

THE FALSE PROMISE OF QUANTUM MECHANICS

by *Timothy Sansbury*

Abstract. The causal indeterminacy suggested by quantum mechanics has led to its being the centerpiece of several proposals for divine action that does not contradict natural laws. However, even if the theoretical concerns about the reality of causal indeterminacy are ignored, quantum-level divine action fails to resolve the problem of ongoing, responsive divine activity. This is because most quantum-level actions require a significant period of time in order to reach macroscopic levels whether via chaotic amplification or complete divine control of quantum events. Therefore, quantum-level divine action either requires divine foreknowledge of purportedly free or random events or imposes such limitations on divine actions that they become late, potentially impotent, and confused. I argue that the theological problem of divine action remains; even at its most promising, quantum mechanics offers insufficient resolution. This failure suggests a reexamination of the assumptions that God is temporal and lacks foreknowledge of future contingencies.

Keywords: chaos theory; divine action; divine temporality; indeterminism; quantum mechanics

The Copenhagen interpretation of quantum mechanics suggests an interesting space for divine action in the causal indeterminacy of fundamental events in the universe. On this interpretation, it is possible that quantum events could be divinely determined in such a way that no laws of nature are violated while responsive divine activity takes place. However, because of the minuscule nature of quantum-level interactions, in order to produce macroscopic effects either God would have to determine all or most quantum events over an extended period of time or a smaller number of determinations would require amplification through some deterministic natural process such as highly sensitive chaotic systems. The first option

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on its own is severely limited by the actual range of quantum indeterminacy, so that divine action would be either incredibly slight or possible only over extremely long periods of time. The latter is more promising, although there are significant theoretical concerns about whether the structures necessary for amplification are common enough to be useful.

Even if conditions turn out to be optimal for the proposed theories, quantum mechanics cannot resolve the underlying theological issues. There are two central questions in the dialogue on divine action. The first is whether God acts in the universe apart from the original creation—that is, whether God continues to act in creation other than by preserving it. The second is whether divine action occurs within the boundaries of the regular order of causal laws or by intervention into that order with the breakdown of those laws. The concern is to allow for ongoing divine activity in response to contingencies, human or material, within the boundaries of natural laws. Quantum mechanics is presumed to provide a location for such responsive divine action. However, the limitations of such minute systems reintroduce the same problems they are expected to solve.

I do not take a position here on whether or not divine activity occurs on the quantum level. Rather, I propose that such activity is ultimately immaterial to theology. My argument is framed by the assumption that the existence of causal indeterminacy (and/or human freedom) entails that God's knowledge of the future is restricted to causally determined future events and probabilities of contingent future events. In fact, the failure of quantum mechanics to provide sufficient resolution to the question of God's ongoing role in creation should bring that assumption into question.

DIVINE ACTION AND QUANTUM MECHANICS

It is the attempt to preserve both a rich notion of God's historical activity and relationship with the human race, and of God's role as creator and sustainer of the universe including the laws and principles governing its behavior, that causes the puzzle of divine action. The first is satisfied by an interventionist model in which God simply acts in whatever manner is suitable to the situation at the appropriate time regardless of any created laws and forces in the universe. The second is satisfied by a position in which God's action is limited to an initial creation so precise that all future states are guaranteed in one perfect beginning (Murphy 1996, 67–68). Philip Clayton describes the situation as follows:

It would now appear, at least at first blush, that either God acts as the Divine Architect, who created a finely tuned machine and left it to function in a perfect manner expressive of its Designer, or God becomes the Divine Repairman, whose imperfect building of the machine in the first place requires him, like an inept refrigerator repairman, to return from time to time to fix up errors he made the first time around. (Clayton 1997, 190)

The clear goal in the current debate is to avoid an interventionist approach. Clayton acknowledges that “it would be metaphysical prejudice to rule out any chance of direct divine action in the natural world” but adds that “the evidence is on the side of regularity” (1997, 191–92). If the universe obeyed perfectly deterministic laws, and if human freedom were not libertarian freedom, the original creative act would be sufficient to account for all desired future states. In this case, divine action, exhausted in the initial conditions of the universe, nonetheless precisely determines future events. However, any such theory excludes the possibility of any causal indeterminacy whether on the quantum or human level and appears to be incompatible with Christian theism. Thomas F. Tracy explains:

Even if God’s providential activity is understood entirely as the outworking of the potentialities that God builds into the universe in creation, we can still identify particular events as special divine acts in the sense that (1) these events play a distinctive causal role in advancing God’s purposes for the world’s history, or (2) these events play a distinctive epistemic role in disclosing God’s purposes to us. The principal objection to this interpretation of special divine action is that it fails to allow for divine actions that *respond* to human actions; it appears that God will have to act directly in the course of history in order to interact with free creatures. Here we find the central (though not sole) theological concern that is addressed by the idea of divine action through natural indeterminacies, namely, the concern to provide a means by which God can affect the course of events once history is underway without disrupting the natural causal order. (Tracy 2000, 894)

Tracy’s explanation is important for two reasons. First, it identifies the notion that the most important means of divine action remains as creator and sustainer of the universe. For this reason, on the same page he strongly rejects the notion that quantum mechanics needs to be the sole or even greatest location of divine action. Second, and more important, it identifies the concern that underlies the excitement over the possibility of causal indeterminacy in quantum events—namely, that such a gap would leave room for responsive divine action within the operation of natural laws.

Nicholas Saunders has identified four possible means by which such divine manipulation of quantum mechanical events might take place, but of them only one is truly noninterventionist (Saunders 2000, 536–39). The first three involve divine manipulation of the wavefunction, but if the wavefunction models a real feature of quantum-level reality (and the current discussion implies that it must), if God alters it—by adding an additional possible state, making measurements that collapse the wavefunction, or altering the probability of particular results—God has changed the deterministic state of the particle and clearly intervened in the natural order. Such a position is no less interventionist than was Newton’s assertion that God occasionally bumped the planets back into their proper orbits. The only model that is viable is that in which divine control comes in determination of the wavefunction collapse.¹

I find the Copenhagen interpretation persuasive and therefore would accept that quantum mechanical events probably provide the kind of causal gap required for noninterventionist divine action. Such randomness is rarely translated into the macroscopic world because the enormous numbers of events occurring within strictly determined limits averages to classically expected, deterministic behavior and because the vast majority of quantum-level particles at any given time are in their deterministic wave state and not undergoing an indeterministic collapse of the wavefunction. In order to produce macroscopic effect, either God controls most or every quantum event and through an incredibly vast number of microscopic interventions a macroscopic change is wrought, or highly sensitive, chaotic systems are used to produce an amplifying effect from very small original actions.² (Geiger counters provide one example; they use an artificially produced, highly unstable system to amplify individual quantum events for macroscopic observation.) For the purposes of this essay, it will be granted that either or both of the preceding models are viable, and they will be granted the greatest reasonable theoretical leeway. However, note that it remains possible that quantum mechanics will prove entirely insufficient for its theological task on purely scientific grounds, as has been argued by Jeffrey Koperski (2000, 552).

FRAMEWORK OF THE DISCUSSION

It is important to describe the theological framework within which this discussion takes place. First, divine foreknowledge is presupposed to be restricted by causal indeterminism. If not, in either the human or the physical activity God's foreknowledge should allow "response" to occur before the event, because God would not be required to wait to see what happens in order to know what happens. This supposition entails that God does not transcend all of time, since indeterminate events are not essentially unknowable; they are unknowable by means of extrapolation from the set of initial conditions from which they arise. (For instance, in a world in which time travel were possible, humans could foreknow an indeterminate event by observing it and then traveling to a time prior to its occurrence.) If we suppose that God transcends all of time, God would know the future—including any indeterminate events—by means of direct observation rather than prediction or simple foreknowledge. Thus, action from the past, even as far back as creation, could be labeled responsive so long as "responsive" regards the *motivation* for an action rather than when it occurs.

One reason for the embargo against foreknowledge involves an imprecise use of language. *Indeterminate* is a word that, in the case of quantum mechanics, makes an ontological claim about the causes of an event: It is not perfectly determined by the circumstances under which it occurs but

is limited to a range of possible final states. This ontological proposition results in a derivative *epistemological* condition: Because the conditions are insufficient for knowledge of the events, the final states cannot be predicted. But the epistemological fact of being unpredictable is not absolute in the way that the ontological claim must be. The causally indeterminate event will always have the quality of being causally indeterminate. It does not always have the quality of being unknowable. It obviously is possible for an indeterminate event to be known by observation; such happens all the time. *Indeterminate* refers to the manner in which the event occurs. As a result of being indeterminate there is no way in time, prior to the event, to know by observation or prediction what will occur. However, if that result could be observed from some other temporal perspective, it would remain ontologically indeterminate even if information about it were transferred into the past.³

Consider the following illustration. If I imagine playing a game of dice with God, I should not be surprised if God “guessed” right every time since rolls of dice are not causally indeterminate; they appear indeterminate because of the vast number of factors involved in the throw. However, if I happen to have a set of quantum dice, in which there are six equipotential states and a truly indeterminate “roll,” if God continues to guess correctly, things are more difficult. There are two immediately obvious possibilities. The first is that Einstein was right all along (except in my example, since God is indeed playing dice) and quantum activity really is determinate. In that case, God’s foreknowledge is that available to any Laplacian demon; it is simply prediction based on perfect knowledge of the present coupled to perfect knowledge of all natural laws and determinacies. The second is that God controls all quantum events, so God determines the result to be what God states that it will be. However, there is a third possibility. God could be unrestricted by time, such that God knows the result by virtue of already being there in the future; it is first-hand knowledge, so that what is called foreknowledge temporally is actually a posteriori knowledge. If God transcends time in any meaningful way, God would have this kind of foreknowledge of indeterminate events, foreknowledge that does not impinge upon their indeterminate status any more than does my knowing the results of the quantum die toss by having seen it.

This third possibility is excluded for the purposes of this discussion. In the first place, it is often explicitly denied. Second, its denial is implicit in the limitations on divine action that make quantum mechanics (or any other causal gap) attractive. If God is not cotemporal with the universe but has equal access to the future as well as the present, even if God’s activity originates temporally before an indeterminate event it can be considered responsive. This further implies that quantum indeterminacy is not sufficient even to make the divine architect impossible. For example,

an omniscient God would know from the beginning what was going to occur at all times and therefore plan out the quantum mechanical determinations needed at all future times to compensate for the vagaries of foreseen contingencies and create an intermediary, deterministic agent as part of the original creation to complete those actions without requiring any further divine acts.

Accordingly, I restrict myself to considering only the case in which God is temporal and lacks foreknowledge of future contingencies, and I presume that being properly responsive implies temporal subsequence, or, if a response is initiated prior to its cause, it is done on an imperfect *presumption* of the future need, not precise foreknowledge of it. The problem of divine action as purportedly answered by quantum mechanics is dependent upon the restriction of God's knowledge to the past, present, and causally predetermined future events.

THE REAL PROBLEM WITH QUANTUM MECHANICS

I contend that even if the science turns out as well as can be hoped, quantum mechanics is ultimately incapable of providing a satisfactory resolution to the originating theological concern. Within the theological restrictions described above, even if it is granted that (1) the Copenhagen interpretation is correct and truly indeterminate events occur at the quantum level, (2) there are sufficient actual events occurring for meaningful changes to be made, and (3) there are sufficient processes, whether chaotic or otherwise, to amplify actions begun at the quantum level into macroscopic effects, quantum mechanics still fails to significantly advance the theological problem of divine action. The reason is that the structure of the divine activity system is such that God will either be unable to act in a timely fashion or will act in a confused or self-contradictory fashion.

Recall Tracy's comment that the primary mode of divine action is in the original creation and in sustaining that creation. Additional actions are required "to provide a means by which God can affect the course of events once history is underway without disrupting the natural causal order" (Tracy 2000, 894). Petitionary prayer serves as a common example of the kind of event prompting such an action. Nancey Murphy has said that "if there is no sense in which God may be expected to bring about a state of affairs that would not otherwise have occurred, then the practice of petitionary prayer is groundless" (1995, 331). Moreover, preserving the notion that the prayer occurs as an undetermined act of the human being would then require that the prayer not be answered before it has occurred. Clayton explains: "Religious believers usually mean something more robust by God's answer to prayer than that, countless millennia ago, God structured the physical world in such a way that, in our day, a certain action would happen just after I would 'happen to' pray for it" (1997, 205).

If the constraint that divine action cannot be initiated before the prompting event is accepted, quantum mechanics severely limits God's ability to respond to free actions in two ways. First, the action at the quantum level requires an amplifying system. In a very few cases, this amplifier might be very fast, as in the Geiger counter. In almost all naturally occurring cases, though, the amplifier will require significant periods of time.⁴ For instance, terrestrial weather, which over long periods of time is a sensitive chaotic system, is nonetheless highly predictable over the short term. It is not inconceivable that a few quantum events could cause an improbable cascade of changes that lead the proverbial butterfly to flap its wings, which action is in turn amplified by a further improbable but possible chain of events into a rainstorm thousands of miles away. However, if that sequence is in response to a prayer, it will be very late. Because of the short-term stability of atmospheric systems, it is unlikely that quantum manipulations could cause any large-scale developments in weather patterns (say, development of rain in an area undergoing drought or fire) in the short term. In many cases this delay may not be problematic, but at times (say, the pressing need for the sudden calming of a storm for a boatload of quailing disciples) quantum mechanics will be too slow. In most cases, instantaneous or near-instantaneous divine action will be impossible if quantum mechanics, with or without chaotic amplifiers, is the means of (responsive) divine actions.

Chaotic amplifiers imply a second, deeper problem. The very indeterminacy that makes divine action possible also makes it possible that it could be naturally thwarted or become unnecessary. The amplifier depends upon a relatively precise sequence of events occurring in succession. It seems unlikely that the usual state of affairs is such that supersensitive systems exist commonly enough to amplify divine actions but that no other such systems will be present that can misdirect the first. On a purely physical level, this concern may be mitigated by the claim that divine control extends to all quantum events. However, unless all human activity is made determinate or divinely controlled, amplifying systems should be sensitive to human actions, which could cause unforeseeable consequences, potentially interfering with a divinely inspired sequence in the same manner. The processes that could translate quantum determinations into specific macroscopic events must be extremely delicate to respond to a limited set of quantum events, and therefore even slight interference should be expected to disrupt or even destroy the process before it reaches its intended conclusion.⁵

One solution to the problem of time delay is to drop the requirement that responsive divine action originate after the initiating event so long as those actions are taken on presumption and not knowledge of future states. It certainly seems that the only way that all divine actions originated on the quantum level can be timely in their macroscopic appearance is for

some of them to be initiated before the event to which they respond. However, because it is presumed that God does not precisely know the future, God would be acting on what amount to guesses about future states. If the initiation of a chaotic sequence reflects a presumption of the most likely state of future events, even granting that God likely guesses very well, it must be true that God will occasionally guess wrong (if the actions to which God is trying to respond are truly indeterminate)—and have to respond to God's own responses in order to cut off incorrect actions. Considering the time scales involved, it seems likely that stopping all improper responses will be impossible or that the presumption that no response or some other response was necessary will be proved incorrect too late for appropriate countermeasures. The web of divine actions and reactions would quickly become confused, and, even if there were no interventions into the natural order, such a divine repairman is far more theologically abhorrent than an intervening deity.

One could simply accept that God never acts quickly but is involved only in slow changes over long periods of time. However, this does not resolve the problem of how to guarantee that all divine actions are appropriate and fruitful. On a weak picture of divine activity such that God almost never acts quickly and is often unable to respond to situations with small windows for opportunity, the model still reduces to either a divine architect or a divine repairman. If divine actions always emerge on the macroscopic level as intended, God must have been able to precisely anticipate all environmental factors that may otherwise have interfered with the amplifying process, including physically or humanly indeterminate ones. But the original problem developed because God did *not* know precisely the states of future indeterminate events. If God does not have such perfect insight into all future states, God is necessarily incapable of consistently acting on the macroscopic level in God's intended manner for the reasons stated above; even if God controls all quantum events, there is still the problem of indeterminate human events that could directly or indirectly alter or destroy the amplifying system before it reaches completion and thus cut off the divine intention from macroscopic realization.

In summary, quantum mechanics leaves the question of divine action in an almost unchanged tension between activity from the past and an absurd cycle of actions and reactions. While quantum mechanics does allow the tinkering divine repairman to act behind the veil of quantum indeterminacy and therefore within natural law, the interventionism problem is exchanged for the probability that divine actions often will fail to produce their desired effect, sometimes improperly anticipate future states, and quite possibly entirely fail to emerge at the macroscopic level because of intervening environmental influences. It is problematic to envision any way that quantum mechanics could provide a robust account of divine action without entailing divine foreknowledge of future contingencies.

One final consideration bears mentioning. All that quantum mechanics allows is slight changes in motion and location. Such are not sufficient to account for such events as (most) acts of creation, prophetic revelations, or alterations of chemical composition. Thus, many types of divine action would remain excluded from the scientific account of divine action. While this may not be problematic to all readers, those whose concern in a theory of divine action is to maintain the historicity of many scriptural divine actions will find quantum mechanics too restrictive. As Peter Hodgson worries, even if quantum level events “did provide those means [for divine action], they would not be able to account for all recorded interventions, since they violate other physical principles. For example, the feeding of the five thousand is contrary to the law of conservation of matter” (2000, 514).

CONCLUSION

Nancey Murphy has stated that “the law-like regularity of nature has regularly been equated with causal determinism, with the result that God’s action can be seen in one of three ways: God is not causally involved in the ongoing process of the universe; God is involved, but only by intervention; or God’s action amounts to supporting the ongoing regular processes” (Murphy 1995, 344). It is understandable that quantum mechanics and the indeterminacy that it may imply could be seen to offer a tantalizing hope of fulfilling the desire—shared by Murphy and others—to find a fourth way, as it could be the site of ongoing, noninterventionist divine action. However, the strong claim that such openness is necessary for theology is problematic; there are deterministic interpretations of quantum mechanics that may well be valid, and a theology that ties itself too closely to quantum indeterminacy faces a potential problem should later scientific theories call its existence into question again.

More important, even if quantum mechanics does offer the space for ongoing divine action without any breakdown of natural law, it does not provide an answer to the underlying problem of how divine action can be responsive to indeterminate events. If the response must come after the event, quantum mechanics implies that divine responses will usually be delayed even if delay is inappropriate to the situation and sometimes will fail altogether. If the action is originated before the event, the implication is either that God knows the final states of future indeterminate events, which is presumed to be contrary to true indeterminacy, or that God acts on presumptions about indeterminate events and therefore can be wrong or thwarted by other indeterminate events. In either case, the problem of avoiding a God who tinkers or who controls from the past is not solved. True ontological indeterminacy in the basic levels of the universe does imply that the future is open, but this openness is not so great that the moment-to-moment regularity of the universe is destroyed. The openness provided

by quantum mechanics should take hours, if not days or more, to make an appearance on the macroscopic level, and could take years or more.⁶ Thus, the question of God's relationship to time and creation is raised and must be further refined and explored before theology begins to interpret and incorporate scientific theory in specifically describing the site of God's activity in the world. A fruitful doctrine of divine action needs to be commensurate with a rich appreciation of scientific concerns, but scientific theory cannot define the theological discussion, and theologians cannot allow an interdisciplinary dialogue to inappropriately shift attention from lingering intradisciplinary problems.

Divine action may well occur on the quantum level. Clearly, however, the program that prompted the examination of quantum mechanics—that of finding a way between the divine architect and the divine repairman—has not been advanced. It is still necessary to either work from a quasi-deistic vision, albeit with a reduced time horizon, or theorize a tinkering or controlling God. It also is true that few of the proponents of quantum theories of divine action believe this to be the only level at which God acts. It is questionable whether there is any value in speaking of divine action at that level at all. In principle it is impossible to detect, cannot occur if deterministic theories turn out to be correct, may not be amplifiable to the macroscopic level in many instances, will often be easily thwarted, is generally incompatible with timely divine action at a macroscopic level, is insufficient for many historical events, and does not further the theological problems that raise the question in the first place. Finally, its difficulties can be solved only by reintroducing the views of God's temporality and foreknowledge, the rejection of which made quantum mechanical indeterminacy originally appear promising.

NOTES

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1. This requires a particularly strong notion of the reality of a quantum wave underlying observed phenomenon. It is my opinion that experiments such as the double-slit experiment, in which quantum waves interact with themselves even in cases where only one "particle" is involved, suggest that quantum waves express more than statistical summaries of quantum events, instead having some independent existence.

2. These two are not necessarily exclusive.

3. I defend the compatibility of indeterminism with temporal transcendence at length in my recent dissertation (Sansbury 2006). Also notable are the arguments of William Lane Craig (1991) and Alan Padgett (1992), among others, that even if temporal God can have perfect and complete foreknowledge regardless of the existence of ontological indeterminacy or libertarian freedom. Despite the near-ubiquitous intuition to the contrary, the existence of ontological indeterminism is not incommensurate with either temporal transcendence or omniscience.

4. I am presuming that there will be little argument with my contention that extremely fast, natural amplifiers are rare and therefore insufficient to escape the problem of the amplification delay. If they were frequent, we should see more indeterminate macroscopic events. If infrequent yet always available when divinely desired, this supposes a very specific, if secondary, divine architecture or intervention.

5. These human actions could be completely immaterial and removed from the human action/divine response scenario. For example, the California butterfly that is intended to cause my Texas rainstorm might fall prey to a child with a bug net before it performs the crucial flap of its wings, and the whole sequence is cut off.

6. Saunders presents the following example (by David Jones): If God wished to destroy the dinosaurs with an asteroid that was otherwise just going to skim the surface of Earth's atmosphere, "God could steer it into the Earth for a collision by using quantum adjustments. Such a steering *would take approximately three million years to achieve* if no violations of physical laws occurred" (2000, 540).

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