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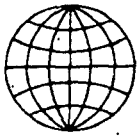
Journal of Interdisciplinary Studies: An International Journal of Interdisciplinary and Interfaith Dialogue (ISSN 0890-0132) co-sponsored by the International Christian Studies Association and published by the Institute for Interdisciplinary Research (Fed. ID No. 95-3956070). **JIS** appears in a double issue once a year (Sept.). Annual subscriptions: $15 Individual; $25 Institutional; $10 Student (Canada/Mexico: $30; Overseas: $35/vol.). **JIS** is trilingual: English, German, French. Foreign language articles carry a 500-word English summary. Indexed/abstracted in Wilson's *Social Sciences-Humanities Index/Abstracts*, *Guide to Social Science and Religion*, *Sociological Abstracts*, *International Bibliography of Periodical Literature* (IBZ), *Religion Index One*, *ATLA Religion Database*, *Religious & Theological Abstracts*, *Catholic Periodical Literary Index*, et al. **JIS** is available also in databases: EBSCO-Wilson *Social Sciences-Humanities Full Text*, ProQuest, Gale-Cengage Learning, etc. Second-class postage paid at Santa Monica, CA, and additional mailing office. Cooperates with all subscription services. Inquiries: **JIS** Editor, IIR, 1065 Pine Bluff Dr., Pasadena, CA 91107, USA. Website: www.JIS3.org E-mail: info@jis3.org



JOURNAL OF INTERDISCIPLINARY STUDIES

An International Journal of
Interdisciplinary and Interfaith Dialogue

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VOL. XXVII NO. 1/2 2015

DOES GOD PLAY DICE? RANDOMNESS AND DIVINE PROVIDENCE

RANDOMNESS, COMPATIBILISM AND DIVINE PROVIDENCE

James I. Lefeu
Trinity Evangelical Divinity School

This essay explores quantum physics and theology to propose that ontological randomness does not exist, but divine Providence does. Some interpretations of quantum physics that involve mathematical formalism and observational phenomenology are deterministic (de Broglie-Bohm, many-worlds, cosmological, time-symmetric, many-minds), while others are non-deterministic (Copenhagen, stochastic, objective collapse, transactional). Yet, quantum events are merely epistemically indeterminable by us, but actually do have a fundamental cause. Compatibilism best describes the teaching of the Bible. Humans possess free agency, and are determined by their desires and values. Hence, they can be said to have "free will," because they do what they want. The fundamental cause, as understood by Compatibilism, is God's Providence, defined as God's continual involvement with creation through keeping it existing, cooperating with creation in every action, and directing it to fulfill His purposes. The interaction between quantum physics and Providence suggests methodological parallels between science and theology in a quest for synthesis.

MEDITATIONS ON RANDOMNESS

The focus of this essay is the question concerning whether randomness may be inherent in quantum physics. To set the stage, this calls for a brief review of major theories and interpretations of quantum physics. The essay also seeks greater clarity regarding the teaching of the Bible concerning how God interacts with His creation. A brief comparative analysis of relevant theological approaches leads to the proposition that the theory of Compatibilism best describes the teaching of the Bible. The crucial link is the concept of God's Providence from the

perspective of Compatibilism that undergirds the interaction between God's Providence and quantum physics.

This essay draws on Millard Erickson's full-inerrancy perspective. That is, the Bible, in the original manuscripts, is considered completely without error, and scientific references within it are considered phenomenal, observed experiences from the eye of the human author (Erickson 1998: 248). In terms of the relationship between science and theology, this essay begins with Ian Barbour's (1997) dialogue model of "methodological parallels," in the quest for an integration model of "systematic synthesis," proposed by James A. Marcum (2005: 48).

James Bradley highlights the confusion that may result from different understandings of what it means to call something "random." "Randomness" here is used according to the common popular definition of something "without purpose." Yet, Bradley mentions that a definition for randomness often used in mathematics, statistics, and the sciences involves that which is merely indeterminate and unpredictable from a human perspective. This randomness is not necessarily an uncaused event. A second mathematical definition is the lack of discernable pattern in an input such that it cannot be compressed. Bradley further distinguishes between the concepts of *epistemically* random and *ontologically* random. A random sequence which is only *epistemically* random will merely appear uncompressible, but actually has a pattern that we are unaware of, which could be used to compress the input. An *ontologically* random sequence does not have any pattern to it, and cannot be compressed (Bradley 2012: 78). As Bradley points out, in computer science, random number generators merely give the appearance of randomness through determining factors that are indeterminable by us (2012: 76). Randomness, as pure randomness or ontological randomness, is the idea that there exist *non-causal* natural events. This essay proposes that ontological randomness does not actually exist.

NON-DETERMINISTIC QUANTUM THEORIES

Our understanding of quantum physics is first founded upon the results of experiments. Upon this foundation, the mathematics of quantum physics was developed. Werner Heisenberg developed a mathematical formalism of matrices. Erwin Schrödinger developed a mathematical formalism of waves, which is mathematically equivalent to Heisenberg's system (Ghirardi 2005:

115-16). Even more recently, a mathematical formalism involving approximations, called perturbation theory, was developed by Richard Feynman to try to combine quantum physics with Albert Einstein's relativity theory (Ghirardi 2005: 117-18). However, the mathematics merely describes the result of the experiments. Thus, there are various theories concerning how to interpret the mathematics or understand what actually is happening.

The first and historically most prominent interpretation is that of the Copenhagen school (Ghirardi 2005: 120). The Copenhagen school was long considered as the orthodox understanding of quantum physics because, except for Einstein, the entire scientific community embraced it. It held that the scattershot results of the quantum experiments were not caused by underlying forces unknown to us, but instead were fundamentally non-causal, random, and stochastic (Ghirardi 2005: 120). Additionally, it held that Heisenberg's uncertainty principle is not merely an observation about our lack of tools to identify position and velocity more accurately. Rather, it describes a physical impossibility for it to happen, regardless of future technological innovations. This is because Heisenberg's and Schrödinger's mathematics were considered complete and exhaustive of all that anyone could ever understand about a quantum system (Ghirardi 2005: 61). In general, this school was founded upon the philosophy of logical positivism, known for its skepticism toward religion, traditional philosophy, and metaphysics (Ghirardi 2005: 127).

Curiously, within the Copenhagen school, there were different versions of the theory. Niels Bohr emphasized language and the meaninglessness of metaphysical description. That is, there was no desire to describe reality as it is, though undetected by us. Rather, Bohr argued that one could only meaningfully describe reality as we perceive it in experiments and tests (Ghirardi 2005: 131). Heisenberg went farther and concluded that atoms, waves, and particles did not exist because we did not have direct experience of them. The mathematics he developed merely describes what happens to fit the description of experimental results. Max Born emphasized that the mathematics represent a positivist probability density of the position and velocity of the particle. To state it more clearly, it is not the probability that the particle is actually at a certain position, but instead is the probability that, if a measurement is taken, then it will register the particle at that position. Pascal Jordan conjectured that the measuring device does not merely disturb the system; it actually is what creates the system (Ghirardi 2005: 131).

John G. Cramer came up with a different non-deterministic interpretation of the mathematics of quantum physics. This interpretation is an adaptation from the deterministic time-symmetric interpretation. In Cramer's view, the process of a particle being emitted from an emitter, traveling some distance, and being absorbed by a measuring device, is called a "handshake" (1988: 228). This "handshake" is a transaction and, hence, his view is called the transactional interpretation. It argues that, in the process of a single particle being emitted, there are actually both "advanced" and "retarded" waves being emitted. The former, represented mathematically as $e^{+i\omega t}$, is normally ignored as "unphysical or acausal" by Copenhagen theory and the latter, represented mathematically as $e^{-i\omega t}$, is the ordinary wave. In the transactional interpretation, when the "retarded" wave finally reaches the measuring device, it deletes the result from the "advanced" wave. Both waves represent valid solutions of the quantum mathematical equations (Cramer 1988: 228). This is different from the Copenhagen interpretation, because it holds that the wave actually exists prior to measurement of the "retarded" wave (Cramer 1988: 230).

Another non-deterministic view is called "objective collapse." This theory, also known as GRW theory, is named after the initials of its creators, Giancarlo Ghirardi, Alberto Rimini, and Tullio Weber, who came up with a new mathematical formalism that fits the experimental results just as well as the previous quantum mathematics. In orthodox quantum theory, the particle is considered in some unusual state, such as the Stern-Gerlach magnet, where it is spinning neither upward nor downward until a measurement is made. The measurement causes a collapse of the wave function, and is subjective to the observer. Rather, in GRW theory, there is an event called a "spontaneous localization" that happens before measurement and after emission, which determines the particle as spinning upward or downward. This "spontaneous localization" itself is considered stochastic, though. This happens for all particles with mass at random as a result of some property of space-time, almost like ether in vacuum space (Ghirardi 2005: 200). However, the author of this theory denies any connection to theories of microscopic black holes throughout the universe, argued by others (Ghirardi 2005: 453). In brief, the discovery of quantum physics led to the development of a new mathematical formalism. The logical positivist Copenhagen interpretation became the orthodox approach to quantum physics. Interestingly, Cramer came up with a time-based approach to quantum physics. In addition, the GRW theory moved the conception of randomness from a generalized state of the particle to a "spontaneous localization."

DETERMINISTIC QUANTUM THEORIES

Fundamental to the debate over the interpretation of quantum physics is whether the apparent randomness is actually caused by some force or not. While the Copenhagen interpretation prohibited speculation, and asserted the non-existence of things that could not be directly observed, some deterministic theories take an opposite approach. In the "many-worlds" interpretation, all possible outcomes of the experimental setup actually occur, but in different universes. This occurs for every kind of measurement and/or process that can lead to states in the superposition state. The mathematics work out, and the system is perfectly deterministic, but there is no empirical evidence of different universes beyond the interpretation of the mathematics (Ghirardi 2005: 390).

In the "many-minds" interpretation, David Albert and Barry Loewer looked at criticisms against many-worlds theories, and came up with this one. Instead of an infinite number of worlds, there is one world with an infinite number of perceptions on an observers' mind. This is synchronized among all conscious observers on the planet. In this way, the system is perfectly deterministic based upon which perception is universally sent to the observer's mind (Ghirardi 2005: 395).

The "cosmological" interpretation considers a single universe of infinite size with many copies of itself within it. Therefore, instead of the results applied to multiple universes, it only occurs elsewhere in the same universe. The hidden variable is identifying the location of the pertinent copy in the single universe (Aguirre 2011: 1). The "time-symmetric" view holds that, in the process of a single particle being emitted, there are actually both forward-in-time and backward-in-time waves being emitted. Nevertheless, this is not enough information to determine the result, and so an additional variable needs to be discovered. This additional variable is the "hidden variable" that determines the system (Watanabe 1955: 179). Richard Shoup argues from the time-symmetric view that backward-causation is evidence of telepathy, clairvoyance, precognition, and psychokinesis (2006: 178-79).

Finally, the de Broglie-Bohm theory, by far, seems the most robust. David Bohm expanded upon Louis de Broglie's theory, which argued that the system could be deterministically described if the positions of all of the particles in the system were known (Ghirardi 2005: 202). Additionally, it was found that some variables are contextual. That is, it requires not only the "hidden

variable," but also knowledge of the whole system. It is possible perhaps that all of the relevant variables could be discovered, and the system would, then, be non-contextual (Ghirardi 2005: 212).

An interesting development that influences the result of "hidden variable" theories is the discovery of Bell's inequality. According to quantum mathematics, two particles emitted from the same emitter have identical properties such that a measurement on one particle will immediately affect the other particle, though it is far away. This was the Einstein-Podolski-Rosen argument that suggested the *incompleteness* of quantum mathematics because more information may be known of the system beyond just what the mathematics indicate (Ghirardi 2005: 176-78). John Stewart Bell proved that quantum effects cannot both be deterministic and local. That is, Bell showed that the apparently identical behaviors of two particles emitted from an emitter were not due to some initial condition at the moment of emission (Ghirardi 2005: 228). Considering a system with light going through polarity filters of 0 degrees, 60 degrees, or 120 degrees, particles set to the same value at the moment of emission would have a 4/9 or 5/9 probability of passing the filter. However, quantum mathematics shows a 50 percent probability of passing the filter. Therefore, this would seem to preclude the possibility of it being set initially (Ghirardi 2005: 233-34).

Alain Aspect and his team built an experiment that proved this true (Ghirardi 2005: 245). It set two particles going in opposite directions for a distance that would take a particle at the speed of light 40 nanoseconds to travel. Aspect alternated the paths for each particle every 10 nanoseconds between an up and down position. If the appearance of instantaneous behavior were caused by travel from one particle to the other, then it would have to travel faster than the speed of light to get to the other particle within 10 nanoseconds. This showed that either a particle travels faster than light, which would violate quantum mathematics, or the opposite particle was immediately affected when the first was measured (Ghirardi 2005: 246). As a result, "hidden variable" theories of the de Broglie-Bohm type must be non-local.

Overall, what is noticeable is that the deBroglie-Bohm theory clearly states that knowledge of the *cause* is theoretically possible, though difficult to find, while the Copenhagen interpretation denies the possibility of finding any cause to the epistemically random behavior. The Copenhagen interpretation has traditionally affirmed ontological randomness (Maudlin 2005: 469). This

assertion of the non-existence of a cause to the apparent randomness is a strong claim. Yet, no evidence has been provided to prove it beyond the argument from silence that we have not found a cause. Thus, for a theory of ontology, it would seem more tenable to hold the de Broglie-Bohm theory, which states that the quantum events merely indeterminable by us actually do have a fundamental cause. Nevertheless, one may draw on any of the theories, deterministic or non-deterministic, if one considers the randomness as merely epistemic.

GOD AS THE FUNDAMENTAL CAUSE

Considering God as the fundamental Cause reflects how God interacts with His creation as taught in the Bible. Taking a full-inerrancy view of the Bible in the original manuscripts, our foundation of understanding here is based upon the words of the 66 books of the Bible, inspired by God. Built upon the words of the Bible themselves, one may study the passages in question, aspiring to an in-depth analysis of the Author's original intent to the original audience. This Biblical theology for each book of the Bible focuses on the categories and topics of the original Author and audience. Systematic theology, built upon the foundation of Biblical theology, looks at how the messages from each book of the Bible combine to form a unified teaching of God (Erickson 1998: 25-26).

To look upon the question of how God interacts with His creation as taught in the Bible, one needs to address the topic of how and what God knows about the present and future. Open theists argue that God completely knows the past and present, but only partially knows the future. They argue that God does not know the future free-will choices that humans will make. God has to wait until the person chooses, decides, and acts (Erickson 2003: 13). The primary argument is based upon Genesis 6:6-7, and passages like it, where God is described as repenting or being grieved at the decisions that humans make (Erickson 2003: 17-18). Also, passages like Jeremiah 7:31 seem to suggest that certain ideas do not enter into God's mind or heart and, thus, God is said to be ignorant about the future (Erickson 2003: 31). The logical result of this approach, if applied to the whole Bible, is the conclusion that God sometimes makes mistakes, is unaware of some past and present things, becomes fatigued, has hatred toward some people, and appears to possess a body (Erickson 2003: 245).

In contrast, foreknowledge is the idea that God has the ability to see all future events (Erickson 2003: 12). However, some argue that God does not determine the future choices of people. Rather, He will merely see the future decisions that people will make to choose or reject Him, as suggested by the invitation in Matthew 11:28. From Romans 8:29, it is argued that God knew beforehand who would choose Him. From this knowledge, God made a decision, in advance, which people would be saved (Erickson 1998: 382). The difficulty of this approach is that, in the Bible, the concept of knowing often carries many more connotations beyond mere information, and often will imply an intimate relationship with the person. Additionally, in the verses immediately after Romans 8:29 through Romans 9:20, Paul's further explanation explicitly states that God's decision is not based upon people's future choices (Erickson 1998: 383).

Molinism, named after Luis Molina, argues for both a strong notion of God's sovereignty and an equally strong notion of human freedom (Keathley 2010: 5). From all possible worlds that could exist, worlds that could accomplish God's plan are selected, and a particular world among these becomes the reality that exists (Keathley 2010: 17-18). Central to the Biblical case for Molinism is the notion that alternate options are genuinely possible. An example of this is in 1 Samuel 13:13-14, which states that the option of Saul as remaining king was a genuinely possible option (Keathley 2010: 29).

Finally, Compatibilism best describes the teaching of the Bible. Known as "soft determinism," Compatibilism teaches that people's choices are determined by their desires and values, but can still be said to have free will, because they do what they want. John Feinberg offers a useful definition:

> Soft determinism says that genuine free human action is compatible with causal conditions that decisively incline the will without constraining it. The causal conditions are sufficient to move the agent to choose one option over another, but the choice and resultant action are free as long as the person acts without constraint. Acting under constraint means that one is forced to act contrary to one's wishes or desires. Acting without constraint means acting in accord with one's wishes or desires. So, an act is free, though causally determined, if it is what the agent wanted to do (2001: 637).

Some might argue that Romans 7:18-24 describes Paul who is constrained against his will by sin. As a result, one might think that Paul is no

longer responsible for his sin. However, this is a misunderstanding of the passage. In verse 18, Paul presents two personas, one that wants to do good, and one that performs evil. The sin within him is responsible for the evil, but Paul is not trying to argue that he is therefore without guilt because of it. Rather, both personas represent who Paul is, and so Paul recognizes his desert of guilt (Schreiner 1998: 375).

As attested to in the Bible, there seems to be a clear connection between human responsibility and some conception of free will. However, what do we mean exactly when we say "free will"? If free will is the libertarian notion that someone has the ability to do the opposite action from what God would want him to do, then there is a problem. If God decides everything in advance, then there cannot be free will (Carson 2002: 206). Especially, as one looks at the case of Joseph in Genesis 50:19-20, there is the idea of Joseph's brothers voluntarily choosing because they intended harm. Another approach in defining the concept of free will found in this verse is looking to one's *intention* rather than one's total and absolute ability to do the opposite action. Therefore, though God planned beforehand for Joseph to be sold into slavery, and there was no other action Joseph's brothers could take, because Joseph's brothers intended harm, they were doing what they wanted to do and, thus, acted freely (Carson 2002: 206-7). To avoid confusion, Carson calls this idea *free agency* because it focuses on people's *intentions* rather than their total/absolute ability to do the opposite action from what God would have them do. Thus, the person has made a voluntary choice in their actions (Carson 2002: 207).

Now, from a purely philosophical stance, one might question if we are still responsible for our actions based upon determined values and desires for every possible determining factor. John Martin Fischer defends against this critique regarding the philosophy of Compatibilism. Fischer mentions that there are certain determining factors to our values and desires for which we are not responsible. Examples would be hypnosis, subliminal advertising, psychological compulsion, past traumatic experiences, direct stimulation of the brain, brain damage from a fall or accident, etc. (Fischer 2007: 51). However, as this seems to be a large and disorganized list of things, Fischer uses the term Semi-Compatibilism to describe the notion that causal determinism is compatible with responsibility, even if we do not have control over the situation. Based upon John Locke's illustration of the person in the locked room, who willingly chooses not to leave, Fischer distinguishes between the

ideas of *guidance* control and *regulative* control. *Guidance* control is when, in our own mind, we make a decision concerning the situation. However, *regulative* control is what actually determines the result of the situation (Fischer 2007: 57). Fischer's idea of Semi-Compatibilist guidance control is similar to Carson's notion of free agency.

Another aspect to consider is the idea that God is the ultimate Cause of things, yet He is not the author of sin, as seen in James 1:13. An idea to explain this is the notion of two causes for a person's sin, such as in Genesis 50:19-20. One cause for the action is God, and the other is the person. It is not that God is only partially responsible, and the person is partially responsible (Carson 2002: 210-11). God's intention is 100 percent responsible for the result, though Joseph's brothers' intention are also co-responsible for the result. God is "to be praised for the good, but not blamed for the evil" (Carson 2002: 212).

In a number of places in the Bible, God demonstrates two kinds of will, a *hidden* will, as seen in Deuteronomy 29:29, and a *revealed* will. Now, one might consider it strange that God describes His will as *hidden* rather than merely unknown. However, there are several examples of God's will being *hidden* rather than unknown. In Matthew 11:25-27, God has hidden knowledge from the intelligent in order to reveal them to children. In addition, Isaiah 45:15 explicitly describes God as One Who hides Himself. Paul Moser writes, "If we take Jesus and the Hebrew prophetic tradition seriously, we should expect God to be morally righteous, perfectly loving, and thus (for redemptive purposes) at times elusive toward wayward humans" (2010: 29). For Deuteronomy 29:29, the hidden things concern the future, and it is not our role to speculate on such things (Tigay 1996: 283).

In brief, open theism proposes a partial denial of God's knowledge of the future. However, foreknowledge is God's ability to see into the future what people's choices would be. Molinism grants both a libertarian free will while also having a determined result. In contrast, Compatibilism is a form of soft-determinism that denies libertarian free will, but allows for human responsibility. It shows how God's responsibility overlaps with man's responsibility, and how God has both a *hidden* and a *revealed* will. This leads directly to the subject of God's providence.

GOD'S PROVIDENCE

There are both Hebrew and Greek examples of providence in the Bible. The Hebrew word, *yir'e* (to see), is used in Genesis 22:8, 14 to communicate the providential idea that God will see to it that provision is made. God provided a sacrifice so that Isaac would not have to be sacrificed (Wenham 1994: 111). Jon Ewing considers the Greek word, *pronoia* (providence). Hellenistic society used it to refer to being primarily as before the mind, such as in one's thoughts. Alternatively, a second definition would be thought of, or perceived, beforehand. Both notions cover the concept of providing or caring for someone, or being concerned about someone (Ewing 2008: 22). The *Greek-English Lexicon of the New Testament and Other Early Christian Literature* (2000) defines *pronoia* (providence) as thoughtful planning to meet a need, forethought, foresight, providence. It is used of God to refer to divine beneficence. It is used of humans to refer to making provision for something or being concerned about something (Arndt 2000: 872-73).

Ewing mentions that the Old Greek version of Daniel 6:19 uses the word providence to describe God's provision for Daniel to shut the mouth of lions, though this phrase is not found in the Hebrew Masoretic Text or in the Hebrew Dead Sea Scrolls (2008: 27). The Jewish theologian, Philo, uses the word, providence, to describe God's provision for the universe. The Jewish historian, Josephus, talks about God's providential care and divine intervention for God's people (Ewing 2008: 55). Platonists described providence differently for the realms of God, heavenly bodies, and human affairs. Stoics identified providence with fate (Ewing 2008: 109). The Church Father, Clement of Alexandria, interprets the Greek Old Testament typologically in Christ, yet borrows heavily from Philo, Plato, and the Stoics. Clement of Alexandria describes providence as an all-pervasive force, personalized in the person of Jesus Christ, to bring mankind from a place of weakness to a place of strength (Ewing 2008: 190).

In looking at the Bible's view of providence, there are four common errors concerning God and His creation. First, the Bible does not teach deism, the idea that God created the world, and then essentially abandoned it. Second, the Bible does not teach pantheism, the notion that the creation does not have a real, distinct existence in itself, but is only part of God. The third error is implying that the Bible teaches that events in creation are determined by pure chance or ontological randomness. The fourth error is implying that the Bible

teaches that events are determined by impersonal fate or determinism. The solution to these errors is the idea of Providence that teaches that, though God is actively related to and involved in the creation at each moment, creation is distinct from Him. It is important to recognize that the Bible teaches that events are determined by God, Who is the personal yet infinitely powerful Creator and Lord (Grudem 2000: 315). Wayne Grudem defines God's providence as God's continual involvement with all of creation in three ways. First, He keeps them existing and maintains the properties which He created. This is God's *preserving* will. Second, He cooperates with all creation in every action, giving direction to their distinctive properties to cause them to act the way they do. This is God's *cooperative providential* will. Third, He directs them to fulfill His purposes. This is God's *governing providential* will (Grudem 2000: 315).

Two primary passages offer support for God's preserving will. Hebrews 1:3 teaches that Christ holds all things by the Word of His power. In addition, Colossians 1:17 teaches that in Him, all things are held together (Grudem 2000: 316). The next part is God's cooperative providential will. God cooperates with creation in its actions. Theologians like John Calvin consider this identical with God's preserving will. However, Grudem considers this a separate category. Ephesians 1:11 says that Christ has all things operating by the purpose of His will (Grudem 2000: 317). This applies to inanimate creation, such as God's control of the snow, ice, and lightning in Job 37:6-13. It applies to animals, such as God's care for birds in Matthew 6:26 and 10:29. It applies to apparently random events like the outcome from throwing dice, as seen in Proverbs 16:33 (Grudem 2000: 318). It applies to the political state of the world, such as seen in Job 12:23, Psalm 22:28, Acts 17:26, and Daniel 4:34-35 (Grudem 2000: 319-20). It applies to every area of our lives.

There are many ways in which this applies to every area of our lives. First, there is daily provision for food in Matthew 6:11. Second, there is the idea that all of our days were planned before we were born in Psalm 139:16, Jeremiah 1:5, Galatians 1:15. Third, there is the notion that success and failure come from God in Luke 1:52. Fourth, there is the idea that our talents and abilities are from God in 1 Corinthians 4:7. Finally, there is the idea that God influences the decisions that human rulers make in Proverbs 21:1, Ezra 1:1 and 6:22, Psalm 33:14-15, Philippians 2:13 (Grudem 2000: 320-21). There are many passages in support of God's governing providential will. Not only does God cooperate with creation in its actions, but also God specifically directs

them for His purpose. Psalm 103:19 teaches that God's Kingdom rules over all. In Daniel 4:35, all things are done according to God's will. Romans 11:36 states that from Him and through Him and to Him are all things. 1 Corinthians 15:27 describes how all things are in subjection under His feet. Ephesians 1:11 describes how all things happen according to His will. Romans 8:28 mentions that, to those who love God, all things work together for good, to those who are called by His purpose (Grudem 2000: 331-32).

In brief, Providence is directly addressed in the Bible through the Hebrew word, *yir'e* (to see), and the Greek word, *pronoia* (providence). Doctrinal problems are avoided by remembering that God is personally involved with creation while remaining distinct from it. Finally, God's providence is defined as God's continual involvement with all of creation by: (1) Keeping them existing and maintaining the properties that He created them with; (2) Cooperating with all creation in every action, giving direction to their distinctive properties to cause them to act the way they do; and (3) Directing them to fulfill His purposes.

QUANTUM PHYSICS AND PROVIDENCE

How, then, does providence interact with quantum physics? Erickson discusses the debate over the miracle of a literal six 24-hour-day creation versus the idea of human evolution. Erickson categorizes this debate as two different philosophies of miracles. On one side of the debate, there is the emphasis on immediate action by God, since the immediacy seems more supernatural. It is evidence of genuine action by God. In addition, the Bible clearly teaches that there are occasions where God acts in miracles of immediate action. On the other side of the debate, God is seen to be doing miracles through nature slowly over long periods of time. An instantaneous action would be seen negatively as an intervention. Moreover, this side argues that God does not intervene in the process already set in creation. The former proposes discontinuous action by God, while the latter argues for continuous action by God. Yet, the Bible gives examples of both discontinuous and continuous divine action (Erickson 1998: 501-2).

As to miracles and the material world, one needs to recall how the human soul relates to the material world. There are at least four views on the mind-body problem (Goetz in Green & Palmer 2005: 33). John Searle suggests an emergent physicalism (Byl 2002: 80-81). Roger Penrose prefers a reductive

physicalism (1996: 216-17). Nancy Murphey holds to a non-reductive physicalism (in Green & Palmer 2005: 115). However, the assumption by most people, and the perspective which seems to fit the Bible's description as well, is that of substance-dualism. Nicholas T. Wright mentions that the Jewish view, in the time of Jesus Christ, was that the idea of bodily resurrection presupposed that a soul existed separate from the body (Goetz in Green & Palmer 2005: 33). René Descartes proposed that substance-dualism involves a dualist-interaction. The chemicals in our brain can produce an effect on our soul and emotional state. In addition, our soul and emotional choices can produce an effect on the chemicals in our brain. John Eccles conjectures that this action takes place at the point of firing and inhibition of each neuron. However, demonstrating the exact place of causal interaction is still an area that needs further research (Goetz in Green & Palmer 2005: 52-53).

How does God interact with creation? *Uniform Divine Action* is the idea that God is acting uniformly throughout all time on all events in history. Some would suggest that events in nature and history merely appear to be special acts of God revealing God's character and intentions, but in fact are part of the same process of Uniform Divine Action in God's continual creation/evolution of the universe (Russell 2001: iii). An example of this approach would be that of John Polkinghorne who holds that there is no difference between general providence, special providence, and miracles (1989: 50). Proponents of *Objectively Special Divine Action* suggest that events in nature and history do not merely appear to be special acts of God revealing God's character and intentions, but actually are objectively special. That is, they are a different kind of act of God than God's general actions on all creation throughout all time in history. The traditional understanding of this is referred to as *interventionist*. That is, God intervenes in the laws of nature and suspends them to perform a miracle.

However, an alternative understanding supports a different type of Objectively Special Divine Action. Instead, an act of God is done in a way that does not break the laws of physics. For example, the miracle of the parting of the Red Sea may be explained as a large gust of wind occurring at just the right moment, position and speed, according to Newtonian physics. This would be known as a *non-interventionist* approach to Objectively Special Divine Action (Russell 2001: iii-v). There are, in fact, several non-interventionist approaches: *Top-Down*, *Bottom-Up*, and *Lateral Amplification*. In the Top-Down approach, God is seen as either acting directly on the human soul to provide

revelation or at some boundary between the created universe and God Himself. The Bottom-Up approach proposes that God affects things at the level of quantum physics which ultimately aggregate together to fulfill the will of God. The Lateral Amplification approach suggests that God performs His special acts through complex physical processes which operate according to Chaos Theory (Russell 2001: v).

Alvin Plantinga argues for objectively special miracles though he recognizes that the definition of a miracle involves answering questions about issues such as Occasionalism (2000: 395). C. S. Lewis also provides rational argument for an intervention (1947: 15). Craig Keener defines intervention as "an extraordinary event with an unusual supernatural cause" (2011: 110). Louis Berkhof also affirms the interventionist approach to miracles, stating that the existing laws of physics are not violated. Rather, the law at that moment is superseded by the will of God. The normal laws of physics are not destroyed, suspended, or stopped. Rather, they are considered counteracted (Berkhof 1996: 177). Wolfhart Pannenberg sees in the pattern in Biblical wisdom literature God's regular cosmic action and God's irregular historical action as evidence that the laws of physics themselves are contingent, thus allowing for objectively special miracles as simply a less frequent form of contingent action (1994: 68-71).

There are many examples in the Bible in favor of non-interventionism, where God uses factors such as disease and weather to perfect His will. Therefore, God perhaps could choose to operate within the laws of physics as we understand them today, acting at a boundary point between creation and Himself. There are two approaches to how quantum physics might interact with providence. Murphey argues that God intentionally acts in every quantum event. Tom Tracy believes that God only intentionally acts in certain quantum events. The former seeks to describe God's Uniform Divine Action, while the latter seeks to describe God's Objectively Special Divine Action (Russell 2001: 315-17). The former fits well with the Bible's description of God's providence through His preserving will. The latter fits well with the Bible's description of God's providence through His cooperative and governing wills.

Bradley Monton maintains that, if one follows the GRW interpretation, miracles as Objectively Special Divine Action are perfectly compatible with quantum mechanics. Monton mentions the example of Jesus' changing water into wine. The subatomic particles which make up the water all happen to

have GRW hits in such a way that they rearrange into a form that would compose wine (Plantinga 2011: 95-96). Stephen Hawking suggests that quantum physics might interact with Einstein's relativity best through the theory of an 11-dimensional universe, where we currently have only observed four of the eleven dimensions (2001: 180). The four dimensions we are aware of would be considered a 4-dimensional surface, or *brane*. Gravity would be the one factor we know of which interacts with the other dimensions. Near our 4-brane might be another P-brane surface, known as a *shadow brane*, which would interact with it. The shadow brane could explain the observations about *dark matter*, since matter on the other brane could affect ours (Hawking 2001: 184). Hugh Ross states that the extra-dimensionality of the universe could explain the boundary between God and creation. That is, at any point in the four dimensions that we have observed, God could interact. This could apply both through interactions at a quantum scale as well as a macro scale. The analogy would be of a three-dimensional person sticking a finger through the surface of a two-dimensional universe (Ross 1993: 149).

The concern we have is to be careful regarding the God-of-the-gaps fallacy. The areas of the human soul, Chaos Theory, and quantum physics are all areas that lack full understanding. In the past, it was common to assume that areas where we lacked understanding would simply be explained by attributing it to God. Moreover, in many cases, we later gained some understanding that could potentially explain the situation. Though the boundary between God's action and creation is possibly at a point in the laws of physics where we are aware that we lack understanding, it is invalid to assume in advance that, merely from the gaps, it must necessarily be so.

Ross proposes that we also have to be aware of the opposite error. The "no-God" of the gaps fallacy is the assumption beforehand by researchers of the non-existence of God. Such an approach can ignore evidence for a divine or supernatural understanding of an observed event. One example of this was the continued adherence to a steady-state model of the universe without evidence (Ross 1993: 66). Another example is Richard Gott's theory of an infinite loss of information prior to the 10^{-43} seconds after the creation of the universe, which possibly could create an infinite number of universes, whereby ours is one viable for sustaining life (Ross 1993: 92). Just as with the God-of-the-gaps fallacy, the caution here is not to assume in advance that, merely from the gaps, it must necessarily be so.

Another possible concern is that even the idea of a boundary between God and creation is itself simply just a moving construct. As more is discovered, the more the boundary moves. However, this is to confuse the *epistemic* boundary of our current observed knowledge with the *ontological* boundary between God and creation. Michael Heller suggests that discussions of the ontological boundary should take into consideration the possibility that God's causal action may be non-local, similar to quantum physics, as well as non-temporal, in the sense of God acting from eternity outside of time (2003: 22). Dennis Polis notes that non-temporal causation is observable through extreme cases of quantum gravity, where time itself is disrupted, while causality continues to exist independent of space-time (2012: 56).

Brian Hebblethwaite presents a theory of providence and science that seeks to avoid the God-of-the-gaps fallacy. He argues that God acts through nature and history without there being gaps in the causal chain. He attributes this to the paradox of *double agency*, which is attributing an event to both God's action and a naturally and/or humanly created cause. Hebblethwaite describes this as God's continuous acting in and through the events of history (Russell 2000: 304-6). This fits well with Carson's theory of free-agency and the narrative of Genesis 50:20, which it is based upon.

CONCLUSION

Does God play dice? The arguments advanced in this essay lead to the conclusion that God, in fact, does not play dice. There is no *ontological* randomness in quantum physics or Christian theology that holds to the full-inerrancy understanding of the Bible. The randomness noticed in quantum physics is merely an *epistemic* randomness, and not an *ontological* randomness. Since conceptions of God's Providence often suggest intentional design, it is considered incompatible with randomness found in quantum physics. Yet Compatibilist theology explicitly denies ontological randomness (Grudem 2000: 315). Surprising to some, there are methodological parallels between a scientific and a theological approach. In a scientific approach, observations serve as raw data upon which a mathematical formalism is developed, upon which interpretations of the mathematical formalism are further inferred. In a theological approach, the inerrant words of the Bible in the original manuscripts serve as raw data, derived through textual criticism. Upon this, Biblical theology is formed through the literary and historical context where each book of the Bible is used to discover the Author's intended

meaning using the categories and topics for the originally intended audience. Upon this, a systematic theology is developed from a unified understanding of all of the books of the Bible, according to the categories and topics of interest to us today. From these methodological parallels between science and theology, one may attempt a systematic synthesis in quest of a larger theoretical framework to describe it all conceptually.

In sum, deterministic theories show how the discovery of quantum physics developed a new mathematical formalism. The logical positivist Copenhagen interpretation became the orthodox approach to quantum physics. Cramer came up with a time-based approach to quantum physics. In addition, the GRW theory moved the randomness from a generalized state of the particle to a "spontaneous localization." For non-deterministic theories, what is noticeable is that the de Broglie-Bohm theory clearly states that knowledge of the cause is theoretically possible, though difficult to find, while the Copenhagen interpretation denies the possibility of finding any cause to the epistemically random behavior. The Copenhagen interpretation has traditionally affirmed pure or ontological randomness (Maudlin 2005: 469). This assertion of the non-existence of a cause to the apparent randomness is a strong claim. Yet, no evidence has been provided to prove it beyond the argument from silence that we have not found a cause. Thus, for a theory of ontology, it would seem more tenable to hold the de Broglie-Bohm theory, which states that the quantum events merely indeterminable by us actually do have a fundamental cause. Nevertheless, one may use any of the theories, deterministic or non-deterministic, if one only has epistemic concerns.

Discussions about God as the fundamental cause vary. Open theism invokes a partial denial of God's knowledge of the future. Yet foreknowledge is God's ability to see into the future what people's choices would be. Molinism grants both a libertarian free will while also having a determined result. In contrast, Compatibilism is a form of soft-determinism that denies libertarian free will, but allows for human responsibility. This shows how God's responsibility overlaps with man's responsibility, and that God has both a hidden and revealed will. Providence is directly mentioned in the Bible through the Hebrew word, *yir'e* (to see), and the Greek word, *pronoia* (providence). Doctrinal problems are avoided by remembering that God is personally involved with creation while remaining distinct from it. Finally, God's providence is defined as God's continual involvement with all of creation by keeping it existing and maintaining the properties which He created

it with, cooperating with all creation in every action, giving direction to its distinctive properties to cause it to act the way it does, and directing it to fulfill His purposes.

To clarify the interaction between theology and quantum physics, there is a conceptual difference between continuous and discontinuous miracles. Substance dualism is the preferred relationship between the body and the soul. There is need to distinguish between Uniform Divine Action and Objectively Special Divine Action. The latter may be further subdivided into interventionist and non-interventionist. Interaction with quantum physics may be described as either God's action in every quantum event or His action in only some quantum events. Admittedly, the very idea of God's interaction with quantum physics remains conjectural. Nonetheless, this essay offers a framework for how the topics of randomness, Compatibilism, and divine Providence may be understood. The randomness is merely *epistemic*. *Ontologically*, divine Providence operates through Compatibilism. God does not play dice.

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James I. Lefeu, Masters in Computer Science and Divinity, graduate student in Systematic Theology, Trinity Evangelical Divinity School. C/o 253 W. Fairfield Ct., Palatine, IL 60067.
