BIOLOGY AND A THEOLOGY OF EVOLUTION

by Arthur Peacocke

Abstract. The challenge and stimulus to theology that is constituted by the scientific version of Genesis which will prevail for the foreseeable future is expounded in relation to the significance of the succeeding stages of the life process and to the general features of biological evolution. A responsive theology of evolution is discerned as involving a renewal of insights associated with the themes of immanence, panentheism, the Wisdom and Word of God, and a sacramental universe. Such a revitalized theology allows one to conceive of humanity and Jesus the Christ in a fully evolutionary perspective without loss of an emphasis on the particularity of the Incarnation.

Keywords: Burgess shale; causality; chance and law; complexity; death; emergence; evolution; extraterrestrial life; humanity; immanence; Jesus the Christ; monism; natural selection; origin of life; pain; panentheism; propensities; rationality; sacramental universe; suffering; trends in evolution; Wisdom of God; Word of God.

PROLOGUE

I want to begin with a story. It recounts a dazzling vista which we are the first generation of human beings to have vouchsafed to us. It might be called "Genesis for the Third Millennium." It is as follows:

Arthur Peacocke was Director of the Ian Ramsey Centre, University of Oxford, from 1985 to 1988 and from 1995 until October 1999. His present mailing address is Exeter College, Oxford OX1 3DP, England; his e-mail address is arthur.peacocke@theology.oxford.ac.uk. This text is broadly that of lectures given at Calvin College, Grand Rapids, Michigan, on 16 April 1999, and at the University of Exeter, England, on 22 May 1999, under the title "The Challenge and Stimulus of Biology to Theology." It is a shorter version of a longer work to be published as "The Challenge and Stimulus of Evolution to Theology" in a volume of papers from a Templeton Foundation Consultation on *Many Worlds: The New Universe and Its Implications for Theology*, held at Nassau, Bahamas, 22–24 November 1998, and to be published by the Templeton Foundation Press (ed. Steven J. Dick).

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There was God. And God was All-That-Was. God's Love overflowed, and God said: "Let Other be. And let it have the capacity to become what it might be, making it make itself. And let it explore its potentialities."

And there was Other in God, a field of energy, vibrating energy—but no matter, space, time, or form. Obeying its given laws and with one intensely hot surge of energy—a hot big bang—this Other exploded as the Universe from a point 12 (or so) billion years ago in our time, thereby making space.

Swirling fundamental matter appeared, expanded and expanded, and cooled into clouds of gas, bathed in radiant light. Still the Universe went on expanding and condensing into swirling whirlpools of matter and light—a billion galaxies.

Five billion years ago, one star in one galaxy—our Sun—attracted round it matter as planets. One of them was our Earth. On Earth, the assembly of atoms and the temperature became just right to allow water and solid rock to form continents, and mountains grew. And in some deep wet crevice, or pool, or deep in the sea, just over 3 billion years ago, some molecules became large and complex enough to make copies of themselves and became the first specks of life.

Life multiplied in the seas, diversifying and becoming more and more complex. Five hundred million years ago, creatures with solid skeletons, the vertebrates, appeared. On land, green plants changed the atmosphere by making oxygen. Then 300 million years ago, certain fish learned to crawl from the sea and live on the edge of land, breathing that oxygen from the air.

Now life burst into many forms—reptiles, mammals (and dinosaurs) on land, reptiles and birds in the air. Over millions of years the mammals began to develop complex brains which enabled them to learn. Among these were creatures that lived in trees. From these *our* first ancestors derived, and then, 40 thousand years ago, the first men and women appeared. They began to know about themselves and what they were doing; they were not only conscious but also self-conscious. The first word, the first laugh was heard. The first paintings were made. The first sense of a destiny beyond, with the first signs of hope—for they buried their dead with ritual. The first prayers were made to the One who made All-That-Is and All-That-Is-Becoming. The first experiences of goodness, beauty, and truth—but also of their opposites, for human beings were free.

Introduction

That is what some have called the epic of evolution. Whatever we call it, it is a thought framework now sufficiently well established that it is impossible, inconceivable, for us to set ourselves back into the temporal framework that has largely shaped theology, which for the present purposes I will take to be *Christian* theology. That framework is, and has been for

two millennia, that of the Bible, which has by and large been the cosmology of the Old Testament, represented explicitly, but not only, in the early chapters of Genesis. The doctrine of creation has largely been shaped by Genesis 1 (together with parts of the Psalms, Prophets, and Wisdom literature). Doctrines concerning human nature have depended strongly on the myths of the Garden of Eden and of the Fall in Genesis, chapters 2 and 3, and so, consequently, have understandings of the work of Jesus the Christ, in particular, theories of atonement; and, of course, much more.

Since theology is in principle the relating of everything to God, it is not surprising that the establishing of this evolutionary perspective has been perceived as a challenge—and even as a threat—to received Christian beliefs about God, nature, and humanity. I hope to show that, far from being a threat, the scientific vista for the twenty-first century constitutes a *stimulus* to theology to become more encompassing and inclusive, but only if it radically expands its currently widely assumed paradigms, not excluding the significance of Jesus the Christ.

To some this might appear an iconoclastic program. But I have to remind you that Christian theology has been at its most creative and most vital when it has faced the challenges of engagement with new systems of thought encountered in new cultural contexts—the Gentile, then the Hellenistic, and later the works of Aristotle in the twelfth and thirteenth centuries.

We are now living through the most fundamental challenge of all to Christian belief—the fundamental displacement of the basic understandings of nature and of humanity, and consequently also of God, that are being provoked by that new scientific vista with which I began. Early in 1999, the BBC radio morning news program invited listeners to name the "most significant British figure (it was the *B*BC, after all) of the second millennium." You can imagine the list that emerged! In the first three or four, Shakespeare was nearly always included, and very often Churchill, but rarely scientists.

Needless to say, many scientists were shocked by the ignorance of the British public. The lack of attention to Darwin outraged, in particular, Richard Dawkins (who has recently been lecturing on "universal Darwinism"). His well-known interpretation apart, I do not think he was wrong in choosing Darwin to head his own list. Yet the impact of Darwin, and especially of Darwin*ism*, is looked at askance and with suspicion by many, especially Christian, believers.

But Darwin's uniquely eminent place in the history of biology is totally assured, for he propounded a plausible mechanism for the transformation of species, that of natural selection (the increasing predominance of forms able to produce and rear more progeny as the environment changes). He brilliantly, doggedly, at immense personal cost, showed that the operation of this mechanism was the best explanation of, and made most sense of,

widely disparate data. Natural selection was eventually fully vindicated by the later discovery of the laws of heredity (to which Darwin did not have access) and by developments (molecular biology) in the twentieth century. As Theodosius Dobzhansky, an Orthodox Christian, famously affirmed (1973), "Nothing in biology makes sense except in the light of evolution."

Any theology—any attempt to relate God to all-that-is—will be moribund and doomed if it does not incorporate this perspective into its very bloodstream. Yet much Christian theology simply tinkers apologetically with its beliefs at what seem vulnerable chinks in its armor, assuming that it will survive into what it hopes will be less challenging times. That is a recipe for extinction, for it is with this evolving world on planet Earth that the tragicomedy of human existence is working itself out. We are part of nature, part of an evolving cosmos—indeed we are stardust become persons!

Let us now look, in sequence, at stages in the life process and reflect on their significance for our understanding of nature, humanity, and God, that is, their significance for theology.

The Stages of the Life Process and Their Significance

1. THE PHYSICAL ORIGIN OF THE UNIVERSE. Extrapolation backward in time on the basis of known physical relations and observations enables astronomers to trace the evolution of the universe back to when it was only a tiny fraction of a second old, in the form of a compressed fireball hotter than the center of the Sun. However far astronomers and cosmologists go back, the universe was indisputably physical, consisting of matter-energy-space-time in its most basic forms (e.g., a fluctuating quantum field). From this all else has developed, hence it can at least be affirmed (and there will be *much* more to affirm) that all concrete particulars in the world, including human beings, are constituted of fundamental physical entities. This is a *monistic* view in the sense that everything can be broken down into fundamental physical entities and that no *extra* entities are to be inserted at higher levels of complexity (e.g., at that of living organisms, no vitalism, no *élan vitale*).

This is entirely in accord with the biblical tradition that "the Lord God formed man of the dust of the ground" (Genesis 2:7 Authorized Version) and that Adam was told "you are dust and to dust you shall return" (Genesis 3:19).

Such a *monistic* view of the constitution of all entities in the universe, including living organisms and human beings, does *not* mean that in the long run all can be explained by fundamental physics. For what is significant is that the concepts needed to describe and understand each emerging level in the hierarchy of complexity are specific to and distinctive of these levels. Moreover, it very often is the case (but not always) that such concepts are not logically reducible to those used to describe their constituent

parts, least of all those pertaining to the fundamental physical building blocks of the universe. When this is the case, and in particular when causal efficacy can be attributed to the way the 'wholes' influence the behavior of the 'parts,' then one is justified in asserting that a new kind of reality has emerged at the higher level of complexity. Life is emergent from the physicochemical, the psychological from the neurological, and personhood from the human brain in the human body: all are levels of reality.

2. THE ORIGIN OF LIFE. There is a complex and unresolved debate concerning the way there came into existence the earliest entities that could be called living—that could replicate complex biochemical structures that maintain themselves by incorporating molecules from their environment. More than twenty years ago two Nobel laureates, Ilya Prigogine and Manfred Eigen, showed by irreversible thermodynamics and by stochastic molecular kinetics, respectively, that the transformation of certain apparently inchoate physicochemical systems into complex, self-copying systems is likely to occur under certain conditions.

The inability of scientists to find the precise mechanisms of the origin of life has led some to become skeptical about the possibility of life emerging on Earth or even in our galaxy without divine intervention. I think the pioneer thermodynamic and kinetic work I referred to shows that this skepticism is unwarranted and that the emergence of living organisms from nonliving matter is a natural phenomenon[1] requiring no "God of the gaps" to intervene as a deus ex machina to ensure its occurrence. For theists, the *whole* process is given its existence, with that potential capacity for life, by God (who is therefore not "of the gaps").

3. THE DURATION OF EVOLUTION. The oldest rocks to contain fossils of living forms (prokaryotic cells—bacteria and cyanophytes, no nucleus) are 3.5 billion years old, and, because these are already very complex, the origin of life must be located in the first billion years of the Earth's existence, of some 4.5 billion years. If Earth was formed at midnight of the day before yesterday and each hour is equivalent to 100 million (10^8) years, then life first appeared during yesterday morning. Only at 6 P.M. *today* did calcareous (hard) fossils appear; at 6 to 7 P.M. on this second day, the seas fill with shelled creatures; at 8 P.M. with fishes; at 9 P.M. amphibia appear on land; by 11:30 P.M. mammals and the first primates spread across the globe; monkeys and apes at 11:50 P.M.; in the last few minutes of this second day of the Earth hominids arise; and only on the last stroke of tonight's midnight bell would we see tool-making *Homo sapiens*.

During the aeons before our emergence on Earth, hundreds of millions (if not billions) of species have come and gone—the predecessors of the perhaps as many as 15 million species still extant, and rapidly being diminished by human action. Theists who believe that the ultimate ground

of all existence is God as Creator have to face new questions: Is it permissible to regard these myriads of species other than *Homo sapiens*, most of them now extinct, as simply by-products in a process aimed at producing human persons? Or do they have value in themselves and for themselves to God as Creator? Surely we now have to escape from our anthropocentric myopia and affirm that God as Creator takes what we can only call joy and delight in the rich variety and individuality of other organisms *for their own sake!*

4. THE MECHANISM OF EVOLUTION: NATURAL SELECTION. Darwin's proposition is that species are derived from one another by natural selection of the best procreators. There are no professional biologists who doubt that natural selection is a factor operative in biological evolution; most would say it is by far the most significant one. Some, such as Richard Dawkins, say it is an all-sufficient explanation. It can certainly be subtle in its operation and counterintuitive with respect to the degree of change and the complexity of new structures and functions it can effect. However, some other biologists are convinced that it is not the whole story, and some even go so far as to say that natural selection alone cannot account for the formation of distinctly new species. What is significant about all these processes is that they all are operating entirely within a naturalistic framework and assume a basically Darwinian process to be operating, although they differ about its speed and smoothness.

Moreover, the depiction of this process and "nature, red in tooth and claw" (a phrase of the poet Tennyson that actually predates the public proposal of Darwin) is a caricature. For, as many biologists have pointed out (e.g., Simpson 1971, 20), natural selection is not even in a figurative sense the outcome of struggle, in spite of the language of Herbert Spencer ("the survival of the fittest") which Darwin unwisely borrowed.

Death of individual members of a species is essential to survival of the species and to the species' ability to adapt to environmental changes and, if need be, to evolve into a new species. Hence, in evolution we witness new life through death of the old, and believers in God as creating through this process have to accept that the biological death of the individual is the means whereby God was creating new species, including ourselves, aeons before human beings appeared. Thus, we can no longer take Paul's "the wages of sin is death" (Romans 6:23) to mean that our biological death can be attributed to human sin, as has often been assumed in atonement theories. If we wish to rescue Paul's phrase, we would have to reinterpret it to refer to some kind of spiritual death as being the consequence of sin.

Furthermore, the believer in God as Creator has to view biological evolution through natural selection (and possibly through the other naturalistic processes I mentioned) as simply the means whereby God has been and is creat*ing*. There is no prima facie case, as I shall elaborate later, for postu-

lating any special supposed intervention by God in order to understand what has been going on.

5. THE EMERGENCE OF HUMANITY. The biological-historical evidence indicates that human nature has emerged only gradually by a continuous process from other forms of primates and that there are no sudden breaks of any substantial kind in the sequences noted by palaeontologists and anthropologists. This is not to say that the history of human culture is simply a smoothly rising curve. There must have been, for example, key turning points or periods. However, there is *no* past period for which there is reason to affirm that human beings possessed moral perfection or existed in a paradisal situation from which there has been a subsequent decline. All the evidence points to a creature slowly emerging into awareness, with an increasing capacity for consciousness and sensitivity and the possibility of moral responsibility and, the religions would affirm, of response to God (especially after the axial period around 500 B.C.E.). So there is no sense in which we can talk of a "fall" from a past perfection. We appear to be rising beasts rather than fallen angels, rising from an amoral (and in that sense) innocent state to the capability of moral and immoral action.

What is also true is that humanity manifests aspirations to a perfection not yet attained, a potentiality not yet actualized, but no original righteousness. Sin as alienation from God, humanity, and nature is only too real and appears as the consequence of our very possession of that *self*-consciousness by which we always place ourselves at the egotistical center of the universe of our consciousness that has evolved biologically. Classical concepts of the Fall as a *past* event that dominate Christian theologies of redemption urgently need, it seems to me, to be rescinded, and we need to rethink what we mean by redemption if it is to make any sense to our contemporaries.

So the questions of not only "Who are we?" but even "What should we be becoming? Where should we be going?" remain acute for us.

6. HUMAN BEHAVIOR. Human behavior thus comes into focus, and our understanding of it has been enriched by the new sciences of sociobiology and behavior genetics. Sociobiology is the systematic study of the biological, especially genetic, basis of patterns of social behavior in socially organized species, including the human, and aspires to include even human culture in its purview. Behavior genetics aims to examine over a wide range the inheritance of many different behaviors in individual organisms, again including humanity. These studies, which do not necessarily have to be pursued with excessively reductionist ambitions, cannot but influence our general assessment of human nature and of the genetic constraints and limitations under which free will operates. Theologians should acknowledge that it is this kind of genetically based creature that

God has actually created as a human being through the evolutionary process. However, that heritage cannot itself determine in advance the *content* of our thinking, for example of our moral reasoning. Just as science is not magic, so ethics, on the same grounds, is not genetics.

Even so, the Christian theologian does not have to enter this debate with destructive ambitions. For if God, as a scientifically sensitive theology affirms, is creating immanently through the evolutionary processes, it would not be inconsistent with such a theology for human moral awareness to have originated sociobiologically. Moreover, humanity could have survived and flourished only if it held social and personal values that transcended the urges of the individual, embodying "selfish" genes—and these values stem from the sense of a transcendent Good.

7. EVOLUTION AND HUMAN RATIONALITY. Evolutionary biology can trace the steps in which successive organisms have acquired nervous systems and brains whereby they obtain, store, retrieve, and utilize information about their environments in a way that furthers their survival. Our sense impressions must be broadly trustworthy, and so must the cognitive structures whereby we know the world; otherwise we would not have survived. In the case of human beings these cognitive faculties include the representations of external reality we individually and socially make to ourselves and must have enough verisimilitude to facilitate survival in the external realities of our environments. This gives us grounds for confidence in the reality-referring capacity of the cognitive processes with which evolution has provided us. It warrants the postulating of the existence of a general rationality in *Homo sapiens* that yields, for the purpose of living, reliable knowledge and justified belief. It is a healthy corrective to the epidemic of relativism associated with postmodernism, for it supports the conviction that our cognitive processes can refer to "reality"—that which we cannot avoid taking account of in our diagnoses of our experience and (in science) of our experiments.

8. THE PARADOX OF HUMAN NONADAPTEDNESS. Oddly enough, there are signs of a kind of misfit between human beings and their environment which is not apparent in other creatures. We alone in the biological world, it seems, individually commit suicide; we alone in our prehistory give evidence by our burial rituals of the sense of another dimension to existence; we alone go through our lives with a sense of incompleteness evidenced by the contemporary quests for self-realization and personal growth. Human beings seek to come to terms with death, pain, and suffering, and we need to realize our own potentialities and learn how to find our way through life. The natural environment is not capable of satisfying such aspirations, nor can the natural sciences describe, accurately discern, or satisfy them. For we are capable of joys and miseries quite

unknown to other creatures, thereby evidencing a dis-ease with our evolved state, a lack of fit which calls for explanation and, if possible, cure.

This alienation of human beings from nonhuman nature and from each other appears as a kind of anomaly within the organic world. We may well ask, Why has, how has, the process whereby there have so successfully evolved living organisms finely tuned to and adapted to their environments failed in the case of *Homo sapiens* to ensure this fit between lived experience and the environing conditions of their lives?

Such considerations raise the further question of whether or not human beings have identified what their *true* environment really is, that environment in which human flourishing is possible. Does not the human condition raise the profound question of what humanity's true environment really is, of the nature of that reality to which it must relate? Did not Saint Augustine (*Confessions* I.1.1), after years of travail and even despair, address his Maker: "You have made us for yourself and our heart is restless till it rests in you"?

9. EXTRATERRESTRIAL LIFE. I have said enough to show that if the chemical conditions were right on a planet of about the same age as the Earth, moving around a star of about the age of our Sun, then it is probable that living forms of matter would have appeared on it; and, with a lower but nonzero probability, that intelligent creatures would have emerged by the operation of natural selection. The physical form of these living extraterrestrial intelligences would, of course, almost certainly be very different from ours.

Christians have to ask themselves (and skeptics will certainly ask *them*) what the cosmic significance can possibly be of the localized, terrestrial event of the existence of the historical Jesus. Doesn't the mere possibility of extraterrestrial life render nonsensical all the superlative claims made by the Christian church about his significance? Would "E.T.," Martians, and the neighbors of Upsilon-Andromeda (the latest candidates for extraterrestrial life) need an incarnation and all it is supposed to accomplish as much as *Homo sapiens* on planet Earth? A contemporary theology has to cope convincingly with such questions in order to be credible.

GENERAL FEATURES OF EVOLUTION

1. CHANCE AND LAW. We have already discussed the creative interplay of chance and law in the evolution of living matter by natural selection. As is well known, Jacques Monod (1972) concluded that the "stupendous edifice of evolution" is, in this sense, rooted in "pure chance," and that therefore all inferences of direction or purpose in the development of the biological world in particular and of the universe in general must be false.

However, there is no reason why the randomness of molecular events in relation to biological consequence has to be given the metaphysical status that Monod attributed to it. It would be more consistent with observation to assert that the full gamut of the potentialities of living matter can be explored only through the agency of the rapid and frequent randomization that is possible at the molecular level of DNA. This interplay of chance and law is the basis of the inherent creativity of the natural order, its ability to generate new forms, patterns, and organizations of matter and energy. One might say that the potential of the *being* of the world is made manifest in the *becoming* that the operation of chance makes actual. God is the ultimate ground and source of both law (necessity) and chance.

A theist must then see God as acting rather like a composer extemporizing a fugue to create in the world through what we call "chance" operating within the created order, each stage of which constitutes the launching pad of the next. The Creator, it now seems, is unfolding the divinely endowed potentialities of the universe, in and through a process in which these creative possibilities and propensities become actualized within created time.

2. TRENDS AND DIRECTIONS IN EVOLUTION? Can God be said to be implementing any purpose in biological evolution? Or is the whole process so haphazard, such a matter of happenstance, that no meaning, least of all a divinely intended one, can be discerned in the process? Popper has pointed out that the realization of possibilities, which may be random, depends on the total situation within which the possibilities are being actualized, so that "there exist weighted possibilities which are more than mere possibilities, but tendencies or *propensities* to become real," and that these "*are properties of the whole situation*" (Popper 1996, 12, 17; emphasis added). Propensities are simply the effects of the context on the outcomes of random events. I suggest that the evolutionary process is characterized by propensities, evoked by natural selection, toward increase in complexity, information processing and storage, consciousness, sensitivity to pain, and even self-consciousness (a necessary prerequisite for social development and the cultural transmission of knowledge down the generations). Some successive forms, along some evolutionary branch or twig, have—through the operation of natural selection—a distinct probability of manifesting more and more of these characteristics. However, the actual physical form of the organisms in which these propensities are actualized is contingent on the history of the crossing of disparate chains of events.

Stephen J. Gould (1989) has interpreted the extraordinary fossils of very early (ca. 530 million years ago) soft-bodied fauna found in the Burgess Shale of the Canadian Rockies as representing a maximum in disparity of forms—after which, he claims, there was a dramatic decline in the range of types (phyla) of species. Hence, he claims, if the "tape" of evolutionary history could be rerun, all the phyla and species would be totally different,

and no intelligent persons in the form of *Homo sapiens* would appear. However, S. Conway Morris, an evolutionary palaeobiologist who has devoted his research life to the study of the Burgess Shale and related formations, argues that Gould has in fact overemphasized the role of contingency and that his argument is based on a "basic confusion concerning the destiny of a given lineage. . . . Nearly all biologists agree that convergence is a ubiquitous feature of life" (Morris 1998, 201, 202). "Again and again we have evidence of biological form stumbling on the same solution to a problem" (p. 204). "The reality of convergence suggests that the tape of life, to use Gould's metaphor, can be run as many times as we like and in principle intelligence will surely emerge" (p. 14). There can, it seems (*pace* Gould), be overall direction and implementation of divine purpose through the interplay of chance and law without a deterministic plan fixing all the details of the structure(s) of what emerges as possessing personal qualities.

Incidentally, I see no need to postulate any special action—any nonnatural agent pushing, or pulling, or luring, for example, by some divine manipulation of mutations at the quantum level—to ensure that persons emerge in the universe, and in particular on Earth.

3. THE UBIQUITY OF PAIN, SUFFERING, AND DEATH. The ability for information processing and storage is indeed the necessary, if not sufficient, condition for the emergence of consciousness. Sensitivity to an organism's surroundings inevitably involves an increase in its ability to experience pain, which constitutes the necessary biological warning signal of danger and disease. Insulation from the surrounding world in the biological equivalent of three-inch nicked steel would be a sure recipe for preventing the development of consciousness.

New patterns can come into existence in a finite universe (finite in the sense of the conservation of matter-energy) only if old patterns dissolve to make a place for them. Biological death of the individual is the prerequisite for the creativity of the biological order, that creativity which eventually led to the emergence of human beings.

Hence, pain, suffering, and death, which have been called "natural evil," appear to be inevitable concomitants of a universe that is creative of new forms, some of which are conscious and self-conscious.

For any concept of God to be morally acceptable and coherent, and if God is also immanently present in and to natural processes, then we cannot but infer that—in some sense hard to define—God, like any human creator, suffers in, with, and under the creative processes of the world with their costly unfolding in time.

There has been an increasing assent in the Christian theology of recent decades to the idea that it is possible "to speak consistently of a God who suffers eminently and yet is still God, and a God who suffers universally" (Fiddes 1988, 3). God, we find ourselves having tentatively to conjecture,

suffers the natural evils of the world along with ourselves, because (we can only hint at this stage) God intends to bring about a greater good thereby, namely, the kingdom of free-willing, loving persons in communion with God and with each other.

4. COMPLEXITY AND CAUSALITY. Finally, another general feature of the evolving biological world is proving to be increasingly of general philosophical and theological significance, namely, the nature of the intricate complexity of living systems, of the principles by which this unfolds, and of the nature of causality operating in them. For we do not have simple causal chains of the kind A→B→C→D . . . , interaction of any stage of which inhibits the process, but webs of interconnection in which the state of the whole system influences the behavior of its parts.

I, for one, have found this to be fruitful in thinking about how God might affect patterns of events in the world without intervening, that is, without abrogating any of the laws that have been found, and continue to be found, to govern patterns of events as studied at their own level. I postulate whole-part influence as a clue to the understanding of God's interaction with the world (and possibly also to understanding personal agency and the mind-body problem).

A THEOLOGY OF EVOLUTION

It is gradually being realized that, far from the epic of evolution being a threat to Christian theology, it is in fact a stimulus to and a basis for a more encompassing and enriched understanding of the interrelations of God, humanity, and nature. An argument for the existence of God in Anglo-Saxon *physico-theology* (an eighteenth-century form of natural theology) was based on the intricacy of particular biological mechanisms which was attributed to the direct action of God the Designer. This argument collapsed in the nineteenth century when Darwin and his successors showed that this apparent 'design' could evolve by a purely natural process based on scientifically intelligible relationships. But even in the nineteenth century, many Anglican theologians, both evangelical and catholic, embraced positively the proposal of evolution. Of the former, one can think of Charles Kingsley, who in his *Water Babies* ([1863] 1930, 248) affirms that God makes "things make themselves"; and of the latter, we may instance Aubrey Moore, who in *Lux Mundi* (a publication of a group of Oxford Anglicans) wrote, "Darwinism appeared, and, under the disguise of a foe, did the work of a friend. It has conferred upon philosophy and religion an inestimable benefit, by showing us that we must choose between two alternatives. Either God is everywhere present in nature, or He is nowhere" (Moore 1891, 73).

GOD AND THE WORLD.

Immanence. Such an emphasis on the *immanence* of God as Creator in, with, and under the natural processes of the world unveiled by the sciences is certainly in accord with all that the sciences have revealed since those debates of the nineteenth century. For a notable aspect of the scientific account of the natural world in general is the seamless character of the web that has been spun on the loom of time—at no point do modern natural scientists have to invoke any nonnatural causes to explain their observations and inferences about the past. As Howard J. Van Till has so powerfully expressed it, "the formational economy[3] of the universe is sufficiently robust to make possible the actualization of all inanimate structures and all life forms that have ever appeared in the course of time" (Van Till 1998, 351). The processes that have occurred can, as we saw, be characterized as processes of *emergence*, for new forms of matter, and a hierarchy of organization of these forms themselves, appear in the course of time. New kinds of reality may be said to emerge in time.

The scientific perspective of the world, especially the living world, inexorably impresses upon us a *dynamic* picture of the world of entities and structures involved in continuous and incessant change and in process without ceasing. This impels us to reintroduce into our understanding of God's creative relation to the world a dynamic element which was always implicit in the Hebrew conception of a living God, dynamic in action—even if obscured by the tendency to think of creation as an event in the past. God has again to be conceived of as continuously creating, continuously giving existence to, what is new. God is creating at every moment of the world's existence in and through the perpetually endowed creativity of the very stuff of the world.

All of this reinforces the need to reaffirm more strongly than at any other time in the Christian (and Jewish and Islamic) traditions that in a very strong sense God is the immanent Creator *creating in and through the processes of the natural order*. The processes are not themselves God but the *action* of God as Creator. God gives existence in divinely created time to a process that itself brings forth the new: thereby God is creat*ing*. This means we do not have to look for any extra supposed gaps in which, or mechanisms whereby, God might be supposed to be acting as Creator in the living world.

Panentheism.[4] Classical philosophical theism maintained the ontological distinction between God and creative world that is necessary for any genuine theism by conceiving them to be of different *substances*, with particular attributes predicated of each. There was a 'space' *outside* God 'in' which the realm of created substances existed. This substantival way of speaking has become inadequate in my view and that of many others. It has become increasingly difficult to express the way in which God is present

to the world in terms of substances, which by definition cannot be internally present to each other. God can only intervene in the world in such a model. This inadequacy of classical theism is aggravated by the evolutionary perspective, which, as we have just seen, requires that natural processes in the world need to be regarded *as such* as God's creative action. In other words, the world is to God rather as our bodies are to us as personal agents—with the necessary caveat that the ultimate ontology of God as Creator is distinct from that of the world. Moreover this *personal* model of embodied subjectivity (with that essential caveat) better represents how we are now impelled to understand God's perennial action in the world as coming from the inside. These considerations lead to the idea of a panentheistic relation of God and the world.

Panentheism is "the belief that the Being of God includes and penetrates the whole universe, so that every part of it exists in Him but (as against pantheism) that His Being is more than, and is not exhausted by, the universe."[5] Recall Paul's address at Athens when he says of God that "In him we live and move and have our being" (Acts 17:28 RSV). It is in fact also deeply embedded in the Eastern Christian tradition.

The Wisdom (Sophia) *and the Word* (Logos) *of God.* Biblical scholars have in recent decades come to emphasize the significance of the central themes of the so-called Wisdom literature (Job, Proverbs, Ecclesiastes, Ecclesiasticus, and Wisdom). In this broad corpus of writings the feminine figure of Wisdom (*sophia*), according to J. G. Dunn, is a "convenient way of speaking about God acting in creation, revelation and salvation; Wisdom never becomes more than a personification of God's activity" (Dunn 1980, 210). This Wisdom endows some human beings, at least, with a personal wisdom that is rooted in their concrete experiences and in their systematic and ordinary observations of the natural world—what we would call science. But it is not confined to this and represents the distillation of wider human, ethical, and social experiences. All such wisdom, imprinted as a pattern on the natural world and in the mind of the sage, is but a pale image of the divine Wisdom—that activity distinctive of God's relation to the world. In the present context, it is pertinent that this important concept of Wisdom (*sophia*) unites intimately the divine activity of creation, human experience, and the processes of the natural world. It therefore constitutes a biblical resource for imaging the panentheism we have been urging.

So also does the closely related concept of the Word (*Logos*) of God, which is regarded (John 1:1) as existing eternally as a mode of God's own being, as active in creation, and as the self-expression of God's own being and becoming imprinted in the very warp and woof of the created order. Again we have a panentheistic notion that unites intimately, as three facets of one integrated and interlocked activity, the divine, the human, and the

(nonhuman) natural. It is, needless to say, significant that for Christians this *Logos* was regarded as "made flesh" (John 1:14) in the person of Jesus the Christ.

A Sacramental Universe. The evolutionary epic, as I have called it for brevity, in its sweep and continuity actualizes over aeons of time the mental and spiritual potentialities of matter, especially in the evolved complex of the human-brain-in-the-human-body. The original fluctuating quantum field, quark soup (or whatever) has in some 10 or so billion years become a Mozart, a Shakespeare, a Buddha, a Jesus of Nazareth—and you and me!

Every advance of the biological, cognitive, and psychological sciences shows human beings as psychosomatic unities—that is, as persons. Matter has in us manifested personal qualities, that unique combination of physical, mental, and spiritual capacities.[6]

For the panentheist, who sees God working in, with, and under natural processes, this unique end result (to date) of the evolutionary process corroborates that God is using that process as an *instrument* of God's purposes and as a *symbol* of the divine nature, that is, as the means of conveying insight into these purposes.

But in the Christian tradition, this is precisely what sacraments do. They are valued for what God is effecting instrumentally and for the meaning God is conveying symbolically through them. Thus William Temple came to speak of the "Sacramental Universe" (1934, chap. 19), and we can come to see nature as sacrament, or at least as sacramental. Hence my continued need to apply the phrase "in, with, and under," which Luther used to refer to the mode of the Real Presence of Christ in the Eucharist, to the presence of God in the processes of the world.

Such reflections leads us, finally, to reflect on

HUMANITY AND JESUS THE CHRIST IN AN EVOLUTIONARY PERSPECTIVE. We have already seen in the section on human nonadaptedness that human beings are incomplete, unfinished, falling short of that instantiation of the ultimate values of truth, beauty, and goodness that God, their ultimate source, must be seeking to achieve in order to bring them into harmonious relation to Godself. We have not yet become fully adapted to the ultimate, eternal environment of God.

It was not long after Darwin published that some theologians began to discern the significance of the central distinctive Christian affirmation of the Incarnation of God in the human person of Jesus the Christ as especially congruent with an evolutionary perspective. Thus, again in *Lux Mundi* in 1891, we find J. R. Illingworth boldly affirming that "in scientific language, the Incarnation may be said to have introduced a new species into the world—a Divine man transcending past humanity, as humanity transcended the rest of the animal creation, and communicating His vital

energy by a spiritual process to subsequent generations" (Illingworth 1891, 151–52).[7]

In this perspective, Jesus the Christ, the whole Christ event, has, I would suggest, shown us what is possible for humanity. The actualization of this potentiality can properly be regarded as the consummation of the purposes of God already incompletely manifested in evolving humanity. In Jesus there was a *divine* act of new creation, because Christians may now say the initiative was *from God*, within human history, within the responsive human will of Jesus inspired by that outreach of God into humanity designated as God the Holy Spirit. Jesus the Christ is thereby seen, in the context of the whole complex of events in which he participated as the paradigm of what God intends for all human beings, now revealed as having the potentiality of responding to, of being open to, of becoming united with, God. In this perspective, he represents the consummation of the evolutionary creative process which God has been effecting in and through the world.

The ever-present self-expression in all-that-is of God as Word or *Logos* attains its most explicit personal revelation in Jesus the Christ. But because it is a (unique) manifestation of this eternal and perennial mode of God's interaction in, with, and under the created order, what was revealed in Jesus the Christ could also, in principle, be manifest both in other human beings (and so in the other world religions) and indeed also on other planets, in any sentient, self-conscious, *nonhuman* persons that inhabited them who are capable of relating to God (whatever their physical form). This vision of a universe permeated by the ever-acting, ever-working, and potentially explicit self-expression of the divine Word/*Logos*/Son as incarnated in extraterrestrial personal beings was adumbrated in a poem of Alice Meynell (1847–1922):

Christ in the Universe

With this ambiguous earth
His dealings have been told us. These abide:
The signal to a maid, the human birth,
the lesson and the young Man crucified.

But not a star of all
The innumerable host of stars has heard
How he administered this terrestrial ball.
Our race have kept their Lord's entrusted Word. . . .

Nor, in our little day,
May his devices with the heavens be guessed,
His pilgrimage to thread the Milky Way,
Or his bestowals there be manifest.

> But, in the eternities,
> Doubtless we shall compare together, hear
> A million alien Gospels, in what guise
> He trod the Pleiades, the Lyre, the Bear. . . . (1972, 292)

For the epic of evolution has been consummated in the Incarnation in a human person of the cosmic self-expression of God, God's Word—and in the hope this gives to all self-conscious persons of being united with that Source of all Being and Becoming which is the "Love that moves the heavens and the other stars" (the closing lines of Dante's *Paradiso*).

May I suggest that, in the second century, Irenaeus said it all, in inviting us to contemplate

> The Word of God, our Lord Jesus Christ
> Who of his boundless love
> became what we are
> to make us what even he himself is.
> —(*Adversus Haereses,* V, praef.)

Notes

1. This view is strongly urged by the Nobel laureate Christian de Duve (1995; 1998). The argument about so-called intelligent design still rages, but it has in my view been convincingly refuted by Howard Van Till (1999).
2. Originally in 1987, then in *Theology for a Scientific Age* (1990), and most recently in "The Sound of Sheer Silence—How Does God Communicate with Humanity?" (in press).
3. By "formational economy" Van Till means "the set of all the dynamic capabilities of matter and material, physical, and biotic systems that contribute to the actualization of both inanimate structures and biotic forms in the course of the universe's formational history" (1998, 349); he draws special attention to capabilities for self-organization and transformation.
4. For further exposition, see Peacocke (1993), 370–72; Peacocke (1995); and Clayton (1998)—to which this account is greatly indebted.
5. *Oxford Dictionary of the Christian Church*, s.v. "panentheism." Ed. F. L. Cross and E. A. Livingstone (Oxford: Oxford Univ. Press, 1983), 1027. See also Augustine, *Confessions* VII.7, quoted in Peacocke (1990), 159.
6. I use *spiritual* as indicating "relatable to God in a personal way."
7. But we cannot today use for this transformation Illingworth's phrase "a new species" in any literal sense, for *species* is for us now a purely biological term.

References

Clayton, Philip. 1998. "The Case for Christian Panentheism." *Dialog* 37:201–8.
Duve, Christian de. 1995. *Vital Dust.* New York: Basic Books.
———. 1998. "Constraints on the Origin and Evolution of Life." *Proceedings of the American Philosophical Society* 142:1–8.
Dobzhansky, Theodosius. 1973. *American Biology Teacher.* Washington, D.C.: National Association of Biology Teachers.
Dunn, J. G. 1980. *Christology in the Making.* London: SCM Press.
Fiddes, Paul S. 1983. *The Creative Suffering of God.* Oxford: Clarendon Press.
Gould, Stephen J. 1989. *Wonderful Life: The Burgess Shale and the Nature of History.* London: Penguin Books.

Illingworth, J. R. 1891. "The Incarnation in Relation to Development." In *Lux Mundi*, 12th ed., ed. C. Gore. London: John Murray.
Kingsley, Charles. [1863] 1930. *The Water Babies*. London: Hodder and Stoughton.
Meynell, Alice. 1972. "Christ in the Universe." In *The Faber Book of Religious Verse*, ed. Helen Gardner. London: Faber and Faber.
Monod, Jacques-Lucien. 1972. *Chance and Necessity*. London: Collins.
Moore, Aubrey. 1891. "The Christian Doctrine of God." In *Lux Mundi*, 12th ed., chap. 2, ed. C. Gore. London: John Murray.
Morris, S. Conway. 1998. *The Crucible of Creation: The Burgess Shale and the Rise of Animals*. Oxford: Oxford Univ. Press.
Peacocke, Arthur. 1990. *Theology for a Scientific Age*: *Being and Becoming—Natural and Divine*. Oxford: Blackwell.
———. 1993. *Theology for a Scientific World*. 2d enlarged ed. London: SCM, and Minneapolis: Fortress Press.
———. 1995. "A Response to Polkinghorne." *Science and Christian Belief* 7:109–10.
———. 1999. "The Sound of Sheer Silence—How Does God Communicate with Humanity?" In *Neuroscience and the Person: Scientific Perspectives on Divine Action*, ed. R. J. Russell, N. Murphy, T. Meyering, and M. Arbib, 309–41. Vatican City State: Vatican Observatory, and Berkeley: Center for Theology and the Natural Sciences.
Popper, Karl R. 1996. *A World of Propensities*. Bristol: Thoemmes.
Simpson, George G. 1971. *The Meaning of Evolution*. New Haven: Bantam Press, Yale Univ. Press.
Temple, William. 1934. *Nature, Man, and God*. London: Macmillan.
Van Till, Howard J. 1998. "The Creation: Intelligently Designed or Optimally Equipped?" *Theology Today* 55:351.
———. 1999. "Does 'Intelligent Design' Have a Chance? An Essay Review." *Zygon: Journal of Religion and Science* 34 (December): 667–82. An earlier version appeared in *Perspectives: A Journal of Reformed Thought* 13 (December 1998): 21–22.