

QUANTUM THEOLOGY: CHRISTIANITY AND THE NEW PHYSICS

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What fellowship has quantum theory with theology? While science and religion approach truth from different paths, they frequently ask the same questions and explore the same territory. Often what is postulated in one affects the other. Christians believe that certain characteristics of God are revealed in what he has made. An investigation of the creation gives us information about the Creator (Rom 1:20; Psalm 19).

Since the enlightenment our finely-tuned universe has been considered a powerful proof for the existence of an intelligent Creator. But in this century, quantum theory—the so-called “new physics”—has provided a strange twist in our understanding of creation.

On a practical level, quantum physics is the basis for innovations in technology. Lasers, computer chips and nuclear power all owe their discovery and development to the findings of quantum physics. But at the theoretical level the new physics provides a view of reality that is bizarre and disturbing.

The nicely organized world of classical physics is shattered by the implications of quantum theory, and the impact of the discoveries has gone far beyond the realm of physics. When he attended a conference on quantum physics Gary Zukav discovered to his surprise that “their discussion sounded very much like a theological discussion.”¹ William Craig has noted: “No serious religious thinker can ignore the tenets of the so-called new physics.”²

Some believe that the discoveries of the new physics provide a mandate to reevaluate the traditional understanding of God and reality. Because of the association often made between the new physics and the new-age movement, many Christians conclude that quantum theory is antagonistic to a Biblical view of God and his creation. This is not a necessary conclusion.

The purpose of this paper is threefold: (1) to give some basic information about the development and assumptions of quantum physics; (2) to describe

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¹ G. Zukav, *The Dancing Wu Li Masters* (New York: William Morrow, 1979) 23.

² W. L. Craig, “God, Creation and Mr. Davies,” *British Journal for the Philosophy of Science* (1986) 163.

the epistemological shift in the philosophy of science as a result of quantum physics; (3) to discuss and evaluate select applications of quantum physics to theological questions.

I. WHAT IS THE "NEW PHYSICS"?

1. *The rise of classical physics.* What is so new about the "new" physics? Before the impact of quantum theory can be understood, a brief explanation of the "old" physics is necessary.

The age of reason brought with it the giants of scientific thought who laid the groundwork for classical physics. Copernicus, Bruno, Kepler, Descartes and Galileo provided Isaac Newton with all he needed to explain motion in the universe. The astounding discovery that a multitude of physical facts could be explained by a few mathematical equations helped to reclassify the age of reason as the age of certainty.

It was not long before a mechanical philosophy of the universe dominated scientific thought. The universe, once unknown and capricious, became a huge clock ticking along inexorably. Every event was easily explained as a combination of known forces. If an event seemed out of the ordinary, the discovery of more facts held the answer to a complete explanation.

With the machine functioning so well, God was no longer necessary. When the Marquis de Laplace (1749–1847) uttered his famous statement to Napoleon that God was no longer a necessary hypothesis, science had adopted an atheistic (or at best deistic) worldview. The mechanical laws of the universe both determined and predicted every event.

This determinism was not limited to the physical world but became an important element in the more ambiguous nonphysical world as well. History, psychiatry and theology were couched in terms of extreme determinism. The concept of free will vanished in what is called the "nightmare of determinism."³ Ethics became an illusion, and human behavior was the solution to the equation of genetics plus environment.

At the beginning of the twentieth century the mechanistic view of the universe dominated scientific thought. While continuing discoveries of the nature of heat and light raised questions about Newton's model, for the most part the clock continued to tick.

In 1905 Albert Einstein, a clerk in the Zurich patent office, published a paper that developed a new theory of space and time. His theory, which was to be called the special theory of relativity, stated that it was impossible to measure a body's absolute motion since time and space are relative for every observer. Far from calling into question the assumptions of classical physics, however, Einstein's theories reinforced the notion that all physical laws are based upon unchangeable absolutes. The speed of light, for example, was a constant that formed the upper limit of physical speed and any kind of communication or influence.

³ F. A. Wolf, *Taking the Quantum Leap* (San Francisco: Harper, 1981) 44.

The basic assumptions of classical physics may be summarized as follows: (1) objective realism—observed phenomena are caused by a physical world that exists independent of human observation; (2) physical sufficiency—each act of motion or change in the universe can be explained by an analysis of all of the physical factors involved; (3) inductive validity—drawing inferences from consistent observations is a valid means of obtaining knowledge; (4) upper limit—no influence of any kind can be made faster than the speed of light.⁴

In retrospect, Einstein's work may be seen as the close of classical physics. Although his findings were based upon the notion of fixed natural laws, he opened the door for the new and bizarre world of quantum mechanics. Atomic physics became the focus of experimentation, and science has never been the same.

2. *The birth and growth of quantum physics.* Centuries ago Newton noted: "I do not know what I may appear to the world. But to myself I seem to have been only like a boy playing on the seashore, diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me."

Many feel that Newton's undiscovered ocean of truth is not found in the distant galaxies but in the subatomic regions. The exploration of the microworld uncovered a new and fascinating dimension of the physical universe. But much of what has been discovered conflicts with the basic assumptions of classical physics, and for many the conclusions have been painful. Nick Herbert writes: "One of the best kept secrets is that physicists have lost their grip on reality."⁵

The new physics is really not so new. Its theoretical and experimental basis was completed before 1930. Quantum theory was born when scientists began to explore the atom. In 1900 Max Planck discovered that blackbody radiation was emitted in "packets" (later to be called "quanta") of energy rather than in a continuous pattern. Five years later Einstein applied this theory to the photoelectric effect, demonstrating that light behaves as particles. The particle nature of light was confirmed experimentally by Arthur Compton several years later. These findings were disturbing because the wave nature of light had been accepted as a fact since 1820. How could light be both particles and waves?

As research into the nature and behavior of subatomic particles continued, the experimental results were baffling. At first it was thought that the elementary building blocks of the universe were atoms consisting of protons, neutrons and electrons. The atom was described as a tiny solar system that followed the classical physical laws of its larger counterpart. Further experimentation showed that such was not the case.

⁴ Adapted from *ibid.* 56 and B. d'Espagnat, "The Quantum Theory and Reality," *Scientific American* 241/5 (1979) 158.

⁵ N. Herbert, *Quantum Reality: Beyond the New Physics* (Garden City: Anchor/Doubleday, 1985) 15.

The atomic model of Niels Bohr (1913) and the application of the wave theory to matter by de Broglie ten years later opened the floodgates to atomic research that resulted in the Manhattan project and the atomic bomb. More peaceful uses of the findings of quantum physics are reflected in laser technology and nuclear medicine.

Contemporary particle physicists continue to find a vastly complex and crowded subatomic world. Over two hundred subatomic particles have been discovered (from “muons” to “charmed quarks”), but their discovery is not as surprising as the way these particles behave. While there are many aspects of particle behavior that conflict with the tenets of classical physics, three major characteristics dominate: observational contradictions, physical uncertainties and superluminal influences.

As mentioned above, the work of Planck, Einstein and others determined that light was both wave-like and particle-like. This truth applies not only to photons (light particles) but to other particles as well. The subatomic particle can be described either as a solid, finite particle (e.g. a billiard ball) or as a wave spread out over a large region of space (e.g. a radio wave). This contradictory description is further complicated by the fact that an observer can create either effect simply by the way he measures the particle. If he looks for particles, he sees particles; if he looks for waves, he sees waves. According to Newtonian physics both possibilities cannot be true.

But the quirks of the quarks do not stop there. To make matters more complicated, we are limited as to how much of a subatomic particle we can see. If we measure its location, we cannot know its velocity; if we measure its velocity, we cannot know its location. This somewhat irritating discovery, known as Heisenberg’s uncertainty principle, keeps scientists from getting a close view of the subatomic world.

Whereas classical physics allowed us to analyze and predict events with extreme accuracy, in the quantum world we are limited to uncertainty and probability. This is not to imply that causality does not operate at the subatomic level. It is simply that no particular cause can be proven to yield a particular outcome.

A most startling discovery in the realm of quantum physics questions Einstein’s upper limit of the speed of light. Certain experiments have shown that a pair of particles can fly away from each other for a great distance and yet behave as though they were one particle.

For example, imagine two billiard balls smacking into each other and rolling apart for several miles. If we were to catch up with one of them and stop it, the other ball would continue rolling along. But not in the subatomic world; whatever we do to one particle immediately affects the other. If we stop one billiard ball, according to quantum theory the other one immediately stops too. Somehow information is transmitted faster than the speed of light—a “physical” impossibility. Such a reality again calls into question the classical understanding of cause/effect, the fundamental principle for certainty in knowledge.

In 1964 Irish physicist John Bell developed a theorem that explained some of the discoveries of quantum physics.⁶ His theory simply claims that any model of reality must be connected by influences that travel faster than the speed of light. Bell's theorem, which is a mathematical formula, has been demonstrated experimentally.⁷

The laws of classical physics operate very well in our everyday world, but the findings of quantum physics make us question whether we really understand the universe. The mechanical clock is smashed, at least at the subatomic level. The only certainty is uncertainty. All of the traditional categories of description for our orderly universe are thrown into disarray.

The late Nobel laureate Richard Feynman stated: "I think it is safe to say that no one understands quantum mechanics. Do not keep saying to yourself if you can possibly avoid it, 'but how can it be like that?' because you will go 'down the drain' into a blind alley from which nobody has yet escaped. Nobody knows how it can be like that."⁸

II. THE DILEMMA OF THE NEW PHYSICS

The earliest recorded philosophers asked the most basic question: "Of what is everything made?" These Milesian philosophers proposed various answers to the question: water, air, the *apeiron*. They felt that knowing the basic stuff of the universe could provide answers to any number of questions about the how and why of our existence.

Quantum theory wrestles with some of the same questions. It is assumed that taking apart the basic building blocks of matter should answer many of the ultimate questions about existence and life. Out of quantum physics have come theories concerning the fundamental forces of nature and the origin of the world.

Modern physics, however, finds itself in a dilemma: The micro-universe is uncertain, unpredictable, and at this point impossible to describe, while the macro-universe is very orderly, neatly arranged and predictable. The result is a scientific schizophrenia about the nature of reality.

Stephen Hawking and others are attempting to find a scheme of reality, a grand unifying theory, that will explain both classical physics and quantum theory. Putting the two together is the holy grail of modern physics.⁹

Classical physics was nice and neat. An orderly universe proved an orderly God. Even nontheists considered the design of the universe to be

⁶ J. S. Bell, "On the Einstein-Podolsky-Rosen Paradox," *Physics* 1 (1964) 195.

⁷ See d'Espagnat, "Quantum Theory" 172-173, for a list of experiments conducted in the 1970s. More recently A. Aspect of the University of Paris performed a series of experiments providing an experimental basis for Bell's theorem; cf. A. Aspect, J. Dalibard and Gerard Roger, "Experimental Test of Bell's Inequalities Using Time-varying Analyzers," *Physical Review Letters* 49 (1982) 1804.

⁸ Herbert, *Quantum* xiii.

⁹ See L. Jaroff, "Roaming the Cosmos," *Time* (February 8, 1988) 58-60.

the strongest argument for a Creator. But quantum theory no longer allows us to assume that science bows to irrevocable natural laws.

Like many scientific theories it has taken half a century for quantum physics to filter through the scientific community and find its way into popular expressions. Philosophical and religious applications now abound. Books such as Capra's *The Tao of Physics*, Zukav's *The Dancing Wu Li Masters* and Wolf's *Taking the Quantum Leap* have applied some of the implications of quantum theory to "prove" everything from monistic pantheism ("The universe is an undivided whole") to positivism ("We create our own reality").

There is no general agreement among specialists as to how quantum physics is to be interpreted and applied. Nick Herbert describes eight different views of the physical universe that are currently held among quantum physicists.¹⁰ Theologically, quantum theory has been utilized to produce a number of theories about God and reality. Three of the more popular views will be summarized here.

1. *Positivism: Now you see it . . .* The most widely-held view among quantum physicists is that physical objects exist only if and when they are perceived. In the early 1700s the empiricist George Berkeley asserted a similar view of reality: "To be" is "to be perceived." His views were rooted in his philosophical and theological assumptions. Modern physics arrives at the same conclusion on the basis of experimental data.

This view, developed by physicist Bohr and known as the "Copenhagen interpretation," is essentially an antirealist position. Such a positivistic approach rejects the existence of an objective world independent from human observation. We create our own reality by our perceptions. Nothing exists until it is observed. Pascual Jordan concluded: "Observations not only disturb what has been measured, they produce it. . . . We compel [the electron] to assume a definite position. . . . We ourselves produce the results of the measurement."¹¹ The practical implications of this view are seen in the statement by Cornell physicist David Mermin: "We now know that the moon is demonstrably not there when nobody looks."¹²

Einstein protested vigorously to such a view of the universe. He was convinced that "the belief in an external world independent of the perceiver is the basis of all natural science." He once wrote to a colleague: "I am convinced that God is not playing at dice" with the universe.¹³ But today his views are counted among the minority.

Biblically, Christians are committed to realism—the belief that the universe actually exists apart from observation. God created the world before there was any human observer to bring it into existence.

¹⁰ Herbert, *Quantum* 16–29.

¹¹ Quoted by M. Jamner, *The Philosophy of Quantum Mechanics* (New York: Wiley, 1974) 151.

¹² D. Mermin, "Quantum Mysteries for Everyone," *Journal of Philosophy* (1981) 397.

¹³ *The Born-Einstein Letters* (New York: Walker, 1971) 91.

To take an antirealist position is to trivialize science as a study of nature.¹⁴ Einstein's comment is appropriate: "I cannot imagine that a mouse could drastically change the universe by merely looking at it." Is it really so absurd to believe that our observations genuinely apprehend that which is objectively real?

Further, scientific positivism and philosophical positivism are close cousins. Rather than dealing with the truth value of metaphysical questions, positivism renders the whole inquiry as meaningless. But scientific positivism suffers the same malady that afflicts philosophical positivism: It fails to meet its own criteria for meaningfulness. The statement "Only that which is perceived actually exists" is an imperceptible and therefore nonexistent assumption.

2. *Pantheism: the new physics and the new age.* While most physicists seem to acknowledge an observer-created universe, popular books draw strong parallels between quantum physics and eastern mysticism. Capitalizing on Bell's theorem, Capra and Zukav describe the universe as an undivided whole. Perception provides only a fragmentary view of reality. Superluminal transfer of information demonstrates that all things are one. Frequent references to eastern religions (Capra devotes five chapters to "the way of eastern mysticism") are employed to "explain" quantum experiments and subatomic motion.

For example, Capra relates subatomic motion to the mythical dance of a Hindu deity: "For the modern physicist then, Shiva's dance is the dance of subatomic matter."¹⁵ Zukav concurs but provides a different dance partner: "Physicists are doing more than 'discovering the endless diversity of nature.' They are dancing with Kali, the Divine Mother of Hindu mythology."¹⁶

Thus, explaining nature becomes nothing more than describing and experiencing the unity of all things. While Capra admits that a mechanistic worldview is helpful for technology and the practical areas of life he concludes that the organic eastern mystical view is helpful for a balanced and fulfilled spiritual life.¹⁷

The pantheistic explanation is by far the most explicit application of quantum theory to the nature of God and reality. The wedding of quantum theory to eastern mysticism has been used by many to give scientific "proof" to a new-age worldview. Some of the more popular books are blatantly evangelistic in their attempt to convert readers to a pantheistic view of the universe. Even the Bible is used for support. Take this example given by Wolf: "The first case of quantum consciousness may have been Moses. When he asked, 'Who are you?' of the presence felt at the burning

¹⁴ See d'Espagnat's defense of realism in "Quantum Theory" 177.

¹⁵ F. Capra, *The Tao of Physics* (Boulder: Shambala, 1975) 233.

¹⁶ Zukav, *Dancing* 330.

¹⁷ Capra, *Tao* 293-298.

bush, the answer: 'I am that I am.' Moses then recognized that within him, the god voice spoke as Moses. And from that moment onward, humans began to control their destiny."¹⁸

Quantum theory may be friendly to pantheism, but it is also friendly to a host of other worldviews. The new physics no more proves the new-age philosophy than it proves any of the others. At its heart new-age philosophy is nothing more than old-age pantheism. Such a worldview founders on the basic problems traditionally faced by eastern religions: the question of evil, the problem describing how individual self-consciousness can arise from a universal, impersonal force, and so forth.

3. *Finite theism: the quantum creator.* From another perspective P. C. W. Davies¹⁹ uses quantum theory to argue against an infinite, omnipotent, creator God. How? By rejecting the Christian view of creation *ex nihilo* by a supernatural God. His view of creation is taken from certain experiments performed on particle conversion. The matter of the universe, says Davies, sprang into existence in space as the result of a quantum conversion of energy. The total balance of energy in the universe is still zero after creation, so no new source of outside energy was necessary to effect the material universe. Thus it is not necessary to postulate a creator God with omnipotent and infinite characteristics. He is a natural, not a supernatural, God.

Davies' portrait of a God with limited power is an inference from certain experiments where subatomic particles are brought into existence in a vacuum fluctuation. His conclusions are based upon this claim: "The world of quantum physics routinely produces something from nothing."²⁰ Such a claim is unfounded and misleading. Quantum physics has never discovered something being created from nothing. Even in quantum physics, basic laws such as the conservation of energy and momentum are in effect. As Craig points out, the experiments to which Davies refers require preexisting energy in a system for there to be any conversion of energy into matter.²¹ Nothing in these experiments argues against belief in a personal, omnipotent, infinite God.

III. A CAUTIOUS APPRAISAL

These views of God and reality are unnecessary interpretations of the facts of quantum physics. Most physicists recognize that science is a limited enterprise that is not designed to prove or disprove the existence of God or other metaphysical claims. Even Hawking admits that if there is an edge of the universe "you would have to invoke God."²²

¹⁸ Wolf, *Quantum Leap* 245.

¹⁹ P. C. W. Davies, *God and the New Physics* (London: J. M. Dent, 1983).

²⁰ *Ibid.* 216.

²¹ Craig, "God, Creation" 165-169.

²² "God as the Edge of the Universe," *The Scientist* (February 23, 1987) 15.

But what are we to make of quantum theory? Does it shatter the tenets of classical physics and thrust us into epistemological uncertainty?

While the findings of the new physics are somewhat disconcerting, they do nothing to alter a Biblical perspective of the world. Too many opportunists have trumpeted quantum theoretical claims while so many questions remain unanswered. Three considerations should make us cautious in the application of quantum physics to philosophical and theological questions.

1. *Too much of too little.* There is still much work to be done. Science is limited in its ability to see the subatomic world. Most of the work in quantum physics is performed in high-speed accelerators that smash together atomic particles and measure the result, much like studying a ping-pong ball by shooting it with bullets. Experimental efficiency and accuracy remain a problem.

While quantum physics continues to focus a great deal of attention on the basic building blocks of nature, we must raise some questions about the legitimacy of the task to give us a comprehensive view of reality. Although there is some validity in the approach, the overall effect seems to be a case of reductionism.

Is the subatomic world more real than the larger realm in which we live? Can studying atomic particles actually define what is real in the world where these particles come together to form real things in the macroworld?

Add to this the simple puzzle that arises when we observe the effects of real-world objects. No one has ever seen a quark or a lepton. They are by their very nature incapable of observation. What relationship do particles, which possess no secondary qualities (i.e. qualities that are empirically observable), have to objects that are perceived in the world? Are they more real? Less real?

The differences between the macro- and the microworld might be explained by postulating different "levels of reality" as Heisenberg does,²³ but here is a case of applying a metaphysical construct to solve a scientific quandary. This is of course no problem to the Christian who would enjoy a lively and honest discussion over competing metaphysical schemes.

These and other puzzles do not negate the importance of particle research but serve as a reminder that such research needs to be kept in perspective.

2. *A change in thinking.* The most paralyzing jolt from quantum theory is delivered by its attack on the once-sacred tenets of classical physics. No longer will facile models and formulae explain the nature of the universe. Scientists will probably continue to find more and more subatomic particles. The world will continue to look more and more bizarre—but this may

²³ W. Heisenberg, *Physics and Philosophy* (New York: Harper, 1958) 186: "The atoms or the elementary particles are not as real; they form a world of potentialities or possibilities rather than one of things or facts."

be more of a commentary on our lack of imagination than evidence of an irrational universe.

We should not be afraid to butcher a few sacred cows if it means a better comprehension of reality. There is nothing in Scripture that dictates Newton's view of physics or Boole's view of reason. We must not forget that we have experienced a change in our thinking many times before. For example Euclidean geometry, once considered the unchangeable framework for describing motion in space, was found to be spatially limited. Einstein's theory of relativity changed the way we think about time and space, and now non-Euclidean geometry functions in places once considered unknowable.

Such a change in thinking from classical Boolean logic may be necessary before the full implications of quantum theory can be logically understood.

3. *No one interpretation.* It is instructive that the findings of quantum theory have been viewed as supporting a variety of worldviews. No one view of reality has cornered the market on quantum application. For this reason, to dogmatically assert that quantum physics "proves" a particular scheme of reality is suspect. Quantum physics is still at the how and what stage. Useful facts are discovered (e.g. a neutron will decay radioactively in about seventeen minutes), but little is known about why these facts are true.²⁴

Christians must be cautious in drawing close parallels between theology and physics. Once the determinism of Newton's physics was used to demonstrate the determinism of God's plans. Now some Christians and non-Christians are pointing to the indeterminism of quantum theory to defend the concept of free will. The appropriateness of such an analogy is obviously questionable.

Further, the whole has not been told. The new physics is still in a state of transition. Many who are conversant with quantum theory realize that the tentative findings may be just a theoretical flash before a more comprehensive explanation is found. Quantum physics may go the way of all flashes and end up in the physics graveyard with luminiferous ether and other displaced theories.

For the time being, Christians and everyone else will have to put up with the outrageous overstatements of popularizers. As Ronald Mirman notes: "People want to believe that the world is weird, strange, incomprehensible."²⁵ John Leslie cautions that intellectual laziness may be a cause for many scientific views about the universe.²⁶

²⁴ See M. W. Browne, "Quantum Theory: Disturbing Questions Remain Unresolved," *New York Times* (February 11, 1986), III, 3:1.

²⁵ In *Physics Today* (November 1983) 136.

²⁶ J. Leslie, "Anthropic Principle, World Ensemble, Design," *American Philosophical Quarterly* 19/2 (April 1982) 149. Leslie was specifically referring to the various "many-worlds" theories that attempt to explain the evidence of design in the universe.

The subatomic world—small, imperceivable and irretrievable—has drawn us into a mysterious realm of awesome power and design. It is here that we become acutely aware that God's might is present at every point in his creation. G. K. Chesterton reminded us that "the first and most thrilling of all lessons of the universe . . . is the infinite and terrible power of small things."

What does quantum physics reveal? That our world is more complex than most have ever dreamed. One scientist has noted that the universe seems "strangely overbuilt." Why is there such an intricate reality underlying a world that functions so ordinarily? He muses that it is as if God has created a beautiful, intricately-patterned golden chair and then overlaid it with common wood. The outside looks ordinary and functional, but within is a treasure waiting to be discovered and explored.