Review Article

DIVINE ACTION AND THE NATURAL SCIENCES

by Steven D. Crain

Physics, Philosophy and Theology: A Common Quest for Understanding. Edited by ROBERT JOHN RUSSELL, WILLIAM R. STOEGER, S.J., and GEORGE V. COYNE. Vatican City State: Vatican Observatory Publications; Notre Dame, Ind.: Univ. of Notre Dame Press, 1988. 2d ed. 1995, M14, 419 pages. $18.95 (paper).

Quantum Cosmology and the Laws of Nature: Scientific Perspectives on Divine Action. Edited by ROBERT JOHN RUSSELL, NANCEY MURPHY, and C. J. ISHAM. Vatican City State: Vatican Observatory Publications; Notre Dame, Ind.: Univ. of Notre Dame Press, 1993. 2d ed. rev., 1996. 468 pages. $21.95 (paper).

Chaos and Complexity: Scientific Perspectives on Divine Action. Edited by ROBERT JOHN RUSSELL, NANCEY MURPHY, and ARTHUR R. PEACOCKE. Vatican City State: Vatican Observatory Publications; Notre Dame, Ind.: Univ. of Notre Dame Press, 1995. 416 pages. $21.95 (paper).

Abstract. The Center for Theology and the Natural Sciences and the Vatican Observatory have jointly sponsored a series of conferences exploring the overarching question: How can we conceive a personal God creating and active within the universe described by the natural sciences? The volumes include significant contributions to the field, although I highlight two important weaknesses: (1) theology is not adequately respected as an active conversation partner capable of advancing the agenda under discussion; and (2) insufficient attention is paid to the many scientific and philosophical uncertainties that plague the overall project.

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We have begun to talk to one another on deeper levels than before, and with greater openness towards one another's perspectives. We have begun to search together for a more thorough understanding of one another's disciplines, with their competencies and their limitations, and especially for areas of common ground. In doing so we have uncovered important questions which concern both of us, and which are vital to the larger human community we both serve. (Russell et al. 1988, M4)

Thus wrote John Paul II in June 1988, soon after the three hundredth anniversary of Isaac Newton's *Principia Mathematica*. The address in question serves to introduce the first of the three volumes reviewed here as well as the entire series of which they are a part. Consisting of papers by scientists, philosophers, and theologians, this collaborative effort on the part of the Vatican Observatory and the Center for Theology and the Natural Sciences (CTNS) can indeed be read as a "search . . . for areas of common ground," an exploration of questions of mutual interest that challenge all concerned to reflect on the "competencies and limitations" of their disciplines. Although we might puzzle over whether the questions considered here are "vital to the larger human community," undoubtedly the series constitutes a contribution of fundamental importance to the dialogue that is the *raison d'être* for the journal *Zygon*.

As explained in its preface, *Physics, Philosophy and Theology: A Common Quest for Understanding* largely resulted from a conference held at the Papal Summer Residence at Castel Gandolfo in 1987, organized principally by William Stoeger and Robert John Russell. The format for this conference, better called a "study week," became a model for those that followed. The participants formed an ecumenical and interdisciplinary community that met to discuss drafts of papers circulated prior to the meeting. The study week itself then provided the occasion and primary means for transforming the papers into publishable form—supplemented, of course, by judicious final editing. For ease of reference, I will refer to this book as *Physics*.

As the introduction to the following volume then explains (pp. 2–3), the success of the 1987 conference led George Coyne, the director of the Vatican Observatory, to call for a series of five conferences over a ten-year period. The first of these conferences, held in 1991, led to the publication of *Quantum Cosmology and the Laws of Nature*, (subsequently referred to as *Cosmology*) while *Chaos and Complexity* (short title: *Chaos*) followed the second conference held in 1993. The volume from the third

conference, convened in June 1996, will focus on evolutionary and molecular biology and has entered the postconference editorial phase. The two remaining conferences will be devoted, respectively, to the mind-brain problem and to quantum physics and quantum field theory.

The subtitle for the volumes of the five-conference series designates the overarching theme linking the series together: "Scientific Perspectives on Divine Action." Conference organizers chose the topic of divine action primarily in recognition that theology all too often fails to take the initiative in its dialogue with science. They believed they found in the theme of divine action a source for a *theologically* motivated agenda of issues and questions (*Cosmology*, p. 3). Be that as it may, one notes that the series theme is "scientific perspectives on divine action," not "theological perspectives on divine action and the natural sciences." This is a series to date very much dominated by discussions of foundational questions in the sciences and debates over how to interpret recent discoveries, hence the organizational principle that has broken the conferences down according to scientific discipline. Nevertheless, in this review I aim to demonstrate the importance of the series for readers of *Zygon* and to encourage the kind of careful critical engagement with the issues raised that would justly reward the hard work and vision of the series organizers and participants.

Overview

Formally, *Physics* stands outside the thematic umbrella of "divine action" as a kind of prefatory volume, although it addresses many of the same questions that the series proper continues to ponder under the rubrics of the individual conference topics. Articles in the volume are arranged in three sections: (1) "Historical and Contemporary Relations in Science and Religion"; (2) "Epistemology and Methodology"; and (3) "Contemporary Physics and Cosmology in Philosophical and Theological Perspective." It is useful to consider the lead article in this first book, namely, Ian Barbour's piece, "Ways of Relating Science and Theology" (pp. 21–48). His taxonomy of possible interdisciplinary relationships is well known. After rejecting both the "conflict" and "independence" theses, Barbour makes his case for "dialogue" combined with a tentative and cautious "integration." The latter envisions using scientific theories to help reformulate Christian doctrine and then drawing on both science and theology to formulate a comprehensive metaphysics as the basis for a coherent worldview.

A survey of the volumes reveals that contributors address most of the important questions that Barbour poses in his article. Are there significant methodological parallels between theology and science on which to base fruitful dialogue? If dialogue depends on addressing "boundary

questions," should attention focus on "gaps" in scientific accounts, and if so, on what sort of gaps? For the purpose of integration, how should Christian doctrine be reformulated on the basis of scientific theories? Which doctrines and which theories? And so on. Hence, for many contributors, including, I believe, at least Robert Russell, Bill Stoeger, Ted Peters, Nancey Murphy, George Ellis, John Polkinghorne, Arthur Peacocke, Keith Ward, Thomas Tracy, William Alston, J. R. Lucas, Denis Edwards, Stephen Happel, Langdon Gilkey, and Jürgen Moltmann, these conferences have provided the context for experiments in "dialogue" and "integration."

On surveying the second two volumes, one sees that a cluster of theological and philosophical commitments prove foundational for a significant number, though doubtless not all, of the contributors just listed. (Obviously, I am interested not in who believes what, but rather in the theological orientation and internal dynamic of the conversation between theology and science represented in the texts.) These commitments include belief in a personal God, in the ongoing redemptive activity of God, and in the meaningfulness of human experience, especially as potentially revelatory of the divine. Many of the participants in question also seem to presuppose that the Christian scriptures are normative for theological discourse. In sum, I believe it is safe to say that for many contributors, albeit certainly not all, key elements of the Christian faith tradition and its claims about divine action are here presupposed, though doubtless variously interpreted and emphasized given the ecumenical nature of the scholarly community assembled. Philosophically, two versions of "critical realism," one scientific, the other theological, also seem pervasive, consistent with the goal of constructing an all-inclusive worldview that reflects, if ever so dimly, a reality at least partially independent of our concepts and systems. Again, although certainly not all participants, nor even perhaps all of those just listed, adhere to this cluster of theological and philosophical commitments, I believe one can accurately call the basic theological orientation of the series "Christian critical realism." In this sense, theological concerns very much shape the conversation here. Hence, for those participants who share most or all of the aforesaid "core" commitments, the fundamental question to be addressed in the series is: How is it possible to conceive of a personal God—specifically, the God in whom Christians confess belief—creating and active within the universe revealed by the natural sciences?

This central question has clearly shaped the organization of the first two volumes in the series. *Quantum Cosmology and the Laws of Nature* contains five sections: (1) "Scientific Background: Standard and Quantum Cosmologies"; (2) "Methodology: Relating Theology and Science"; (3) "Philosophical Issues: Time and the Laws of Nature"; (4) "Theological

Implications 1: Time and Quantum Cosmology"; and (5) "Theological Implications 2: The Laws of Nature." The first section consists of two articles that lay out, sometimes with a formidable degree of sophistication, the basic scientific concepts of both standard Big-Bang and quantum cosmologies. The remainder of the book is then devoted to the philosophical and theological implications of contemporary cosmology in both its "standard" and its "quantum" forms, the bulk of the articles focusing on the question of whether God can still be conceived as dynamic and personal especially in the light of the new quantum cosmology, which some argue requires a radical revision of our concept of time.

Chaos and Complexity, like the preceding volume, begins in section 1 with an overview of the science in question, in this case the theory of chaos. The remaining sections of the volume include: (2) "Chaos, Complexity, and the Philosophy of Life"; (3) "Chaos, Complexity, and Divine Action"; and (4) "Alternative Approaches to Divine Action." Section 2 focuses on the topic of reductionism and emergence, outlining the empirical and conceptual basis for the claim that the universe is hierarchically structured by order of increasing complexity and "openness" to "novelty." Sections 3 and 4 then ask how God can be understood to act in the world so pictured. Each article in section 3 finds chaos and complexity theory helpful, whereas, for various reasons, articles in section 4 do not. Three contributors here (Tracy, Ellis, and Murphy) instead exploit microlevel indeterminism in order to suggest how divine action in the world is possible.

The discussions throughout are careful and stimulating, welcome contributions to the field. All participants seem open to the possibility that a dimension of reality exists that transcends ordinary human experience and gives it meaning. As already noted, many participants strive specifically to defend a Christian interpretation of this meaningfulness. Most who do maintain a strong distinction between divine and finite causality: God is not a "cause among causes." Some draw on the conceptual resources of the doctrine of the Trinity or on insights from specific scriptural texts or strands of the Christian tradition. But for all this, one wishes for a more thorough discussion of the various components of what I earlier referred to as the "Christian critical realism" that pervades our texts. Specifically, if one is committed to Christian critical realism, and if one desires theology more often to "take the initiative" in a genuine "two-way" conversation with the sciences on the topic of divine action, then questions in christology, pneumatology, and soteriology deserve careful treatment. This would require that exegetical analysis, studies in historical theology, and systematic theological reflection be devoted to topics such as the following: (1) the Resurrection of Jesus—how to interpret claims about the Resurrection and how to understand the nature of the divine activity here; (2) the

relationship between God and the human being Jesus; (3) the activity of the Holy Spirit and God's relationship to that activity; and (4) the experience of salvation in the Spirit. An editorial policy seems to be at work, however, that in particular has deemphasized biblical exegesis as well as studies devoted to the historical development of theological reflection on divine action. That *Cosmology* and *Chaos* begin with enormously sophisticated presentations of standard and quantum cosmology and the theories of chaos and complexity—far too specialized for the uninitiated to follow in detail—while including no christological or pneumatological studies even approaching that depth suggests that even in a "postmodern" era theology has relatively little to bring to the discussion table despite ostensibly establishing the agenda under consideration.

An analysis will illustrate some of the major strengths and weaknesses in the way the texts typically bring science to bear on the question of divine action.

Analysis

Broadly speaking, four categories of questions play pivotal roles in this interdisciplinary conversation about divine action. They include questions regarding:

1. The foundations of the sciences.
2. The metaphysics of science.
3. Metaphysics proper.
4. The epistemology of science.

In the first category are foundational questions arising within specific scientific research programs, for example, questions concerning the viability of the hidden-variables interpretation of quantum theory. Such questions, although quite philosophical in nature, are subject to debate in professional journals of science. The second category designates more inclusive metaphysical questions concerning the practice of scientific inquiry, for example, questions about the ontology of "causes" consistent with scientific investigation. Such issues fall within the competency of philosophers of science. The third category is still more inclusive, including metaphysical questions on which both scientific inquiry and general human experience bear, for example, the nature of human freedom—the concern of metaphysicians rather than specifically of philosophers of science. Finally, "epistemology of science" treats the nature and justification of scientific knowledge, a broad category cutting across the competencies of philosophers of science and epistemologists.

A question representative of each category follows, each drawn from *Quantum Cosmology and the Laws of Nature* and each crucial in its implications for reflection on divine action.

1. Is quantum cosmology possible?
2. Do physical laws transcend and thereby prescribe natural phenomena?
3. What is the ontological status of time?
4. What form of scientific realism is most viable?

Regarding the first question, the standard Big-Bang model includes a "singularity" at the time $t = 0$, meaning a breakdown at the point of origination of the universe where physics as we know it (e.g., general relativity) fails to apply. Quantum cosmology seeks to avoid such a breakdown by constructing a new, quantum theory of gravity and finding solutions to the resulting equations that lack the singular point $t = 0$. But given the peculiar nature of quantum theory, whose application to a single as opposed to an ensemble of systems is highly problematic, the question arises whether one can legitimately apply its mathematical formalism to the entire universe. (See especially Isham's fine discussion on pp. 78–81.) If not, as significant numbers of cosmologists assert, then of course the question of quantum cosmology's metaphysical and theological implications becomes moot, because the whole effort to construct a quantum cosmology would be "fundamentally misguided" (p. 78). Although theological speculation about quantum cosmology remains useful, as Russell in particular shows ("Finite Creation without a Beginning: The Doctrine of Creation in Relation to Big Bang and Quantum Cosmologies"), it therefore proceeds against a backdrop of deep scientific uncertainty.

The second question turns on Stoeger's analysis in "Contemporary Physics and the Ontological Status of the Laws of Nature" (pp. 209–34). Stoeger challenges the view that the laws of nature enjoy an ontological priority that endows them with an existence in a sense independent from the various entities populating the universe. (By "laws" here Stoeger means the actual regularities in nature, not the laws in theoretical models that refer to and partially describe these regularities.) Instead, he argues that the laws of nature are "given in" the reality of the phenomena themselves, that is, that they derive from entities, like quarks and electrons (or fields), as they actually exist and interact with each other. According to this view, natural laws do not prescribe that such entities exist nor how they interact. If Stoeger is right, then (as he himself notes) this renders highly problematic "anthropic" reasoning (like that used by Murphy and Ellis) that posits the existence of alternate universes governed by alternate sets of laws that are not "fine-tuned" for life. For, given the priority of entities over laws, based on our knowledge of the actual universe, Stoeger argues we cannot safely infer that alternate sets of laws are truly physically possible (pp. 224–29). The issues here are enormously complex, but the question Stoeger raises indicates that typical "anthropic" reasoning takes place against a backdrop of deep metaphysical uncertainty.

The third question concerns the ultimate nature of time (see especially articles by Isham and Polkinghorne, Lucas, Russell, and Drees). The question of God's relationship to time has of course a long history, with the tradition typically called "classical theism" denying that God experiences temporal succession or bears a temporal relationship to the world. But the question repeatedly debated in *Cosmology* is logically prior, for it concerns how to understand in the first place the temporal dimension of the universe to which God relates. Contributors therefore evaluate the status of time in standard Big-Bang and quantum cosmologies with respect to our subjective experience of time's "flow." Is our experience deceptive? Is time ultimately "frozen," meaning that past, present, and future enjoy the same ontological status, as many insist that general relativity and, even more, quantum gravity imply? Are references to "*the* future" of the universe (as in "the future of the universe is open") otiose because contemporary cosmology renders illegitimate any claim presupposing an absolute time scale? Hence, contemporary cosmology poses serious objections to the understanding of time presupposed in traditional discussions of God's relationship to the temporal order.

Finally, Mary Hesse defends an alternative to the form of critical realism in science that pervades the texts, an alternative that poses the most serious objection to the majority of the theological projects pursued in these volumes. (See her article in *Physics*, pp. 185–202, especially pp. 187–89, along with Drees's insightful commentary in *Cosmology*, pp. 360–65.) Hesse distinguishes between "structural realism" and "substantial realism." Structural realism holds that the mathematical structures of successive physical theories progress with respect to their predictive power and internal coherence by virtue of "captur[ing] such reality of the world as permits this application to be successful," whereas substantial realism goes one step further in claiming that the entities in terms of which mathematical structures are interpreted actually exist and that successive theories ever more accurately describe these entities (*Physics*, p. 187). Hesse rejects substantial in favor of structural realism based on references to historical episodes involving radical, discontinuous changes in ontology even as the corresponding mathematical structures of theoretical models smoothly and progressively increase in predictive power, unity, and scope of applicability. From this she concludes "that no truths about the substance of nature which are relevant to metaphysics or theology can be logically derived from physics" (*Physics*, p. 189). Willem Drees seems most acutely aware that her position undermines any project seeking an all-inclusive metaphysic, indeed a worldview, to which the sciences and theology can contribute (*Cosmology*, pp. 360–65). For, according to Hesse's arguments, such projects involve a "reification of scientific theories" that "turns science into myth" (*Physics*, p. 198).

The upshot of my four-part analysis, which I believe accurately conveys a sense of the dialectic running throughout the volumes, is that even as many participants pursue the tasks of "dialogue" and "integration" more or less as Barbour conceives them, questions arise that highlight the deep scientific and philosophical uncertainties that dog many of the individual projects, and that—with respect to Hesse's arguments—threaten in particular the very legitimacy of pursuing even a cautious "integration" of science and theology. I find this dialectic in the series most stimulating and helpful, especially because it reveals that theology is not the only discipline confronting the kind of serious uncertainties that make interdisciplinary conversation tentative and difficult. What I find missing, however, is more careful and critical attention paid to the "project-stopping" potential of these questions and others like them.

The third question regarding the theological implications of the ontological status of time receives the most careful attention, although in my opinion articles by Ted Peters and J. R. Lucas really do not take seriously enough the challenge that even standard Big-Bang cosmology, much less quantum cosmology, poses to belief in a dynamic, personal God. Quite helpfully, though, both Peters and Robert Russell begin to reflect on the implications of trinitarian conceptions of God for addressing this challenge, precisely the kind of theological "initiative-taking" the series ought to encourage. The other three questions I highlighted receive less attention, however. This is understandable regarding the first: if quantum cosmology is a "no go" theory, then theologians simply have to await a more promising alternative to standard cosmology. But more regrettable is inattention to the second question regarding the ontological status of natural laws. For example, neither Ellis nor Murphy devotes significant attention to the challenge Stoeger poses to anthropic reasoning about alternative universes. If we cannot confidently speculate about alternate sets of natural laws, then most if not all attempts at reviving natural theology in the context of contemporary cosmology fall to the ground.

Mary Hesse, however, poses the greatest challenge to every participant adopting the perspective of what I earlier called "Christian critical realism," for she disputes that *any* metaphysical or theological implications can be drawn from the results of even the most widely accepted scientific theories. Only Willem Drees, in what I believe is the most remarkable and critically astute article of any published in the series to date ("A Case against Temporal Critical Realism? Consequences of Quantum Cosmology for Theology" in *Cosmology*, pp. 331–65), reflects at length on her challenge, which he quite openly confesses poses a formidable alternative to his own plea that theologians committed to divine temporality should take quantum cosmology "more seriously" than they have. One wonders why then her contribution to

Physics has received no sustained philosophical or theological rebuttal in a series whose very legitimacy her article seems especially designed to undermine.

In conclusion, I point out one other important issue not addressed in these three volumes. This question concerns the relationship between the theology-science conversation and Christianity's dialogue with world religions. That no contributions concerning the latter dialogue have been solicited constitutes more evidence that theology is not adequately respected here as an active conversation partner capable of driving forward the agenda under discussion. Especially since Vatican II, the entire Christian intellectual community has become more aware of the challenges posed by the diversity of religious experience in the world and of the metaphysical speculation to which that experience stands in dialectical relationship. It seems one could reasonably turn to this other interdisciplinary engagement to find models for Christian theology's encounter with the sciences, especially on the topic of divine action, since that subject necessarily plays a key role in interreligious dialogue. Moreover, there remains the still more difficult question regarding the relationship between various world theolog*ies* and the natural sciences. (This question is particularly relevant for projects, like Murphy's and Russell's, that attempt to construct Lakatosian theological research programs and show how they progress. Do Buddhist theologies represent different theological research programs in competition with Christian programs, or do they collectively constitute a different discipline whose programs, like those of the natural sciences, cannot in principle compete with research in Christian theology?) One wonders, would confronting the diversity of beliefs and practices, and especially of metaphysical categories, among world religions imperil the commitment to critical realism in theology that so pervades these volumes? For, to engage the whole question of Christianity's relationships to world religions would provoke more discussion of issues raised by Janet Soskice ("Knowledge and Experience in Science and Religion: Can We Be Realists?" in *Physics*) that have received little or no attention here despite the centrality of such questions for the ongoing series of conferences.

I offer these critical remarks in a spirit of constructive engagement with a publication effort that I find stimulating and extremely helpful for my own reflection on divine action and the natural sciences. Indeed, many of my criticisms here apply to my own work on the subject. Organizers, editors, and participants deserve our thanks for setting in motion an endeavor that continues to make and promises to encourage rich contributions to the field.