space. The expanding, closed universe has no center and no boundary but has complex geometrical properties such that any "straight" line moving in any direction will eventually return to its point of origin. As far as our knowledge goes, one cannot speak of anything beyond or in addition to this one complete, self-contained space-time, mass-energy continuum.

Put here ever so briefly and abstractly is the view of the physical world which seems to be the outcome of the discoveries and theories of present-day physics. What is of most interest here are the philosophical implications of this vision. While there is great controversy in this respect and while much remains to be learned, particularly with respect to the ultimate layers of matter and the origin and end of things,[25] it would appear to be the case that a metaphysical view which intends to connect its conclusions with the findings of contemporary physics must at least stress two basic features of the physical world: its organic-unitary nature and its dynamic-creative character. By the first is meant that there is indeed a *uni*verse, a unity in diversity, a whole consisting of mutually interacting parts.[26] This appears to be the case whether one looks at the entire space-time, matter-energy continuum or at the world of atomic events. Of particular importance in this latter connection are the remarkable implications of the Pauli exclusion principle, which states that in a given atom no two electrons can be in identical states.[27] This principle introduces a law of social behavior into physics which points to the interdependence of the whole and its parts. This is only one example which could be multiplied indefinitely in other respects. What this seems to mean is that science today requires a holistic

metaphysics which emphasizes the total organic unity of the world as well as the reality of its constituent parts.[28] Moreover, a logic of internal relations is called for, which rules out mere atomic facts and independent propositions. Wholeness, unity, and organic structure are as much a part of reality as plurality, individuality, and diversity.

The dynamic-creative character of the world is equally important. Here we refer to the importance of time, process, development, the emergence of novel forms and functions, and the thrust of the universe toward higher levels of actuality. Whether one looks at the principle of indeterminacy in quantum mechanics, or examines the inherent features of space-time itself, or takes note of the facts of cosmic and biological evolution,[29] it seems necessary to speak of potentiality,[30] of becoming,[31] of the principle of creative advance as a basic characteristic of nature. There appears to be a nisus in the cosmos which is at work at every level of organization, which accounts for the differentiation of primordial space-time into the elaborate hierarchy of activities which make up the evolving universe.[32] Thus, not only does contemporary science seem to require a philosophy which views the world as being constituted by a complex unity of structured processes, it also appears to demand the notion of a pattern of events capable of self-transcendence.[33] No metaphysics is adequate which does not allow for and offer some explanation of the fact of emergence, that is, the appearance in time of more advanced levels of being and value.

Biological Evolution

The next step is to show that such a vision is relevant to the interpretation of the evolutionary process as seen by contemporary biology. That evolution has been a basic category in biology since the time of Darwin cannot be gainsaid. Indeed, the theory that present forms of life have emerged from other, more primitive forms and that life itself emerged from non-living matter is the overarching principle which provides the context for all biological interpretation. The present-day understanding of the mechanisms of evolution involve in essence a combination of Mendelian genetics with a revised conception of Darwinian natural selection, augmented by the recent discovery of DNA and RNA as the physiochemical basis of life and reproduction.[34] The prevailing neo-Darwinian or synthetic view of evolution is summarized by Ernst Mayr as follows:

> What do we mean by twentieth century Darwinism and what do we mean by the synthetic theory of evolution? I think its essence can be characterized by two postulates: (1) that all the events that lead to the production of new

genotypes, such as mutation, recombination and fertilization, are essentially random and not in any way whatsoever finalistic, and (2) that the order in the organic world manifested in the numerous adaptations of organisms to the physical and biotic environment, is due to the ordering effect of natural selection.[35]

Michael Polanyi puts it even more succinctly, suggesting that neo-Darwinism "regards evolution as the sum total of successive accidental hereditary changes which have offered reproductive advantage to their bearers."[36]

While there are obviously many other factors which enter into contemporary evolutionary theory, the essential content has to do with the way in which hereditary variations, the adaptive behavior of organisms, and environment are related to each other in such a way as to determine which genetic types will have long-term differential reproductive success. Waddington's summary would doubtless find much support among contemporary biologists:

It remains true to say that we know of no other way than random mutation by which new hereditary variation comes into being, nor any process other than natural selection by which the hereditary constitution of a population changes from one generation to the next. But if one confines oneself to the remark that the basic processes of evolution are not finalistic, this, while true, can no longer be regarded as adequate. The non-finalistic mechanisms interact with each other in such a way that they form a mechanism which has some quasi-finalistic properties, akin to those of a target-following gunsight.[37]

What I wish to argue is that, however necessary, accurate, and complete within the limits of its own methodology the prevailing scientific interpretation of evolution may be, there is something fundamentally inadequate about it as a total account of what is actually going on. It may well be that apparent purpose may be all that can be affirmed by scientific procedures. I am not competent to judge the validity of neo-Darwinism as a scientific theory and do not wish in principle to set forth any thesis not in conformity with the best available scientific knowledge. However, I have maintained that scientific method yields only a partial perspective on reality in that it necessarily involves an abstraction from the total concrete actuality. As stated before, science can provide us with a theoretical system which interprets processes as observed externally but does not yield any direct insight into the inner reality of organic events. Since I have affirmed that there is a within, as well as a without, of things, I believe that scientific explanations of evolution require supplementation in ways described earlier.

Two consequences of this methodological principle need to be

examined at this point as a way of introducing my own basic view of evolutionary emergence. The first concerns the relationship between teleological and mechanistic modes of reasoning in biology, while the second concerns the role of chance in the evolutionary process. There is a sense in which teleological explanation is valid even within a rigorous view of scientific method. Ernest Nagel, to take only one example, has made this clear. If teleological interpretation means "to focus attention on . . . the contribution of parts of a system to its maintenance," to "view the operations of things from the perspective of certain related wholes to which the things belong," and to deal "with properties of parts of such wholes only in so far as these properties are relevant to some complex features or activities assumed as characteristic of those wholes,"[38] then Nagel agrees that such modes of interpretation exist on a par with non-teleological explanations. Or, as Barbour puts it, if we regard mechanistic reasoning as referring to causes and teleological reasoning as referring to goals, then there can be no doubt of the validity of each and of their compatibility.[39] Certainly goal-directed behavior and the contribution of parts to organized wholes in living organisms require teleological interpretations in this restricted sense. However, in the widest application, this kind of teleological reasoning could apply to self-adjusting machines or cybernetic servo-mechanisms. While recognizing the limited validity of this wider usage, I wish to insist that, in organic beings to which the metaphysical concept of life is applicable, as I have defined it, there is an inner aspect which is not found in man-made machines. I refer to the experience of enjoyment in the presence of the fulfilment of the organic functions of self-creation, self-preservation, and self-transcendence. The structures and functions of organisms do exhibit activities in which parts of a whole are so organized as to achieve ends integral to the total system. Such goal-directed activities are purposive or teleological. However, I wish to insist also on the inner experience of value which to some degree must be thought characteristic (at least potentially) of all organic entities.

The role of chance in bringing together the required combination of physiochemical elements necessary for the emergence and evolution of life has been hotly debated. It would certainly appear to be clear now that if by chance one means a purely random collocation of atoms with no integrating factors at work anywhere, then the emergence of life is so unlikely that the statistics of probability become positively forbidding.[40] However, it is argued by many contemporary biochemists and biologists that there are anti-chance factors at work which cumulatively

operate to make the improbable probable. It is urged that there are laws governing the stability of chemical combinations which led to the origin of life[41] and that the combination of chance variation and natural selection is integrative in such a way as to give direction to evolution and to assure that, given enough time, the right combination of material ingredients could occur in such a way as to produce highly complex and adaptive organisms. All this is said to occur entirely apart from any special teleological principles or agencies operating either externally or internally.[42] This may well be the case,[43] and I am content to leave this problem in the hands of the experts to determine what must be affirmed within the limits of scientific methods of observation, analysis, and generalization. However, regardless of the scientifically knowable mechanisms which have been at work in the production, reproduction, and evolution of life, and regardless of the way in which chance and anti-chance factors are related to each other, one still has to account for the fact that reality is of such a nature that certain chemical combinations actually give rise to and constitute living beings. In short, while the prevailing synthetic theory of evolution may or may not be sufficient to account for the outer manifestations of the evolution of living organisms, I wish to insist that there is also an inner meaning to what is observed which must be included.

What is required is a way of accounting for the actual observed facts of emergence, namely, that from (biologically) non-living matter there has come (biological) life and that from lower forms of animal existence there arose man with his unique structure, functions, and capacities. Three subsidiary questions are involved: (1) What is the nature of life itself, set before us as a given in a multiplicity of forms from the amoeba to man? (2) How can we account for the fact that a living organism ever came into being? (3) Given the fact of biological life, how do we explain the upward trend of evolution which finally, in one line of its development, produced a human being? My own way of providing an answer to these questions is already implicit in what has already been said and needs only to be spelled out. An appropriate way of accomplishing this is to compare two evaluations made of contemporary scientific thinking about evolution. Errol Harris has written as follows:

> To account for life, therefore, we need, in addition to known physio-chemical laws, "some different principle," some sort of "radial energy," some nisus to order and wholeness which can transcend thermodynamics. Whatever this principle turns out to be, it is not necessarily confined to life—the evidence is rather to the contrary. . . . And this only strengthens the case for presuming the existence of a positive, constructive, ordering nisus in nature, and weakens

the hypothesis that in the sphere of life all phenomena can be explained in terms of random shuffling and natural selection.[44]

In sharp contrast, G. G. Simpson has said of his own understanding of the synthetic theory of evolution:

It casts no light on the ultimate mystery—the origin of the universe and the source of the laws or physical properties of matter, energy, space, and time. Nevertheless, once these properties are given, the theory demonstrates that the whole evolution of life could well have ensued, and probably did ensue, automatically, as a natural consequence of the immanent laws and successive configurations of the material cosmos.[45]

Now while my own philosophical commitments predispose me to agree that even the qualifications which Simpson and others introduce as counteracting factors to sheer randomicity still leave something to be desired, I am willing to leave that part of Harris' claim to the experts to settle, however much I otherwise agree with him philosophically. Rather, I propose to take Simpson's own statement that, given our universe and the laws and properties of matter, energy, space, and time, evolution would follow automatically. One can only say that this is a rather large "given" which, in effect, begs our whole question of whether purpose in the evolutionary process is only apparent or whether it is real. What is required is some thesis about the character of the material cosmos in which biological life and human existence have actually emerged. I wish only to refer to the proposal I have already made and to show its relevance to the question at issue.

The Unity of Cosmos and Life

The metaphysical conception of life developed above grows out of a scientific understanding of living organisms as intricately organized systems of mutually sustaining activities oriented toward the fulfilment of the total potentialities of the given system. Organisms are dynamic wholes made up of parts internally related to each other and to the total unit to which they belong in such a way as to carry out the functions of developing, preserving, and perpetuating the entire organized system, thus actualizing its potentialities. Biological life is a self-organizing, self-regulating, self-perpetuating system of purposive activities.[46] Moreover, the whole span of evolutionary development discloses major trends toward increasing complexity of organization which make possible a widening range of functions, culminating at one point in the emergence of man as a self-conscious center of goal-seeking and value-enjoying activity. What I have been suggesting is that the category of life so understood is applicable not only to entities defined biologically

as living organisms but that it provides a clue to the inner nature and reality of the primordial matrix of space-time itself and to every successive level of organized activity and to every structured process which emerges in cosmic and biological evolution. Life takes many forms and appears at many levels of organization. But the organic-unitary, dynamic-creative character earlier attributed to the physical universe would seem to hold true of the processes and structures of reality at every level and is descriptive both of the cosmos as a whole and of the subordinate organic systems which compose it. The world externally examined may look like a vast cybernetic machine with intricate, interlocking parts which gives only the appearance of purposiveness in its operation, but I am suggesting that in its inner meaning and reality, it is better thought of as having the character of life—organic-unitary, dynamic-creative, goal seeking, and value producing.[47]

Thus, in the strictest sense, we should not speak of life emerging from non-living matter but of life developing and taking on new forms of organization[48] as the primordial continuum of matter-energy, space-time by its own inner drive elaborates from within itself ever expanding actualities and potentialities of being and value. When seen in this way the statements of Harris and Simpson quoted above can be reconciled and in fact merge together. There is, I believe, as Harris contends, "a positive, constructive, ordering nisus in nature" to which the category of life provides the clue. Simpson may be correct that, once the laws and properties of matter, energy, space, and time are given, the evolution of life "could well have ensued, and probably did ensue, automatically, as a natural consequence of the immanent laws and successive configurations of the material cosmos," *if*, as I believe, but Simpson does not, the innermost nature of the primordial physical matrix has at least the incipient character of life.[49]

To put it even more succinctly, I am taking as a basic presupposition that human existence epitomizes the inner and outer nature of events and that man's emergence is simply the unfolding, development, and consummation of potentialities, powers, processes, and purposes built into the very structure of reality at its primordial base in the space-time continuum itself. Hence, there are continuities of structure running right through the whole of the cosmos. There are also basic discontinuities which an appropriate analysis can spell out which do constitute levels of emergence. Life is obviously not the same thing for an atom, for an amoeba, for a honeybee, for a dog, for a chimpanzee, and for a man. Self-transcendence takes on unique dimensions in man in the form of self-conscious rational spirit. But I am insisting that, while

these levels of emergence must be marked off, there are continuities running up and down the whole scale of being. The cosmosphere, the biosphere, and the homosphere do point to major points of breakthrough in evolutionary development, but every attempt to make precise lines of separation runs into difficulties. Midnight and noonday are clearly different, but the limits of twilight and dawn are hard to pin down.[50] In short, though there is a hierarchy of being, I am maintaining that each level interlocks with all the rest in highly complex ways and that life as it is known in man gives us the most illuminating clue for the understanding of what is basic in the cosmos itself.

It has already been noted that life at every stage of development and in every form is threatened by disruption. Life as the possibility for the experience of value stands always in a dialectical relationship with death. Its emergence, development, and fulfilment require a constant constellation of favorable environmental situations, and the limits within which the self-maintaining, self-adaptive, goal-seeking activities of the organism can make proper adjustive responses are narrow. The life needs of different organisms, species, individuals, and societies conflict with each other. Moreover, the environmental conditions which determine the success or failure of organisms arise from relatively autonomous lines of causation which seem blind from the point of view of emerging, struggling living beings.[51] Thus, the world exhibits a large number of non-teleological, merely mechanical and external, interactions, many of which result in pain and death for organisms.

It may be helpful to set this picture within a larger context. The cosmos as a whole seems to be characterized by two divergent trends. On the one hand, the available energy of the physical world apparently is gradually wasting away. The cosmic system to which we belong has, for some billions of years, been expending a vast fund of energy which was derived we know not how or from where and which moves toward greater disorder, dissipation, and finally "heat death." On the other hand, a countertrend is in evidence which moves toward greater complexity, order, and achievement. The rush of the physical world toward death of available energy gives rise under certain conditions to life. What we get, then, is a vision of the groping struggle of some creative factor within the world which has yielded only a limited success. Hence, all around us we see suffering, failure, conflict, frustration, pain, and death. But we also see joy, triumph, harmony, satisfaction, pleasure—life growing, and reproducing, and evolving into ever higher levels of realization. Life, even in its higher forms, has only a precarious foothold in existence. Its occurrence seems to be quite rare in

the total cosmos. Nevertheless, it did appear, and its emergence brings with it the capacity for the experience of value. Having recognized the enormity of natural evil, one can only contend that the joy and triumph of life are worth the risk of the pain and suffering which are inevitable accompaniments of its creation. Wherever living beings appear, their unending struggle to survive and to achieve the fulfilment of their potentialities seems to confirm the deep and abiding human intuition that it is good to be.

Conclusion

To summarize briefly, I have argued that the cosmos may be said to be purposeful insofar as it potentially and actually gives rise to experiencing subjects who can enjoy the fact of being. The fundamental foundation of the interpretation of the world offered here is the direct, immediate awareness in experience that life is intrinsically worthwhile. From that basic perspective, an effort has been made to frame a comprehensive vision of the cosmos which incorporates what is known about the world by scientific methods of inquiry into a metaphysical vision in which life becomes the central category. The tentative, speculative, and experimental nature of any such attempt is evident to the briefest critical reflection. Nevertheless, the assumption is that every generation must seek a vision of the nature of things as a whole as the overarching framework within which the basic decisions about meaning, morality, and motivation in human affairs are made. I believe that the vision of the unity of process and purpose suggested in this paper provides the foundation of a philosophy of life which is both credible and relevant in the light of the contemporary sciences.

NOTES

1. See Milton K. Munitz (ed.), *Theories of the Universe* (New York: Free Press, 1957), pp. 271–432.
2. See Stanley L. Jaki, *The Relevance of Physics* (Chicago: University of Chicago Press, 1966), pp. 173–87.
3. This is a common distinction between matter, life, and humanity made, among others, by Paul Tillich and Julian Huxley. For the former, see *Systematic Theology* (Chicago: University of Chicago Press, 1963), III, 15–21. For the latter, see *Evolution in Action* (New York: New American Library, 1957), pp. 9–14.
4. It will become evident that the point of view developed in this chapter is heavily dependent on the thought of Alfred North Whitehead, although I do not claim merely to be reproducing his views. The connections of my thought with that of Paul Tillich and Teilhard de Chardin are also quite apparent.
5. Cf. Charles Hartshorne, *Reality as Social Process* (Glencoe, Ill.: Free Press, 1953).
6. A. N. Whitehead, *Process and Reality* (New York: Macmillan Co., 1929; reprinted as a Harper Torchbook, 1960).
7. Tillich, *op. cit.*, III, 11–110.

8. *Ibid.*, I, 241.

9. See Tillich, who, instead of self-creation, self-preservation, and self-transcendence, speaks of self-creation, self-integration, and self-transcendence (*ibid.*, III, 30–32). Cf. also Huxley, who speaks of self-transformation by way of referring to evolutionary advance (*op. cit.*, pp. 10 ff.). For Whitehead, the three basic characteristics of life are self-enjoyment, creative activity, and aim (see *Modes of Thought* [New York: Macmillan Co., 1938; reprinted as a Capricorn paperback, 1958], pp. 205–8).

10. Tillich, *op. cit.*, III, 11–30.

11. *Ibid.*, I, 181.

12. See Isaac Asimov, "Over the Edge of the Universe," *Harper's Magazine* (March, 1967), pp. 97–106, for a review of the latest cosmological theories.

13. I speak in this connection largely of organic or physical evil. In addition, there is moral evil or sin and mental or psychological evil (anxiety, meaninglessness, despair, etc.)

14. Cf. Ian Barbour, *Issues in Science and Religion* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1966), pp. 337–47; and F. S. C. Northrop in his Introduction to Werner Heisenberg, *Physics and Philosophy* (New York: Harper & Bros., 1958), pp. 19–20.

15. Whitehead, *Modes of Thought*, p. 211. My indebtedness to this whole book, especially Part III, "Nature and Life," is obvious.

16. S. Wright, quoted in L. C. Birch, *Nature and God* (London: SCM Press, 1965), p. 49. Birch himself agrees with this statement and refers to Teilhard de Chardin and Charles Hartshorne as holding similar views. Cf. also E. W. Sinnott, *Cell and Psyche* (Chapel Hill: University of North Carolina Press, 1950; reprinted as a Harper Torchbook, 1961), pp. 48 ff.; J. W. N. Sullivan, *The Limitations of Science* (New York: Viking Press, 1933; reprinted by New American Library, 1949), chap. vi; and Hans Jonas, *The Phenomenon of Life* (New York: Harper & Row, 1966). Last but not least, see Charles Hartshorne, *The Logic of Perfection* (La Salle, Ill.: Open Court Publishing Co., 1962), pp. 191–233; *Beyond Humanism* (Chicago: Willett, Clark & Co., 1937), pp. 165–210.

17. I. Barbour, "Five Ways of Reading Teilhard" (an unpublished paper given to me by the author).

18. Teilhard de Chardin, *The Phenomenon of Man* (New York: Harper & Bros., 1959; reprinted as a Harper Torchbook, 1961), p. 56.

19. Tillich, *op. cit.*, III, 20–21.

20. S. Alexander, *Space, Time, and Deity* (New York: Macmillan Co., 1920), II, 44. For a sympathetic treatment of this theme in Alexander, see Errol E. Harris, *The Foundations of Metaphysics in Science* (New York: Humanities Press, 1965), pp. 64–84. For a full exposition and evaluation, critical but appreciative, see A. P. Stiernotte, *God and Space-Time* (New York: Philosophical Library, 1954).

21. Whitehead, *Modes of Thought*, p. 184.

22. *Ibid.*, p. 149.

23. See Whitehead, *Science and the Modern World* (New York: Macmillan Co., 1925); Milic Capek, *The Philosophical Impact of Contemporary Physics* (Princeton, N.J.: D. Van Nostrand Co., 1961), pp. 141–399; Harris, *op. cit.*, pp. 37–159; for a brief account, see Barbour, *Issues in Science and Religion*, pp. 273–316. Further references can be found in all of these books; and, in addition, see the bibliography in John Dillenberger, *Protestant Thought and Natural Science* (Garden City, N.Y.: Doubleday & Co., 1960), pp. 296–300. See also R. G. Collingwood, *The Idea of Nature* (Oxford: Oxford University Press, 1945; reprinted as a Galaxy paperback, 1960), pp. 9–27, 142–77.

24. Whitehead, *Modes of Thought*, p. 200. Part III of this book (pp. 173–201), contains an excellent discussion of modern physics and of the philosophy it requires.

25. Cf. Jaki, *op. cit.*, pp. 141–235. See also Adolf Grünbaum, *Philosophical Problems of Space and Time* (New York: Alfred A. Knopf, Inc., 1963), a book which

makes clear how unsettled and complicated are the philosophical issues associated with space and time. It is not even indisputably clear that the notion of absolute space has finally been eliminated (pp. 418–24).

26. See Whitehead, *Process and Reality;* Harris, *op. cit.*, pp. 142–59.

27. Barbour, *op. cit.*, pp. 294–98. See Henry Margenau, *The Nature of Physical Reality* (New York: McGraw-Hill Book Co., 1950), pp. 442–46.

28. Cf. J. C. Smuts, *Holism and Evolution* (New York: Macmillan Co., 1926).

29. See Harlow Shapley, *Of Stars and Men* (Boston: Beacon Press, 1958); W. H. Thorpe, *Biology and the Nature of Man* (London: Oxford University Press, 1962), pp. 1–19.

30. See Heisenberg, *op. cit.*, especially the Introduction by Northrop (pp. 1–26).

31. Capek, *op. cit.*, pp. 361–99.

32. Alexander, *op. cit.* The influence of Alexander on my thought is apparent at many points.

33. Great caution must be exercised at this point not to overstate the philosophical implications of the new physics. It would be going much too far to suggest that the contemporary view of the physical world is "spiritual," proves "free-will," and requires only "purposive" or "organismic" models of reality. While every view of physical reality assumed in physics has metaphysical connotations, the actual philosophical capital that can be gained from physical science is relatively small. The mistake of previous centuries was to take the deliverances of the physicists and the chemists as literal accounts of concrete reality. It has been argued in this study that scientific theories, particularly in physics, involve a high degree of abstraction and must be correlated with insights about the nature of reality as a whole derived from other approaches and finally from the human experience of being. Despite these qualifications, however, it does seem necessary to say that present-day physics does have important though limited implications for metaphysics, although physics can never be the basic source of a vision of the whole of concrete reality. Philipp Frank has offered some wise observations on the tendency of philosophers and theologians to distort physics for the sake of some personal viewpoint. See his *Philosophy of Science* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1957), pp. 232–59. Cf. Dillenberger, *op. cit.*, pp. 269–92; Barbour, *Issues in Science and Religion,* pp. 283–316; and Jaki, *op. cit.*, pp. 330–70. See Northrop, *loc. cit.*, for an excellent discussion of the status of causality in contemporary physics. Cf. Rudolf Carnap, *Philosophical Foundations of Physics* (New York: Basic Books, 1966), pp. 277–92; Frank, *op. cit.*, pp. 260–96, 342–48; and Louis de Broglie, *The Revolution in Physics* (New York: Noonday Press, 1953), pp. 216–17. There is, of course, great controversy with respect to what indeterminacy in quantum mechanics does or does not imply for larger wholes where, presumably, statistical laws reduce the limits within which alternative outcomes are possible. Is indeterminacy relevant to the discussion of mutation, free will, and biological and cosmic evolution? The experts are divided. Suffice it to say that the reality of creativity in nature and freedom in man do not stand or fall with indeterminancy, although indeterminacy at the atomic level may be involved. For balanced statements, see Jaki, *op. cit.*, pp. 360–65; and Barbour, *Issues in Science and Religion,* pp. 305–14. Cf. Hartshorne, *The Logic of Perfection,* pp. 166–70; and J. C. Eccles, *The Neurophysical Basis of Mind* (Oxford: Clarendon Press, 1953), pp. 271–79.

34. Standard accounts of contemporary evolutionary theory can be found in Julian Huxley, *Evolution: The Modern Synthesis* (New York: Harper & Bros., 1942); George Gaylord Simpson, *The Meaning of Evolution* (New Haven, Conn.: Yale University Press, 1949); Theodosius Dobzhansky, *Mankind Evolving* (New Haven, Conn.: Yale University Press, 1962); C. H. Waddington, *The Nature of Life* (New York: Atheneum Press, 1962); Simpson, *This View of Life* (New York: Harcourt, Brace & World, 1964; reprinted as a Harbinger paperback).

35. Quoted in Waddington, *op. cit.*, p. 85.

36. Michael Polanyi, *Personal Knowledge* (Chicago: University of Chicago Press, 1958), p. 382.

37. Waddington, *op. cit.*, p. 98.

38. Ernest Nagel, "Teleological Explanations and Teleological Systems," in Herbert Feigl and May Brodbeck (eds.), *Readings in the Philosophy of Science* (New York: Appleton-Century-Crofts, Inc., 1953), p. 553. Cf. Harris, *op. cit.*, pp. 259–78.

39. Barbour, *Issues in Science and Religion*, pp. 337–47, 359.

40. See Jaki, *op. cit.*, pp. 317–24; H. Blum, *Time's Arrow and Evolution* (Princeton, N.J.: Princeton University Press, 1955); Harris, *op. cit.*, pp. 163–278. Huxley and Simpson agree that pure chance alone, without any other factors involved, could not have produced life and its subsequent elaboration into the scene before us today. For Huxley, see *Evolution in Action*, pp. 33–53; for Simpson, see *This View of Life*, pp. 71–84, 190–212.

41. See A. I. Oparin, *Origin of Life* (New York: Macmillan Co., 1938; reprinted as a Dover paperback, 1953); George Wald, "The Origin of Life," *Scientific American* (August, 1954); George Wald, "The Origins of Life," *Proceedings of the National Academy of Sciences* (August, 1964).

42. This is the view taken by Huxley and Simpson in the works listed in the preceding footnotes.

43. However, I am impressed with the objections to the prevailing biological opinions of the neo-Darwinists put forward by such thinkers as A. N. Whitehead, *The Function of Reason* (Princeton, N.J.: Princeton University Press, 1929; reprinted as a Beacon Press paperback), pp. 3–34; Polanyi, *op. cit.*, pp. 381–405; Harris, *op. cit.*, pp. 163–378; Jaki, *op. cit.*, pp. 314–29; and Birch, *op. cit.*, pp. 50–80.

44. Harris, *op. cit.*, p. 225.

45. Simpson, *This View of Life*, p. 21.

46. This account of biological life indicates my congeniality with the organismic biologists, such as Sinnott, W. E. Agar, *A Contribution to the Theory of the Living Organism* (Melbourne: Melbourne University Press, 1943); E. S. Russell, *The Directiveness of Organic Activities* (Cambridge: Cambridge University Press, 1945); Sewall Wright, "Gene and Organism," *American Naturalist*, Vol. LXXXVII (1953). See Barbour, *Issues in Science and Religion*, pp. 337–44.

47. Cf. Birch's chapter, "The Universe: A Machine or a Birth?" pp. 13–34, in his book *Nature and God*. I find myself in close agreement with the philosophy and theology expressed in this little volume. See also, Charles Hartshorne, *Man's Vision of God* (Chicago: Willett, Clark & Co., 1941), pp. 174–211.

48. In his Introduction to Oparin, *op. cit.*, p. vii, Sergius Morgulis writes, "The biologist, unlike the layman, knows no lines of demarcation separating plant life from animal life, nor for that matter living from non-living material, because such differentiations are purely conceptual and do not correspond to reality."

49. Simpson would doubtless return my compliment by insisting that it is I who beg the question and not himself. In referring to Sinnott, Simpson quotes with approval Huxley's statement with respect to Bergson that to ascribe evolution to an *elan vital* is like explaining the movement of a locomotive by an *elan locomotif*. Simpson apparently holds that every effort to attribute the forward and upward tendency of evolution to some non-mechanistic factor is guilty of this fallacy. Now this is certainly the case, *if* living beings are indeed mechanisms, like a locomotive, and nothing else. If a locomotive is the model, then his view follows. But that is just the issue under debate. Obviously, each of us feels that the other would have no problems, if the other in each case would adopt the philosophy of the first. Until locomotives start deciding by themselves to which station they will go, we may at least keep the question open. See *This View of Life*, pp. 198–200, 219–23. Cf. Huxley, *Evolution: The Modern Synthesis*, pp. 457–66.

What Huxley and Simpson fear and detest are interpretations based on a priori, "mystical," "metaphysical," etc., assumptions which preclude or stultify scientific explanations and which are not productive of testable hypotheses. This is a legitimate concern for any scientist to have. It should be clear by now that the perspective offered here does not undercut or offer a substitute for rigorous scientific inquiry; rather, it calls for more and better empirical investigation. However, problems do arise over the question as to the limits and legitimacy of mechanism as offering an adequate view of the total concrete reality of organisms and of the upward trends of evolution. At this point, philosophical questions enter which cannot be answered by science alone, although the findings of science are highly relevant to and indispensable for the solution of the problem.

50. See Thorpe, *op. cit.*, p. 89: "To sum up, it seems to me that over recent decades biology has been adducing most impressive new evidence for the unity of the cosmos."

51. The assumption here is that the world is made up of a plurality of entities and events and that there are relatively independent lines of causation which produce conditions and results which are random with respect to each other. Thus, sometimes conflict and destruction result. For example, a cyclone arising from a certain constellation of meteorological circumstances blows away houses, nests, etc., in which people, birds, etc., may be living. Sudden changes in environmental conditions surpassing the range of possible adaptation for certain organisms result in their deaths.