

# THE THEOLOGICAL-SCIENTIFIC VISION OF ARTHUR PEACOCKE

by *Robert John Russell*

*Abstract.* Arthur Peacocke has made seminal contributions to the interdisciplinary field of Christian theology and natural science. First, this paper presents a summary of his work, including his argument that critical realism provides for theology and science a common philosophical basis preferable to that of reductionistic materialism, vitalistic dualism, or divine interventionism. In specific, Peacocke proposes a form of pantheism in light of cosmology and evolution: God is immanent in and transcendent to the universe, with its open-ended processes characterized by both law and chance. God suffers with the travail of evolution; and Jesus is the normative realization of God's creative involvement with nature—a form of emergence with continuity. This paper then critiques each of these philosophical and theological positions.

*Keywords:* cosmology; critical realism; evolution; pantheism; theology and science.

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Even more than the results of his scientific career, Arthur Peacocke's most enduring accomplishment will be the way he has found to rethink Christian theology in light of the very serious challenge and opportunity posed by science and the philosophy of science in this century. After I summarize portions of his work in constructing a philosophical bridge between theology and science using critical realism, I will present his views on three theological issues in light of science. Then, after a critical appraisal of these issues, I will suggest questions he might explore in the future.

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## CRITICAL REALISM: A BRIDGE BETWEEN SCIENCE AND THEOLOGY

Peacocke, who espouses a form of critical-realist epistemology, believes that scientific language is metaphorical—and that models play a heuristic role, extending our knowledge from the known to the unknown. Although concepts in science refer to reality, they never fully articulate the underlying complexity of nature. By claiming that critical-realist epistemology is also appropriate in the theological context, Peacocke seeks to form an epistemic bridge between these seemingly disparate fields.

Peacocke rejects both reductionism and dualism. In their place he adopts a hierarchical epistemology that leads to a philosophy of emergence (against epistemic reductionism). However, he prescinds from a strong ontological claim about emergence that might entail actual levels in nature (thus rejecting ontological dualism). To understand its complexity, we must look at each part of his argument.

The various academic disciplines in his epistemic scheme are semiautonomous fields of study that can be pictured as forming a series of levels, starting with physics and proceeding to chemistry, biochemistry, cell physiology, neurophysiology, and so on (Peacocke 1979, 112–22; 367–71). The concepts, languages, laws, and data of a field that studies more complex phenomena in nature are neither reducible entirely to, nor predictable exhaustively from, concepts, languages, laws, and data of a field that studies simpler phenomena. Yet the lower levels place rules of constraint on the upper levels; thus a biologist cannot propose a scientific explanation of a biological process that violates a law of physics. This epistemic scheme, the hierarchy of levels, allows Peacocke to argue against epistemological reductionism in favor of emergence.

Peacocke nevertheless resists ontologizing the structure of his epistemic scheme; the levels of knowledge do not lead to—or, more properly, arise from—levels of reality. The epistemic concept of *mind* (which psychologists, for example, employ) is not to be taken as pointing to an ontological entity separate from the *brain* (a term that neurophysiologists use). In this way Peacocke avoids ontological (mind/body) dualism. Instead, reality is ultimately of a piece, a seamless and continuous whole, though structured by spontaneously emergent forms of increasing complexity and novelty.<sup>1</sup>

Thus, on the one hand, emergence is opposed to vitalism and other forms of dualism, as we see in Peacocke's rejection of Bergson's notion of an *elan vital*, Driesch's conception of entelechy, and vitalism in general (Peacocke 1971, 85). On the other hand, Peacocke deploys

his philosophy of emergence against all forms of monism, including panpsychism and reductionistic materialism, based on his claim about the nonreducible character of the epistemic hierarchy. Since Peacocke opposes making one field (typically, physics) normative epistemically, he can block what usually follows: the ontological claim that *matter* (in the generic sense of “what there is”) is merely “matter in motion” (i.e., whatever physics, as the only truly necessary study, says it is). Peacocke argues that no discipline (*pace*, physics!) studies matter per se, thereby leaving only its exotic properties (e.g., organizational complexity) to other disciplines. Instead, since “matter” becomes increasingly complexified as we advance along the evolutionary history of nature, new and unpredictable processes arise that require new fields of study.<sup>2</sup>

Although Peacocke tends to abstain from heavily ontological language in general, I suggest the phrase *emergent materialism* to describe his ideas’ implicit ontological commitments. This phrase is meant to convey the position that if matter in the generic sense is what the universe is composed of, no discipline can study all that matter can do, nor is any discipline to be granted special privilege in making ontological inferences about what matter really *is*.

The rejection of ontological dualism for philosophical reasons gives Peacocke an important advantage when it comes to theology. Since life and mind are not to be understood as distinct entities in nature, Peacocke is free to reject a theology of divine intervention as their source. According to him, this strategy is not only wrongheaded theologically (since God is immanent everywhere, thereby rendering intervention illogical), it is also philosophically unnecessary, since there is nothing about life and mind whose discontinuity with the evolution of phenomena in nature needs an interventionist explanation (Peacocke 1971, 131). Instead, God is the fundamental creative power immanent in all physical processes—a theme that recurs throughout Peacocke’s writings, culminating in his espousal of pantheism with its combination of transcendence and immanence.

Yet his philosophical rejection of reductionistic materialism gives Peacocke an equally important theological advantage. Since life and mind are not to be understood merely in terms of physics and chemistry, their ultimate explanation will necessarily include theological categories, as well as those drawn from all other fields of study. Thus Peacocke can talk about God as the immanent creator of the world without fearing that the theological language is superfluous to the secular study of human existence.

PANENTHEISM: GOD AS TRANSCENDENT TO, AND  
IMMANENT IN, NATURE

Peacocke's fundamental theological understanding of God's relation to the world is panentheism: "the world is regarded as being, as it were, 'within' God, but the being of God is regarded as not exhausted by, or subsumed within, the world" (Peacocke 1984, 79; his definitions of panentheism recur throughout his writings). This position involves two distinct but interrelated assertions: God is transcendent to nature, and God is immanent in nature. In relation to the doctrine of creation, these assertions lead Peacocke to claim that God is the transcendent Creator out of nothing (*ex nihilo*) and the immanent continuous Creator (*creatio continua*). He develops his views on panentheism in light of physics, cosmology, thermodynamics, and evolution.

The universe as a seamless realm of matter, energy, space, and time thematizes God's transcendence to nature. Moreover, the universe is contingent, dependent on a power beyond itself for its very existence. Yet the open character of the world, evidenced by the fundamental role of chance in quantum physics, thermodynamics, and biological evolution, allows Peacocke to describe God as immanent, continuously creating "everywhere and all the time" (1979, 204).

These two modes of understanding God, as Creator and as creating, are brought together in the form of panentheism (a term that often carries a spatial connotation of the world as within the divine transcendent being). Peacocke adds to this the dynamic (and compassionate) understanding of creation as proceeding from the inner life of God as love (1979, 45). Panentheism also suggests a distinctly feminine image of God's relation to the world by drawing from biological language; mammalian females, for example, create their embryos within their bodies (Peacocke 1984, 64). The emergence of novelty, of higher orders of complexity, brought about through the temporal processes of nonequilibrium thermodynamics and biological evolution, fleshes out the panentheistic claim that God is at work continuously creating the world, manifesting ever anew its inherent potentialities—"ringing the changes" to produce the magnificent universe being discovered by science. Thus drawing these various models together we can say that "God creates a world that is, in principle and in origin, other than him/herself but creates it, the world, within him/herself" (1979, 142).

### GOD AS SUFFERING WITH NATURE

God creates in, with, and through the processes of nature, but at a price. From a scientific point of view, suffering is part of the natural, evolutionary process. But is it necessary? Could things, as they are now, have come about another way? Peacocke's response is that although suffering is natural (i.e., inherent in nature and a necessary part of evolution), it calls for a theological interpretation. Thus he argues that suffering occurs within the divine being: even God suffers. Since God (as continuous creator) is involved in the evolution of nature, God suffers with nature: God experiences the dead ends and false leads that are part of the emergence of conscious life, just as God experiences the pain and struggle of our personal existence (Peacocke 1984, 68-69).

### GOD AS INCARNATE LOVE AND THE RESURRECTED CHRIST

Peacocke draws upon his epistemic hierarchy to argue that the emergence of humankind allows nature to express God's supra-personal character and creative love in ways that incorporate, but cannot be reduced to, the ways in which God is expressive through the lower levels of nature. Humankind carries the "image of God" in a unique way, though in a broken and distorted form. Moreover, in the person, life, and work of Jesus, God is so entirely immanent that yet another irreducible characteristic emerges, with its attendant language and concepts, signified by what theologians call *Incarnation*. Jesus possesses to a unique and normative degree the openness to the purposes of God that we see partially expressed in simpler stages throughout creation. Peacocke sees this claim as entirely congruent with, but not reducible to, our present scientific knowledge of the world (1979, 211f.f., 231). God's action in the Incarnation is not the intervention of an external deity, but the unique manifestation of a universal possibility in evolving nature (1979, 241). Jesus is thus a normative example of the general characteristic of God's immanent action in nature—that is, the bringing about of "emergence-from-continuity."

Picking up his earlier themes, Peacocke then argues that, through the cross of Christ, God suffered with Jesus and thus with all creation. Jesus' suffering and his openness to God made possible the Resurrection, and with it a realm of potentialities to be actualized in those who are willing to share in Jesus' human response to God (1979, 232). Because of Jesus, "death becomes the opportunity of a new kind of existence, emergent from its matrix of matter-

energy-space-time”—one of openness to God and the divine kingdom of self-offering love (1979, 245).

#### CRITIQUE OF CRITICAL REALISM: WILL THE BRIDGE BEAR HEAVY TRAFFIC?

Critical realism raises both philosophical and theological questions on which Peacocke might wish to focus further attention.<sup>3</sup>

*Philosophical Difficulties.* Among philosophers of science the term *critical realism* stands for a number of distinct positions that vary significantly (Leplin 1984, 1–2; Cushing, Delaney, and Gutting 1984; McMullin 1985; Soskice 1985). It is therefore important to know exactly which of these positions Peacocke wishes to defend. Indeed, the differences will affect the way he emphasizes explanation versus prediction and the meaning he gives to “convergence on reality” in science, theology, and the relations between the two.

Additional, more technical philosophical issues are raised for most versions of critical realism by quantum physics, cosmology, and the prospect of a grand unification theory (a “theory of everything”). In several related ways, quantum physics (for example) challenges the assumptions about nature that Peacocke makes, and one of the most apparent ways is in terms of “chance.” Striking correlations in certain kinds of chance events in atomic and nuclear physics lead one to believe that nature is *not* ultimately made of particles and waves in the classical sense. It is possible, instead, that the stuff of the world is highly interconnected—that phenomena, once coupled, can never be completely separated, that the spatial extension and apparent discreteness of nature arise from an underlying order of vastly different topology.<sup>4</sup>

To most interpreters it seems increasingly clear (from quantum physics) that one has to choose between a critical-realist but nonlocal view of nature that somehow takes quantum holism seriously and a local but antirealist approach that settles for a positivistic or instrumentalist view of nature.<sup>5</sup> If Peacocke wants to maintain a critical-realist view, he must account for the nonlocal effects as somehow reflecting the way the world really is. This means that the metaphysical presuppositions inherent in modern science, such as atomism (simple location in [pseudo-] Euclidean space and time), with the resulting interaction of fully separable matter, must be reconsidered. The world, if really nonlocal, will be far more complex and holistic than is presupposed in the language most realists (such as

Peacocke) use when describing nature.<sup>6</sup>

Cosmology also raises profound philosophical issues that bear against critical realism (cf. Stoeger 1988, 219–47). For example, in what way is the universe an object of study for the sciences? What do we mean by observation in the context of cosmology? How much of the universe can in principle (as well as in practice) be observed? What do we mean by its origins? What is the meaning of space (is it the extension of objects or their container)? What is the significance of the relation between space and time (is the universe a static space-time or a dynamic process in time)? Is there a cosmological basis for the “arrow of time”? Is the universe self-explanatory or contingent? In what ways do our theories about the universe pertain to the “real” universe? Could a scientific theory of the universe be given a realist interpretation without falling into reductionism? And so on.

*Theological Difficulties.* To what extent do we want to adopt a critical-realist view in theology? This sort of question lies at the heart of much of the current debate over the meaning of theological language (cf. McFague 1987; Lindbeck 1984), the form of theological method (Tillich 1967; Pannenberg 1976; Tracy 1975), and the aim of theological doctrines as robust theories about religious experience (Murphy 1990). Of course, one wants some form of reference for theological language so that we are not solipsists when, for example, we speak about God. Moreover, theologians want some sense that historical continuity and the consensus of the faithful counts for the truth to which that faith bears witness. But does one want convergence, predictive success, and all the rest that seems to go with critical realism in the sciences? And what would these terms mean in religion?

An important goal, then, for critical realists such as Peacocke (and to some extent myself) will be to show, to a much more detailed extent than previously, whether and how these and other biblical and systematic topics can be interpreted fruitfully in realist terms.<sup>7</sup>

#### THEOLOGICAL CRITIQUE OF PANENTHEISM: GOD AS TRANSCENDENT TO, AND IMMANENT IN, NATURE

Several theological questions are related to Peacocke’s fundamental theological position, panentheism. Being so central to his thought, panentheism serves at least implicitly as both method and specific proposal about God’s relation to the world, and both of these aspects invite further discussion.

*Theological Method.* In what ways does pantheism function as Peacocke's theological method, serving to shape the theological development of his views? If pantheism is Peacocke's basic theological category for relating God to the world, how does it, as method, guide the way he treats specific theological doctrines in relation to each other and to science? Clearly, the strength of a theological proposal will depend intimately on the fruitfulness of the overall method and on the consistency with which it is employed, and thus this kind of question must come first in our analysis of Peacocke's work.

*Theological Content.* Along with its apparent role in terms of method, pantheism serves as Peacocke's substantive proposal for relating God and nature. This, in turn, generates a number of important questions:

1. What is the precise definition of pantheism, as Peacocke uses the term? How does this relate to its variety of historical and current roots, meanings, and uses in both philosophical and theological traditions?<sup>8</sup>

2. How close is Peacocke to process theology, where pantheism is prevalent? In what ways does he distinguish himself from process theology and yet maintain pantheism?<sup>9</sup>

3. How, exactly, are transcendence and immanence combined into Peacocke's doctrine of God? How is this doctrine related to his use of trinitarian language? What, in turn, serves as the theological principle of unity in Peacocke's doctrine of God? (For example, is the unity metaphysical, as in Barth or Tillich, or eschatological, as in Pannenberg or Moltmann?) How is this principle related to his view of nature and God's action in nature? That is, how is his understanding of creation and science related to trinitarian theory as affirming a three-in-oneness? (For example, is the Father the Creator, or are all three Persons involved in creation specifically as creation is related to science? And similarly for Redemption?)

4. Although time is a key ingredient in Peacocke's philosophy of nature and thereby his theology of creation, there is widespread disagreement on the status of time in physics and its fundamental role in nature. To many (but certainly not all) writers, time is problematic in several ways. According to relativity theory, (1) there is no fundamental physical significance to "the present." (2) Even if there were, the "arrow of time" that distinguishes the future from the past is missing in fundamental physics. (3) From the perspective of relativity and cosmology, the universe can be viewed as static—a time-independent, four-dimensional *geometry*.

Such an "atemporal" view of nature is hotly contested. Still, if



it were to prevail, would it undercut Peacocke's ability to interpret science in a theologically meaningful way? Panentheism is particularly vulnerable to this sort of "atemporal" critique, as Hartshorne has pointed out (Hartshorne 1967, 93f.f.).

From the opposite perspective, there is a problem for those who take time and time's passage *too* seriously. If God is fully immersed in time as immanent, continuing Creator, so that even God cannot know the future, in what ways can we say that God can guarantee the eventual fulfillment of history as its eschatological Lord?

5. As a way to understand the relation of God to the world, Peacocke suggests the analogy of God : world :: mind : body. But if "the world" means "the universe" as studied by cosmology, with *its* philosophical issues, does Peacocke's analogy make sense? In particular, is the universe really like a body?<sup>10</sup>

6. One of Peacocke's most significant accomplishments in dealing with God's relation to the world as Creator is, in my opinion, his response to Monod—that chance need not undercut divine action in the world but, instead, is an essential ingredient in that action. For Peacocke, chance and law work together as part of God's instrumentalities, as the means through which God acts as transcendent lawgiver and as immanent manifester of potentialities in the world. However, Peacocke *does* adopt a thoroughly classical (i.e., anthropocentric) view of chance in natural processes.<sup>11</sup> The challenge will be to ask what effects a quantum interpretation of chance will have on our theology. For example, does Peacocke's argument that God creates through chance and law really make sense theologically, when chance is not thought of in human-centered terms (i.e., as classical chance), but as pointing to a much different metaphysical view of "the world," one that takes quantum nonlocality seriously?

#### CRITIQUE OF THE CONCEPT OF GOD AS SUFFERING WITH NATURE

The problem of evil usually begins with moral evil, the sinful acts we do against God and our fellow creatures that cause suffering, alienation, and death. Yet the question often expands to include suffering throughout nature: needless and brutal death, disease, tempests, and other natural disasters. Eventually the problem of evil, from the list of horrendous human atrocities to the vast carnage of nature, leads to the problem of theodicy: How can a God who is all good and all powerful allow evil on so vast a scale? Like the challenge of science, the problem of evil is one of the main impediments for many people to the plausibility of the Gospel, and it is a perennial

problem for systematic theology's wrestling with the origins and nature of sin within the creaturely dominion of God's grace.

Is it enough to argue that suffering is natural (read *necessary*) to the production of free creatures by the evolutionary process and that God suffers with us? Or is there a deeper theological lesson here, one that more adequately probes the dialectical relations between competition and cooperation, between individuals and ecological communities, and between the roles of living and dying in the context of evolution and, ultimately, of cosmology? Must an anthropic universe be a thermodynamic universe? (Is a precursor to evil in nature necessary to the evolution of sentient life?)

#### CRITIQUE OF THE CONCEPTS OF GOD AS INCARNATE AND THE RESURRECTION OF CHRIST

As John Cobb has stressed (Cobb 1975), the image of Christ as conveying "saving power," which has been central to Christendom for millennia, is now in massive decline. Secularity, pluralism, modernism, and even science are components in this decline. Can Christians retrieve their central claim and persuasive symbol, and then reconstruct it in a way that will lead others to find in it normative significance while respecting as inviolate the differences between world religions? These questions surround Peacocke's attempt to reinterpret the Christ event in an evolutionary, cosmological context, and they revolve around the meaning Peacocke gives to the Incarnation.

Peacocke works here with what theologians call an *upward Christology*, which means that he starts with the human being, Jesus, and inquires about his relationship to God.<sup>12</sup> He understands Jesus in the context of evolution, and he describes his relation to God as a supremely clear example of the potentialities God has placed within all of nature and manifested in the person of Jesus. Peacocke's particular form of upward Christology is called an *exemplarist Christology*, since Jesus is seen as the example (or perhaps the exemplar), the paradigmatic figure whose life and values we strive to emulate. An alternative, or "downward," Christology starts with God as trinitarian and asks how the second Person of the Trinity, Christ, is related to the person of Jesus.<sup>13</sup>

Peacocke's approach has several advantages over a downward Christology. By starting with the human context and seeking to understand the divinity of Jesus, Peacocke can approach describing the unknown (divinity) by presuming upon what is known to all (human existence). This approach has the added advantage that it allows

Peacocke to engage with science in understanding more empirically than do other theologians the humanity of Jesus in an evolutionary and even cosmological perspective.

However, I raise two questions about this approach. (1) From a strictly theological point of view, can an exemplarist Christology lead to an adequate soteriology? That is, *how* does Jesus Christ save us? (If it is merely by inspiration, then it surely fails, for I often know what I should do but do not do it.) More to the point, How does exemplarist Christology support the definitive and shocking claim of Christianity, that Jesus rose from the dead and that he offers us life everlasting? (2) How will Peacocke relate his response to this question to science? Indeed, how consistently does Peacocke interpret the Resurrection in the context of science? To be as explicit as possible, would it matter theologically if the bones of Jesus were found one day and what bearing would science have on his answer? This may be the most daunting question of all.

#### NOTES

1. Peacocke (1979, 21-22, 367-71) does allow the hierarchical epistemology to suggest "intimations" about the actual structure of reality (ontology) without making too strong a claim about these structures.

2. The history of the development of this position in Peacocke's thought is fascinating. I reconstruct it as follows:

In 1971 his case against reductionistic materialism lacked reliable scientific arguments. Consequently he gave tentative consideration to marginally scientific ideas such as Polanyi's "boundary conditions" and "phylogenetic field" (1971, 132). Within the ensuing years, and clearly by the time Peacocke wrote *Creation and the World of Science* (1979), the research of Ilya Prigogine in nonlinear, nonequilibrium thermodynamics and Manfred Eigen in kinetics showed how complex systems can, in certain cases, arise from simpler ones. They provided Peacocke with the needed scientific grounds for both his philosophy of emergence and through this his panentheistic doctrine of God as a distinctive combination of transcendence and immanence.

The results of Prigogine and Eigen were entirely unexpected from a classical thermodynamics perspective of the nineteenth century. They showed that open systems can degrade the larger systems of which they are a part in order to become more complex. For example, the earth receives solar energy at 6000 degrees Kelvin and reradiates it at infrared temperatures. This entails a massive production of entropy which offsets by far the loss of entropy due to the evolution of biological systems. Hence life does not defy the second law of thermodynamics (as creationists still contend) but lives off it. Science has thus achieved an important level of coherence in its diverse explanatory systems, linking of thermodynamics to evolution.

Thus, in my interpretation of Peacocke's position, it seems that "order out of chaos" provides a critically important basis for Peacocke's philosophy of nature (what I call his philosophy of emergent materialism) and thus his theology of divine immanence (as a subsidiary of panentheism). Peacocke can equally avoid ontological dualism since, given the consistency with thermodynamics of the biological explanation, there is no clear warrant for ontologizing life as a separate principle or distinct entity in the world, such as Polanyi's phylogenetic fields might have suggested.

It is noteworthy, however, that the boundary condition problem does resurface in Peacocke's recent book, *God and the New Biology* (1986; cf. pp. 23-26, 61). Here he grants that Polanyi wants to give a strong antireductionist argument, but he contends that

reductionists use the same examples (regarding the spatial relationships of the parts of a machine) and yet reach the opposite conclusion! Still Polanyi is on safer grounds, according to Peacocke, when making his case by using examples drawn from biology.

3. I wish to stress that Peacocke's position on critical realism seems in large measure shaped by his scientific research in physical chemistry and biology. Though my background in quantum physics and cosmology leads me to assess the philosophical issues surrounding critical realism from a somewhat different perspective, I find his arguments attractive for several reasons, not the least of which is that, like my own, they are so thoroughly worked out in the context of Peacocke's personal experience as a scientist.

4. These ideas, stemming from quantum physics, are highly controversial, and one must be sparing in coming to conclusions—including the conclusion that after it all gets "sorted out," things of most interest (to *theologians*, at least) will return to their classical and innocuously anthropocentric status.

5. There are other interpretations, such as "quantum many worlds," but these seem implausible, compared with the more widely held views described here.

6. In the last analysis, the strategy of avoidance—that these remarks, after all, only apply to the quantum level—doesn't work for at least two reasons: (1) Many macroscopic phenomena in everyday life—the blue color of the sky, the expansion of water as it freezes, the electrical **resistance** of an insulator, the transparency of glass to light, the chemical and physical **properties** of solids, and so on—are the direct result of quantum (microscopic) nature, so that the quantum-level metaphor fails to demarcate reality into micro and macro levels. (2) The realist ought no more be a reductionist upward than a reductionist downward; that is, he or she should no more let the metaphysics (or ontology) be drawn normatively from comfortably human-size macronature or from counterintuitive micronature.

7. Realism in science works best when drawn from such fields as geology and chemistry, biology and astronomy, thermodynamics and mechanics. I suspect that the difficulty realists have when expanding their approach in the sciences to include such fields as quantum physics and cosmology might prove instructive in the shift to the theological area and its even greater challenges to realism.

8. For a particularly helpful introduction to the meaning of pantheism in distinction to other theological and philosophical positions, see Hartshorne and Reese (1953). Peacocke's position should be compared critically with that of contemporary process theologians, as well as with those theologians who do not place themselves precisely within process theology but who nevertheless understand themselves as pantheists.

9. For example, Peacocke rejects panpsychism and other forms of dualism, but need he reject panexperientialism, which some authors claim is the view held by process theologians?

10. See the response to Peacocke's CTNS 1986 Fellow's Lecture by Ian Barbour (1988), where the point was raised that Peacocke's use of the body metaphor may not be applicable to the universe as a whole.

11. When Peacocke talks about chance, he is referring to its two classical interpretations: chance is either our blindness to hidden variables that actually determine the outcome, or a manifestation of real indeterminacy in nature. Quantum physics, however, raises a third option—indeed, a radically different, holistic meaning for chance, leading to a serious challenge to our underlying metaphysical assumptions about nature (see Russell et al. 1988).

12. Precedents of this type of Christological formulation include figures in the ancient church, in the Middle Ages, and in Martin Luther, Friedrich Schleiermacher, Albrecht Ritschl, and (more immediately) Rudolph Bultmann and Wolfhart Pannenberg. See Pannenberg (1968, 197, 33-37).

13. For a very helpful analysis of Peacocke's Christology, see Duane H. Larson (1986), in which he compares Peacocke's Christology, with its distinctive Abelardian form, to the vicarious-satisfaction model of Anselm, the more dominant model in historical and contemporary theology.

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