# QUANTUM INDETERMINACY AND THE SOVEREIGNTY OF GOD

***David Tong***
*International Reformed Evangelical Seminary, Jakarta*

**ABSTRACT:** Pada akhir abad ke-18, paradigma fisika Newtonian dinilai mendukung wawasan materialisme dan determinisme. Konsep akan Allah yang deistik dinilai sebagai suatu alternative pemikiran rasional dari konsep akan Allah yang tradisional. Akan tetapi, keyakinan akan paradigma fisika Newtonian, beserta implikasi filosofis dan teologisnya, telah tersisihkan dengan munculnya paradigma baru fisika kuantum pada permulaan abad ke-20. Ketidakpastian Kuantum dilihat oleh sebagian pihak sebagai sekutu mereka untuk membawa kembali hal-hal yang bersifat supra-natural dan immaterial ke dunia ini. Akan tetapi, paradigma fisika yang baru ini sekaligus datang dengan tantangan-tantangannya sendiri; sebagian pihak telah menemukan sokongan ilmiah di dalam paradigma fisika yang baru ini terhadap wawasan Molinisme dan Teisme yang terbuka. Kedua wawasan akan Allah ini memberikan batasan akan kedaulatan Allah sehingga menyepelekan gambaran Allah yang alkitabiah. Komitmen kita kepada kemutlakan kedaulatan Allah akan setiap detil dari dunia yang Ia ciptakan dan kepada perbedaan antara Pencipta-ciptaan, telah memberikan suatu jalan keluar bagi kita untuk mengerti ketidakpastian kuantum.

**KEY WORDS:** *Fisika, kuantum, ketidakpastian, Newton, kedaulatan, Allah*.

Christian worldview has always stood in a diametric opposition to materialism and determinism. Thus, from its early beginning, Christians had fought the Epicureans and the Stoics. Our battle against materialism and determinism, however, has only been intensified with the appearance of Newtonian physics. This "new" physics provided a comprehensive paradigm to explain all phenomena in the world, from the movement of atoms in gas and liquid to the motions of large celestial bodies; everything seems to be mathematically expressible. Thus, for many, Newtonian physics necessarily implies a materialistic and deterministic world. And if there be a God then he is, at best, a non-intervening God. Deism was considered to be the only reasonable alternative to Christian Theism. The triumph of the philosophies of materialism and determinism seemed secured by the advance of Newtonian physics. Christian super-naturalism was pushed aside.

However, confidence in Newtonian physics—and with it, the materialistic and deterministic worldviews—was undermined by the emergence of quantum physics in the early 20$^{th}$ century. Against all intuitions, the fundamental building block of the universe—the world of the atomic and sub-atomic particles—was highly probabilistic and indeterminate. Unlike Newtonian physics, a complete information about the state of a quantum system at one time does not give its future predictability. As the old physics gave way to the new one, many philosophers and theologians alike have embraced this new physics in their battle against materialism and determinism. Yet, the new physics is not without its own dire theological implications, considering that some have found it as evidence supporting Molinism and Open Theism.

Our understandings of God need not be challenged and compromised by this new physics. In fact, as I will show in this paper, it is only through our commitment to the biblical understanding of God, a God who is meticulously sovereign over all and to the Creator-creatures distinction, can we address the problem posed by quantum physics.[1] But before such a discussion is possible, we shall now turn into a brief overview of quantum physics and the challenges it offers.

---

1 The concept that God as absolutely sovereign over his creation, not only in the work of redemption, but also in the work of providence, is uniquely reformed contribution. A comprehensive discussion over this matter is beyond the scope and limit of this paper. It suffices to say here that the reformers did not simply return to, but also advance, Augustine's thought.

## From Classical to Quantum Physics: A Brief Overview

Newtonian physics was seen superior not only because it undermines Aristotelian worldview (the terrestrial-celestial dichotomy, in particular)[2] but also because it seems to describe all phenomena in the world in mathematical language. The world suddenly appears predictable. Knowledge of the state of the present physical system (e.g., the known masses of both the sun and the earth and the earth's relative current position with respect to the sun) determines complete knowledge of its future (e.g., the position of the earth relative to the sun 3,893,221.28 seconds in the future).

Yet, this does not automatically lead to deism, at least not right away. In fact, during the first half of the eighteenth century it was actually believed that Newtonian laws of motions and his universal law of gravity provided evidence for the existence of God who actively interferes with natural processes. The force of gravity acting on two objects across vast empty spaces ("action at a distance") was believed as evidence for the existence of "some kind of active, nonmaterial agent, either God or something added by God to matter."[3] Furthermore, Edmond Halley (1656-1742), upon analyzing the Chaldean observations transmitted by Ptolemy in 228 BC, showed that there was apparent instability in the solar system: Jupiter's orbit appeared to be shrinking while Saturn's expanding.[4] Thus, as Olson points out, "Newtonian natural theology acknowledged (indeed, it insisted upon) the need for God's infrequent, but unquestionably miraculous, interference with natural processes for, without such miraculous interventions, it seemed clear from calculations based on Newton's Principia (1687) that instabilities in the solar system would have caused it to collapse within the duration of historical time."[5] Natural philosophy at the time was seen fundamental for the project of natural theology.

But beginning in the middle of the eighteen century, continuing development in classical physics "modified the way in which physics and religion were understood to be connected."[6] Pierre Simon Laplace (1749-1827) and Louis Lagrange (1736-1813), for example, formulated the equations of motion that took into account effects of perturbation from other planets. Laplace was able to show that his theory of motion for Jupiter

---

2 It was Newton who proposed that the explanation behind the motions of falling objects on earth can also be used to explain the motions of heavenly objects. In its revolution around the earth, the moon simply "falls" to the earth just as an apple falls from a tree.

3 Richard Olson, "Physics," in *Science and Religion: A Historical Introduction*, ed. Gary B. Ferngren (Baltimore, The Johns Hopkins University Press: 2002), p. 302.

4 Crude extrapolation to these observations seems to suggest that Jupiter and Saturn were at the same distance away in the distance past.

5 Olson, "Physics", p. 302.

6 Olson, "Physics", p. 302.

and Saturn matched the eighteenth century observation in very good agreement and showed that the apparent instability of Jupiter's and Saturn's orbits was simply periodic terms caused by effects of perturbations. Thus, the necessity of God's miraculous intervention in the world, assumed previously, was vitiated. By the end of the eighteenth century, "Laplace's physics came to symbolize the position of most French scientists, who argued that physics no longer offered any support for the traditional notion of God and that its implications favored pure materialism."[7]

In addition, it was evident that all of nature, not only objects with masses but everything that exists in the world—including immaterial phenomena (such as electricity, magnetism, and light)—follow trajectories governed by exact mathematical equations. For over two hundred years after Isaac Newton, "every indication from physics was that the laws of physics *are* completely deterministic."[8] The world not only appears predictable but deterministic as well. So seemingly deterministic the world was that in 1819, Laplace wrote that "[For] an intelligence which could know all the forces by which nature is animated, and the states at some instant of all the objects that compose it, *nothing would be uncertain*; and the future, as well as the past, would be present to its eyes."[9] By the end of the nineteenth century, Newtonian mechanics was seen as supporting philosophical materialism and determinism.[10] If there be any God then we must modify our traditional understanding of God. The notion that God continues to be involved in the world He created seems superfluous. The world appears to simply "tick" on its own and mathematics, not God, is the sufficient explanation for the phenomena in the world.

However, confidence in the Newtonian world was heavily eroded in the early years of the twentieth century. As physicists probed further into the world of atomic and subatomic particles, our conceptions of the physical world were being seriously challenged, in such a non- and even counter-intuitive way, by the new emerging quantum picture of the world. According to the new physics, the fundamental building block of the universe—the world of the atomic and sub-atomic particles—was highly

---

7 Olson, "Physics", p. 303.

8 Stephen M. Barr, *Modern Physics and Ancient Faith* (Notre Dame: University of Notre Dame Press, 2003), p. 27.

9 Pierre Simon Marquis de Laplace, "A Philosophical Essay on Probabilities" (New York: Dover, 1951), pp. 4-5, quoted in Barr, *Modern Physics and Ancient Faith*, p. 171. Emphasis is mine.

10 Against Cartesian mind-body dualism, materialism holds that the only things that exists is matter (and, through the "law of conservation of matter and energy," energy). As such, everything, including consciousness, is composed of matter and the result of material interactions and, as a consequence, is object of scientific investigations.

probabilistic and indeterminate. At the atomic and subatomic levels, we can only have probabilistic, rather than certain and deterministic, knowledge of the system being investigated. Thus, for example, we can no longer talk about the exact position of an electron orbiting a Hydrogen atom (the simplest atom). What quantum physics allows us to say is the *probability* of finding the electron at some particular location.[11] Within a relatively short period of time, a revolution happened and the old Newtonian mechanics was replaced by the new emerging quantum physics.

The new physics certainly met its early resistance. Science, above all other disciplines, was seen as the de-facto method by which the validity of other truth claims is judged.[12] The privilege that science enjoys over other disciplines is attributed to its predictive power. In fact, "The ideal of physical science is prediction. Predictions are how theories are tested. To be able to explain the physical world is to be able to predict it in detail."[13] Thus, the idea that the fundamental building blocks of the universe were highly probabilistic and indeterminate was shocking and even unwelcomed by many physicists, including by some of the founders of quantum theory themselves. Einstein, for example, never quite accepted the probabilistic character of quantum theory and derided it with his famous remarks, "God does not play dice!" There have been unceasing attempts to restore determinism to physics in general by proposing, among many, the idea that quantum theory must be incomplete and that there are "hidden variables." Yet quantum theory, as we know it, is still indeterminate and, hence, probabilistic.

The view that our world in its fundamental atomic and sub-atomic levels is highly probabilistic is caused by, for the most part, several thought-provoking counter-intuitive discoveries of quantum theory: the quantum indeterminacy and the wave property of all particles. We shall briefly discuss each of these below.

## *Quantum Indeterminacy*

The new quantum physics gives us hints that events in the physical world are highly indeterminate. An example of this quantum indeterminacy can be given.

Many atomic nuclei and subatomic particles are unstable and, given enough time, they will decay. Uranium-235, one of the three isotopes of Uranium, for example, is an unstable nuclei and will decay into lighter

---

11 "Probability of finding" means the electron may not be at that particular location even after the measurement to locate that electron is performed.

12 Bertrand Russell once declared, "Whatever knowledge is attainable, must be attained by scientific methods; and what science cannot discover, mankind cannot know." Russell's remark resonates well with Ernest Rutherford's statement that "there is physics and there is stamp-collecting."

13 Barr, *Modern Physics and Ancient Faith*, p. 27.

nuclei, Thorium-231, which itself is an unstable nuclei, causing further chain of decays. Muon, a subatomic particle, will eventually decay into a group of three particle, electron, neutrino, and anti-neutrino. The laws of physics, however, prevent anyone to predict whether and when any particular particle will decay. We can only assign probability, stated in half-life, for the decay to happen within a certain period of time. Both and have a half-life time of (roughly 703.8 million years) and 2.2 millionth of a second, respectively. What it means is that within this half-life time period, these particles, and alike, will have 50% chance of decaying. Suppose we start with a sample containing a large number of particles. While any single one of them may not decay in its half-life period, *about* (not necessarily exact) half of the original sample would remain with the rest having decayed within 2.2 millionth of a second. After 4.4 millionth of a second, only *about* one-quarter of the original sample would remain, and so on. Physicists understand that which particle decay and when is purely a matter of chance. Quantum indeterminacy results in highly probabilistic and unpredictable events, particularly in the atomic and sub-atomic levels.

In fact, in this world of atomic and sub-atomic particles, simultaneous measurements of certain physical properties, such as a particle's velocity and position, will always be uncertain. This fundamental uncertainty principle is termed "Heisenberg's uncertainty principle," named after Werner Heisenberg who discovered the principle in 1925. Described mathematically, the Heisenberg uncertainty principle states that , where , a very small number, is the Planck constant, the notation denotes uncertainty, and and are the particle's momentum (a product of its mass and its velocity) and its location, respectively.[14] This seemingly harmless equation yields two implications. First, our measurement cannot be arbitrarily precise; there is a limit by which our measurement cannot be made any more precise. Second, measurement that makes one property more certain will make the other property more uncertain. In Heisenberg's own words, "the more precisely the position is determined, the less precisely the momentum is known in this instant, and vice versa."

Several important points need to be noted here. First, these uncertainties in the measurements are not the result of our measurement limitation (e.g., the width of the lines in our ruler set the uncertainty for our length-measurement; the thinner the width, the more exact and certain our

---

14 In reality, the Heisenberg's uncertainty principle applies to all objects, macroscopic as well as microscopic. However, since the Planck constant is a very small number, the effect is mostly seen in the atomic and sub-atomic levels.

measurements are, et cetera). Furthermore, these uncertainties are not a result of measurement errors (e.g., systematic and random error). Rather, these uncertainties are inherent to the fabric of our universe. Our inability to simultaneously determine, with absolute certainty and precision, simple physical properties such as velocity and position is because the particles themselves cannot have definite position and velocity at the same time. Thus, for example, no particle can end up sitting at rest for this will imply that the particle has no uncertainty in its position  and in its velocity and, hence, its momentum .

## *Wave Property of Particles*[15]

Quantum theory also informs us that all particles exhibit both wave and particle properties. Neither one property alone can fully describe the particle's behavior. Thus, in quantum mechanics it is simply meaningless to talk about a particle's exact location. The wave property implies a particle, like wave, fills all space. Observation and measurements made on a particle will collapse its wave (wave function) and only at that time particle's localization occur and we can locate the particle. However, no definite knowledge can be obtained with regards to particle's location prior to the observation and measurement being done. Under the Coulomb interaction, an electron orbiting the nucleus of a Hydrogen (or simply, a proton) will have a ground-state (i.e., lowest state:) wave function described, in spherical coordinate, by the following equation:

(1) where  meter is the classical Bohr radius and , the radial axis on the spherical coordinate, indicates the position in space away from the nucleus (assumed to be pointlike object located at). It is not important for our purpose here to know how the electron wave function above is obtained. Neither it is important to understand everything in the equation. What's important is to realize that since the wave function is a function of the radial axis, equation (1) above tells us that the electron's wave function fills all space. Obviously at a very far distance away from the nucleus (approches infinity), the wave function diminishes.

Furthermore, contrary to the classical expectation in which the electron is pictured to orbit the  nucleus at a definite and fix distance away from it (exactly at Bohr's radius for ground-state Hydrogen electron), in the quantum picture the electron is a cloud surrounding, even penetrate, the

15 The Copenhagen interpretation of quantum mechanics, pioneered by Niels Bohr and Werner Heisenberg and supported by Max Born, Wolfgang Pauli, and John von Neumann, is assumed here. It is customary in the Copenhagen interpretation to affirm only the epistemic status of the wave function, denying (or at least being agnostic) to its ontic status: the wave function is simply a mathematical tool representing information about some aspects of reality without having any discreet physical reality. However, recently it has been argued that the wave function must be real and physical (Matthew F. Pusey, Jonathan Barrett and Terry Rudolph, "On the Reality of the Quantum State," *Nature Physics* no. 8 (June 2012): pp. 475-479).

nucleus and extending to all space. The probability density that this electron wave function is found to occupy an infinitesimal region of space  is given by multiplying the square of the wave function with, the infinitesimal unit volume (in spherical coordinate):

Obviously, when we integrate this probability density for all possible value of  we obtain: , which is the same as saying we will always find the electron somewhere in space. Nothing out of extra-ordinary here. But the probability of finding an electron within a region of space delimited by and is given by , with a value of less than one. In other words, since we can only talk about probability of discovering the electron located in any definite region of space and that probability is less than one, we can never be certain, even after repeated measurements, that we will find the electron located in any specific region of space. The *most probable* location for the electron is given by taking the derivative of equation (2) and set it to zero (finding the maxima of the wave function), the solution of which is , the classical Bohr radius, as expected. But *there is no necessity* that the ground-state electron of Hydrogen atom will be at the Bohr radius, as predicted by classical physics.

## Quantum Indeterminacy: Not Our Ally

The probabilistic and indeterminacy nature of quantum physics were seen as threats to the worldviews of materialist and determinist philosophers. Some have argued that quantum indeterminacy lends support to the idea that the world is not merely material, but also immaterial. In the purely materialistic world of Newtonian mechanics, for example, how does one explain what free will is? If the future history of each single particle in the world can be determined by knowing the state of the particle's present state, then free will is an illusion. After all, human being is constructed of billions and billions of particles. But given the new quantum picture, a number of physicists, biologist, and philosophers have made use of quantum indeterminacy to explain human freedom. On this view, "freedom" of the will is associated with unpredictable behavior resulting from the randomness of quantum process happening in the brain. The British-American theoretical physicist Freeman Dyson (b. 1923), for example, argued that "electrons, are active, choice-making agents and that experiments force them to make particular choices from the many option open to them,"[16] and the brains of animals "appear to be devices for the amplification of ... the quantum choices made by the molecules inside our heads."[17]

16 Olson, "Physics", p. 311.

17 Freeman J. Dyson, "Science and Religion," in *Religion, Science, and the Search for Wisdom*, ed. David M. Byers (Washington, D.C.: Bishops' Committee on Human Values, National Conference of

Christianity certainly stands in diametrical opposition to philosophical materialism and determinism. Though quantum indeterminacy undermines the validity of these non-Christian philosophies, Christians should not embrace quantum physics completely and uncritically to battle philosophical materialism and determinism.

First of all, quantum indeterminacy is not our answer against philosophical materialism and determinism. Determinism by itself does not necessarily imply predictability. To say that there is no free will and that matter is the only reality simply because everything in the world is deterministic and, thus, predictable is simply a gross inaccuracy. If all one wants is to introduce a notion of unpredictability to explain the immaterial characteristic of the world we live in, then quantum indeterminacy is not necessary. A system can be mathematically deterministic, yet highly unpredictable.[18] Besides, Laplace was wrong in his conviction that the world is completely deterministic. The idea that the world can be completely described in the language of mathematics—crucial for philosophical determinism—is an illusion to begin with. No mathematical equations, no matter how complex they are, can completely describe the simplest particle.

The wave function of a ground-state electron of Hydrogen in equation (1) above, for example, does not describe the electron's true wave function but is only its approximation.[19] The same is true when we consider Newtonian physics on large-scale objects. The mathematical description of the orbit of the earth revolving around the sun is only an approximation. It

---

Catholic Bishops, 1987), quoted in Olson, "Physics", p. 311.

18 For example, a classical (non-quantum) chaotic system is deterministic, yet highly unpredictable, system. In a chaotic system, slight variations to the "initial conditions" can lead to very large uncertainties to the system's subsequent behavior. Thus, in a chaotic system the future is highly unpredictable. A double pendulum (a pendulum attached to another pendulum) is the simplest classical chaotic system. It is almost impossible for one to see the double pendulum trace the same trajectories at two separate occasions since it is quite impossible for us to repeat the initial condition (i.e., the angle of each of the pendulum with respect to the vertical axes). The trajectories of the pendulum differ greatly with the slightest variations in the initial conditions. But though the trajectories may be unpredictable, there is still a mathematical equation that describes the trajectories. Thus, chaotic system is still deterministic.

19 The wave function above was obtained when only the Coulomb interaction (between the electron and the proton nucleus) is considered. This model neglects any other effects (such as relativistic effect, spin effects, and so on) and any overlap between the electron's and the proton's wave functions; In other words, to get the wave function description of the electron, the simple model starts with the assumption that the electron and proton are particles with definite localization without any wave property! But even after all the relativistic and spin-orbit coupling corrections have been applied, the wave function is still an approximation. While it is true that the Coulomb interaction is the strongest interaction between the electron and the proton in a Hydrogen atom ( or 1,500 billion billion billion billion times stronger than the gravitational interaction), it is still an approximation. This model also considers the electron and proton in isolation from other particles, neglecting possible interactions with other particles. Interactions with other particles are quite small simply because other particles, even in a solid, will be an astronomical distance away compare to the distance between the electron to the nucleus. But if a particle's wave function extends all space, the wave function, as negligible as it may be, will overlap with other particle's wave function.

is simply impossible to take into account all the gravitational force exerted on the earth by the earth's moon, all the planets (and their moons) in the solar system, all the objects in our solar system (e.g., the millions of asteroids between Mars and Jupiter, the man-made satellites orbiting the earth, the comets that have passed and will pass our solar system, et cetera), the distant objects outside our solar system (e.g., the trillions trillions of other stars in our universe, each possibly with its own planets, comets, et cetera), and even dark matters in the universe. The point is, while a good model will very closely approximate the reality, *no model will describe the reality exactly*. Thus the world *cannot* be completely and exhaustively described by mathematical equations.

Secondly, as pointed by Stephen M. Barr, if the human mind were simply a function of a random process happening at the atomic level, then our behavior would have been erratic and undependable. This certainly does not correspond to what we observe in most people in general. But more importantly, "To be subject to random mental disturbance is not freedom but a kind of slavery or even madness."[20] In addition, quantum indeterminacy does not give rise and can never explain our moral responsibility. Alex Rosenberg writes that "if the fundamental sub-atomic interactions that constitute our brain processes are not determined by anything at all, as quantum physics tells us, then there is even less room for moral responsibility in our actions. For actions will then stem from events that have no causes themselves, no reason at all for their occurrence."[21]

Thirdly, quantum physics itself is a theory that may undergo changes and may be replaced in the future. While physicists are able to formulate GUT ("Grand Unified Theory") in which the electromagnetic,[22] weak,[23] and strong[24] interactions are unified into a single model, they have embattled one of the greatest unsolved problems (yet) in physics: the search for a final theory, the "Theory of Everything" (TOE). TOE requires a unification of general relativity of gravitation (gravitational interaction) with the remaining three forces unified under GUT. Thus, some physicists have considered that there are some deficiencies in quantum physics and the Standard Model. Christians should not embrace science completely and uncritically as if science is final. Science, as historian of science can easily point, is constantly changing. A controversial hypothesis in the past has become today's standard paradigm. New revised and updated science college textbooks are being released every three years.[25] Christians should

---

20 Barr, *Modern Physics and Ancient Faith*, p. 179.

21 Alex Rosenberg, *Philosophy of Science: a contemporary introduction*, 2nd ed. (New York: Routledge, 2006), p. 10.

22 Force acting between two electrically charged particles.

23 Force responsible for radioactive decay of subatomic particles.

24 Force that binds neutron and proton to form a nucleus.

25 Nigel Brush, *The Limitations of Scientific Truth: Why Science Cant's Answer Life's Ultimate*

avoid attaching their theology to fit any particular scientific model. Such an attempt "is self-defeating since scientific views are always changing. As a result, a theology that attaches itself to one scientific family today will surely be an orphan tomorrow."[26]

And finally, and more importantly, quantum physics does offer its own challenges to the traditional notion of God. Some have taken quantum indeterminacy as evidence against God's meticulous providence over the world. For some, the idea that God is sovereign in the world contradicts the very idea of quantum indeterminacy. Christians have attempted to "reconcile" this conflict in different ways. One way is to consider quantum indeterminacy as supporting Molinism.[27] This is the option taken by the philosophical theologian and Christian apologist, William Craig. When asked whether it is possible for God to know the outcome of indeterminate quantum events without controlling them, William Craig emphatically answers "Yes, via His middle knowledge!" Taking quantum events as analogous to counterfactuals human freedom, Craig claims that "by taking into account counterfactuals of quantum indeterminacy along with counterfactuals of human freedom, God can sovereignly direct a world involving such contingents toward His desired ends." And finally, he concludes that "given quantum indeterminacy, a robust theory of divine sovereignty and providence over the world will require appeal to God's middle knowledge."[28]

Another way is to argue for a limitation on God's knowledge. The biblical concept of God's omniscience has often been seen as a Platonic construct as it conflicts with other passages in Scripture (e.g., the fact that God relents). And now quantum indeterminacy is seen as giving the scientific evidence of the limitation of God's knowledge. Under this consideration, God, just like human, will not know which radioactive atom will disintegrate. Only after the atom decays does God know what we also

---

*Questions* (Grand Rapids: Kregel Publications, 2005), p. 27.

26 John Cast, "Paradigm Lost: Images of Man in the Mirror of Science" (New York: William Morrow and Company, 1989), p. 65, quoted in Brush, *The Limitations of Scientific Truth*, p. 28.

27 Louis de Molina (1535-1600), a Jesuit theologian, attempted to resolve the tension between God's omniscience and human freedom by posing middle knowledge (*scientia media*) of God. This type of knowledge is situated between God's "necessary" (or "natural") knowledge—God's knowledge of all necessary truths because he is omniscient (e.g., propositions that would be logically true in all possible world)—and his "free" knowledge—God's knowledge of things because he has decreed them. Middle knowledge is that divine knowledge of God concerning things contingent prior to his decreeing them. As Bavinck explains, "The object of this knowledge is not the merely possible that will never be realized, nor that which by virtue of a divine decree is certain to happen, but the possibilities that depend for their realization on one condition or another." Thus, through his middle knowledge God makes many possible outcomes depend on conditions, and knows in advance what he will do, in case these conditions are, or are not, fulfilled by humans." Quotations from Herman Bavinck, *God and Creation*, vol. 2 of *Reformed Dogmatics*, John Bolt, ed., trans. John Vriend (Grand Rapids, MI: Baker Academic, 2004), p. 198.

28 William L. Craig, "Divine Sovereignty and Quantum Indeterminism," Q&A with William Lane Craig, http://www.reasonablefaith.org/divine-sovereignty-and-quantum-indeterminism (accessed March 24, 2014).

know. Open theists, for example, have argued that quantum indeterminacy means that God *deliberately* created a world with a genuinely open future.[29] The theologian-physicist John Polkinghorne, for example, is a proponent of open theism and had publicly endorsed open theism at Baylor University in 2002.[30]

While we are certainly against materialism and determinism, neither Molinism nor Open Theism is an acceptable solution for us, for both put the limit on God's sovereignty. In contrast, the God of the Bible is a God whose kingdom rules over all (Ps. 103:19) and, by declaring the end from the beginning, his counsel stands and all of his purposes accomplished (Isa. 46:10). The biblical idea of God's meticulous providence is summarized by the Westminster Confession of Faith when it declares that "God from all eternity, did, by the most wise and holy counsel of His own will, freely, and unchangeably ordain whatsoever comes to pass."[31] Such a providence, however, does not imply determinism in a materialistic sense. While the limit and the scope of this paper prevents a thorough discussion on the relationship between God's absolute sovereignty and his meticulous providence, perhaps a subject of a another paper, it suffices to say here that contrary to the notion of God's meticulous providence, the determinism resulting from the materialistic worldview gives no room for a counsel of God but rather leaves everything to a blind chance of nature, an irrational will, and an unconscious fate.[32] The point of this paper is to show how God's absolute sovereignty addresses the problem raised by quantum indeterminacy. We shall now turn into this concluding subject.

## God's Sovereignty over Quantum Indeterminacy

Molinism and Open Theism leads to a limited concept of God's sovereignty. In insisting that the future is open to God just as it is open to us, Open Theist has collapsed the Creator-creatures distinction.

---

29 Del Ratzsch explains this position as follows: "just as the clock-work Newtonian universe was taken as indicating a creator favoring mathematical precision, sharp distinctions, overriding micro-order, autonomous and static identities, and infinite predictability, . . . the quantum world suggests a creator favoring openness, freedom, fuzzy edges, dynamic fluidity, interconnectedness, novelty, innovation, emergence, surprises. This openness, it is argued, allows for free will and also suggests new ways of conceptualizing God's immanentness."Del Ratzsch, "Science and Religion," in *The Oxford Handbook of Philosophical Theology*, Thomas P. Flint and Michael C. Rea, eds. (New York: Oxford University Press, 2009), p. 68.

30 On Polkighorne's endorsement for open theism see (accessed March 28th, 2014).

31 WCF 3.1: "God from all eternity, did, by the most wise and holy counsel of His own will, freely, and unchangeably ordain whatsoever comes to pass; yet so, as thereby neither is God the author of sin, nor is violence offered to the will of the creatures; nor is the liberty or contingency of second causes taken away, but rather established."

32 Herman Bavinck deals with the issue of determinism and the divine counsel of God quite comprehensively in Chapter 7 ("The Divine Counsel") of *God and Creation* (Vol 2 of *Reformed Dogmatics*).

Furthermore, Open Theist's God is clearly not a sovereign God; the future which is open to God is certainly disjoint from the purview of God's sovereign decree. On a similar note, God's middle knowledge implies that God is merely a chess grand master who is simply ready for whatever moves his opponent decides to take. Similarly with God, "He foresees and knows all possibilities and makes his decisions and provisions with a view to all those possibilities. He knew in advance what he would do if Adam fell and also if he did not fall; if David did or did not go to Keilah; if Tyre and Sidon did or did not repent." In this case, "God's knowledge of contingent events precedes his decree."[33] In the Molinists' scheme, God is no longer self-sufficient as His action is determined by something outside of Him; God simply waits upon and respond to human's free decision. But if this is the case, "It is not God who makes distinctions among people, but people distinguish themselves. Grace is dispensed, according to merit; predestination depends on good works."[34]

But as Vern Poythress points out, such a limited concept of God's sovereignty is at odds with the Bible. Isaiah 46:9-10,[35] for example, indicates "not only that God can 'declare' or describe the future, but that this future happens in accordance with his 'counsel' and 'all my purpose' (verse 10). He not only *knows* the future, but plans it and *controls* it."[36]

But some may voice objections towards the idea that God ordains whatsoever, big or small, important or trivial matters, to come to pass. It is more worthy that God controls the major things and events. To speak of God micro-managing the world of atomic and subatomic particles seems to speak something unworthy of him. Certainly God does not micromanage this world and would limit his interference in it? The seventeenth century, for example, witnesses the rise of philosophical naturalism (to be distinguished from methodological naturalism) which, among many, was driven by theological concern. It was seen by many people at that time that it would be clumsy for God to continuously intervene with nature. An idea developed that "a non-intervening God is a better God." The Anglican cleric Thomas Burnett (1635-1761), for example, wrote: "We think him a better Artist that makes a Clock that strikes regularly at every hour from the Spring and Wheels which he puts in the work, than he that hath so made his Clock that he must put his finger to it every hour to make it strike."[37]

---

33 Bavinck, RD II, p. 198.

34 Bavinck, RD II, p. 201.

35 "for I am God, and there is no other; I am God, and there is none like me, declaring the end from the beginning and from ancient times things not yet done, saying, 'My counsel shall stand, and I will accomplish all my purpose,' ...."

36 Vern S. Poythress, *God or Chaos: A God-Centered Approach to Chance and Probability*, unpublished manuscript (read March 8, 2012), p. 45. This manuscript will soon be published with a title of *Chance and the Sovereignty of God: A God-Centered Approach to Probability and Random Events* (Crossway, forthcoming April 30th, 2014).

37 Quoted in Cornelius G. Hunter, *Science's Blind Spot: The Unseen Religion of Scientific*

But such an idea of God does not originate from the Bible. In fact, there is no single verse in the Bible referencing any idea that there exists event taking place outside of God's plan and control. What justification is there for a limited sovereignty of God? Poythress answers:

> It comes, I think, because we human being *do not like* the prospect of an all-controlling God. Every [sic] since the fall of human beings into sin, sin has pervaded the human heart. And sin includes at its roots the desire for independence from God. "You will not surely die," says the serpent. In other words, the serpent claims that God is not universally in control. And the serpent says, "You will be like God, knowing good and evil." That is, you will be independent. You will take charge of your own decision-making, independent of God. You will do what you decide to do, not what God directs you to do. Such is the voice of Satan, who speaks through the serpent and instigates human rebellion against God. Such also becomes the internal voice in our hearts, when our hearts are corrupted by sin.[38]

In contrast, John Calvin asserts God's absolute decree over everything. In the realm of salvation, for example, God predestined some unto salvation and also reprobated others to damnation. Calvin writes:

> Indeed many, as if they wished to avert a reproach from God, accept election in such terms as to deny that anyone is condemned. But they do this very ignorantly and childishly, since election itself could not stand except as set over against reprobation. God is said to set apart those whom he adopts into salvation; it will be highly absurd to say that others acquire by chance or obtain by their own effort what election alone confers on a few. Therefore, those whom God passes over, he condemns; and this he does for no other reason than that he wills to exclude them from the inheritance which he predestines for his own children. And men's insolence is unbearable if it refuses to be bridled by God's Word, which treats of his incomprehensible plan that the angels themselves adore. However … hardening is in God's hand and will, just as much as mercy is.[39]

Yet, for Calvin, God's decree concerns not only the subject of

---

*Naturalism* (Grand Rapids, MI: Brazos Press, 2007), pp. 20-21.

38 Poythress, *God or Chaos*, p. 46.

39 John Calvin, Institutes 3.23.1. However, it must be stressed in passing here that Calvin approaches the subject of predestination and reprobation asymmetrically.

predestination—that God has predestinated some to be saved and reprobated some others to damnation—but also over his general providence. Denying that there is anything resulting from fortune or chance, Calvin writes:

> Suppose a man falls among thieves, or wild beasts; is shipwrecked at sea by a sudden gale; is killed by a falling house or tree. Suppose another man wandering through the desert finds help in his straits; having been tossed by the waves, reaches harbor; miraculously escapes death by a finger's breadth. Carnal reason ascribes all such happenings, whether prosperous or adverse, to fortune. But anyone who has been taught by Christ's lips that all the hairs of his head are numbered [Matt. 10:30] will look farther afield for a cause, and will consider that all events are governed by God's secret plan. And concerning inanimate objects we ought to hold that, although each one has by nature been endowed with its own property, yet it does not exercise its own power except in so far as it is directed by God's ever-present hand. These are, thus, nothing but instruments to which God continually imparts as much effectiveness as he wills, and according to his own purpose bends and turns them to either one action or another.[40]

But at the end, we uphold God's absolute sovereignty and his meticulous providence over everything in the world because it is the teaching of the Bible. Even the casting of a lot, as unworthy as it may seem, has its outcome decided by God (Pro. 163:33); it is the will of the Father that keep the sparrow (Mat. 10:29); even the hair in our head are all numbered (Mat. 10:30). God is sovereign over all because he not only knows the future contingents, but because he ordains all future events, big or small. On the sovereignty of God, Poythress concludes that

> God is indeed a "micromanager," if we must use that term. He is not merely a "micromanager," who controls microscopic events in individual living cells in our bodies, but a nanomanager, a zeptomanager, who controls events far more minute than what we can observe even in a microscope. He controls it all. Since the word *manager* may create difficulties by suggesting false comparisons with human managers, we might say simply that God rules over all events, great and small. "His kingdom rules over *all*" (Ps

40 Calvin, Institutes 1.16.2. It must also be pointed out here that Calvin denies that God's meticulous providence leads to Stoic fate (1.16.8).

103:19).[41]

Indeterminacy in quantum physics may be so for human being. But our commitment to the Creator-creatures distinction forbids us to project this creaturely indeterminacy back to God. Nothing is indeterminate for God for nothing is hidden in His sight (Heb. 4:13). One thing is certain, there is no uncertainty in God. And exactly because the world was created, quantum indeterminacy makes sense. The world is not a mechanical world that can be understood a priori. The world, being contingent, ground the very necessity for us to look into the world to investigate it. Quantum events, then, are contingent events. As briefly discussed above, we can never know, for certain, where the electron is located. In fact, only upon our attempts to locate the electron will the electron's wave function collapses and the electron could be located in a region of space. Even then, we can only talk about the probability that the electron, as particle, being found in that region of space. The electron cannot necessarily assume a location because the electron is created and, thus, contingent. Observations and measurements are needed to find where it is.

Furthermore, the world is not mechanistically deterministic and necessarily predictable because it is created. The living God who created the world has "his kingdom rules over all" (Ps 103:10). And because it is created, there is no necessity for the world to exist the way it is now. In fact, if Christ returns tomorrow, we will not expect the world to continue existing the way it is now for "the heavens and earth that now exist are stored up for fire, being kept for the day of judgment" (2 Pet 3:7) and the new heavens and new earth await us (2 Pet 3:1). This does not imply that the world is unintelligible to us; it is contingently predictable because He, who holds together everything, is faithful.

Quantum indeterminacy may be indeterminate for us, but not so for God. In fact, God not only knows which particular  atom will decay, but He ordains which of them should decay. He not only knows where, upon human measurement, the electron will appear to us, but He ordains where the particle will be located. Such an intervening God is the greater God!

## BIBLIOGRAPHY

Barr, Stephen M. *Modern Physics and Ancient Faith*. Notre Dame: University of Notre Dame Press, 2003.

Bavinck, Herman. *God and Creation, Vol. 2 of Reformed Dogmatics*. John Bolt, ed., trans. John Vriend. Grand Rapids, MI: Baker Academic,

41 Poythress, *God or Chaos*, p. 47.

2004.

Brush, Nigel. *The Limitations of Scientific Truth: Why Science Cant's Answer Life's Ultimate Questions*. Grand Rapids: Kregel Publications, 2005.

Cast, John. *Paradigm Lost: Images of Man in the Mirror of Science*. New York: William Morrow and Company, 1989.

"Divine Sovereignty and Quantum Indeterminism", Q&A with William Lane Craig. http://www.reasonablefaith.org/divine-sovereignty-and-quantum-indeterminism. March 24, 2014.

Dyson, Freeman J. "Science and Religion," in *Religion, Science, and the Search for Wisdom*, David M. Byers, ed. Washington, D.C.: Bishops' Committee on Human Values, National Conference of Catholic Bishops, 1987.

Hunter, Cornelius G. *Science's Blind Spot: The Unseen Religion of Scientific Naturalism*. Grand Rapids, MI: Brazos Press, 2007.

Laplace, Pierre Simon Marquis de. *A Philosophical Essay on Probabilities*. New York: Dover, 1951.

Olson, Richard. "Physics," in *Science and Religion: A Historical Introduction*. Gary B. Ferngren, ed. Baltimore, The Johns Hopkins University Press: 2002.

Poythress, Vern S. *God or Chaos: A God-Centered Approach to Chance and Probability*, unpublished manuscript. Read March 8, 2012.

Pusey, Matthew F, Jonathan Barrett, and Terry Rudolph. "On the Reality of the Quantum State", *Nature Physics* no. 8. June 2012.

Ratzsch, Del, "Science and Religion," in *The Oxford Handbook of Philosophical Theology*. Thomas P. Flint and Michael C. Rea, eds. New York: Oxford University Press, 2009.

Rosenberg, Alex. *Philosophy of Science: a contemporary introduction*, 2nd, ed. New York: Routledge, 2006.