

THEOLOGY AND SCIENCE IN THE EVOLVING COSMOS: A NEED FOR DIALOGUE

by Jeffrey S. Wicken

Abstract. Theology and science are both essential to the process of making sense of the world. Yet their relationship over the centuries has been largely adversarial. The Darwinian revolution, in particular, has necessitated a radical reinterpretation of the traditional dogma concerning creation. In this paper I discuss two general issues that presently obstruct communication between scientists and theologians in this arena and that are brought into acute focus by Wolfhart Pannenberg. First, the need to exercise care in the use of such denotative concepts as *field* especially in understanding the Darwinian character of the evolutionary process is addressed. Second, the ontological room science *necessarily* leaves theology in this enterprise is considered.

Keywords: evolution; field; scientism; theology.

I feel diffident about commenting on theological treatises. I know little about theology, and much of my commentary will reflect that fact. This disclaimer having been made, I put aside the diffidence to observe that contemporary Christian theology seems to be in the midst of an identity crisis brought on by accomplishments of modern science which have undercut its traditional creationist base.

History has shown that humans are motivated by intensely religious feelings that strenuously resist reduction to Freudian longings for the womb or to sociobiological adaptive payoffs for moral regulative principles. We need to know where we fit in a cosmos whose dimensionality exceeds the capacities of our senses. Science and theology are both essential to this enterprise of partial understanding. The present level of discourse between theologians and scientists however is sufficiently low to warrant lowering the drawbridges of disciplinary specialization

Jeffrey S. Wicken is associate professor of biochemistry at Pennsylvania State University, Behrend College, Erie, Pennsylvania 16563. He presented this paper as part of the Pannenberg Symposium held at the Lutheran School of Theology at Chicago 16-17 April 1985.

[*Zygon*, vol. 23, no. 1 (March 1988).]

© 1988 by the Joint Publication Board of *Zygon*. ISSN 0591-2385

virtually to sea level. Perhaps then common languages for communication can be found.

The adversarial relationship between science and religion that has prevailed increasingly over the past three centuries makes this communication challenging and difficult. Prior to the seventeenth century, natural philosophy *was* theology. The emergence of modern science came with the recognition by the likes of Galileo Galilei, René Descartes, and Francis Bacon that only certain kinds of questions could be asked of nature. We could ask how it operated according to external relationships among its parts, but we could not ask about its reason for being. Similar to Eve in John Milton's *Paradise Lost*, science was born in desire and contingency.

Once the Church finally came to terms with the Copernican revolution by abandoning Aristotelian-Ptolemeic cosmology, this separation of existence and operation proved safe and even reinforcing for the science-religion dichotomy. Natural theology prospered under it with eighteenth- and early nineteenth-century discoveries in taxonomy; and writers like William Paley could rhapsodize about the perfection of the designed order in which each creature played its part—attesting to the perfection and beneficence of the Great Watchmaker. Charles Darwin separated this alliance on fundamental and tightly interconnected scores that none of the several bickering factions in contemporary evolutionary theory would deny.

First, nature does *not* attest to God's "goodness." What we call the *order of nature* is built on opportunism. Darwin's own parting of the ways with the natural theologians was based in no mean measure on careful empirical studies of the cruelty of this opportunism. Second, nature does not attest to great craftsmanship in its production. Embryological studies reveal that the development patterns of complex organisms are anfractuous in the extreme—with gill slits forming and disappearing, with organs being formed by tissue migrations rather than by straightforward organizational elaboration. All this fits with the *historicity* and makeshiftedness of life. Within this context the meaning of anatomical homologies, which had until that time been the province largely of transcendentalist speculations about the inviolability of *bauplane*, now became clearly understandable as the result of descent with modification under developmental constraints. New anatomical forms do not spring into nature full-blown but are selected according to performance in the ecological arena under developmental and phylogenetic constraints.

These nonnegotiable understandings of evolutionary science have divided the two-millennial basis of the God/Man relationship in Western thought and presented post-Darwinian theology with a real crisis.

Whereas science and theology have gone their own epistemological ways since the seventeenth century, asking them to go their own ontological ways *fractures* the unity of nature. If theology is the study of cosmic wholeness and of humanity's relationship to that wholeness, then the sensitive dimension of nature that is the source of feeling, perception, and consciousness must somehow be included within it. Joint efforts by theologians and scientists are necessary to accomplish this. As far as *initiative* in this enterprise is concerned, the ball seems largely in the theologians' court.

Scientists have been able to make a successful business of studying *how* nature works for nearly four centuries. Yet scientists work only at the phenomenal skin of being. This was stated implicitly by Galileo, explicitly but two-dimensionally by Descartes (mind and matter), and given firm metaphysical grounding by Immanuel Kant. Yet the fruits of science have been sufficiently impressive that it is very easy to forget that its terrain *is* restricted and to assume that world-building is exclusively its province. Thus, the seductive appeal of the "evolutionary epics" advanced by E. O. Wilson (1978) and Jacques Monod (1971), which state that the subjective domain of being—the precondition of objective science—will in time be explained by objective science. The various versions of pantheism and panpsychistic identism advanced in the literature are even worse. I should not predicate our *real* consciousnesses on the hypothetical consciousnesses of atoms. Science's limitations must be pronounced again and again, like a *mantra*, as its necessary juggernaut marches on.

Most scientists attuned to evolutionary realities while feeling a deeper ground of Being penetrate those realities choose to keep their mouths shut and keep their religion and their science in separate tracks. This professionally prudent move does not serve the interests of wholeness to which humans aspire. Hence the need for theological and scientific hermeneutics that are sufficiently clear to open doors of communication.

It may be that scientists are more practiced in this than theologians. Science has always had to pass the test of public discourse—of falsifiability. That theology has never had to do this has much to do with its ambiguous epistemological status. It also, I would venture, is related to its worries about *commensurability* with science. My own impression is that, in their attempts to come to terms with science while retaining a whole world view, theologians overpay obeisance to science at one end of the spectrum and misunderstand it at other. What is important is that we keep doors of communication open, and work to find some common language in which we can understand each other. The Institute on Religion in an Age of Science (IRAS) conferences provide important fora for this dialogue.

Central to the project of communication between scientists and theologians are, first, that we do not do violence to each other's vocabulary or concepts and, second, that we do not do violence to the *cosmos*. In the remainder of this paper I will consider these themes.

Certain terms must be used with appropriate precision by both scientists and theologians if we are to understand each other. In this spirit we all grant the importance of metaphor in expanding and unifying cognitive terrain. Yet while metaphor is essential to knowing, the objects of our knowledge are not themselves metaphors. Terms with specific denotative meanings must not be muddied over with a connotative penumbra. If we want to use the word *energy* or *field* in science-theology discourse, let us do so in a way commensurate with their understandings in physics. Talking about "spirit" as "energy" and granting it by implication the status of physical law runs dangerously close to usurping the hard-won denotive language of science for physicalizing theology. This serves neither enterprise.

Wolfhart Pannenberg's insistence that theological descriptions of the world be commensurable with those provided by science is essential for dialogue. However, "commensurability" leaves much room for play. In the following sections particular attention will be given to the theological predilection to pay obeisance to science, and to misconstrue or take linguistic license with its concepts in pursuit of that commensurability.

THE NEED FOR COMMON LANGUAGE

Much of what scientists have to say is nonnegotiable: planets orbit the sun; grass is green because of the absorption of red and blue portions of the spectrum by photosynthetic pigments; the diversity of species inhabiting the biosphere has arisen by a process of evolution rather than special creation.

But the "secondary qualities" problem introduced by Galileo and Descartes has not disappeared just because we now know something about neurophysiology. In point of fact we understand no more of the internal, subjective dimension of being today than did Plato, and we have no reason to expect that we ever will except in the philosophically restricted sense that brain centers and their electrochemical activities will be brought into tighter connection with subjective states as research proceeds. The *scientistic* impulse is to move from this increasingly textured resolution of the world's objective surface to intemperate predictions about inner realities. The only way that religion can be *intellectually* protected against the excesses of scientism is for theology to stand firm against these skin-deep pronouncements about the reducibility of all things to matter however sublimely it be organized.

There is a true ontological vacuum here; and I think theologians should try harder to fill it—not just by working for commensurability with physics and chemistry but by engaging the subjective, existential dimension of life for which those sciences cannot provide answers. No one can be a consistent positivist, and insofar as one's trade becomes both lens and blinders on what one sees, it is inevitable that the current reverence for science express itself in a degree of scientism about the way the world is built. There is an "Eleatic syndrome" in human thinking that seeks clarity at any cost. One of the jobs of theology—though not one to which it is historically accustomed—is to systematically resist this tendency.

"Coming to terms with science" therefore includes a critical dimension, which concerns what science actually *does* understand and where its license to speak ends. The *feel* of Pannenberg's analysis seems right in many ways. The Stoic-field conception of spirit he advances aids the project of making this cosmos a *whole*, relation-bound place. However, I feel he puts too many metaphysical eggs in the basket of physics, and a misconceived physics as well.

Behind the long adversarial relationship between science and theology has been a yearning for a simple cosmos about which fundamental clarity might be achieved. Prior to Darwin this simplicity took the form of the "great chain of being," ascending from minerals to angels. Subsequent to Darwin it has taken the form of a monodimensional, mechanistic view of causation derived from physics. If the premise of monodimensionality is even unconsciously accepted (i.e., lip service to plurality but fixation to physics), the stage is set for the ineluctable displacement of the mysterious and numinous by the spreading but ontologically limited light of science. Pannenberg continues theology's long tradition of making itself vulnerable to scientific erosion by anchoring itself to physical cosmology. Productive dialogue between science and theology requires a creative tension between the two disciplines. Theology must resist becoming the handmaiden of science.

CONTINGENCY AND HISTORY

While the midsection of Pannenberg's argument is consonant with this creative tension, its tangents stray into scientism. He rightly claims that science provides an essentially incomplete epistemology for understanding nature. He wrongly claims that this follows from science's dealing in laws that are insufficient to capture historical particularities, and that theological discourse distinguishes itself from science by its emphasis on those particularities.

This distinction begs the wrong question of where science ends and the theology begins. It is a casualty of monodimensional thinking that

strives to reconcile the ways of God to physics. Granted that scientific laws are general, and granted that the contexts of their operation must be “given” by initial conditions that cannot be derived from those laws. Once one feeds in those conditions of operation, one *gets* particularity.

So far, I see no theology. All natural phenomena are contingent on boundary conditions not specifiable by laws of operation. This does not make them incapable of scientific explanation. Planets, for example, are governed in their motions by the principle of inertia and the inverse-square law of gravity plus some relativistic fine-tunings. The derivation of particular planetary orbits from these laws requires independent information about configurations in phase-space—positions and momenta at some instant of time. However, that the existence of the solar system is contingent on particularities that might conceivably have been otherwise is in itself a theologically neutral proposition. If one can *in principle* explain the existence or emergence of those initial conditions, then contingency is brought into science’s orbit.

Much of Pannenberg’s contingency-argument seems juxtaposed against the atemporal, pre-evolutionary physics of the seventeenth and eighteenth centuries. In Isaac Newton’s day the solar system was *given* and was presumed by all to have been the product of divine construction. *Then* of course, contingency cried out for theological explanation—and Galileo, Descartes, and Newton were perfectly happy to keep science out of those affairs.

In an evolutionary cosmos the situation is very different. Science *could* be kept out of the emergence of boundary conditions if evolution were teleologically directed to the attainment of some goal. Then one temporalizes the problem of design and moves to a temporalized natural philosophy. Jean-Baptiste Lamarck flirted with this from deist tenets, and Pierre Teilhard de Chardin from tenets which have a certain affinity with G. W. F. Hegel’s “interiorizing” dynamics.

Such notions must be left at the level of metaphor in Darwin’s nature. Those developments in science over the past 150 years that have had the most sweeping philosophical implications for an evolutionary cosmos have all contributed to recognizing that the temporality of nature has a basis in physical law, not teleology. Lest I be accused of inconsistency, I think that the teleological *mode* of explanation is essential to science since it allows asking *why* irreversible phenomena occur (Wicken 1981) in the most general of terms. However, for this mode of explanation to be of value in evolutionary world-building, it must be decoupled from the ontological teleology of the Aristotelian-Scholastic school. Evolution has been of central importance in establishing a natural history of change. Physics, chemistry, and cosmology lie at the theoretical heart of that change.

The idea that temporality and historical particularity belong to the domain of theology is to me the most significant misunderstanding that afflicts Pannenberg's analysis, the least solid plank in his attempt to reconcile theology with science. Relativity theory does not "spatialize" time as he suggests in his article; rather it "temporalizes" space. Space in the Newtonian sense was the geometric arena of simultaneity. Where the structure of space-time provides an in-principle proscription of simultaneity, space becomes temporalized.

This caveat, however, is relatively unimportant to the present discussion. More important is the temporalization of *process* by cosmic expansion and the second law of thermodynamics. Every macroscopic change or matter-energy transformation generates entropy. The systematic basis for irreversible, macroscopic changes is in cosmic expansion, which generates quantum-space faster than equilibrating processes can fill it (see Layzer 1975).

Evolution resulting from irreversible processes creates boundary conditions—operational contingencies—as it proceeds. While we have no concrete ideas about what events precipitated cosmos-creation or about the ground of Being from which it was precipitated, the scientific point is that, once started, cosmic evolution has been an extremely rule-bound process in which contingencies of operation such as configurations of planets in phase-space have arisen deterministically.

FIELDS AND RELATIONAL-CONSTITUTION

Let us now return to the theme of ontological wholeness, of how theology might engage the sciences in its pursuit and how semantic care must be exercised in this enterprise. The concept of *field* is another central image in Pannenberg's picture for which he seeks theoretical justification in physics. *Field* has been used in a spectrum of senses in science ranging from the specifically denotative to the connotative to the metaphorical. Pannenberg uses them all in pursuing a theology of wholeness in evolutionary process. While I find the general *sense* of his argument congenial, its specifics fall to the two perils discussed earlier in this paper: they are overly bound to physical science, and they misconstrue much of that physical science.

In physics, a field might loosely be described as that which transmits influences or disturbances. Action-at-a-distance was magic; in gravitation and in electromagnetism some concept of field had to intervene to save the phenomena even before the physics was there to support it. Before Albert Einstein the field of space was hypostatized to an ether filling a void. After Einstein the void ceased to exist, and space itself *became* a field, the central connective tissue by which forces were transmitted.

If I follow Pannenberg correctly on this point, he believes that this dematerialization of the field gives God (being immaterial) a kind of physical justification in nature's wholeness. Although as metaphor this notion is rich for theology, taken literally it binds God needlessly to physics. Is God conceived here as a *field as in physics*? If so, why the need for God at all? If not, the relativistic reification of the space-field seems important to theology only in the sense of showing that nature has its own grounds for wholeness that might provide boundary conditions for God's presence in nature. In short I do not see what relationship any of this has with the theological project of making religious sensibility intellectually supportable.

I am especially concerned about biased assignments of ontological priorities in Pannenberg's field-interpretation of nature, which seems to treat a field *itself* as a "whole" exerting regulative influences (God's hand) over material elements. It is not. Granted, space consists of fields of force which exert regulative controls on material elements; but its "structure" is reciprocally regulated by those elements and their movements. The two together constitute the only "whole" of which physics can speak. If all the matter were removed from the universe, there would be no field. When the ether left, so did ontological dichotomy. Space and matter have *coevolved*, and are *relationally constituted* by each other. They have no identities apart from each other.

Another related but more connotative sense in which *field* is used in science is to indicate the complex of relationships that determines the character of embryological development (e.g., Webster & Goodwin 1982). These "developmental fields" have no vitalistic or autonomous existence apart from their elemental organizations. The terminology is used to counter the antiquated, atomistic neo-Darwinian predilection to talk about "phenotypes as expressions of genotypes." The organizational whole determines the behavior of its components.

However, the field concept breaks down quickly in biology when pushed past the developmental level. The concept of a phylogenetic field advanced by Michael Polanyi (1962) and favored by Pannenberg (1981; 1988) has only metaphoric value, and a misleading one at that as we shall discuss presently. The concept of relational-constitution is by far more versatile. Nucleic acids and proteins, for example, are relationally constituted by their functional roles in organisms, and their behaviors are regulated by those wholes. At a higher level of the organic hierarchy, the identities of organisms are relationally constituted by their ecosystemic roles (Wicken 1987).

EVOLUTION AND PHYLOGENETIC FIELDS

The risks of assigning ontological priorities in biology—for example, "genotypes producing phenotypes" are readily apparent in current

evolutionary debate. Much of this debate centers on what it means to be an *organism*. The neo-Darwinian program tends to treat organisms as genetic houses, constructed by genes for their own perpetuation and propagation. This indisposition of the current evolutionary paradigm to the “organism” creates problems for a theology trying to come to terms with evolutionary science.

There are relational, holistic ways to link life with the rest of nature to whose discussion I have devoted much attention (e.g., Wicken 1987). The way out, however, is not through “phylogenetic fields.” Yet concepts hang together in networks, and the mutual affinity of Pannenberg’s field conception of nature with “historical contingency” makes the phylogenetic field subscription practically inevitable.

Let us see how this connection works. If there were *teleological* trends operating in evolution that could not be derived from the ordinary laws of nature, then boundary conditions for operation might be regarded as emerging under some kind of theistic supervision. This, however, is incommensurable with all that we know about evolution. An alternative is to have the laws of nature *themselves* move systems toward greater complexity, and mentality. Teilhard’s approach seems to be of this flavor; so too do treatments of evolution as ontogeny writ large in the idea of a “phylogenetic field.”

A parenthetical aside about Teilhard is quite apropos of the communication barriers between scientists and theologians: Some theologians see Teilhard as a prophetic bridge between science and religion. This sentiment stands in stark contrast to the assessment of Jacques Monod (1971) that Teilhard’s writing was a “spineless” refusal to look evolution in the face.

This kind of dispute is more than a disagreement among reasonable people. It points to lack of care with language. I read *Phenomenon of Man* as a beautiful poetic vision of the co-evolution of God and Man. Whether it is good theology or not, I cannot say. Science it is most definitely not. Yet this is *precisely* the claim Teilhard makes for it. In this science, he invents an entirely new physics where energy is factored into “tangential” and “radial” dimensions. The former approximates what physicists would understand as energy: that which has the capacity for physical work. The latter has no measurable physical correlates; it is spirit actualizing itself. Playing loosely and easily with hard-won concepts does not help communication.

I do not think talking about phylogenetic fields serves the cause of clear language much better. Evolution is opportunistic, and success is measured by survival and reproduction. This is not to say that there are no “wholes” which exert regulative influences over evolution. Ecosystems impose selective conditions on their constituent populations. For example, while nitrogen-fixing bacteria serve their own selfish

interests in oxidizing nitrites to nitrates, those interests are contextualized within that web of resource flows that constitute the nitrogen cycle. The cycle as a whole exerts selective pressures on the evolution of its parts. This is far from saying that evolution is regulated by a phylogenetic field. The part-whole relationships of populations to ecosystems is loose, and it is precisely *because* of this looseness that evolution is able to occur. The diverse directions of evolutionary change have been determined by chance, ecological opportunity, and historical (phylogenetic-developmental) constraint on adaptive possibility.

For their parts, humans emerged to fill a niche for creatures able to use past experiences to plan future activities. Divine participation seems unnecessary to explain this emergence. With consciousness of self comes the adaptive need for moral regulative principles, as the sociobiologists argue. Pannenberg's remark about evolution leading toward "increased participation in the divine spirit" needs to be carefully couched in such real-world terms (Pannenberg 1981, 75).

Thus, in response to Pannenberg's (1981) challenge to scientists to be true to spiritual kinds of questions, I offer the counter-challenge to theologians to take very seriously the broad implications of the Darwinian revolution for understanding the human condition. Every living thing that runs, swims, or flies on this planet does so by virtue of exploiting an adaptive niche of some kind. Given this, one must look very hard-headedly at what *transcendence* and *contingency* might possibly mean. It may seem that the sweep of evolution suggests some kind of increasing participation in a divine spirit or *logos* which has some kind of moral structure to it. However, Occam's razor would settle for the more economical explanation that adaptive openings for organisms with a sense of *time*—and hence of planning—have created the moral cosmos by creating a psychological future.

This point is made steadily by sociobiologists. Yet science constantly oversteps its authority at this juncture. While the facts of evolution limit what we can attribute to God as participant in nature, they by no means obviate the concept of God as the source of being or of the interior, sensitive dimension of life. Many evolutionary scientists take it for granted that this interior dimension of nature is ultimately explainable in the same materialistic terms used to deal with its exterior, objectifiable dimension. Those who bring such reductionist tenets into the theological arena invariably strike hollow chords. E. O. Wilson, in his in many ways rich and humanistic book *On Human Nature*, proclaims with confidence that, in time, mind will be "explained as an epiphenomenon of the neuronal machinery of the brain" (Wilson 1978, 195). There is nothing whatever—theoretically, philosophically or empirically to

support this position. Yet once the very precondition for perceiving materiality is itself materialized, it is only a small step further for Wilson to answer affirmatively Jehovah's challenge to Job, and to claim for science a comprehensive understanding of nature's wonders (Wilson 1978, 202). For religion, we should substitute the evolutionary epic.

Against this scientific hubris theology should firmly stand its ground. We can connect mental processes with the operation of the brain, and increasingly hone in on the involved cortical regions. However, we know no more today of that *interior* dimension of nature that animates, conceives, and makes concepts of divinity endure the ages than did the ancients. Science and theology should join hands with Galileo in pronouncing from time to time that "wise, ingenious, and modest sentence, 'I know it not'" (Burt 1932, 103). Only from such frank admissions can the needed dialogue between science and theology develop.

REFERENCES

- Burt, E. 1932. *The Metaphysical Foundations of Modern Science*. Garden City: Doubleday.
- Layzer, D. 1975. "The Arrow of Time." *Scientific American* 233:56-59.
- Monod, J. 1971. *Chance and Necessity*. New York: Vintage Books.
- Pannenberg, W. 1981. "Theological Questions to Scientists." *Zygon: Journal of Religion and Science* 16:65-77.
- . 1988. "The Doctrine and Creation of Modern Science." *Zygon: Journal of Religion and Science* 23: 3-21.
- Polanyi, M. 1962. *Personal Knowledge: Toward a Post-Critical Philosophy*. 2d ed. London: Routledge & Kegan Paul.
- Webster, G. and B. Goodwin. 1982. "The Origin of Species: A Structuralist Approach." *Journal of Social and Biological Structure* 5:15-47.
- Wicken, J. 1981. "Evolutionary Self-Organization and the Entropy Principle: Teleology and Mechanism." *Nature and System* 3:129-43.
- . 1987. *Evolution, Thermodynamics and Information: Extending the Darwinian Program*. New York: Oxford Univ. Press.
- Wilson, E. O. 1978. *On Human Nature*. Cambridge, Mass.: Harvard Univ. Press.