How Science Discovered God

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It is no secret that physicists today have been brought, by the implications of their own theories, fact-to-face with God – whether or not they choose to believe in Him. The eminent Cambridge mathematics professor Stephen Hawking, in his best-selling book *A Brief History of Time*, continually addresses questions about Creation and the role of a Creator. Hawking takes great pains to explain how and why questions about God and His importance to the very existence of the universe have recently become important to physicists. The results of advanced research compel them to ask questions that were left in the province of religion until now. Questions such as: Is the universe the product of a fortuitous sequence of events? Or is it the product of a great design? Why is the universe the way we observe it? Who selected the initial conditions that produced such a precise and unique universe?

This new interest in the design behind the universe is not a result of philosophical musings or vague speculations, but of rigorous mathematical calculations based on the laws of particle physics, quantum mechanics, and the general theory of relativity.

The most advanced theories now being explored and tested demand answers to these questions about the reason of our existence. Theoretical physicists are now engaged in a serious quest for a complete description of reality – the observed universe and the meaning of it all. It is hoped that such a description of reality can be found and made an integral part of the quantum theory of the universe. In the search for this description, scientists who believe in God and those who do not are arriving at the same conclusions regarding the creation of the universe and its continuing existence. A growing number of serious researchers are defying recent scientific tradition and admitting that it is at least possible that the universe has a Creator. Some are going even further and declaring that God as Creator may be the only answer to the ultimate questions about existence.

What is causing this revolutionary change in scientific thought? For several decades classical cosmology, a theory of the universe based on the general theory of relativity alone, was the principal explanation of the observed characteristics of our universe. According to this theory, the big bang model was an adequate explanation of how the universe began. Cosmologists thought this model provided a nearly complete understanding of the universe. But the big bang model placed the very beginning of the universe beyond the scope of science. Questions regarding the nature of the universe and its condition prior to one second after its creation remained unanswered. Cosmologists believed that the early universe was a result of special initial conditions that they were content to leave outside the scope of their theories. But recent developments in physics have brought them to realise that if cosmology is to truly understand the universe, these questions must be faced.

The well-designed universe

The new cosmology is based on the quantum theory of the universe, a theory that has developed from efforts to merge the implications of quantum mechanics with the general theory of relativity. The goal of the new cosmology is to develop a precise mathematical definition of the properties of our universe, from subatomic particles to the largest structures. In the quest for this definition, scientists determined that unique initial conditions were necessary to bring about the existence of intelligent life in our universe. In addition the calculations indicated that these conditions could not have been a product of chance. So the evidence led them to look for an intelligent plan and planner behind the initial conditions.

Thus in their search for a logical explanation for our existence, scientists were forced to dust off the centuries-old "by design" argument and begin a serious investigation of the possibility that a Creator selected the constants that govern the behaviour of our universe.

The universe by design argument, as it relates to study of the properties of our universe, compelled scientists to give new consideration to the anthropic cosmological principles. These principles become important to physics because quantum mechanics makes it clear that nothing can really exist unless there is an intelligent observer whose observation makes it real. In other words, scientists are discovering that the existence of the universe is inseparably tied to the existence of intelligent beings in it.

The anthropic cosmological principles

Since quantum mechanics requires observers, the anthropic principles are needed to help find a link between the properties of the universe and the intelligent observers.

There are three anthropic cosmological principles: the weak anthropic principle, the strong anthropic principle, and the final anthropic principle. The weak anthropic principle states that certain properties of the universe are necessary if it is to contain carbon-based life like us, and that our observation of these properties is restricted by our very special nature. The strong anthropic principle states that the universe must have dimensions and properties that allow life to develop, because intelligent observers are necessary for the universe to exist. The final anthropic principle holds that intelligent information processing must come into existence in the universe, and that once it comes into existence it will never die out.[1]

A little background may help to explain the basis of these conclusions about the necessity of an observer.

Understanding the universe

The basic constituents of matter, such as electrons, possess a dual nature. They can be observed either as a point particle or as a wave, but not as both at the same time. Furthermore, all the matter and energy in the universe is made up of "packets" of energy called quanta. Radiant energy cannot be emitted in quantities smaller than a quantum, and must be emitted in multiples of a quantum.

In other words, the subatomic world is not a uniform soup, but is somewhat lumpy because everything comes packaged in quantum-sized lumps. Quantum mechanics was developed to help explain or account for this lumpiness.

But in many ways quantum mechanics only made the real nature of the subatomic world more confusing. An electron, for example, possesses properties of spin, momentum, position, and charge. But only one of these properties can be observed in a given time and laboratory setup. If an experimenter wants to observe another property of an electron, he must do so in a separate attempt at another time, employing a different electron in a different apparatus. Furthermore, the experimenter must decide, prior to the experiment, which property of an electron he wants to observe, and must specify exactly how he plans to observe it. An experimenter is required to decide in advance not only which property he wants to observe, but also what an electron is to be – a point particle or a wave. In addition the experimenter can, by what he decides now, in some sense influence how an electron shall have behaved in the past.[2]

When these puzzling facts about the nature of atomic matter were revealed in laboratory experiments, the revelation stimulated considerable discussion about what particles really are and what all this means about the reality of our universe.

To clarify the nature of the atomic world, Niels Bohr, director of the Institute for Theoretical Physics in Copenhagen, proposed what is believed to be a consistent interpretation of quantum mechanics. This is commonly referred to as the Copenhagen interpretation. According to this interpretation, the experimenter in his capacity as an intelligent observer is an essential and irreducible feature of physics.[3] In addition the interpretation states that before an experimenter can make sense of what an electron is doing, he must specify the total experimental context. It appears that the quantum reality of microworld is inextricably entangled with the organisation of the larger world. The part has no meaning except in relation to the whole.[4]

But an experimenter in the laboratory can, by his observation, bring into concrete reality only a single property of an electron, not the electron itself. When this experimental fact is projected onto the entire observed universe, the result is shocking. It appears that some larger system or a final observer is required if the universe is to be what it is.

This implication of the Copenhagen interpretation came to light at a time when theology and science were on diverging paths in their description of reality. So most scientists, at first refused to even consider the need of a final observer for fear of being ridiculed as religious nuts.

Mathematician John von Neumann attempted to add mathematical credibility to the Copenhagen interpretation by formulating an axiom that recognises the need for a chain or series of intelligent observers if the universe is to be what it is. But his axiom also states that there can be no last observation and therefore, no final observer. The axiom, however, did not resolve the matter, and scientists remained unsatisfied. For many years scientists' inability to explain away the need for a final observer helped keep this shocking implication of quantum mechanics, and inquiry into its meaning, isolated among a closed circle of scientists. They discussed it more as a form of amusement than as a serious study.

Even though experiments demonstrated the validity and accuracy of quantum mechanics, scientists refused to admit that the implied need for an ultimate observer had any importance.

But recent work on the quantum theory of the universe has stimulated new interest in the implications of the anthropic cosmological principles. As a result, and increasing number of scientists are coming to believe that there is an ultimate observer, and some are now willing to refer to that probable being as the Creator, or God.

John D. Barrow and Frank J. Tipler believe that the fact that we, as intelligent observers, can bring into existence only a small-scale property like the spin of the electron leads to the conclusion that there is an ultimate observer who is responsible for co-ordinating separate intelligent observations and bringing the entire universe into concrete existence. They go on to state that "this joining of a sequence of observers continues – and even includes the observations made by different intelligent species elsewhere in the universe – until all sequences of observations by all the observers of all intelligent species that have ever existed and will ever exist, of all events that have ever occurred and will ever occur are finally joined together by the final observation by the Ultimate Observer."[5]

Merging quantum cosmology with the anthropic principles leads to the conclusion that the sequence of observers recognised by Von Neumann's axiom can be extended to include an ultimate observer because the ultimate observer is not limited by being a part of the universe to which quantum law applies. In other words, the ultimate observer is not subject to the laws of quantum mechanics that govern our observed universe, and hence is not subject to the conditions of Von Neumann's axiom.

Who is the ultimate observer?

Once their calculations had made room for an ultimate observer, scientists began to try, without much success, to find out mathematically what or who the ultimate observer is. Paul Davies, a theoretical physicist, notes that "in recent years physicists have been interested in the subject of quantum cosmology – the quantum theory of the entire universe. By definition, there can be nothing outside the universe to collapse the whole cosmic panorama in to concrete existence (except God, perhaps?)."[6]

Developments in the field of quantum cosmology led to consideration of the possibility that space and time together might form a finite four-dimensional universe without singularities or boundary. Singularity is a mathematical point at which all known laws fail to function and matter no longer exists. Big bang cosmology assumes that the universe originated as a singularity that exploded to form all the matter and energy that compose the universe.

The absence of singularities could be taken to imply that the universe never had a beginning and will never collapse, but will continue to exist forever. The finite, but unbounded universe may be compared to the surface of the earth. One could travel around the earth forever without finding the end or the beginning of the surface. In like manner, the universe may be finite but without boundaries. This property of the universe plays an important part in our understanding of the nature of reality. Stephen Hawking contends: "But if the universe is completely self-contained, with no singularities or boundaries, and completely described by a unified theory, that has profound implications for the role of God as Creator."[7]

The universe as defined by the new cosmology requires unique and special conditions that must be selected a priori. In pondering an answer to questions about the initial conditions and what or who selected them, Hawking suggests the "one possible answer is to say that God chose the initial configuration of the universe for reasons that we cannot hope to understand. This would certainly have been within the power of an omnipotent being." He goes on to point out that "it would be very difficult to explain why the universe should have begun in just this way, except as the act of God who intended to create beings like us."[8]

Hawking's final conclusion does not require that the universe has a Creator, but he certainly leaves the door open. He concludes his book by commenting that if we ever should find the answer to why the universe exists, "then we would know the mind of God."[9]

Science and theology are coming to the same conclusions – we need God. Theologians need no longer apologise for making a leap of faith – scientists are coming to see the necessity of this leap. Even though cosmologists are far from claiming to be able to prove that God exists, the evidence certainly points strongly to the need of a Creator. In his summary of the dilemma of the new physics, Dr. Tony Rothman gets almost theological: "The medieval theologian who gazed at the night sky through the eyes of Aristotle and saw angels moving the spheres in harmony has become the modern cosmologist who gazes at the same sky through the eyes of Einstein and sees the hand of God not in angels but in the constants of nature…

"Even as I write these words my pen balks, because as a twentieth-century physicist, I know that the last step is a leap of faith, not a logical conclusion…

"When confronted with the order and beauty of the universe and the strange coincidences of nature, it's very tempting to take a leap of faith from science to religion. I am sure many physicists want to. I only wish they would admit it."[10]

In his recent book *The Great Design*, Dr. Robert K. Adair, associate director of Brookhaven National Laboratory, contends: "Physicists are searching for a simple idea that fits the complexity of experience so well that the fit cannot reasonably be accidental. Perhaps we are close to God's Equation; perhaps we are far away. But most physicists believe that we are at a point in scientific history when a search for that Equation can be sensibly conducted."

And in pondering the utility of scientific inquiry into Creation, Dr. Adair draws a conclusion that may offend some who believe that the Bible teaches that all the matter in the universe was created just 6,000 years ago, but will prove encouraging to other creationists: "Although the world is not flat and was not constructed 6,000 years ago, physicists know nothing that contradicts the cores of various religious beliefs held by most people today, and some have found a deeper faith as a result of their inquiry."[11]

It is clear that research in quantum cosmology points researchers' minds toward God. This new development in science may have come as a surprise to scientists and some religionists, but theologians have always known that the heavens declare the glory of God!

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[1] John D. Barrow and Frank J. Tipler, *The Anthropic Cosmological Principle* (New York: Oxford University Press, 1986), pp. 15-23.
[2] P.C.W Davies and J.R. Brown, *The Ghost in the Atom* (Cambridge, Mass.: Cambridge University Press, 1986), pp 9-12.
[3] Barrow and Tipler, p. 458.
[4] Davies and Brown, p. 12.
[5] Barrow and Tipler, pp. 470, 471
[6] Paul C. W. Davies, *God and the New Physics* (New York: Simon and Schuster, 1983), p. 116.
[7] Stephen Hawking, *A Brief History of Time* (New York: Bantam Books, 1988), p. 174.
[8] Ibid., pp. 122-127
[9] Ibid., p. 174.
[10] Tony Rothman, "*A 'What You See Is What You Beget' Theory*", Discover, May 1987, p. 99.
[11] Robert K. Adair, *The Great Design* (New York: Oxford University Press, 1987), pp. 345, 365.