

# The Oxford Handbook of Religion and Science

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Print publication date: Sep 2009

Print ISBN-13: 9780199543656

Published to Oxford Handbooks Online: Sep-09

Subject: Religion, Religion and Science

DOI: 10.1093/oxfordhb/9780199543656.001.0001

## Quantum Physics and the Theology of Non-Interventionist Objective Divine Action

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DOI: 10.1093/oxfordhb/9780199543656.003.0035

### Abstract and Keywords

Since the rise of modern science in the seventeenth century, Christians have hungered for an intellectually and spiritually satisfying view of non-interventionist objective divine action (NIODA) that can support a theology of special providence located between general providence, on the one hand, and miracle, on the other. This article evaluates a specific proposal for NIODA based on an indeterministic interpretation of quantum mechanics (QM). It provides working definitions of the terms involved and the assumptions brought to the conversation. The article then stipulates the criteria that any potential candidate for NIODA must satisfy. Finally, before specifically turning to QM-NIODA, the discussion responds briefly to six frequent misconceptions (FAQs) regarding NIODA that tend to obscure the conversation and delay progress in assessing serious candidates for NIODA.

NIODA, quantum mechanics, divine action, miracle, theology

### Introduction to NIODA

Since the rise of modern science in the seventeenth century, Christians have hungered for an intellectually and spiritually satisfying view of non-interventionist objective divine action (NIODA) that can support a theology of special providence located between general providence, on the one hand, and miracle, on the other. Such a view must take the natural sciences seriously and work with an incompatibilist view of human, and thus by rough analogy divine, freedom to act in nature as well as history. Can we at last

overcome the ‘forced option’ between conservative preferences for objective divine action that is interventionist and liberal tendencies to prefer non-interventionist but merely subjective divine action? (Murphy 1997: esp. [ch. 5](#)).

The task of this chapter is to evaluate a specific proposal for NIODA based on an indeterministic interpretation of quantum mechanics (QM). To begin, we need working definitions of the terms involved and the assumptions brought to the conversation. We can then stipulate the criteria which any potential candidate for NIODA must satisfy. Finally, before specifically turning to QM-NIODA, I will respond briefly to six frequent misconceptions (FAQs) regarding NIODA that tend to obscure the conversation and delay progress in assessing serious candidates for NIODA.

## Terms and Assumptions

### (1) Laws of nature

By ‘laws of nature’ I mean the regularities of natural processes as subsumed into scientific theories, most often through mathematical formulation. Examples would be Newton’s law of gravity and the Dirac equation in relativistic quantum mechanics. Some scholars view the laws of nature *philosophically* as having an ontological status, typically in the sense of Platonic realism. They are then often said to ‘govern’ natural processes prescriptively, and such processes are said to ‘obey’ the laws of nature. Others view them as descriptions of simple natural regularities or, perhaps underlying these regularities, the causal efficacy inherent in nature. In either case, from a *theological* perspective the laws of nature and the kinds of causal efficacies they represent are due ultimately to God’s faithful and trustworthy action in creating the world *ex nihilo*, both as a whole and at each moment, and in giving the world its natural regularities as described by these laws. I tend to view the laws of nature in the latter, descriptive sense, although I sometimes say that nature ‘obeys’ them because this encourages me to take seriously the consequences of scientific theories even if these mitigate against my theological position.

### (2) Ontological indeterminism

By ‘ontological indeterminism’ I mean that nature does not always provide a sufficient efficient cause for a specific effect. The decision to regard nature

as (in)deterministic is a philosophical interpretation based on the best-known scientific theories and the laws they incorporate.

In classical physics, the fundamental laws were deterministic and implied, philosophically, that nature itself is deterministic, a closed causal system of forces rigidly determining the motion of matter. This mechanistic view of nature challenged human free will and divine action. Statistical laws, as in the kinetic theory of gases, were used merely for practical purposes because the underlying forces and the relevant boundary and initial conditions were too complicated to make explicit calculations possible. Accordingly, chance is really 'epistemic ignorance' and points to our lack of detailed knowledge of the underlying causes. It includes chance events affecting a single trajectory, such as tossing a coin, and chance events consisting of the random juxtaposition of two trajectories, such as a car crash (Peacocke 1998: 360-4).

Twentieth-century natural science opens the possibility of interpreting chance as a sign of ontological indeterminism in nature. Scholars in theology and science have made powerful cases that various fields, including cosmology, thermodynamics, chaos theory, the neurosciences, and quantum mechanics, do indeed point to ontological indeterminism. If this is correct, it would mean that the presence of statistics in these fields arises not from our ignorance of the underlying deterministic forces but from the fact that there are, in reality, no sufficient underlying forces or causes that fully determine particular physical processes, events, or outcomes. Chance as indicative of 'ontological indeterminism' is radically different from chance as mere 'epistemic ignorance'. NIODA is a search for scientific theories that support ontological indeterminism.

### (3) Objective versus subjective acts of God

Conservatives stress the possibility of objective acts of God. Put in counterfactual terms, events are considered the result of an 'objective act of God' if they would not have occurred in precisely the way they did had God not acted in a distinctive or special way in bringing them about. Conversely, liberals believe that God acts uniformly in all events, even though some may be viewed as 'subjectively' special when the religious believer attributes to them specific revelatory meaning or distinctive divine agency (Tracy 1995: 294-6).

#### (4) 'Direct' or 'indirect' acts

The distinction between *direct* and *indirect* acts comes from the philosophy of action regarding human agency. By a 'direct act' or a 'basic act' I mean an act which an agent accomplishes without having to perform any prior act. By an 'indirect act' I mean an act which an agent eventually accomplishes by setting into motion a sequence of events stemming from a direct act which the agent performs.

In turning to divine action I will use the distinction between direct and indirect acts analogously, recognizing the severe apophatic limitations on any such analogy. An objective act of God may be either a direct act of God or an indirect act resulting from God's direct act elsewhere in nature. Every event in the universe, including (but not limited to) the absolute beginning of the universe at ' $t = 0$ ' (if it had such a beginning), is a direct act in the sense of its sheer existence—that is, of its being created *ex nihilo*. Each event in nature exists *per se* because it is created directly by God. That is, God doesn't create event A by acting through event B. To exist is to exist by the direction action of being created or held in being by God.

#### (5) Mediated and immediate divine action

By 'mediated', I mean that God acts in, with, and through the existing processes of nature without thereby becoming a secondary, or natural, cause. By 'unmediated' or 'immediate' I mean God's action of creation *ex nihilo* which accounts for the ontological existence of the world as a whole and at every moment of time. The act through which every event in nature exists *per se* is an unmediated divine act; it is not mediated by anything that exists prior to it in time. To underscore this we can say that God's direct act of creating an event is not even mediated by the event itself, since its existence *per se* is ontologically prior to its capabilities as an existing event to mediate God's action of creation *ex nihilo*. In short, every event, in that it exists, is the direct result of the unmediated creative act of God *ex nihilo*. At the same time the character of all events in the world excepting  $t = 0$  (if there is such an event) is also the result of God's mediated action—that is, God's action mediated in, with, together, and through prior events, and this action is mediated through the secondary causal processes of nature.

Note that, by combining (4) and (5) we can delineate the following possibilities. Events may be considered as the result of God's immediate and direct action (i.e. the event  $t = 0$ , where the existence and the nature of the

event are the direct result of God's act), as embodying God's mediated and direct action (where the existence of the event is God's direct, immediate act, but its character is mediated by the nature of the event), and as representing God's mediated and indirect action (where the character of the event is also mediated by God's previous action via the processes of nature). Note that in this scheme it would make no sense to talk about God's immediate and indirect acts; all indirect divine acts are mediated (i.e., even if God acts indirectly through the mediation of natural processes, the existence *per se* of every event is never bestowed by God through these processes; it is God's direct gift to each and every event).

Note too that we simply cannot answer the question of 'how' God acts, and these comments are definitely not meant to be understood in that way. God's causality is radically different from any of the kinds of causality we know about, just as God's nature as necessary being is ontologically different from ours as contingent being. An 'apophatic epistemic aura' surrounds our entire thinking about divine action, and must not be forgotten, lest we seem to be 'explaining' it or 'answering' the 'causal joint' problem, etc. Because divine agency is radically different from natural agency, it would probably be more circumspect everywhere in the preceding comments to refer to an event as 'the locus of the effect of God's action' rather than as the effect of God's action.

#### *(6) 'Top-down', 'whole—part', 'lateral', and 'bottom-up' causality, and their combinations*

Proposals for NIODA take several forms. 'Top-down' causality refers to God's action at a higher epistemic and phenomenological level than the level of the effects (e.g. the 'mind/brain' problem). 'Whole—part' causality or constraint refers to the way the boundary of a system affects the specific state of the system. 'Lateral' refers to effects lying in the same epistemic level (e.g. physics, biology, etc.) as their causes, but greatly amplified by the long causal chain (e.g. chaos theory and the 'butterfly' effect) which produces them. 'Bottom-up' causality refers to the way in which the lower levels affect higher, more complex levels (e.g. quantum mechanics). Most scholars want to combine all four types of causality when it comes to human agency in the world and to God's action in human life and history. The challenge, however, is to conceive of God as acting in the processes of biological evolution or physical cosmology long before the arrival of any kind of complex biological organism (let alone humanity). Here bottom-up causality may be the only approach available.

(7) *(In)compatibilist views of God's action in relation to nature as (non)-interventionist*

The term '(in)compatibilism' arises in the philosophy of mind and concerns the problem of free will. Roughly speaking, an incompatibilist asserts that human freedom requires physical indeterminism; a compatibilist (such as Kant) asserts that human freedom is consistent with physical determinism.

These terms can be extended provisionally, and by analogy, to the problem of God's action in nature. Both compatibilists and incompatibilists usually agree that the laws of nature ultimately describe God's regular action working in, with, and through natural processes. For a compatibilist, divine action is consistent with a deterministic world, since what God does in bringing about special events is exactly what God does in bringing about ordinary events, and nothing more. What we consider to be special events are only subjectively special.

Conversely, for an incompatibilist, objective divine action is inconsistent with a deterministic world, since what God does in bringing about special events is more than what God does in bringing about ordinary events. What we consider to be special divine acts are objectively special. It is crucial to note that a compatibilist will label God's special objective action 'interventionist', whether or not the world is deterministic, because God's special objective action goes beyond what the laws of nature describe, *whether or not God's action contradicts God's ordinary action in and with nature*. Contrary to this, an incompatibilist will view God's special objective action as 'interventionist' *only if the world is deterministic*. If the world is indeterministic, then God's special objective action is *non-interventionist* when it brings about events which go beyond those described by the laws of nature without contravening or disproving them, because natural efficient causality, as described by these laws, is created by God *ex nihilo*, to be insufficient to bring these particular events about.

## Criteria for a Successful Proposal for NIODA

I am now prepared to state the criteria for deciding whether I have a successful proposal for NIODA:

For non-interventionist objective divine action to be intelligible in light of science from an *incompatibilist* perspective, the events that result from God's action must occur within a domain of nature in which the appropriate scientific theory

can be interpreted philosophically in terms of *ontological indeterminism*. The events themselves must be considered as *direct, mediated, and objective acts of God*.

## 'FAQs': Responses to Six Frequently Asked Questions (Typically Misconceptions) about NIODA

A number of misconceptions about NIODA frequently arise, which tend to prevent or detract from a substantive assessment of the proposals. My hope is to minimize any future confusion over just what the NIODA project is and is not about, so that serious discussion of specific proposals can be more efficient and constructive.

(1) *NIODA is not 'physico-theology', nor is it meant to prove that or 'explain' how God acts in nature* NIODA is not a form of natural theology, or physico-theology, and is most certainly not an argument from design. Instead, it is part of a general constructive theology pursued in the tradition of *fides quaerens intellectum*, whose warrant and justification lie elsewhere, such as in Scripture, reason, and experience, and which incorporates the results of science and the concerns for nature into its broader framework mediated by philosophy. Science should not include reference to God's action in nature as part of its explanation of the world. Theology, however, in *its* explanation of the world should do so. This is as it should be for the mutual integrity of, and distinction between, the two fields of inquiry, and for the order of containment entailed by emergence views of epistemology which requires that theology include and be constrained by, while irreducibly transcending, science.

(2) *NIODA is not a gaps argument in either the epistemic or the ontological sense of gaps* Let us consider the two senses separately.

Type I: Epistemic gaps. An *epistemic* gaps argument is based on what we don't know about the world, and invokes God to explain it. But many gaps in our current understanding of nature will eventually be filled by new discoveries or changing paradigms in science. We ought not to stake our theological ground on transitory scientific puzzles: candidates for a successful NIODA must not be based on epistemic gaps. Instead, they must be based on what is known by one branch of science within a reasonable interpretation of it: namely, ontological indeterminism.

Type II: Ontological gaps. An ontological gaps argument assumes that natural processes are ontologically deterministic; God must

create gaps in order to act in nature. An ontological gaps argument is therefore interventionist. The problem with interventionism is that it suggests that God is normally absent from the web of natural processes, acting only in the gaps that God causes. Furthermore, since God's intervention breaks the very processes of nature which God created and constantly maintains, it pits God's special acts against God's regular action, which underlies and ultimately causes nature's regularities. Finally, it undermines the very integrity and autonomy of science which the 'theology and science' interaction seek to uphold because it implies that God's action is equivalent to a natural, or secondary, cause which science on its own should include (e.g. intelligent design). I agree that we should avoid an ontological gaps argument when these gaps are viewed as disruptions of nature by God's intervention. Instead, a successful approach to NIODA must claim that the processes of nature are created by God *ex nihilo* with intrinsic, naturally occurring gaps.

(3) *NIODA is not undermined by the fact that scientific theories can be given multiple and mutually contradictory interpretations* I agree that multiple interpretability is a real problem for NIODA, but this is not particularly surprising or unavoidable, since multiple interpretability is a real problem for any theology seeking to engage with scientific theories. In short, every scientific theory is multiply interpretable! Clearly we cannot avoid the reality of multiple interpretability. What each scholar must do instead is to build a response to it directly into her or his methodology for relating theology and science. In my view, the best response is to take a 'what if' stance to this problem: be rigorously clear in acknowledging the multiple interpretability of a given theory, in choosing one particular interpretation, and in stressing that this approach to NIODA is hypothetical and tentative. With this stated up front, one can proceed to be as clear as possible about what this interpretation would tell us about the world *if it were true, which it might in fact be*.

(4) *God's action is not reduced to a natural cause* NIODA does *not* reduce God to a natural cause because, according to the philosophical interpretation of the candidate theory in science, there are no efficient natural causes for the specific events in question.

(5) *God's action is hidden from science* NIODA is entirely consistent with the basis of science in methodological naturalism. Neither theology nor science will view 'God' as a proper part of a scientific explanation of

the world, such as when an explicit reference to God is hidden behind the rhetoric of 'intelligent design'. More sharply, God's direct action according to NIODA will be hidden in principle from science, because, according to ontological indeterminism, there is no natural cause for each event in question for science to discover.

(6) *NIODA is not meant to address 'miracles'* Objectively special divine acts support and fulfil the meaning of God's general acts that provide for the regularities of nature even as they go beyond their meaning in surprising and novel ways. Still, they are not 'miracles' in the Humean sense: they are not interventions by God which suspend the ordinary regularities of nature or violate the laws of nature that we construct to describe these regularities. Nor are they what theologians for millennia have meant by miracles, namely the nature miracles, the healing miracles, and the central threefold miracle of the Incarnation, Resurrection, and Ascension of Christ—events which involve the transformation of nature as a whole and with it the transformation of the laws of nature (Russell 2002).

#### QM-NIODA: The Proposal and its Assessment

A variety of proposals have been explored by diverse scholars in recent years. Many creative results can be found in the series of collaborative publications by the Vatican Observatory (VO) and the Center for Theology and the Natural Sciences (CTNS).<sup>1</sup> In my opinion the most promising approach is to base NIODA on quantum mechanics, with the specific philosophical interpretation that nature's ontology at the subatomic level is at least partially indeterministic. This approach has roots in the early 1950s with scholars such as Karl Heim (1953), E.L. Mascall (1956), and William Pollard (1958), and includes very recent work by George Ellis, Nancey Murphy, and Thomas Tracy.

Quantum mechanics, c.1900–30, describes the behaviour of atomic and subatomic particles with extraordinary accuracy. It is a foundational theory in contemporary physics, which, when combined with special relativity, leads to quantum field theory and, eventually, to the gamut of current supersymmetry and string theories. Yet QM can be interpreted in a variety of competing and conflicting ways which date back to its formation and which remain highly debated today (Herbert 1985; Shimony 2001).<sup>2</sup> Here I will adopt the view first championed by Werner Heisenberg as a form of the Copenhagen interpretation: namely, that quantum mechanics depicts nature as ontologically indeterministic. By 'ontologically indeterministic' I mean, again, that nature provides the necessary but not the sufficient

causes for quantum events to occur. While the Schrödinger equation applies deterministically to the propagation of the wave function and includes efficient causes in the form of potential energies (representing forces at work in nature), during a quantum event, or ‘collapse of the wave function’, the Schrödinger equation does not apply, and there is no efficient natural cause that brings about this event. It is this interpretation which forms a promising basis for what I will call ‘QM-NIODA’. My central thesis is that God acts objectively and directly in and through (mediated by) quantum events to actualize one of several potential outcomes; in short, the collapse of the wave function occurs because of divine and natural causality working together even while God's action remains ontologically different from natural agency.

A variety of theological issues now emerge in the relationship between divine action and the Heisenberg interpretation of quantum physics. I will separate them into general issues and crucial issues.

## General Theological Issues

(1) How QM-NIODA responds to six key FAQs regarding NIODA proposals

(a) *Is QM-NIODA an epistemic or an ontological gaps argument?*

No! QM-NIODA is *not* an epistemic gaps argument; instead, it relies on what we *do* know about nature, assuming that quantum physics is the correct theory and ontological indeterminism its correct interpretation. Therefore, it is *not* an ontological gaps argument; it does *not* require God to ‘break into’ the causally closed processes in nature. Instead, God has created the universe *ex nihilo* such that some natural processes at the quantum level are insufficiently determined by prior natural events. Because nature is indeterministic, God acts as continuous creator together with nature, which supplies the material and formal causes, to bring about quantum events. In such a non-interventionist account of divine action, we are relating God's action in the world to our knowledge of the world based on quantum mechanics, not to our ignorance about the world. With it objective special providence is achieved without contradicting general providence, since God's particular acts, being non-interventionist, do not violate or suspend God's ordinary action.

(b) *Is God's action at the quantum level in effect a natural cause?*

No! QM-NIODA does not reduce God to a natural cause, because, according to the philosophical interpretation of quantum mechanics deployed here, there are no efficient natural causes for a specific quantum event. If God acts together with nature to produce the event in which a radioactive nucleus decays, God is not acting as a natural, efficient cause.

(c) *Is God's action at the quantum level hidden from science?*

Here my response is Yes! for several reasons. First, as stated above, all proposals for NIODA are entirely consistent with methodological naturalism. Second, God's direct action at the quantum level will be hidden in principle from science because, given this philosophical interpretation of QM, there is no natural cause for each specific quantum event for science to discover. Third, and alternatively, God's action will remain hidden from science because it will take the form of realizing one of several potentials in the quantum system, not of manipulating subatomic particles as a quasi-physical force.

(d) *Can even God know the outcome of a quantum process given the underlying ontological indeterminism?*

Here my response is Yes!, contrary to Peacocke, who rejected the relevance of quantum indeterminacy to the problem of divine action. According to Peacocke, even God cannot know which potential state will become actual during a quantum event, and therefore what the future trajectory will be for that state, because of quantum indeterminism (Peacocke 1995: 279–81). But I am claiming that God acts together with nature to determine which quantum outcome becomes actual; God can know which potential state will become actual, since *God causes it to become actual!* In essence, quantum indeterminism is the result of it being God, not nature, which determines the outcome (Russell 2001: 314; see also Ellis 1999: 471–2). Moreover, once the system is in a definite state, its future state is predictable to God, because it is determined by the Schrödinger equation (although it would be better to claim that God ‘knows’ the future state in its own present than ‘foreknows’ it by predicting it from the present).

(e) *Does QM make divine action ‘episodic’?*

Contrary to Polkinghorne, I do not believe that QM-NIODA makes divine action ‘episodic’ (Polkinghorne 1995: 1523; 2001: 186–90). Polkinghorne has

actually given several arguments against QM- NIODA. (i) The first focuses on chaos theory, where small changes in the initial conditions are amplified rapidly into large changes as the system develops in time. Some have speculated that quantum physics may be the ultimate source of these initial changes, but to move forward, we need an explicit theory referred to as 'quantum chaology' that unites quantum mechanics and chaos theory and thus accounts for how quantum indeterminacies are amplified by chaotic processes. But the search for such a theory has floundered so far on a host of technical problems. According to Polkinghorne, we must first solve these problems before treating QM as a reliable basis for NIODA. (ii) Quantum physics is subject to competing interpretations, including deterministic ones. It is unwise to base NIODA on a specific interpretation of QM, since this interpretation may turn out to be invalid. (iii) Then there's the measurement problem: How can a piece of apparatus yield exact measurements on a quantum system if it is composed of elementary particles obeying the indeterminacy principle? (iv) Finally, divine action related to quantum mechanics would be 'episodic', because the indeterminacies in quantum behaviour arise only in 'those (occasional) events which qualify, by the irreversible registration of their effects in the macro-world, to be described as measurements'. Such episodic divine action is far too limited an account in light of the general, continuous, multilayered character of God's action in the world.

With respect to (i), I disagree with Polkinghorne about the relevance of quantum chaology to QM-NIODA. There are numerous ways in which quantum processes both underlie and give rise to specific effects in the classical, macroscopic world that do not depend on chaos to amplify them (see below). Quantum chaology is clearly a problem for Polkinghorne's chaos-based approach to NIODA, but it is not a problem for QM-NIODA. (ii) The problem of multiple interpretability was addressed above. Finally, point (iii) is the standard criticism of Bohr's 'two worlds solution' to the measurement problem. It is not a criticism of the claim being made here which is based, instead, on Heisenberg's advocacy of ontological indeterminism.

(iv) What about the charge that the measurement problem makes God's actions 'episodic'? First, Polkinghorne asserts that indeterminacies in quantum behaviour arise *only* when an irreversible registration of their effects occurs in the macro-world. I have argued instead that they occur not only at the micro-macro level of irreversible interactions but also in irreversible interactions at the micro-meso and the micro-micro levels. This leaves his second claim that measurements occur only occasionally. In fact,

however, they can occur at any time and place in the universe when the conditions are right for micro-micro, micro-meso, as well as micro-macro, irreversible interactions. This suggests a God who is *acting providentially everywhere and at all times* in and through all of nature—a God whose agency is hardly ‘episodic’ (Russell 1998: 211–12; 2001: 310).

(f) *Why the Saunders/Wildman ‘tetralemma’ argument against QM-NIODA fails in principle*

Nicolas Saunders has offered a lengthy criticism of the special divine action project in general (‘SDA’) and the QM-NIODA project in particular (‘QSDA’). He concludes that the case being made for ‘the “traditional understanding” of God’s activity in the world (is) extremely bleak ... (and that) *contemporary theology is in crisis*’—a judgement which has been quoted frequently (Saunders 2002: esp. [chs. 5, 6](#)). A detailed rebuttal to Saunders would require much more space than is available here. Wesley Wildman, however, has produced a careful, and I believe fair, summary of Saunders’s arguments (Wildman 2004), and I shall use it here to challenge both Saunders and Wildman (see n. 3 below).

According to Wildman, the argument advanced by Saunders depends on four propositions whose conjunction provides ‘the most demanding criterion for an adequate theory of SDA’. Indeed, it constitutes ‘the criterion of success’ for SDA proposals. Wildman poses the conjunction as a ‘tetralemma’: (1) objectivity, (2) incompatibilism, (3) non-interventionism, and (4) the ‘strong ontological view of the laws of nature’. By the latter Wildman means Saunders’s view that the stochastic laws in quantum mechanics refer to ‘principles or deep structures of nature that statistically govern *each individual event* within an ensemble of events’. Wildman claims that ‘all theories of SDA fail to meet this criterion’—the tetralemma. Recognizing this failure in advance, each advocate in the QM-NIODA field intentionally ‘protects’ his or her version of SDA by ‘weakening or rejecting one of the four propositions defining the criterion for success’. The failure of SDA proposals to meet the tetralemma accounts, according to Wildman, for Saunders’s dismissal of these proposals (Wildman 2004: 57, 41, 43/table 2, 56).

What, then, of the tetralemma? Is it a valid criterion of success for SDA proposals? Hardly. As Wildman himself caustically states, if the strong ontological interpretation were correct, ‘we do not need ... two chapters of [Saunders’s] book or a bunch of conferences to conclude that a non-interventionist account of QSDA is impossible’. I would add that none of the scholars searching for QSDA (QM-NIODA) view the tetralemma as

representing the 'criterion for success' for their proposals. None worked at 'weakening or rejecting one of the four propositions' in the tetralemma in order to avoid its fateful verdict. The reason for this is quite simple: *the tetralemma is intrinsically self-contradictory*, as should be obvious: an incompatibilist account of non-interventionist objective, special divine action (NIODA) requires that nature is causally *indeterministic*; but a strong ontological interpretation of the stochastic laws of nature (if such an interpretation is even cogent) means that nature is *deterministic*, governed event by event by these stochastic laws.

It is not surprising that Tom Tracy dismisses the tetralemma out of hand, writing that 'these four assertions are logically incompatible' and that the tetralemma 'cannot possibly define "the criterion for success"' for SDA proposals. Not affirming the criterion is not a 'weakening of such proposals', as Wildman claims, because 'a theory is not compromised by its inability to accomplish a logically impossible task'. Indeed, Tracy (2004) calls support for the tetralemma a 'flatfooted mistake'.<sup>3</sup>

## (2) Divine action at the quantum level and general providence

The quantum-mechanical properties of fundamental particles ultimately account for many of the classical properties of the ordinary world of nature. For example, the statistics associated with protons, electrons, and other 'fermions' give rise to such features as the impenetrability and electrical conductivity of matter, while the statistics of photons, gravitons, and other 'bosons' produce phenomena such as superconductivity and the attractive forces in nature. It is to this world of ordinary experience that we attribute God's general providence (or continuous creation): namely, the ongoing creation and sustenance of the general features of the classical world of physics, geology, chemistry, meteorology, evolutionary biology, and so on. Thus, what we routinely take as general providence arises indirectly from God's *direct* action of sustaining in existence quantum systems and their properties during both their time evolution and their irreversible interactions (Russell 1988: 344–6; 1998: 200–1; Murphy 1995: 340–3; Ellis 2001: 259–60).

## (3) Divine action at the quantum level and its relation to special providence and theistic evolution

QM-NIODA also views the domain of quantum mechanics as giving rise to particular events in nature (i.e. special providence). While it is widely asserted that individual quantum events always 'average out' at the

macroscopic level, thus making quantum mechanics irrelevant to special providence, it is actually quite clear that quantum processes underlie and give rise to specific effects in the macroscopic world in several ways (which, to repeat, do not involve chaotic phenomena and thus 'quantum chaology').

One way is through those phenomena, such as superfluidity and superconductivity, which, though found in the ordinary world, are really 'bulk' quantum states—what Ellis calls 'essentially quantum effects at the macro level' (Ellis 2001: 261–2). Another, quite different way is through specific quantum processes, which, when amplified correctly, result in particular effects in the classical world. Obvious examples range from such jury-rigged situations as 'Schrödinger's cat' to such routine measurement devices such as a Geiger counter or a photo-multiplier. In fact, the production of specific effects at the macroscopic level from quantum processes includes a whole range of phenomena in nature such as the animal eye responding to a single photon, mental states resulting from quantum events at neural junctions, or the eventual phenotypic expression of a single genetic mutation in an organism (Russell 2001: 299, 306). Consequently, I claim that a quantum-based NIODA is enormously relevant to deploying a robust account of 'theistic evolution' in which God's non-interventionist objective divine action works in and with nature at the physical and biological levels of complexity, resulting in the neo-Darwinian evolution of life on Earth (Russell 1998).

In previous writings, I pointed to a watershed accomplishment in theology and science when, in the 1970s, Arthur Peacocke shifted the discussion of chance from a conflict model, 'law versus chance', as urged by atheists such as Jacques Monod (unfortunately, a formulation all too often accepted by Christians who reject evolution), to an integrative framework, 'law and chance'. As a result of this shift, Christians could claim that God acts through both law and chance to create physical, chemical, and biological novelty in nature. Still, the meaning of chance in this context may not be adequate for a genuine sense of non-interventionist divine action in specific events in time. I suggest that we now face a more fundamental shift in our discussion of 'law and chance' in light of quantum physics: a shift from chance in classical physics (where chance as mere epistemic ignorance of underlying causal processes precludes NIODA) to chance in quantum physics (where chance as onto- logical indeterminism is open to NIODA). Rather than saying that God deistically watches the endless unfolding of the potentialities built into nature at the beginning, as the early proponents of theistic evolution seemed to imply, we can now say that God indirectly creates order in the classical realm by (1) directly creating a quantum- mechanical universe with

the properties that give rise to many of the phenomena in the classical world and (2) by acting directly in time as the continuous creator in, with, and through the indeterminism of quantum events to bring about novelty in the classical world. God is thus truly the God of both order and novelty in the physical and biological realms (Russell 1998: 344–6).

In summary, then, God's action at the quantum level can be seen as bringing about, in a non-interventionist mode, both the general features of the world we describe in terms of *general providence* (or continuous creation) and those specific events in the world to which *special providence* refers.

## Crucial Theological Issues

We are now ready to move directly to the key questions in the debate on divine action and (non-relativistic) quantum physics.

(1) *Does God act providentially (general and/or special) in all, or only in some, quantum events?*

Murphy supports the claim that God acts intentionally in all quantum events. In her view, all quantum events involve a combination of natural and divine causality; they are determined, though only in part and not solely, by God (Murphy 1995: 340–3). Tracy explores the option that God acts in some but not all quantum events (Tracy 1995: 321–2).

On the one hand, I find Murphy's approach helpful for several reasons. The idea of God acting in all quantum events supports the theological claim that God does more than sustain the existence of all events and processes; in fact, God governs and cooperates with all that nature does. This idea also offers us a subtle but compelling way of interpreting God's action as leading to both general and special providence. Tracy's option seems to violate the principle of sufficient reason, since some quantum events would occur without sufficient prior conditions, constraints, or causes. Yet on the other hand it underscores the 'special' character of 'special providence': God's direct acts in key quantum events are special, not only because their indirect outcome is special, but also because God normally does not act in other quantum events beyond creating them and sustaining them in being.

Actually we can combine Murphy's pervasiveness of divine causality with Tracy's concern for the event to be objectively special because of the nature of quantum statistics: God acts in all events (God's action is never 'more' or 'less', but always equally causative). Still, on certain occasions, God will

choose to actualize one state in particular, and not the other, because that state, and not the other, promotes life, thus conveying God's intentionality in this particular event.

In sum, QM-NIODA delivers just what is needed for non-interventionist objective, special providence. It involves *objective* special providence, for it involves a difference in what actually happens; it is objective special *providence*, since it truly conveys God's intentions through events that nurture life and wellbeing in the world; and it is *special* providence, because it is that event that we use to refer to God's providence against the assumed backdrop of the general situation itself: a wonderful outcome, a healing, a renewal of hope. Most importantly, it is *non-interventionist* objective special providence, because it is an act of objective special providence that God achieves without violating or suspending the ongoing processes of nature and the laws that describe them. So in short, God causes all the processes of the ordinary world (general providence), but a few of them genuinely convey special meaning because the choices God makes in causing *them*, and not the other options available to God, bring them about (Russell 2001: 315–17).

I also want to reiterate that I am not proposing an explanation of how God acts in nature (i.e. the 'causal joint' problem or the relation between primary and secondary causality); in addition this is, at most, a proposal about one of many domains in nature where the effects of God's acts arise. Hence, for all that has been said here, my proposal is fundamentally circumscribed and moderated by the profoundly apophatic nature of theological language.

## (2) Quantum physics, divine action, and the problem of human freedom

The problem of free will, as formulated in the modern period, is the following: how are we able to act freely in the world if, as in the classical science picture, deterministic laws govern us somatically? Actually the problem arises only on an *incompatibilist/ libertarian* account of free will, which I adopt here. Many scholars have seen quantum indeterminism as a way out of the impasse: perhaps the human mind, through some form of 'top-down' causality (viz. the mind-brain problem), can objectively influence the brain through a direct or basic act which then indirectly affects the movements of the body via the central nervous system, making the enactment of free choices possible because the body is not determined mechanistically. This, however, raises a concern: how do we allow God's action to determine the quantum events that occur in my body and still allow

for my own mind/brain to determine them? I will call this the problem of 'somatic overdetermination' (Russell 2001: 317–18).

My suggestion is that God acts in all quantum events in the universe until the evolution of organisms capable of even primitive levels of consciousness. God then increasingly refrains from determining the neurophysiological outcomes we associate with conscious choices, leaving room for top-down, mind—brain causality in conscious and self-conscious creatures. This would be one version of the standard 'solution' to the problem of free will: namely, God's voluntary or metaphysically necessary self-limitation, but seen now as a temporal development of the limitations, from minimum to maximum. God also abstains from acting in those quantum events underlying bodily dispositions resulting from indirect, central nervous system triggering, thereby allowing the developing levels of consciousness to act out their intentions somatically. Hence God bequeaths us not only the capacity for mental experience via God's special action in evolution and the resulting rise of the central nervous system, but God also bequeaths to us the capacity for free will and the capacity to enact our choices by providing at least one domain of genuine indeterminacy in terms of our somatic dispositions.<sup>4</sup> This approach suggests a rough analogy between the mind—brain problem, in which the mind acts as a source of influence on neuro-physiologically located quantum events, and God's action in bringing about particular outcomes ('measurements') out of quantum indeterminacies (even though—and this is where the analogy fails completely—the means by which the brain does this is radically different from the means by which God does it).

### (3) Quantum physics, divine action, and the challenge of theodicy

The problem of theodicy, of course, is a perennial issue for theism. If God is purely good, and if God can really act in history, why doesn't God minimize the evil done by humanity (i.e. 'moral evil')? When we expand the scope of divine action to include the evolutionary history of life on Earth, the question becomes: Why doesn't God act to minimize suffering, disease, death of individual organisms, and extinction of species (i.e. 'natural evil')? Theodicy has been discussed extensively in the 'theology and science' literature, where its subtle connection to the problem of human freedom has frequently been stressed. But theodicy becomes a particularly intense issue in light of the present thesis regarding a non-interventionist approach to objective, special divine action. George Ellis put the problem eloquently: '[T]here has to be a cast-iron reason why a merciful and loving God does not alleviate a

lot more of the suffering in the world, if he/she has indeed the power to do so' (Ellis 1995: 360; see also 384 and Tracy 1998, 2001).

In response to the challenge of theodicy, Murphy calls on her notion of God's respect for the integrity or 'natural rights' of all creatures. This certainly works for humanity. Being non-coercive, God's action is consistent with human freedom and thus addresses, in part, the issue of theodicy as 'moral evil'. But what of 'natural evil': why does not God act to prevent suffering in nature in those cases where human freedom is unaffected, including the vast sweep of pre-human and even pre-sentient evolution? I believe that the search for an acceptable response to theodicy should be sought not within the doctrine of creation but within a fully developed theology of redemption as Resurrection-based new creation. I believe that it is only here that we will find the 'cast-iron reasons' that Ellis so rightly demands—reasons that will have the form of the cross and the empty tomb (Russell 2002). In any case, the problem of theodicy is stunningly exacerbated by all the NIODA proposals, including my own. The development of an adequate theological response is an overarching goal for future theological research.

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Notes:

(1) See the first five entries in the Bibliography under Russell *et al.* with the indication 'CTNS/VO Series'. For convenience, these volumes are referred to in the remainder of the Bibliography by the initials given here.

(2) In this brief chapter I will not treat such critical issues as non-locality, entanglement, challenges to realism, etc. See [Russell \(2001\)](#).

(3) Does Wildman agree with Saunders? Actually he criticizes Saunders for not stating why we must accept a strong ontological interpretation of the laws of nature in the first place; it is a 'key lapse' in Saunders's book. He also criticizes proponents of QM-NIODA (Ellis, Murphy, Tracy, and me) for not providing reasons for rejecting it. More significantly, however, he provides his own reason for why SDA proposals must fail the tetralemma, viz. Kant's insight rooted in the antinomy of reason: causality in nature and human freedom can never be reconciled unless we presuppose a compatibilist view of freedom. According to Wildman, Kant's argument 'applies equally well to divine freedom to act'. Hence SDA proposals must inevitably fail ([Wildman 2004: 58](#)). My response to Wildman is to disagree with his endorsement of Kant. Instead, I believe that the search for an indeterministic interpretation of natural causality, particularly in light of QM, represents a new conception of nature, to which Kant's metaphysics on this point at least is inapplicable. [Philip Clayton \(2004\)](#), in response to Wildman's article, lists five powerful arguments that seek to refute Kant's view.

(4) This discussion needs further refinement to take into account the claim that *God's grace, active within the human person, makes free will possible*, including the way grace liberates the will from the bondage of sin. The metaphor of divine 'self-limitation' mitigates against this insight. In essence, I am in agreement here with Ted Peters, who rejects a 'zero-sum' view of divine/human agency and, in particular, its excessive deployment in current 'kenotic' theologies of creation.

