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Quantum Indeterminacy & the Omniscience of God

Does the reality of quantum indeterminacy in nature require a revision of classical theism's understanding of the omniscience of God? At least one prominent scientist-theologian believes that it does. According to Oxford's Arthur Peacocke, a leading contributor to the growing body of literature relating theology to the natural sciences, "God has so made the natural order that it is, in principle, impossible even for God, as it is for us, to predict the precise, future values of certain variables."[1] To illustrate his point, Peacocke argues that in this "self-limited omniscience" God "does not know *which* of a million radium atoms will be the next to disintegrate in, say, the next 10 seconds, but

[1]Arthur Peacocke, "God's Interaction with the World," in *Chaos and Complexity,* ed. Robert John Russell, Nancey Murphy and Arthur Peacocke (Vatican City: Vatican Observatory, 1995), p. 280 (hereafter cited as *GIW*).

only . . . what the average number will be that will break up in that period of time."[2]

In an earlier generation the theologian was occasionally faced with a question such as, could God make a stone so heavy that he could not lift it? Peacocke appears to be arguing that turn-of-the-millennium physics confronts the theologian with new questions: Given the laws of quantum mechanics, has God made radium atoms that not even he knows when they will split?

Here we will consider only the specific question of the possible impact of quantum physics on the traditional Christian understanding of the omniscience of God. A general acquaintance with selected features of quantum mechanics such as Heisenberg's uncertainty principle and Bohr's principle of complementarity is assumed.[3] I will make no attempt to adjudicate between the various competing interpretations of quantum theory that are held in the scientific community.[4] The broader issues of "divine action," providence and the question of how God interacts causally with the physical world, while obviously related to the matter at hand, are also beyond

[2]Peacocke also argues for this concept of "self-limited omniscience" in Arthur Peacocke, *Theology for a Scientific Age,* 2nd ed. (London: SCM Press, 1993), pp. 121-24 (hereafter cited as *TSA*).

[3]Nontechnical introductions to quantum mechanics may be found in J. C. Polkinghorne, *The Quantum World* (London: Longman, 1984); Nick Herbert, *Quantum Reality: Beyond the New Physics* (London: Rider, 1985); P. C. W. Davies, *The Ghost in the Atom* (Cambridge: Cambridge University Press, 1986), especially chap. 1, "The Strange World of the Quantum"; and Nancy R. Pearcey and Charles B. Thaxton, *The Soul of Science: Christian Faith and Natural Philosophy* (Wheaton, Ill.: Crossway, 1994), chap. 9, "Quantum Mysteries: Making Sense of the New Physics." Polkinghorne also deals with issues raised by quantum mechanics in *Reason and Reality: The Relationship Between Science and Theology* (Philadelphia: Trinity Press International, 1991), and in *Science and Providence: God's Interaction with the World* (Boston: Shambala, 1989), but in neither of these is the issue of divine omniscience given extensive analysis.

[4]The various schools of interpretation are presented in the works by Davies and Herbert cited in note 3 above. More technical discussions of the historical development of quantum mechanics and the philosophical issues raised by it may be found in Max Jammer, *The Philosophy of Quantum Mechanics* (New York: John Wiley & Sons, 1974); Bernard D'Espagnat, *Conceptual Foundations of Quantum Mechanics* (Menlo Park, Calif.: W. A. Benjamin, 1971), and *Reality and the Physicist: Knowledge, Duration and the Quantum World* (Cambridge: Cambridge University Press, 1989); John Archibald Wheeler and Wojciech H. Zurek, eds., *Quantum Theory and Measurement* (Princeton, N.J.: Princeton University Press, 1983); Roland Omnes, *The Interpretation of Quantum Mechanics* (Princeton, N.J.: Princeton University Press, 19944); Asher Peres, *Quantum Theory: Concepts and Methods* (Dordrecht, Netherlands: Kluwer Academic, 1993). Jammer writes that never "in the history of science has there been a theory . . . which scored such spectacular successes in the prediction of such an enormous variety of phenomena. . . . [Yet] the interpretation of this formalism . . . is . . . still an issue of unprecedented dissension" (*Philosophy of Quantum Mechanics,* p. v).

the scope of this chapter.[5]

During the twentieth century it became increasingly clear that modern physics has dramatically altered our understandings of the nature of space, time, matter and energy. Modern understandings of nature have been as deeply affected by the discoveries of quantum physics as the medieval view of the solar system was by the discoveries of Galileo. It is not clear, however, what implications the new view of nature holds for traditional Christian understandings of God. Here I will examine Peacocke's proposal and relate it to historical and contemporary theological discussions of divine omniscience. A "revisionist" model of classical theism which affirms both contingency in nature and unlimited knowledge in God will then be presented as an alternative to the Peacocke proposal.

The Peacocke Proposal: "Self-Limited Omniscience"

It is to Peacocke's credit that he is one of the few contemporary theologians who have wrestled extensively with the specifically *theological* implications of quantum mechanics.[6] Peacocke would seem to be correct in discerning that revolutions in human understanding of nature inevitably affect understandings not only of God's relationship to nature but, even more fundamental, understandings of the divine nature itself.

Peacocke believes that quantum theory and the countless experiments that have verified its predictions imply *a real indeterminacy in nature*, not merely a "fuzziness" or imprecision in human knowledge of nature. He shares the current majority view in the physics community that there are not in fact "hidden variables" that, if known, would allow an exact and deterministic picture of subatomic realities in the fashion of classical physics. Contingency and unpredictability on this view represent *ontological* features of nature itself, not merely *epistemological* limitations on human knowledge of nature. As a fur-

[5]Helpful discussions of these matters are found in Owen C. Thomas, ed., *God's Activity in the World: The Contemporary Problem* (Chico, Calif.: Scholars Press, 1983), and Ian G. Barbour, *Religion in an Age of Science* (London: SCM Press, 1990), chap. 9, "God and Nature," surveying classical theism, neo-Thomism, process theology and other alternatives.

[6]In this regard the earlier work of William Pollard, *Chance and Providence: God's Action in a World Governed by Scientific Law* (New York: Charles Scribner's Sons, 1958), should be acknowledged, as well as the section "Quantum Theory" in Barbour, *Religion in an Age of Science.* At this point the term *theological* is used in the narrow sense of the doctrine of God and the divine attributes per se, in distinction from the broader issues of the nature of God's relationship to nature.

ther consequence, Peacocke believes, this "inherent unpredictability also represents a limitation of the knowledge even an omniscient God could have" of events at the quantum level.[7]

According to Peacocke, God has voluntarily limited his omniscience in order to make a world of a particular sort: one characterized by freedom and contingency. In this conception, God "has allowed his inherent . . . omniscience to be . . . restricted and curtailed by the very open-endedness that he has bestowed upon creation."[8] God has chosen to make a world in which some future states, such as the precise time when a radium nucleus will decay, are unknowable even by an "omniscient" being. Omniscience is redefined to mean "knowledge of all things that are *possible* to know" rather than "knowledge of all things that could *conceivably* be known."

This voluntary self-limitation of God's knowledge is not a strictly logical one, in the way, for example, that it is logically impossible to know a proposition such as "2 + 3 = 6." This latter proposition cannot be "known" in any possible state of affairs or any possible universe, because it is inherently false and contradictory. In the Peacocke proposal, on the other hand, though God could have chosen to create a (deterministic) universe in which his knowledge would have been unlimited in the traditional sense, he has in fact decided to actualize a universe with an unpredictable character, and so chosen to limit his knowledge of its future states.[9]

In Peacocke's view the future has "no ontological status"—that is, it "does not exist in any sense"—and consequently there is no content of "future events" for even God to know.[10] He appears to qualify this statement, however,

[7]Peacocke, *GIW*, p. 279. I am in agreement with Peacocke on this point: true contingency and indeterminacy are features of the quantum world itself. Since 1965 an important theorem established by the physicist John Bell ("Bell's Theorem") and experiments based on it have led most physicists to conclude that "hidden variables" versions of quantum mechanics, which have attempted to preserve a "classical" view of subatomic reality, are no longer viable. See Fritz Rohrlich, "Facing Quantum Mechanical Reality," *Science* 221 (1983): 1251-55; Bernard D'Espagnat, "The Quantum Theory and Reality," *Scientific American* 241 (1979): 128-40; and on recent experimental tests, James Glanz, "Measurements Are the Only Reality, Say Quantum Tests," *Science* 270 (1995): 1439-40. (The title of this latter article is somewhat misleading. Glanz's main point is that recent experiments give further evidence that "commonsense" notions are inadequate to describe quantum realities.) On Bell's Theorem and its implications, see James T. Cushing and Ernan McMullin, eds., *Philosophical Consequences of Quantum Theory: Reflections on Bell's Theorem* (Notre Dame, Ind.: University of Notre Dame Press, 1989).

[8]Peacocke, *TSA*, p. 121.

[9]Ibid., p. 122.

[10]Peacocke, *GIW*, p. 280.

in cases where deterministic laws apply and where God could have an infinitely precise knowledge of all the relevant initial conditions.[11] Presumably God *could* know future events such as eclipses of the sun or moon that are calculable by the laws of classical physics. In the quantum realm, however, Peacocke believes that God can know the future only in terms of *probabilities* and the various *possible trajectories* of such systems; there is nothing else that even God can know.[12] God could know the probability of finding an electron at a given distance from the nucleus of a helium atom, but neither we nor God could know simultaneously, with unlimited precision, both the position and the momentum of that electron. Peacocke believes that God has chosen to create a universe in which God's own knowledge is limited by the Heisenberg Uncertainty Principle.[13]

In the Peacocke proposal, then, God has bestowed a substantial degree of autonomy not only on human beings but also on the natural order itself. The natural order is allowed to develop "in ways that God chooses not to control in detail," such that there is an inherent "open-endedness and flexibility" in nature.[14] Peacocke believes that this view of the created order has the advantage of making it easier to understand the emergence of the "flexibility of conscious organisms" and, perhaps, the emergence of human freedom itself.[15]

There is no doubt that Peacocke's vision of an open-ended and contingent creation has both considerable empirical plausibility and intellectual and aesthetic appeal. It remains, however, to examine this proposal more closely in the light of classical theism's understanding of divine omniscience and God's relationship to time.

God's Knowledge of Contingent Future Events in Classical Theism

The Peacocke proposal addresses, in the light of modern physics' understanding of nature, issues that have been discussed for centuries by philosophers and theologians: Can God know with certainty the choices that a free moral agent will make at some time in the future? If God can know with certainty such choices, how can divine foreknowledge be reconciled with genuine

[11]Ibid.

[12]Ibid., p. 281.

[13]Peacocke, *TSA*, p. 122: The Heisenberg Uncertainty Principle "is, then, a limitation on God's omniscience. . . . It is a *self*-limitation, because God as Creator 'chose' . . . to create a world in which these subatomic constituents . . . had such an unpredictable character."

[14]Peacocke, *GIW*, p. 281.

[15]Ibid.

human freedom? Does divine foreknowledge inevitably lead to fatalism? If God knows with infallible certitude what I will choose to eat for breakfast tomorrow morning, am I free to choose otherwise? Is my "free" choice really an illusion?

It is readily apparent that the issues raised by the contingency of the human will are conceptually parallel to those raised by the contingency of quantum phenomena. While it is true that the two cases are metaphysically dissimilar in that one deals with the personal order and the other with the impersonal, the cases are in some respects metaphysically *similar* in that the issue involves the possibility of a divine being's knowing the possible future states (or choices) of finite, contingent entities (the human will, a radioactive nucleus) that are embedded in the temporal order. To that extent, it is relevant to examine the long tradition of philosophical and theological discussion regarding divine foreknowledge of future contingent events in order to see what light might be shed on Peacocke's proposal.

A paradigmatic expression of the standpoint of the theological tradition of "classical theism" may be found in Thomas Aquinas's discussion "Has God Knowledge of Contingent Future Events?" in the *Summa Theologiae* 1a.14.13.[16] According to Aquinas, God knows not only those things that exist in actuality but also those things that "are in the potency of himself or of a creature" *(quae sunt in potentia sua vel creaturae).* That is, God fully knows all things that he could, by an act of his will, choose to create at some time in the future—say a new star or species of plant. Further, he knows fully the potentialities inherent in all creatures, such as the potentiality for an acorn to become an oak tree; for a human embryo to become an adult. While Aquinas did not, of course, have in view the quantum realities discovered only in the twentieth century, it would seem the implication of his view would be that God has a comprehensive knowledge of all the potentialities inherent in a radioactive nucleus. In this case "potentiality" could correspond to the quantum-mechanical *probability* that the nucleus would decay at a given time *t.* For

[16]Thomas Aquinas, *Summa Theologiae,* vol. 4, *Knowledge in God* (1a.14-18), Blackfriars edition, trans. Thomas Gornall (New York: McGraw-Hill, 1964), pp. 45-52. The discussion of Aquinas is significantly influenced by the earlier work of the neo-Platonist philosopher Boethius (A.D. 480-524), especially in the matter of the "timelessness" of God. For a penetrating exposition and analysis of the history of the discussion of this issue prior to the eighteenth century, see William Lane Craig, *The Problem of Divine Foreknowledge of Future Contingents: From Aristotle to Suárez* (Leiden, Netherlands: E. J. Brill, 1988), examining the views of Aristotle, Augustine, Boethius, Aquinas, Molina and others.

Aquinas, for whom there are no uncaused events (every effect having a sufficient cause), there would be the further implication that there is a causal nexus that accounts for the actual decay of a given radioactive nucleus at time *t1* rather than *t2.* Given that God has comprehensive knowledge both of the internal structure of the radioactive nucleus and the causal nexus in which it is embedded, God can know when a certain potentiality of the creature—in this case the decay of a nucleus—will be actualized.

How can God have such knowledge of the potentialities of a creature? For Aquinas a crucial element in the answer to this question is found in God's relationship to time. God does not know contingent future events successively, as we do. Rather, God's knowledge is "measured by eternity, as is also his existence." That is, everything that takes place in time "is eternally present to God," not merely in the sense that their intelligible essences or forms are present in the divine mind, but because "he eternally surveys all things *[quia ejus intuitus fertur super omnia ab aeterno]* as they are in their presence to him." In this "intuitionist" or "perceptual" model of the divine knowledge, God "sees" all creatures and events in one "eternal present."[17]

It is obvious that the notion of *eternity* presupposed in this model of the divine knowledge is critical. Aquinas explains his understanding of eternity in the *Summa Theologiae* 1a.10.1-2, "The Eternity of God."[18] Eternity, he says, has two characteristics: *unending duration,* or lack of a beginning or ending, and *lack of succession,* or eternity existing as an "instantaneous whole."[19] It is this latter "timeless" aspect of eternity that Aquinas stresses in relation to God. He explains that when it is said that God is "eternal," this means that God is "utterly unchangeable," beyond time, the notion of time itself deriving from change. When Scripture describes God using different verb tenses (such as God's being wrathful in the past but not in the present or future), this does not

[17]In the theological tradition this type of divine knowledge is known as "knowledge of vision." A traditional illustration of this notion of simultaneous knowledge in an "eternal present" is that of an observer at the top of a tower looking down on a road. A person on the road can see travelers on the road only successively, as they come around the bend, while the observer at the top of the tower can see them simultaneously.

[18]Thomas Aquinas, *Summa Theologiae,* vol. 2, *Existence and Nature of God* (1a.2-11), Blackfriars edition, ed. Timothy McDermott (New York: McGraw-Hill, 1964), pp. 137-55.

[19]To illustrate the notion of eternity as "timelessness," one could think of pure numbers existing in a transcendent Platonic realm of the Forms. Numbers exist in an ideal realm apart from space, time and succession. On the other hand, the "eternal life" offered to believers in Scripture implies not complete transcendence of space and time but "unending life/duration," though, to be sure, in a qualitatively new dimension of existence.

mean, according to Aquinas, that God actually varies from the past to the future but that "his eternity comprehends all phases of time." Just as Scripture can describe God metaphorically in bodily terms (face, arm and the like), so it can describe God's timeless eternity in temporal and successive terms.[20]

It is apparent that this notion of divine "timelessness," in which Aquinas has followed Boethius, pays a high price theologically in order to explain how God can know future contingent events. If God's eternity *must* entail the exclusion of any sort of succession in the divine nature, then it is difficult to see how there could be any change in the emotional states of an "eternal" God. As it has been said, such a God is "religiously unavailable." A God whose emotional states never change is not the God of the Bible; the personal and living God of biblical theism is a God who changes not in his essential nature, character or purposes but does change in the way he responds to his covenant people. It remains to be seen whether one is in fact forced, logically and theologically, to choose between a "timeless" God who is omniscient (but impersonal and unresponsive) and a "temporal" God who is personal but limited in the scope of his knowledge.

In recent decades the issues of divine foreknowledge, omniscience and the "timelessness" of God have been major objects of attention among philosophers and theologians. The 1970 book by the philosopher Nelson Pike, *God and Timelessness,* is a major contribution to this discussion and has generated a considerable number of responses. Pike expressed a quite negative view of the notion of God's timelessness, noting the criticism of contemporary theologians, influenced by Alfred North Whitehead, that such an utterly transcendent and timeless God is not "religiously available" to respond to human actions and petitionary prayer.[21] In the conclusion of his book Pike expresses the suspicion that the doctrine of God's timelessness was introduced into Christian theology because Platonic thought was fashionable at the time and that "once introduced, it took on a life of its own."[22] Pike believes that the notion of timelessness is not required by either the biblical or the confessional traditions, nor is it logically entailed by an Anselmian concept of God as a being greater than which none can be conceived.[23] Pike sees little advantage in the doctrine of God's timelessness and wonders why it continues to be defended by Christian theologians.

[20]For a modern example of this concept of God's "timelessness" see the neo-Thomist theologian Reginald Garrigou-Lagrange: God's eternity implies that the divine essence is beyond time and space; in God there is not beginning or end nor "change of any kind." He believes that the exclusion of any idea of succession in the concept of God's eternity "though apparently not as yet a dogma of the Catholic faith, nevertheless is a certain truth, proximate to the faith" (Reginald Garrigou-Lagrange, *God: His Existence and Nature,* trans. Dom Bede Rose [St. Louis: B. Herder, 1934], 1:3-4).

[21]Nelson Pike, *God and Timelessness* (London: Routledge & Kegan Paul, 1970), p. xi.

[22]Ibid., p. 189.

One of the most significant recent contributions to this debate is by the evangelical philosopher of religion William Lane Craig, *Divine Foreknowledge and Human Freedom* (1991).[24] Craig recognizes that the two fundamental questions in the debate are "How is genuine contingency preserved in the face of infallible divine foreknowledge?" and "*How* can God know future contingent propositions?" He rejects as inadequate solutions limitations on the divine omniscience and denials that future contingent propositions can have truth value, and argues that divine omniscience can be affirmed without endorsing fatalism.[25] Craig and others in this conversation are concerned with *human* contingency, but as I have previously noted, the issues raised by *quantum* contingency in relation to divine omniscience and timelessness are conceptually parallel.

Craig notes at the outset of his discussion that God's foreknowledge of contingent future events is assumed in biblical theism. This unlimited divine foreknowledge is not a tangential teaching but is fundamental to the biblical view of history and serves to distinguish the God of Israel from the false gods of the surrounding nations (Is 41:21-42; 44:6-8; 46:9-10).[26] This teaching is affirmed in both Testaments; the same sort of foreknowledge ascribed to Yahweh in the Old Testament is ascribed to Jesus in the New (Mk 8:31; 9:31; 10:32-34; 14:13-15,

[23]Ibid., pp. 165, 190.

[24]William Lane Craig, *Divine Foreknowledge and Human Freedom: The Coherence of Theism—Omniscience* (Leiden, Netherlands: E. J. Brill, 1991), hereafter cited as *DFHF.*

[25]Other important recent contributions to this discussion include William Hasker, *God, Time and Knowledge* (Ithaca, N.Y.: Cornell University Press, 1989; limits foreknowledge to avoid fatalism); Richard M. Gale, *On the Nature and Existence of God* (Cambridge: Cambridge University Press, 1991), chap. 3, "The Omniscience-Immutability Argument" (argues forcefully against "timelessness" in the interests of a "religiously available" God); in Thomas V. Morris, ed., *The Concept of God* (Oxford: Oxford University Press, 1987), the essays by Alvin Plantinga, "On Ockham's Way Out," pp. 171-200 (attempts to reconcile unlimited divine knowledge with human freedom), and Eleonore Stump and Norman Kretzmann, "Eternity," pp. 219-52 (defends a Boethian concept of a timeless, eternal God); H. P. Owen, *Christian Theism: A Study in Its Basic Principles* (Edinburgh: T & T Clark, 1984; accepts limits on divine foreknowledge); and Jonathan L. Kvanvig, *The Possibility of an All-Knowing God* (London: Macmillan, 1986; argues for the adequacy of a Molinistic account of maximal divine omniscience).

[26]Craig, *DFHF,* p. 12.

18-20, 27-30, and parallels). God's foreknowledge encompasses the most contingent events, even the thoughts that a person will think (Ps 139:1-6).[27] The plausible implication of the biblical outlook is that God would also know (in a more than probabilistic sense) when a given radioactive nucleus would split.

Craig argues for the compatibility of unlimited divine knowledge and genuine finite contingency by appealing to the doctrine of "middle knowledge" developed by the Counter Reformation Jesuit theologian Luis Molina (1553-1600).[28] In his own attempt to reconcile the sovereignty of God and divine omniscience with human freedom Molina postulated the existence of a third type of divine knowledge—"middle knowledge"—that is intermediate between the two types of divine knowledge then recognized in traditional Thomism: the "natural" and "free" knowledge of God. "Natural" knowledge is God's knowledge of everything that is possible (or necessary) in any universe, given the nature of logic and God's own nature. For example, God's natural knowledge would include his knowledge of his own necessary existence, or, in the more trivial case of the toss of a coin, his knowledge of the three possible outcomes: heads, tails or (very improbably) landing on the edge. Such "natural" knowledge is not dependent on an act of the divine will but is "necessary" in the sense of being entailed by God's nature and the laws of logic. The "free" knowledge of God, on the other hand, is dependent on the divine will, on God's choice to actualize one state of affairs rather than another. God foresaw that human beings would disobey but willed to permit the Fall, though God could have chosen to prevent it. Such "free" knowledge is necessitated neither by the laws of logic nor by the divine nature as such.

According to Molina, there is in the mind of God a "middle" knowledge, such that God knows that "if an agent *X* is placed in circumstance *Y*, then *X* will freely choose to do *Z*." There is, according to Molina, a "supercomprehension" in the infinite divine intellect that discerns every individual essence, these essences existing conceptually in the divine mind. Thus in the question of divine grace and predestination, God infallibly foresees that if *X* is offered the grace of salvation in circumstance *Y*, then *X* will choose to respond positively to the offer; God chooses to actualize circumstance *Y* and so "predestines" agent *X* in this sense. Thus, according to Molina, can God's foreknowledge and sovereignty be reconciled with genuine human freedom.

[27]Ibid.

[28]The parts of Molina's work most immediately relevant to the present discussion are now available in translation: Luis Molina, *On Foreknowledge,* part 4 of the *Concordia,* trans. Alfred J. Freddoso (Ithaca, N.Y.: Cornell University Press, 1988); for an exposition of Molina, see Craig, *Problem of Divine Foreknowledge,* chap. 7. Without apparently being aware of Molina, Alvin Plantinga, in *The Nature of Necessity* (Oxford: Clarendon, 1974), pp. 174-80, developed a view quite similar to that of the sixteenth-century Jesuit.

After extensive and intricate analysis, Craig concludes that the arguments against middle knowledge[29] are not convincing, and that middle knowledge is at least *possible.* Craig argues that this possibility of middle knowledge "is all that needs to be proved in order to show that God's knowledge of future contingent propositions is not impossible."[30] Extending Craig's conclusion to the case at hand, one could say that by virtue of his middle knowledge, God knows that a given radium atom, placed in a given causal nexus, would or would not split at a given time *t;* and given this middle knowledge, God could choose to actualize or not actualize such a set of circumstances. In the subsequent discussion a revised version[31] of Molina's middle knowledge will be incorporated into my own proposal for unlimited divine knowledge of quantum realities.

Divine Omniscience and Quantum Indeterminacy: A Revisionist Proposal

Now for an alternative to Peacocke's proposal. This model of "neoclassical theism" will attempt to incorporate revised forms of both divine "timelessness" and Molina's middle knowledge. I will argue that such a model is capable of recognizing true indeterminacy in nature at the quantum level and at the same time can give an account of how God can have comprehensive knowledge of such quantum events—omniscience in the traditional sense.

The neoclassical model presented here assumes concepts of space and time

[29]Traditional Thomists reject middle knowledge because they believe that it has no real object (in the case of true contingency there is "nothing there" for God to know) and because it posits a passivity or dependency of God's knowledge upon the creature, inconsistent with the divine independence or aseity; see Craig, *DFHF,* pp. 242-46.

[30]Craig, *DFHF,* p. 278.

[31]I differ from Craig in two respects. Rather than favoring an "innatist" explanation of middle knowledge—that God has a "supercomprehension" of every individual essence based on the conceptual existence of such essences in the divine mind—I favor a "perceptual" model in which God immediately "sees" every existing entity in the created order from the divine perspective, unlimited by space or time. The innatist perspective seems to be in danger of undermining the dynamic aspect of events in space and time by associating them too closely with the divine mind and essence. In the second place, Craig appears to follow Molina (*DFHF,* p. 241) in holding that "it is not within the scope of God's power to control what free creatures would do if placed in any set of circumstances." I hold that in biblical theism, God not only foreknows the potentialities and inclinations of contingent entities in all circumstances but is also free—through divine sovereignty and immanence within the created order—to alter or redirect those inclinations should he so desire.

as generally understood in Einstein's special and general theories of relativity. Space and time are assumed to be relational concepts, the forms and structures of orderly events in the universe, not absolute "receptacles" or "containers" that exist apart from the universe's mass and energy.[32] Space and time are not separate entities but part of a four-dimensional space-time continuum. Following Augustine, one could understand God's *ex nihilo* creation to involve the creation of the universe not "in" (preexisting) time but "with" time: God creates mass-energy *together with* the space-time manifold, this manifold being a creaturely reality ontologically distinct from the divine essence.[33]

In modern physics and cosmology the dynamic development of the physical universe from the moment of the initial big-bang singularity to the present is often visually modeled in terms of a "light cone" (see figure 1).

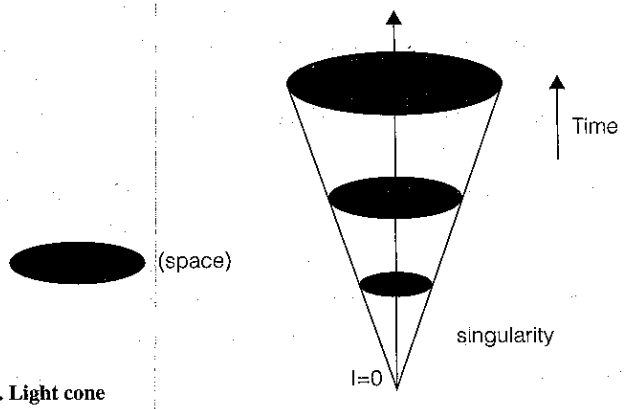

Figure 1. Light cone

[32]For philosophical treatments of space and time, incorporating modern physical theory, see Hans Reichenbach, *The Philosophy of Space and Time,* trans. Maria Reichenbach and John Freund (New York: Dover, 1958; argues against idealist and subjectivist views of space-time from a realist standpoint); G. J. Whitrow, *The Natural Philosophy of Time* (London: Thomas Nelson & Sons, 1961; argues against the "block universe" concept of time, in which time and becoming are only apparent to the observer); Adolf Grunbaum, *Philosophical Problems of Space and Time* (Dordrecht, Netherlands: D. Reidel, 1973; very technical discussion of issues raised by Einstein's special and general theories of relativity); Lawrence Sklar, *Space, Time and Spacetime* (Berkeley: University of California Press, 1974; suspicious of attempts to reduce spatiotemporal categories to something else). For recent attempts to incorporate twentieth-century concepts of space-time in theological analysis, see the important works of Thomas F. Torrance, *Space, Time and Incarnation* (Oxford: Oxford University Press, 1969), and *Space, Time and Resurrection* (Edinburgh: Handsell, 1976).

[33]Cf. Augustine *Confessions* 11.14: "In no time, therefore, hadst thou 'not made' anything; because time itself was of thy making *[quia ipsum tempus tu feceras]*" (*St. Augustine's Confessions,* trans. William Watts [Cambridge, Mass.: Harvard University Press, 1946], 2:237); see also *City of God* 12.15.

The horizontal surfaces of figure 1's cone represent the three dimensions of space, while the vertical axis represents the dimension of time. It should be emphasized that such diagrams are only conceptual models; it is obviously impossible to represent with full adequacy the reality of a changing four-dimensional universe with a static diagram drawn on a two-dimensional surface. Taking such diagrams "literally" gives rise to unnecessary objections concerning a "block universe" in which time is robbed of reality and movement. The diagram is presented here not to endorse some static model of a universe like Parmenides's in which there is only "Being" and no "becoming," but merely as a conceptual tool to aid in the discussion of God's relationship to the spatiotemporal order.

As an alternative to the doctrine of divine "timelessness" found in Boethius and Aquinas, God's relationship to space-time is here understood in terms of a concept of transcendence-immanence complementarity (TIC). In this TIC principle, God is understood to be both immanent within the space-time order and transcendent of it. The language of biblical theism speaks of God's "eternity" both as an unending life within a temporal order, a life without beginning or end, and in the more absolute sense of a life that transcends time altogether.[34] These different ways of speaking of God's relationship to time in the biblical texts are understood to be complementary rather than contradictory, reflecting the different purposes of the biblical authors in a given text.

The language of "complementarity" is borrowed from Niels Bohr's philosophical reflections on quantum theory.[35] Rather than asking whether an electron is "really" more like a particle or a wave, in this view we can understand that "wave" and "particle" are two complementary ways of describing the electron, whose appropriateness depends on the particular experiments and measurements that are being performed. In certain experimental contexts the wavelike characteristics of the electron are manifest, while its particlelike characteristics are manifest in others. The two models are not visually commensurable, but each is valid in its own context.

[34]On the concept of the divine eternity and God's relationship to time in the biblical writings, see Hermann Sasse, "*aion, aionios,*" in *Theological Dictionary of the New Testament,* ed. Gerhard Kittel, trans. Geoffrey W. Bromiley (Grand Rapids, Mich.: Eerdmans, 1964-1976), 1:197-209.

[35]For discussion of Niels Bohr's principle of complementarity and other aspects of quantum theory, see John Honner, *The Description of Nature: Niels Bohr and the Philosophy of Quantum Physics* (Oxford: Clarendon, 1987). Honner is quite sympathetic to Bohr's standpoint and argues that Bohr was more of a philosophical realist and less an "instrumentalist" than usually thought.

If we apply such a model to the present discussion, we can recognize that in some contexts the biblical writers are concerned with God's presence and relationship to his creatures within space and time, while in others the focus is on God's transcendence over the created order. In terms of the light-cone diagram of figure 1, the God of biblical theism is free to be present within the space-time manifold (immanence) but at the same time is not contained or limited by it (transcendence). In his transcendent aspect God stands "outside" the light-cone and immediately "sees" every point along the temporal axis—including the decay of radioactive nuclei. But in his *immanent* relationship to the created order, God enters into real relationships to his creatures, responding to them as the personal, living God, changing not in character, essence or ultimate purpose but in the way in which he may relate to them at a given moment.[36]

In principle, of course, classical theism has always recognized both the transcendence and immanence of God. In discussions of divine "timelessness," however, it seems that Aquinas and others have taken an unbalanced approach, overemphasizing transcendence at the expense of immanence, in an attempt to safeguard divine omniscience. The present proposal, with its appeal to transcendence-immanence complementarity, is an attempt to correct that imbalance.

A second element in the model being advanced here as an alternative to Peacocke involves a modified form of Molina's middle knowledge and of classical Thomism's understanding of divine causality in relation to contingent events. According to the doctrine of middle knowledge, it will be recalled, God knows immediately, through "supercomprehension" or "knowledge of vision," how a contingent being *X* will act in circumstance *Y*. God "sees" both the essential nature of the creature and the laws and structures constituting the causal nexus in which the creature is embedded. In the case of the radioactive

[36]Torrance expresses a similar understanding in *Space, Time and Incarnation*, p. 67: "While the Incarnation does not mean that God is limited by space and time, it asserts the reality of space and time for God in the actuality of His relations with us." See also Alan G. Padgett, "God and Time: Toward a New Doctrine of Divine Timeless Eternity," *Religious Studies* 25 (1989): 213: "God, then, can enter into our space-time at will, but is not contained within it of necessity. And this is as one might expect, since God is the Creator of space and time. It is he that calls the universe into existence, and he cannot be limited by anything that is wholly dependent upon him." In Padgett's view, God is "relatively timeless"; that is, God's life is not limited to the time of our space-time universe, rather than being "absolutely timeless" in the sense of Plato, Boethius and Aquinas.

nucleus, the causal nexus is constituted by the space-time manifold, the energy fields and the laws of quantum mechanics.

Now it is well known that one of the major objections raised by classical Thomists to Molinistic middle knowledge concerns the alleged "passivity" in God that is entailed by this concept. According to classical Thomists, middle knowledge would involve a dependency of God's knowledge on the contingent acts of the creature, and as such it would be inconsistent with God's "pure actuality." From the perspective of classical Thomism, God knows with certitude a future contingent state of affairs *Z* precisely because he knows the act of his own will that has determined that *Z* shall obtain. Reginald Garrigou-Lagrange states the Thomistic objection concerning "passivity" this way: "Either God is the first determining Being, or else He is determined by another; there is no other alternative. . . . *Scientia media* involves an imperfection, which cannot exist in God."[37] Garrigou-Lagrange believes that a maximally perfect Being can in no way be dependent on the creature, and middle knowledge, he argues, implies such a passive dependence of God's knowledge on the actions of the creature. God, as it were, "must look at the weathervane in order to learn which way the wind is blowing"—rather than knowing the direction of the wind and the weathervane by a prior determining act of his will.

The modification here proposed to the standard Thomistic understanding argues that, contrary to Garrigou-Lagrange, there is in fact a third alternative to God's either being the "first determining Being" or being determined by another. This revision of classical Thomism posits a concept of bilateral, a posteriori determination of contingent events by acts of the divine will. The term *bilateral* calls attention to the fact that the futurition of many events is the product of a joint causality involving both the creature and the Creator. At the level of secondary causes, it is true to say that "sunlight and the process of photosynthesis cause the grass to grow," while at the level of primary causation, it is true to say that "God causes the grass to grow." Both statements are true; they address different levels of reality. On the other hand one could speak of "unilateral" causation, in which the actualization of some state of affairs is caused by an act the divine will alone. The creation of a physical universe *ex*

[37]Cited in Freddoso's introduction to Molina, *On Foreknowledge*, p. 66. In pp. 1-81 of this work Freddoso provides an extensive introduction to, and philosophical defense of, the Molinist perspective.

nihilo would be an example of such "unilateral" divine causality; there would be no finite, contingent beings yet in existence that could contribute to the causal efficacy of such a divine creative act.

The concept here termed "bilateral causation" is, of course, recognized in classical Thomism's distinction of primary and secondary causes. It seems worthwhile, however, to call attention again to the reality of bilateral causation, in that there seems to be a tendency in classical Thomism to deemphasize—in the interests of guarding God's "pure actuality"—the creature's causal contributions, especially those contributions that might be thought to initiate or determine future states of affairs.

The term *a posteriori* in the phrase "bilateral, a posteriori determination of contingent events" (by the divine will) is intended to recognize creaturely initiative in the futurition of certain contingent events. In this model of God's action in the world, God, at any given time *t1*, "sees" the tendencies and potentials in a creature *X*—say, a radium nucleus—and because of this comprehensive knowledge of both the essential nature and potentials of the creature, and of the causal nexus in which it is embedded, knows that nucleus *X* is about to disintegrate at some time *t2*. By an a posteriori determination of his will, based on the immediate and comprehensive knowledge of vision, God then chooses to concur in the creaturely tendency and render certain the decay of the nucleus at time *t2*. The determination by the divine will is a posteriori in the sense that it is a "foreseen" response to a set of tendencies *initiated within* the creature.[38] This would be contrasted with a purely a priori determination of a future event that in no way responded to or took into account the existing tendencies of the creature.

In this proposal it could be said that—in some cases—"the creature proposes but God disposes." That is, so to speak, the radium nucleus "proposes" to decay at time *t2*, but unless God chooses to concur in or "ratify" the creaturely tendency, the possible future contingent event does not actually transpire. This model attributes real causal initiative to the creature in a way that traditional Thomism seems to deny. That is to say, in certain cases the initiative for a given chain of events is understood to come from the creature; the creature is seen as a real source of metaphysical *novelty*, insofar as God has delegated to the creature some of his own creative power.

[38]Strictly speaking, of course, the tendencies of the radium atom are not "foreseen" but simply "seen" by God, standing outside of and transcending the space-time continuum.

Admittedly, this revision of classical Thomism does attribute a measure of "passivity" to God, if divine passivity is defined as including any element of responsiveness to the creature. In traditional Thomism this seems to be seen as an "imperfection"; but this revisionist proposal questions such a notion of "perfection." In biblical theism, God's responsiveness to the creature is not a weakness but a strength, not an "imperfection" but indeed a perfection, an expression of his unsurpassable, unchanging nature as a living and personal God.

This concept of bilateral, a posteriori determination of future contingent events allows a measure of divine responsiveness to creatures that makes God "religiously available" to the believer, thus avoiding some of the problems associated with the timeless, impassible God of classical theism. At the same time, the proposal involves a revision of the Molinist concept. According to Molina, it is not in the scope of God's power to *control* what free creatures will do in a given circumstance, though God can *know* their inclinations and choices and choose to actualize the circumstances accordingly.[39] In the model of divine action being argued here, God reserves the right to intervene in creaturely reality—not merely in circumstances external to a creature—and to redirect, change or override a creature's preexisting tendency. In this proposal the creature is given a genuine "voice and vote," but God retains the right to veto the creaturely inclination. This positing of the possibility of divine revisionary action within the creature as well as external to it seems more in keeping with the "interventionist" element of biblical theism, which asserts that, in a redemptive context, "God has mercy on [softens] whom he wants to have mercy, and he hardens whom he wants to harden" (Rom 9:18).

This proposal, then, attributes less control to God than does traditional Thomism, in that it recognizes the possibility of genuine causal initiatives on the part of the creature; at the same time it recognizes more control than does Molinism, for it views God as remaining free to change or redirect inclinations and tendencies internal to the creature. Such revisions of both traditional Thomism and Molinism produce a model of divine causation that can account for maximal divine knowledge of future events while at the same time recognizing genuine contingency in nature and causal ini-

[39]At the personal level of grace and conversion, for Molina grace is not *intrinsically* efficacious (as in the Augustinian and Calvinistic concept of "irresistible" grace) but *extrinsically* efficacious for those who choose to cooperate with it (as in the Arminian view); see Craig, *DFHF*, p. 241.

tiatives by the creature.[40]

In conclusion, then, I have argued, as an alternative to Peacocke's model of "self-limited omniscience," that it is possible to recognize genuine contingency in nature at the quantum level and at the same time hold that God's knowledge of such events is not limited ("maximal omniscience"). The neoclassical model I propose involves concepts of "transcendence-immanence complementarity" and a bilateral, a posteriori causal relation of the divine will and contingent events. It remains to consider some important objections to this point of view that have been raised by those who argue for limited divine omniscience.

Responding to Objections

According to Oxford theologian Keith Ward, God knows all that it is logically possible to know, but "no possible being can know as actual what is not yet actual."[41] Ward believes that the idea that God could "see" all creaturely choices and then determine the world to take account of them is incoherent, because "such choices do not actually exist unless the world exists in time up to that point," and once the world exists, one cannot subsequently change it.[42]

Ward's objections may be telling in relation to the concept of a purely "timeless" God, but not in regard to the model being proposed here. While Ward would seem to be correct in arguing that no being can know *as actual* what is not yet actual, he does not give adequate weight to the ontological category of *potentiality*. Various states of (physical) potentiality may have less ontological weight than actual states, but they constitute, in the physical order,

[40]Theologically this proposal stands in the Calvinistic tradition, as expressed in the 1647 Westminster Confession of Faith 5.2, which in its statement "Of Providence" holds that "although in relation to the foreknowledge and decree of God, the first cause, all things come to pass immutably and infallibly, yet by the same providence he ordereth them to fall out, according to the nature of second causes, either necessarily, freely, or contingently." This statements affirms both infallible divine foreknowledge of contingent events and genuine contingency at the level of secondary causation. The present proposal attempts to give an account of how these two realities can be compatible. It shares the Calvinistic presupposition that God is free to change or redirect the preexisting tendencies and inclinations of the creature. It would appear to differ, however, from the traditional Calvinistic model in attempting to give greater place to creaturely causal initiatives through the concept of bilateral, a posteriori divine determination of (some) events. It would seem that the Confession statement just quoted has usually been understood as similar to the view of classical Thomism.

[41]Keith Ward, *Rational Theology and the Creativity of God* (Oxford: Basil Blackwell, 1982), p. 130.

[42]Ibid., p. 152.

real states of being distinct from mere logical possibility and full actuality, and as such can be objects of divine knowledge. God can fully know both physical potentialities and physical actualities.[43] In the model proposed here, God is not only outside space-time in his transcendent aspect but also immanent within space-time—and so immanent within each instant of the time dimension itself—such that each creaturely essence, together with its potentialities and tendencies, is immediately present to the divine vision. The model's appeal to divine immanence within time, I suggest, relieves some of the difficulties associated with the picture of a static "block universe" that comes from stressing only the divine transcendence of time, as in the traditional Boethian and Thomistic concepts of a "timeless" God. God's middle knowledge of the creature, then, is based both on divine knowledge of all actualities and potentialities internal to the creature and on knowledge of the causal nexus external to the creature. [44] God "sees" that a given nucleus is about to disintegrate, and is free either to concur—and so make certain—or not concur in the creature's propensities and tendencies.

It might also be noted at this point that this defense of maximal divine omniscience of quantum-mechanical realities assumes the validity of a "causal principle" that could be stated in a proposition such as "Everything that begins to exist has a cause of its existence."[45] Quantum-mechanical events may not have classically deterministic causes, but they are not thereby uncaused or acausal. The decay of a nucleus takes place in view of physical actualities and potentialities internal to itself, in relation to a spatiotemporal nexus governed by the laws of quantum mechanics. The fact that uranium atoms consistently decay into atoms of lead and other elements—and not into rabbits or frogs—shows that such events are not acausal but take place within a causal nexus and lawlike structures. Accordingly, it seems plausible to

[43]An illustration of the notion of potentiality as an ontological reality distinct from pure actuality and mere logical possibility is found in the quantum-mechanical formalism of the wave function, which can describe the probability of finding the electron at a given distance from the nucleus of a hydrogen atom. Such "probability waves" are not fully actual, but neither are they merely logical possibilities, because they refer to existing features of the space-time universe.

[44]The foregoing observations, I suggest, also help to meet classical Thomists' objection to middle knowledge: that it has no real object, since only actual determinations of the divine will or actually existing states in the world can be known with certainty. I argue that physical states of potentiality do have ontic reality and can be known as such by God.

[45]For a discussion of issues of causality in relation to cosmology, see William Lane Craig and Quentin Smith, *Theism, Atheism and Big Bang Cosmology* (Oxford: Clarendon, 1993), and John Leslie's review of this work in *Zygon* 30, no. 4 (December 1995): 653-56.

assume the validity of some causal principle in such cases. God, knowing both the states internal to the nucleus and its external environment and governing laws, can at any given moment "see what the nucleus is about to do."

Finally, I should clarify that my purpose here has not been to argue that Peacocke's "self-limited omniscience" proposal is either impossible or incoherent. It seems quite possible to conceive a world as described by Peacocke, in which quantum-mechanical "fuzziness" and contingency really do obtain and in which God has chosen not to know certain states of affairs in advance. Whether such a proposal is consistent with biblical theism is another matter. My argument here is that the realities of quantum physics do not *require* an abandonment of the concept of maximal divine omniscience, and a model of the relationship of the divine will to contingent events postulating principles of transcendence-immanence complementarity and bilateral, a posteriori determination has been advanced in support of this view.