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DIVINE ACTION IN A WORLD CHAOS: AN EVALUATION OF JOHN POLKINGHORNE'S MODEL OF SPECIAL DIVINE ACTION

Steven D. Crain

John Polkinghorne, formerly a physicist and now an Anglican priest and theologian, has made a significant contribution to the current dialogue between Christian theology and the natural sciences. I examine here his reflection on what is commonly called the problem of special divine action in the world. Polkinghorne argues that God acts in the world via a "top-down" or "downward" mode of causation that exploits the indeterministic openness of chaotic systems without requiring that God violate natural laws. In response, I argue: (1) that divine intervention in response to human sin is theologically, as well as scientifically unobjectionable; and (2) that the belief that God is the transcendent creator of the world renders the "causal joint" between God and the world metaphysical in nature, thus obviating the need to uncover a physical feature of the world that God exploits in order to act in the world.

John Polkinghorne is one of many scientists contributing to a growing body of literature that explores the interrelationships between science and Christian theology. After retiring from professional activity as a mathematical physicist, he sought ordination in the Church of England, whereupon he served as vicar of a country parish for some years before returning to an academic setting. Now, as President of Queens' College, Cambridge, he devotes much energy to his work on theology and science in books and papers that span the whole range of metaphysical and epistemological issues central to the current dialogue. Broadly speaking, he is trying to construct a new natural theology, one informed by contemporary science that demonstrates the consistency and coherence between the practice and findings of the natural sciences and "the substance of Christian orthodoxy."¹ One particular topic on which he has labored is the subject of divine action in the world. Drawing on recent work in chaos theory, Polkinghorne explores how the belief that God acts within the created order might be conceived in a way acceptable to the scientific mind, which, he argues, resists the notion that the laws of nature would ever be suspended or violated, and acceptable as well to the theologian concerned to elaborate an adequate concept of the freedom of creation. My paper evaluates some key aspects of Polkinghorne's work on divine action. The reader will discover that he addresses many questions of



interest to the philosophical theologian and philosopher of science.²

Polkinghorne's arguments concerning divine action can be analyzed as follows:

(1) God performs particular acts within the created order. That is, in addition to the comprehensive act of creation and conservation, God is "specially active" in the world, responding, for example, to the needs of personal beings expressed in prayer.

(2) God performs these particular acts without interfering with the operation of natural laws, i.e., without performing miracles, a notion with which the scientific mind is uncomfortable, but, more importantly, to which there are important theological objections.

(3) God's special activity must be understood so as to avoid committing the religious believer to what is typically known as the "God of the gaps." This means that God's special activity must not be located in "gaps" in the contemporary scientific account of the world. For history suggests that such gaps inevitably close with the progress of science.

(4) In virtue of satisfying the preceding criteria, a promising model of special divine action holds that God acts in the world via a "top-down" or "downward" mode of causation that exploits the indeterministic openness of complex dynamical systems.

In the following I will examine and then evaluate these arguments. I will proceed by developing each of the preceding four points and then offer extensive critical commentary.

I

According to Polkinghorne, to deny special divine activity would strike at the heart of the Christian conviction that God is "personal." A personal God freely responds to individual personal need, thereby evoking a free response in turn on the part of human beings.³ The divine response can take many forms: calling, convicting, healing, reproving, consoling, forgiving, demanding, inviting. God's action - if discerned - can in turn evoke gratitude, puzzlement, praise, anger, hope, contrition, sorrow, joy. The objects evoking these responses are events or sequences of events interpreted as meaningful, i.e., as bearing the impress of divine purpose for the ongoing relationship between God and human beings. Hence, the belief that events fall out one way and not another at least in part because God has freely acted in one way as opposed to another is essential to the daily living out of the Christian faith. Moreover, in its doctrinal structure, Christianity is supremely a religion dependent on the claim that God is active in the world. For at the heart of the Christian faith lies the fundamental divine "act" upon which hinges the salvation of the world, namely, the life, death, and resurrection of Jesus of Nazareth. Therefore, any model of divine activity that limits God's action merely to creating the universe and conserving it in being, such as

Maurice Wiles' model of creation as a single, complex divine act, must be rejected as incompatible with Christian faith and practice.⁴

II

Polkinghorne grants that in order to respond to the individual needs of creatures, God possesses the power to interfere with the operation of natural laws - to perform miracles in the traditional sense - but argues that it is unfitting for God to use such power when acting within the created order. For as creator, God upholds the laws of nature in the first place: they are an expression of the divine will. If God proceeds to suspend or otherwise interfere with the operation of these laws, then, Polkinghorne contends, God would be acting contrary to God's own will, in a sense undoing an aspect of creation in an attempt to "fix" what God could not "get right" in the first place. Moreover, a God whose special activity is thus sporadic or intermittent would be inconsistent and undependable. Such a God could not be depended on to act in a rationally coherent way, but would rather resemble a magician or conjurer performing tricks at whim. Indeed, the theologian who argues that God interferes with natural laws must then confront an especially difficult form of the problem of evil: why does God not violate the laws of nature more often in order to alleviate the suffering of creatures? For a God who acts sporadically comes to the rescue of some while unaccountably withholding divine help from others. Polkinghorne rejects such a picture of divine action. God's action must rather be conceived as continuous and wholly rational, as befits the unconditional trust the believer bestows on God. The laws of nature are therefore inviolable.⁵

According to Polkinghorne, in this way the reliable operation of natural laws reflects the faithfulness of God. But the inviolability of natural law expresses divine faithfulness in another sense as well. God is faithful, not only in acting consistently, but also in granting to all creation that degree of autonomy befitting a "partner" with which God freely relates. That is, in an important sense, freedom characterizes God's relationship to all creation insofar as the universe as a whole exists as God's partner in a free relationship. In this context, by "freedom" Polkinghorne means the freedom of all created being - of the universe in its entirety - to be itself, to be what God has created it to be. Since the natures of created things are at least in part defined by the laws which govern their interrelationships, to interfere with the operation of these laws - to overrule, in other words, what helps make the entire order of created things what it is - therefore violates the freedom of creation.⁶ In sum then, from a theological perspective, one is as strongly motivated to deny that God interferes with natural laws as to assert that God performs particular acts within the created order. Hence, although as a scientist, Polkinghorne shares the basic intuition of the "scientific mind" that the laws of nature operate without fail in all circumstances, his rejection of miracles in the traditional sense does not follow from slavish adherence to the intellectual spirit of the age, but from fundamental theological convictions.

III

According to Polkinghorne, therefore, the contemporary Christian theologian must chart a course between a "deistic" rejection of special divine action, and the equally unacceptable affirmation that God interferes with natural laws. Moreover, in so doing, the theologian must not repeat an error especially common in the eighteenth and nineteenth centuries, when God was conceived to act in the world precisely in those contexts where explanations in terms of natural laws were thought unlikely or impossible.

Charles Darwin is credited with undermining a widely popular version of this natural theology in the nineteenth century: the notion that evidence for special acts of divine creation can be found in the marvelous diversity of living things and in the exquisite adaptation of organisms to their environment. For Darwin offered a plausible account - or at least the core of such an account - that explains how nature herself could produce such tremendous diversity among living things so wonderfully adapted. That is, he argued that the laws of nature alone can account for biological diversity and fitness, without need for particular divine activity in the form of special creation. What had been considered a "gap" in the scientific account of the world was now "filled." Moreover, in the wake of the *Origin of Species*, a consensus developed that Darwin had undermined the entire approach to natural theology whereby one attempts to locate God's special activity within such "gaps" in the scientific account of the world.

Polkinghorne approves of the downfall of the "God of the gaps," for as the Darwin episode dramatically illustrates, the God-of-the-gaps natural theology is inherently unstable, since in order to prevail it depends on certain scientific advances not being made. The practice of science and the conviction that God acts in the world therefore collide, with the result that when the relevant scientific advances do happen, they then appear to send the believer into retreat before the steady progress of science. The "God of the gaps" is thus, so to speak, "squeezed" out of the world, and faith in God's ability, or willingness, to act in the world is undermined. Hence, Polkinghorne argues that no acceptable conception of special divine activity ought to depend on temporary scientific ignorance.⁷

To summarize, then, Polkinghorne's position on divine action to this point: God performs particular acts within the created order without violating natural laws and without operating under cover, so to speak, of phenomena for which scientists only temporarily lack explanations in terms of natural laws. Polkinghorne exploits recent developments in the new physics, specifically in the study of complex dynamical systems ("chaos" theory), in order to develop his model of divine action.

IV

Polkinghorne argues that special divine activity would violate the integrity of creation if the world were a deterministic mechanism governed by the laws of classical physics. For in order for God to act in a Newtonian world, God would have to break or suspend the operation of

natural laws. Polkinghorne views the Newtonian world as a "closed" and "rigid" structure wherein at any given time all events are pre-determined to occur by the laws of nature and the state of the universe at any given time in the past. The Newtonian world is therefore not "open" to special divine activity of a non-invasive sort - for any such activity would entail God's tampering with some deterministic law or laws in order to bring about what otherwise would not have occurred had this law or these laws been in force.

However, Polkinghorne argues that the "new physics" has overthrown the deterministic, mechanistic Newtonian worldview. The world is no longer seen to be a rigid, closed structure. The world is open, for the past does not rigorously determine the future, since at any time "t," any number of possible futures are compatible with the state of the universe and its laws. Why? Because we now know that a significant number of natural laws are indeterministic, namely, in the micro-realm, the laws of quantum mechanics, and in the macro-realm, the newly-discovered laws of chaotic systems.⁸ Polkinghorne suggests that God exploits this openness, especially in the macro-realm - the realm of our experience - in order to act providentially in the world.⁹

How does God exploit indeterminism, especially of a macroscopic variety, in order to act in the world? In brief, Polkinghorne argues that "downwardly" acting causal powers can "emerge" in indeterministic systems - especially those studied by the new science of "chaos" - and that in virtue of this possibility, an indeterministic world is open to non-interventive divine action. A few words of explanation are in order, although Polkinghorne himself admits that his thoughts here are meant to be suggestive of a fruitful direction in which to look for light on the problem of divine action, rather than a model worked out in comprehensive detail.

An "emergent" of a system is a power or property obtaining at the level of the whole whose operation cannot be fully explained in terms of the powers or properties of the system's constituents. That is, an emergent power or property is "wholistic" - it cannot be "reduced to" the powers or properties of the system's parts. For example, one can claim that powers or properties obtaining at the level of the brain-as-a-whole are irreducible to the powers or properties of its constituent neurons. "Downward causality" is an example of an emergent power, one emerging in certain complex "chaotic"- and therefore indeterministic - systems. A downwardly-active causal power is an irreducible power that a system-as-a-whole has to influence the states of that system's parts by exploiting the indeterminism obtaining on the lower ontological level of the system. It is therefore as if the system considered as a whole is a causal entity impinging on the system's parts, such that the causal contribution of the system-as-a-whole must be taken into account just as are the causal contributions of external entities and the causal interactions governed by the indeterministic laws holding on the level of the parts. Polkinghorne conceives of this wholistic causal contribution in terms of a "top-down" non-energetic "input" of "information" that determines on the lower level what the laws obtaining on this level otherwise leave

undetermined. The system considered as a whole thereby "selects" for the system one from among many of the evolutionary paths allowed by the applicable indeterministic laws.¹⁰

The relationship obtaining between an emergent, wholistic, downwardly-active causal power and the laws governing a system's parts provides the key component of Polkinghorne's model for non-interventive divine action in the world. For a wholistic causal power, because it acts non-energetically on (and therefore under cover of, so to speak) the indeterministic processes at a system's lower ontological levels, influences the behavior of the system's parts without violating the laws governing the behavior of the parts. Hence, the downwardly active causal power acts on the system's constituents with a degree of autonomy, yet without in any way interrupting the laws governing the behavior of the parts. In sum, such a causal power acts non-invasively to affect the states of the system's constituents. In view of this, Polkinghorne suggests that God acts downwardly in the world by exploiting and thereby working "under cover of" the indeterministic openness obtaining throughout the world's various ontological levels.¹¹

The model gains credibility, he suggests, by considering that free human action may well depend on our exploiting indeterministic dynamical systems in our own bodies. In other words, that we can act freely in the world suggests how God can act freely as well. For if one rejects various dualistic solutions to the mind-body problem, as Polkinghorne does, then one must look for ways in which human agents can escape being trapped, as it were, by chains of causality in the natural world that would otherwise determine human actions. Hence, Polkinghorne speculates, by exploiting indeterminism in the world, both divine and human agents find means for acting freely in a world governed by natural laws.¹² Although God is thus conceived to act in the indeterministic "gaps" of the world, Polkinghorne argues that he is not thereby committing himself to the "God of the gaps" of nineteenth-century natural theology, for the gaps in and through which free action occurs are built into the world itself: they are not products of temporary scientific ignorance.

Polkinghorne uses his model to address the problem of evil: God's activity is constrained in that the world's openness allows limited room for divine maneuver, a limitation that God must respect in order to respect the freedom and integrity of creation. To see this, consider the analogous case of the brain interacting with its own neurons. The state-of-the-brain-as-a-whole cannot cause its neurons to assume just any set of neuronal states at a time "t." Presumably, what neuronal states are accessible depends on the neuronal states at time "t-1," as well as on the state-of-the-brain-as-a-whole at "t-1," as well as on the states of any intervening subsystems between the wholistic state and the brain's neurons (i.e., the states of any emergent sub-systems). Hence, by extension, one can envision numerous constraints on God's downward activity in the world: not just any state of affairs can be brought about at time "t." Hence, God cannot prevent or otherwise influence every evil if God is constrained to act via downward causation.

V

This, then, in rough outline, is Polkinghorne's analysis of the problem of divine action and his proposed model, a model which, again, he himself admits is not a proposal worked out in fine detail. He does include enough detail, however, to warrant careful study, for in constructing his model he raises a number of important issues that any study of divine action must address, many of which concern his basic motivation for designing the model along the lines that he has. I begin my evaluation, then, not by examining the model itself, but by taking up one of these preliminary issues, namely, the topic of the "God of the gaps." As we have seen, one of Polkinghorne's major concerns has been to understand how God acts in the world without becoming in the process a "God of the gaps." I will argue for an alternative way of thinking about the relationship between special divine activity and the practice of science than that Polkinghorne has proposed.

As we have seen, Polkinghorne rejects both the traditional concept of miracle and the God of the gaps. Although he does not, to my knowledge, argue that these notions stand or fall together, it will prove helpful to ask whether and how one might affirm that God occasionally interferes with the operation of natural laws in response to personal need, and yet still deny that God's special activity should be located within gaps in the scientific account of the world. For on the one hand, I agree with Polkinghorne that theologians ought eschew the God of the gaps, yet I also argue that a Christian seeking to adhere to the "substance of Christian orthodoxy" is strongly motivated to find acceptable the traditional notion of miracle, since the miracle central to the Christian gospel, the resurrection of Jesus, at least *prima facie* appears to involve interference with natural laws. (Polkinghorne, I hasten to add, affirms the bodily resurrection of Christ, but in the context of an alternative understanding of this and other miracles.¹³) I will respond to Polkinghorne's theological objections to miracles conceived as violations of natural law later. For now, I will seek to justify my claim that, at least with respect to the practice of science, one can consistently affirm the traditional concept of miracle and still reject the God of the gaps, once, that is, the latter is properly understood. The comments that follow will be seen to have implications for Polkinghorne's overall approach to special divine action.

My argument is as follows. One can call a single event "miraculous" without pitting the practice of science against one's conviction that God is specially active in the world. This is so because, with one important exception to be considered below, the practice of science does not require that every event be scientifically explicable, *i.e.*, explicable in terms of the operation of natural laws. Consider the belief that a patient has miraculously recovered from an illness, *i.e.*, recovered in such a way that religious believers argue no scientific explanation for the recovery is possible. Although one can demand that, in principle, the "scientific account of the world" must include explanations for all events - including apparently miraculous ones - one cannot do so on empirical grounds. By this I mean that the actual practice of a science like medi-

cine only demands that a given *class* of phenomena be explicable in terms of natural laws. For scientists seek answers to questions that are general in scope, questions like the following: What causes continental drift? How do stars generate their energy? Why does a certain drug slow the growth of pancreatic tumors? With an important exception to be considered below, it is in addressing questions of this kind that science constructs its account of the world, what I am calling “the scientific account of the world.” When sciences like medicine encounter events that religious believers claim are miraculous, they can, and do, write off such events as simply anomalous (if not necessarily miraculous) without having to seek an explanation for the event in terms of natural laws: the profession can simply, as it were, move on without violating its methodological canons. It is thus incumbent on scientists to recognize that only on non-empirical grounds, for example, on the basis of a materialist metaphysic, can one demand that science in principle must explain all events. Of course, an event thought to be miraculous can, on reconsideration, turn out to be scientifically explicable after all, perhaps in terms of a newly discovered natural law, and when this happens, religious believers are required to retract their claims that a miracle has occurred. I will return to this possibility momentarily. But the practice of science does not demand that, in principle, all claims about the miraculous be explained away in this manner.

The practice of science is compatible with single events going unexplained scientifically, be they, for example, miraculous healings, or indeed even resurrections from the dead, because a universe whose natural laws are only occasionally interrupted still in general exhibits law-like behavior, so that general classes of phenomena remain open to scientific investigation. Indeed, from a theological perspective, this is simply to affirm that for the most part, natural laws operate without fail, except on those rare occasions when God interferes with that operation. For this reason, in order to avoid conflict with science, religious believers ought limit their claims about special divine action to isolated single events. To rely on special divine action to address questions of general scope, i.e., to account for classes of phenomena (like stellar energy production) necessarily commits one to the God of the gaps, because it is precisely by answering such questions in terms of natural laws that science builds its account of the world. On the other hand, to claim that God has intervened on isolated single occasions does not, on my use of the term “the God of the gaps,” necessarily commit a religious believer to the belief that a “gap” exists in the scientific account of the world within which God is specially active. (It might: I will try to resolve this question later.) For the same reason, if forced to revise her claims about, for example, a putative miraculous healing because of a new discovery, it would be improper to say that a “gap” in the scientific account of the world has been closed, forcing the believer to “retreat” before scientific progress. Claims about the miraculous will necessarily have this untoward effect only from the perspective of a materialist or naturalistic metaphysic that rules out the miraculous in principle.

Hence, on this account, one way to explain how nineteenth-century

natural theology erred would be to say that it posited special divine action as the answer to what, in virtue of its generality, was properly a scientific question, namely the question, Why are living organisms so diverse and wonderfully adapted to their environments? In this case, unlike that where a particular healing is called miraculous, religious believers did indeed contend that a "gap" existed in the scientific account of the world, and therefore inevitably they come into conflict with science and eventually "retreated" before its progress. One could then argue that if in the nineteenth century proponents of special divine creation had limited their claims to isolated, occasional events of divine intervention, rather than trying to explain the entire general shape of the biological world in terms of special divine activity, we would not accuse them of having committed themselves to the God of the gaps.

To this last possibility, however, evolutionary biologists today would object. For my argument to this point had depended on claiming that science ultimately addresses questions of general scope, rather than seeking explanations of, or involving, single events. Evolutionary biology, however, represents an important exception to this claim that must now be considered. For it, and other sciences, like cosmology, that reconstruct cosmic history often seek explanations of or involving single events. For example, cosmologists working with the big-bang model seek to understand the event or events that led to the breakdown of various symmetries in the early universe, such as that between matter and anti-matter. Sciences like cosmology might be called "historical," not because they treat human history, but because they employ explanations that are "historical" in form, i.e., their explanations are essentially narratives that make reference to natural laws. As a result, the "historical" sciences inevitably engage in conflict with religious believers over explanations involving single isolated events.

For example, consider the possibility, as many biologists do, that life on earth began with a complex biochemical reaction occurring at a given time in a given location, although to date science has failed to offer a compelling, detailed account for the origin of life. In this case, one could argue, and indeed some have, that God interfered with natural laws in order to cause this - but only this - single event, and thereby to bring into being the first living organism. Evolutionary biology today cannot tolerate such a claim, for its method is to seek explanations for the origin and development of life exclusively in terms of natural laws. Hence, although in this case the religious believer has attributed only a single, isolated event to special divine action, open conflict with science inevitably results that looks all the world like an argument over a putative "gap" in the scientific account of the world. In this case, one could amend my previous discussion and add that where "historical" sciences such as evolutionary biology or cosmology are concerned, *any* claims about miraculous intervention, even if involving only single events, commit religious believers to the God of the gaps, and therefore must be avoided.

An alternative response is possible, however. One could argue that the situation just envisioned is simply analogous to the case of a miraculous healing, and therefore no more objectionable with respect to the

practice of science than that case proved to be. Hence, even if God did miraculously create the first living organism, evolutionary biologists could still go about doing science. For once again, a single event's slipping through the grasp of science - even one as crucial as the origin of life - would not render the universe a chaotic jumble impenetrable to human reason. Biologists in this case would still have much work to do investigating the evolution of life, just as medical science would continue to experiment with cancer drugs even if it reached a consensus that a certain patient had miraculously recovered from pancreatic cancer. On the other hand, if the believer were mistaken and life's origin could be scientifically explained, then the believer need not cower before the advance of science, as if science were "squeezing" God and divine activity from the world. It would simply become necessary for the believer to revise her beliefs regarding God's special responsibility for the single event in question. Hence, if conflict between science and theology results over the origin of life, it is no more harmful to religious belief than conflict over the explanation of a mysterious healing. Postulating miraculous divine interventions in cosmic history only wreaks havoc for religious belief when these interventions are conceived to occur on a wide scale, as was the case in the Darwin episode, and therefore only in such instances ought the pejorative phrase "God of the gaps" find application, if, in light of this discussion, it still remains a useful term at all.

The preceding response is, I believe, quite rational. Short of rejecting any kind of divine interference with natural laws, as Polkinghorne does, this response allows the theologian to apply consistently the rule developed earlier: to avoid commitment to the God of the gaps, attribute only isolated single events to miraculous intervention. Yet, however the Christian might perceive the situation, the community of evolutionary biologists, for example, objects to any defense for the notion that God miraculously created earth's first life form. For, again, evolutionary biologists investigating the origins of life seek to reconstruct the history of life in terms of the relevant natural laws. Those scientists who reject this presupposition cannot get their work published in reputable journals; they are ostracized by their scientific community.

Religious believers ought to ask whether they should follow biologists in responding this way to the idea of miraculous interventions in the history of life, and if so what theological justification they might have for affirming on the one hand that sciences like cosmology and evolutionary biology, which reconstruct cosmic history, legitimately reject the possibility of miraculous divine action in that history, and for affirming, on the other, that God might miraculously intervene in the affairs of human beings. Recall that Polkinghorne finds miracles theologically objectionable because they imply that God returns to the scene of creation, so to speak, in order to "fix" it, and indeed doing so by seemingly contradicting the very divine intention responsible for the existence of the relevant natural laws in the first place. Moreover, he argues that miraculous interventions violate the freedom of creation to be what God created it to be, which is, I believe, to say that miracles violate the integrity of the natural order, an integrity that depends on the

uniform operation of natural laws. Finally, he argues that the problem of evil becomes especially difficult for those who believe that God interferes with natural laws: why does God not intervene more often? A God who intervenes miraculously in human history appears capricious and undependable. I will now respond to these arguments (delaying for the moment discussion of the problem of evil) in order in turn to argue that claims about miraculous interventions of the sort that evolutionary biologists reject are likewise theologically suspect, but that claims about miraculous interventions on behalf of human beings are not only scientifically tolerable, but theologically acceptable as well.

I take up first the notion of the integrity and freedom of creation and ask, Does creation's freedom and integrity, as Polkinghorne suggests, consist primarily in God's not interfering with the operation of natural laws? And secondly, would such interference constitute both an internal inconsistency within the divine will and a divine return to the scene of creation, as it were, to repair what might have been created properly in the first place? First, it must be recognized that neither Polkinghorne nor I claim to have unique insight into the divine will, as if it were open to scientific or philosophical investigation. All arguments here depend on our halting and quite fallible sense of what is "fitting," given what we do know of God and the world. Second, I remind the reader that Polkinghorne does not deny that God acts in special ways in the world, even in ways that deserve to be called miraculous. What he questions is whether in so doing, God ever interferes with natural laws.

My basic response to Polkinghorne's arguments depends on distinguishing between two contexts in cosmic history, one involving the existence of personal beings, the other not.¹⁴ Where personal beings are absent, I argue that it is fitting for God to refrain from interfering with natural laws, but where they are present, it seems theologically justifiable that God might so interfere. The difference turns on how creation's freedom and integrity ought be understood in the two different contexts. In the context of personal beings, I argue that miraculous interference with natural laws would not violate the freedom and integrity of creation, whereas in a context where personal beings are not present, miracles so understood would not seem appropriate.

I begin by reflecting briefly on the notion of miracle itself. Of course, Scripture is neutral on the metaphysical status of miracles, whether they constitute interference with natural laws or not, not least because the concept "law of nature" is, technically, a creation of the scientific revolution. But beginning with the Old Testament and continuing on into the New and into the early Church, miracles perform two different functions. First, a miracle represents a *crux*, a "wonder"-inspiring turning point in the course of events: but for the miracle, things would have turned out otherwise in some significant way. Second, a miraculous event follows from God's desire and intent that an unfolding story take this unexpected turn. As such, a miracle, already having inspired wonder, then demands to be interpreted in terms of God's intentions. Miracles thus function as "signs" to be read, as the Gospel of John specifically refers to the miracles of Jesus. Miracles thereby become spe-

cial vehicles of God's personal communion with human beings.

Consider, then, the question whether miraculous interference with natural laws would be appropriate in contexts not involving human beings, say during the early history of our planet just prior to the origin of life. I argue that in this context, miracles are not fitting because they cannot fulfill what one might call their "sign" function in a context where no personal beings are present to witness them and interpret their meaning. Although one might claim that God expects personal beings to interpret miraculous events in retrospect, this would presuppose that they could discover such events in the first place. But given that an event like the miraculous origin of life could only be "seen," as it were, as a single, isolated lacuna in the scientific account of the world, its discovery would be difficult and controversial, indeed far more controversial than claims that, for example, witnesses had encountered a man risen from the dead.

One can still inquire, however, whether it would be fitting for miraculous intervention to serve at least the first function, that of providing a turning point in cosmic history - whether discoverable or not - in, for example, causing life to begin where otherwise it would not have. This is equivalent to asking whether God might fail to build into cosmic processes the potential to produce life apart from such interference, or whether even if God did provide such potential, God would still miraculously interfere with cosmic process on a given particular occasion. God might do so in order to guarantee that life develop despite the unfolding of a sequence of events that threatens to frustrate the in-built potential for life, or in order to guarantee that life develop at a particular time and place where otherwise it would not have.

In this particular context, where as yet no personal beings exist, I do indeed agree with Polkinghorne that miraculous intervention seems unfitting. For in such a context, God can accomplish the divine will by means of natural laws without confronting self-conscious rebellion against the purposes of the creator. Atoms cannot so rebel, nor can galaxies, nor complex organic molecules, nor again arational living organisms. Of course, possessing distinct natures, different entities respond in diverse ways to the forces God's creative act sets at work, and therefore God's purposes can neither be executed instantaneously, nor even in what might be called "a straight line." Galaxies are destroyed, species go extinct, and apparently promising lines of development come to a halt. But not needing to respond to sinful rebellion, there seems no compelling reason for God to interfere miraculously with the course of events. I say this because I accept Polkinghorne's arguments concerning the freedom and integrity of creation to a point, namely, that, *all other things being equal*, God shows love and respect for the God-given natures and causal powers of created things by not miraculously intervening in cosmic processes, and therefore by working patiently, as it were, within the limitations of the materials chosen. In this context, then, I agree that it is fitting for God to demonstrate respect for the "freedom and integrity" of creation by not interfering with the operation of natural laws. The long, complex unfolding of cosmic history that science has uncovered gives powerful witness to this divine

respect for creation's freedom and integrity.

Once, however, rational beings enter the scene of cosmic history, then, I argue, the means by which God respects the freedom and integrity of creation necessarily changes. For at this point, it finally becomes possible not only for creation to relate to its creator self-consciously and therefore personally, but also for it self-consciously to rebel against the creator's purposes. Whereas in the previous context I argued that God respects creation's freedom and integrity precisely by not interfering with natural laws, in this new context creation's freedom and integrity depend on God's responding appropriately to agents possessing moral responsibility who can and do abuse this gift. At minimum, God's response must not undermine the moral responsibility of free creatures. But what can be said about the status of natural laws in this context? Must they still be viewed as inviolable?

One could argue that a miraculous act would violate creation's freedom and integrity just as much in this new context as in the old and for the same reason, namely, by interfering with the operation of God-given causal powers of created things and therefore violating that degree of autonomy befitting God's created "other." I argue, however, otherwise. For here, in this new context, the "integrity" of creation refers not simply to its relative autonomy from God, as required for it to be God's partner, but also, and more importantly, to the "wholeness" that creation is intended to achieve when it attains its divinely-intended end. That is, the integrity of creation ultimately depends on creation's reaching its final goal: consummation in a "face-to-face" personal relationship, to cite the Apostle Paul, wherein creation itself is taken up into union with God. When personal beings are present, therefore, creation's freedom and integrity depend on God's so responding to sinful rebellion that creation achieves that end for which God creates a semi-autonomous partner in the first place. Therefore, from the perspective of creation's final goal, when personal beings abuse their gift of freedom through sin, they compromise the "integrity" of creation by placing its end in peril. The divine response to sin in the form of miraculous activity therefore does not constitute an "adjustment" to creation that thereby spoils creation's integrity, nor an internal contradiction in the divine will, but rather an answer to what has become of creation in light of sin. To put the point another way, miracles do not constitute an adjustment to creation, but an aspect of what the Apostle Paul calls the "new" creation. Indeed, that a miracle violates natural law is itself a sign indicating the depths to which sin spoils the integrity of the created order, for in the wake of sin, God re-creates that order to its very roots, all the way down to the natural laws that for so long had operated without interference.

I conclude therefore that, properly qualified, the belief that God acts in the world occasionally by means of violating natural laws is acceptable from the perspective of the practice of science. Furthermore, at least tentatively I conclude that the belief is theologically acceptable as well, at least in light of the preceding theological reflection on the relationship between miracles, human sin, and the ultimate goal of creation. I have not yet addressed all of Polkinghorne's objections to this notion insofar

as I have not evaluated his discussion of the problem of evil. I will delay doing so until examining the details of his model for divine action. Based on the preceding discussion, I can say, however, that I do not find Polkinghorne's model for divine action compelling simply insofar as it allows for God to act in the world without violating natural laws. I now turn to the specifics of the model itself.

VI

Polkinghorne claims that special divine activity would violate the integrity of creation if the world were a deterministic mechanism governed by the laws of classical physics. For in order for God to act in a Newtonian world, God would have to break or suspend the operation of natural laws. Polkinghorne views the Newtonian world as a "closed" and "rigid" structure wherein at any given time all events are pre-determined to occur by the laws of nature and the state of the universe at any given time in the past. The Newtonian world is therefore not "open" to special divine activity of a non-invasive sort - for any such activity would entail God's tampering with some deterministic law or laws in order to bring about what otherwise would not have occurred had this law or these laws been in force.

Two comments are in order here. First, ironically enough, Newton and other mechanistic philosophers saw in their mechanical philosophy precisely a way to understand how God might be active in the world. For these mechanistic philosophers saw the *Aristotelian* world as a world closed to divine action in virtue of natural substances exercising their causal powers in a way they thought detracts from divine sovereignty. Occasionally, some of these natural philosophers even opted for a voluntarist understanding of the laws of Nature, according to which natural laws simply specify how God usually acts. They would not then have the kind of autonomy that Polkinghorne envisions the laws of classical mechanics having. Polkinghorne would probably not find compelling, however, such an understanding of a law of nature, first, because it would give insufficient significance to the world as an "other" with which God relates, and second, because the scientist on this view would not be getting at the underlying structure of God's "other" so much as understanding the divine will - how God usually acts.¹⁵

My second comment is that Polkinghorne apparently rejects a possibility that was very much a live option for Isaac Newton himself, namely, that God's special action be through the operation of (deterministic) natural laws. For example, Newton considered the possibility that God might "arrange for" the appearance of comets at propitious moments in order to preserve the stability of the solar system, adjustments that would not require any laws of mechanics to be broken. Indeed, I believe that Polkinghorne designed his model in order to devise an alternative to such a notion, perhaps because it fails to give sufficient significance to the world as God's "other" with a freedom to "go its own way." The notion of "special providence" as "arrangement" and especially "pre-arrangement" is too manipulative, a notion of providence unworthy of

the respect God has for God's "other." Polkinghorne's model thus provides an alternative to God's special activity violating natural laws on the one hand, and requiring "arrangement" or "pre-arrangement" on the other.

We have seen how Polkinghorne argues that God could exploit the indeterministic openness of chaotic systems in order to act in the world without need for "pre-arrangement" or miraculous intervention. My first objection to this model of divine action is that it is by no means clear that chaotic systems are indeterministic. Indeed, the standard analysis of them has it that they are deterministic, but in a manner which leaves them exquisitely sensitive to external fluctuations on the one hand, and on the other, impossible to predict over the long term based on any reasonable knowledge of their state at any time "t." In order to argue that they are indeterministic, the case has to be made for their being qualitatively different from other classical systems that do not show this sensitivity. I do not think this case has been made, although there are interesting philosophical questions here, the most important being, how does one adjudicate a dispute over the kind of causality - deterministic or indeterministic - occurring in a dynamical system? To discuss these issues in detail would take us too far afield.¹⁶

Questions about indeterminism aside, however, the chief problem with the model follows from the fact that as "emergent," a downwardly-acting causal power is embodied in the system out of whose micro-structure the power emerges. By "embodied" I mean that the causal power is ontologically dependent on (i.e., is sustained by) the very micro-structure upon which it acts. Indeed, it is through this very dependence that the emergent power gains access to lower ontological levels in order to effect change there without "miraculously intervening," as it were, in the processes occurring at these levels. Hence, I argue that for Polkinghorne's model to "work" as a model of God's action in the world, God would have to be emergent from and thereby embodied in the world, a relationship between God and the world that Polkinghorne rightly rejects as incompatible with the Christian doctrine of creation.¹⁷

Another British scientist-theologian, Arthur Peacocke, has developed an alternative model that, while exploiting the concept of downward causation, does not entail that God is ontologically dependent on the world. According to this model, rather than acting downwardly in the world, God interacts with the state-of-the-universe-as-a-whole (SOTU-AAW). The SOTUAAW is the most all-encompassing state possible, one that Peacocke envisions as emerging from the interactions between entities at every ontological level in the universe. As emergent, this wholistic state exerts downward causal influence throughout the universe at all ontological levels. God interacts with this universal wholistic state in such a way that the SOTUAAW in turn exerts its downward causal influence in order to bring about those states of affairs God desires. Although the model thus avoids any ontological dependence of God on the world, it fails to accomplish its primary task of suggesting how God acts in the world without intervening in the operation of natural laws.

For it is difficult to see how God might interact with the SOTUAAW without somehow interfering with the laws governing this universal, wholistic state: God would act "on" the world in this case rather than "in" it. Therefore, if one is willing to admit that God can intervene here at this upper-most level in the universe, I do not see why one should object to divine intervention at any other ontological level. The introduction of downward causation here is therefore superfluous.¹⁸

To summarize the argument to this point, Polkinghorne's model for divine action aims to suggest how God might act in special ways in the world without violating natural laws. I have argued that his model either entails that God is ontologically dependent on the world, or if constructed along the lines Arthur Peacocke suggests, fails to show how God's special activity does not interfere with natural laws. I pass then to consider one of the most important aims for Polkinghorne's model of divine action. That is, in response to the problem of evil, the model should suggest how God's activity in the world is constrained, with the result that God cannot act in all situations and circumstances in order to prevent or otherwise lessen the impact of evil. For if God acts downwardly in the world, then God cannot accomplish all that God could accomplish if God directly intervened in the world.

Like many, I think the problem of evil is the most serious problem confronting the theologian pondering God's action in the world, and therefore I am open to suggestions from any quarter which might address this problem. I do not believe, however, that Polkinghorne's model for divine action helps in this respect.

First, the success of his proposal regarding the problem of evil can be no stronger than the plausibility of his model for divine action. I have already indicated why I think this model fails to accomplish its first primary task: to suggest how God is specially active in the world without interfering with natural laws.

Second, although the model provides for constraints on divine activity, it cannot specify how the mechanism for divine agency restricts what God can accomplish in the world in any given situation, not even in general terms. Hence, on the basis of the model, one can only say that God is constrained by the mechanism of divine action in the world, but one cannot specify how God is so constrained in any given instance. Where does this put us regarding the problem of evil? I submit, not significantly beyond where we were before developing the model. For it must already be supposed that there were some constraints on God's activity, namely, God's goodness, God's wisdom, and God's desire to bring all human beings freely into union with Godself - and in no specific case can it be understood how these constraints limit God's activity. It is not clear to me therefore how the claim that God is constrained by the mechanism of God's agency helps any further to reduce the force of the problem of evil.

VII

I close by reflecting on the most fundamental issue at hand, that of specifying, if possible, the "causal joint" between God and the world.

Polkinghorne argues that the joint depends on certain *physical* conditions obtaining in the world, namely, that there exist "flexible" indeterministic processes in which God can maneuver, as it were. Is this a promising way to approach the problem of special divine action? Polkinghorne has repeatedly denied that indeterministic processes constitute "gaps" in the scientific account of the world, at least in the nineteenth-century sense of the concept. I agree: the model does not require that a given phenomenon like biological adaptation remain scientifically inexplicable. However, note that his model is quite dependent on there *being* indeterministic processes, especially macroscopic ones. Hence, although no scientific discovery could in this case undermine his model in the way that Darwin's theory undermined special creation, any discovery or theoretical development that suggested that chaotic systems, or even quantum systems, are not indeterministic would at very least count against his model. This seems to me an unhealthy, even unacceptable, relationship between science and theology, for in this case a scientific discovery could cast doubt on whether in principle God can act in the world.¹⁹

The way for Polkinghorne to avoid this consequence would be to reject the very idea of constructing a model of special divine action that specifies the *physical* conditions that must obtain if God is to act in the world. The alternative is to recognize that because the divine act of creation itself is not a physical act, i.e., one that presupposes pre-existing material, but rather a bringing forth *ex nihilo* of all that exists outside of God, then the causal joint between God and the world is *metaphysical* in nature, located "behind" or "under" the physical world open to scientific investigation. One could then assert that God's action in the world is *analogous to* wholistic downward action within chaotic systems - if indeed there exists such a mode of causation - without further claiming that divine action actually exploits physical indeterminism. The analogy would thereby suggest what the relationship between God and the world is "like," but only given the fundamental metaphysical proviso - derived from the doctrine of creatio *ex nihilo* - that God's being and God's power to act do not depend on or derive from the world. It is this metaphysical proviso that strictly limits how this or any other analogy for divine action can be exploited by, for example, ruling out the search for the physical mode of causation that divine action exploits. Despite this limitation, though, the analogy under consideration here does do some work, for it suggests that the causal joint between God and world, albeit "behind" or "under" the physical world and hence not physical in nature, is "more like" the causal joint between a wholistic, downwardly active causal power and its sustaining microstructure than is the causal joint between, for example, two billiard balls colliding with each other. The analogy thus helps us better to grasp the metaphysical relationship between the Creator and the creation in which the Creator acts by illustrating something of what is meant by "non-invasive divine activity," although that relationship itself is in principle beyond the power of the natural sciences to locate or investigate.²⁰

By using what I am calling the "metaphysical proviso" to limit how the analogy between divine action and downward causation is used, one

builds a stronger, and I believe more proper buffer between scientific discovery and the credibility of the fundamental religious belief that God acts in the world. For I believe that the claim that God transcends the world as its creator renders highly suspect attempts like Polkinghorne's to argue that God must exploit a built-in physical feature of the world in order to act in the world. Hence, no discovery about the mode of causation obtaining in a given kind of physical system can put belief in divine action at risk. This places the burden of the debate about divine action squarely where it ought to rest, on the struggle to interpret the human experience of death and rebirth that Christians understand in terms of the God who creates and who saves.²¹

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NOTES

1. John Polkinghorne, *The Faith of a Physicist* (Princeton, NJ: Princeton University Press, 1994), p. 1.

2. Polkinghorne's most recent contribution to the discussion of divine action, "The Metaphysics of Divine Action," can be found in Robert John Russell, Nancey Murphy, and Arthur Peacocke, eds., *Chaos and Complexity: Scientific Perspectives on Divine Action* (Vatican City State: Vatican Observatory, 1995; Berkeley, CA: Center for Theology and the Natural Sciences, 1995), pp. 147-156. This volume is a rich resource for reflection on divine action in light of developments in contemporary physics, especially quantum mechanics and chaos theory. The product of an international research conference (the second of five devoted to dialogue between theology and science sponsored by the Vatican Observatory and the Center for Theology and the Natural Sciences), the articles gathered here cover many of the issues I raise in this paper (and many more that I do not). Articles most pertinent to my discussion are: Willem B. Drees, "Gaps for God" (pp. 223-238); "William R. Stoeger, "Describing God's Action in the World in Light of Scientific Knowledge of Reality" (pp. 239-262); "Arthur R. Peacocke, "God's Interaction with the World: The Implications of Deterministic "Chaos" and of Interconnected and Interdependent Complexity" (pp. 263-288); Thomas F. Tracy, "Particular Providence and the God of the Gaps" (pp. 289-324); and Nancey Murphy, "Divine Action in the Natural Order: Buridan's Ass and Schrödinger's Cat" (pp. 325-359). I discuss divine action and contemporary physics in detail in my unpublished doctoral dissertation, *Divine Action and Indeterminism: On Models of Divine Agency That Exploit the New Physics* (University of Notre Dame: 1993).

3. *Science and Providence: God's Interaction with the World* (Boston: New Science Library, 1989), pp. 6-7.

4. *The Faith of a Physicist*, p. 82; *Science and Providence*, pp. 5-6.

5. *Science and Creation: The Search for Understanding* (Boston: New Science Library, 1988), pp. 51-68; *Science and Providence*, pp. 45-58.

6. *The Faith of a Physicist*, pp. 68-69, 79.

7. *Science and Creation*, pp. 13-16.

8. Polkinghorne's claim that chaotic systems are indeterministic is controversial. He recognizes that chaotic systems are analyzed in terms of *deterministic* laws exhibiting extraordinary sensitivity to variations in initial

conditions and external fluctuations. But he argues that the determinism here is only "apparent," a determinism that "emerges downwardly" as an approximation holding when a chaotic system is considered to be causally isolated. See *Reason and Reality*, p. 41; *The Faith of a Physicist*, pp. 28-29; and "The Metaphysics of Divine Action" in *Chaos and Complexity*, pp. 147-149, 153-154. It is difficult, however, to understand what this concept of downward emergence amounts to, so I have omitted it from my exposition and simply settled for the claim that chaotic systems are indeterministic.

9. Polkinghorne is skeptical about God's acting through quantum indeterminacy because he doubts that micro-level "openness" affords God sufficient maneuverability, as it were. For details on Polkinghorne's model of divine action, see *Science and Providence*, pp. 2, 25-44; *Reason and Reality* (Philadelphia: Trinity Press International, 1991), pp. 34-48; *The Faith of a Physicist*, pp. 68-69, 78-79; and "The Metaphysics of Divine Action" in *Chaos and Complexity*, pp. 151-156. My analysis of the model attempts to construct the strongest, most coherent account possible using Polkinghorne's somewhat tentative remarks in the pages just cited. To the degree that I have misinterpreted his intentions, however, my criticisms may well be wide of the mark.

10. *Reason and Reality*, p. 45; *The Faith of a Physicist*, pp. 23, 25-26, 28-29. Polkinghorne does not explore in detail what a "non-energetic" interaction is and how it is possible. See "The Metaphysics of Divine Action" in *Chaos and Complexity*, p. 154, for an introductory discussion of what Polkinghorne suggests should be called "active information," the mechanism of this non-energetic transaction.

11. The reference here to "under cover" implies that the wholistic causal action is not detectable on the level of the parts, but is rather "hidden" within the indeterminism obtaining on this level. Presumably this means that the causal contribution is consistent with whatever statistical laws might govern the behavior of the parts. In any case, Polkinghorne stresses that he does not have in mind a picture of God "nudging" complex dynamical systems on the level of atoms and molecules. The leverage God exercises obtains on the level of the system as a whole, where the system is extremely sensitive to changes in its "context" (hence he suggests the name "contextualism" for his rendering of the top-down causal relationship). See "The Metaphysics of Divine Action," in *Chaos and Complexity*, p. 154.

12. Polkinghorne works out his model for divine action in terms of what he calls a monistic, dual-aspect metaphysic, according to which "mind" denotes a flexibility that emerges in the complex systems constituting the human brain. I have avoided reference to his metaphysical speculation on the mind-body problem because in my estimation his analysis of downward causation ultimately does not depend on it.

13. *Science and Providence*, pp. 51-52, 89-91.

14. In what follows I am indebted to Ernan McMullin, "Evolution and Special Creation" *Zygon*, volume 28, number 3 (1993), 299-335, especially pp. 323-325. I am also indebted to David Burrell, C.S.C., for discussions on the topic.

15. On the topic of divine action in a mechanistic universe from a seventeenth-century perspective, see John Hedley Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge: Cambridge University Press, 1991), pp. 117-151. On Newton in particular, see pp. 135-151. Brooke makes clear the connection between voluntarist theology and the mechanical philosophy of nature.

16. See, for example, G.M.K. Hunt, "Determinism, Predictability and

Chaos," *Analysis*, volume 47 (1987), pp. 129-133 and Mark A. Stone, "Chaos, Prediction and Laplacean Determinism," *American Philosophical Quarterly*, volume 26 (1989), pp. 123-131.

17. See "The Metaphysics of Divine Action" in *Chaos and Complexity*, pp. 155-156. For helpful discussions of emergence and downward causation, see A. Beckermann, H. Flohr, and J. Kim, eds., *Emergence or Reduction? Essays on the Prospects of Nonreductive Physicalism* (Berlin: Walter de Gruyter, 1992). I have attempted to construct a coherent notion of downward causation in my unpublished paper, "Is Downward Causation the Achilles' Heel of Nonreductive Physicalism?"

18. See Arthur Peacocke, *Theology for a Scientific Age: Being and Becoming - Natural, Divine, and Human*, enlarged edition (Minneapolis, MN: Fortress Press, 1993), pp. 135-183. In a private conversation, Arthur Peacocke has argued that I should not understand his efforts here to involve the construction of a model for divine action that conceives of God exploiting a physical feature of the world, but rather the elaboration of an analogy that presupposes an ontological gap between God and the world that renders such an idea inappropriate. (I myself argue this below.) It is, however, difficult to understand pp. 157-160 of the work just cited in this manner. See also Peacocke's latest reflection on this issue: "God's Interaction with the World: The Implications of Deterministic "Chaos" and of Interconnected and Interdependent Complexity" in *Chaos and Complexity*, pp. 282-287.

19. This raises a question of profound importance for the dialogue between theology and science: to what extent should theological proposals depend on current scientific theories? On one extreme, any such dependence is rejected. In this case, developments in science cannot possibly pose risks to theology. This option seems both unwise in principle (theology must address the world as best we understand it) and impossible to carry out in practice (our understanding of the natural world, even on a most basic level, as well as our metaphysical speculations, are inextricably entangled with modern science). The opposite extreme I wish to reject here is pinning the intelligibility and intellectual respectability of a religious belief - in this case, the belief that God acts in the world - on a particular development in contemporary science, something I believe Polkinghorne has done. He does so by making the first, and perhaps the second of the following two claims: (1) if God is to act in the world, macroscopic indeterministic physical systems of some sort must exist (weaker claim); and (2) if God acts in the world, God does so specifically through "chaotic" systems, which must therefore be indeterministic (stronger claim). If Polkinghorne in fact is only making the weaker claim, his position puts theology far less at risk than if he is asserting both claims. Although for the position I sketch below, I reject both claims, I am far less certain that theologians ought in principle to avoid ones of the weaker sort. My uncertainty turns on my intuition that fruitful speculation on *human* action might draw on speculation that macroscopic indeterminism obtains in the human brain and nervous system (as I argue in my dissertation, *Divine Action and Indeterminism*, Chapter 6 - "Freedom, Action, and Downward Causation"). On the whole, however, I am inclined to argue that because human beings are embodied (perhaps necessarily so), it is appropriate to seek physical prerequisites for free human action, whereas, as I argue immediately below, the fundamental ontological distinction between the Creator and creation renders this kind of speculation in the case of divine action highly suspect.

20. My argument here, I believe, is broadly consistent with Thomas Aquinas' reflection on "divine action," given that for Aquinas God's action

is essentially always that of creator (that of bestowing *esse*, or being). See David B. Burrell, C.S.C., *Freedom and Creation in Three Traditions* (Notre Dame, IN: University of Notre Dame Press, 1993), especially pp. 67-73.

21. My thanks go to William Wainwright and an anonymous referee for their critical comments on this paper. A different version of this paper was presented at Valparaiso University in 1993, and at the Eastern Meeting of the Society of Christian Philosophers in 1995.