

The Challenge of Quantum Physics for Atheism: A Reflection on Science and Faith

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This opinion piece by Dr Nick Hawkes ponders the significance of quantum physics for theology and proposes that the necessity of an observer “for matter to exist in physical form” is an argument against atheism: reality needs God as the external “observer.”

Abstract

Both science and theology are concerned with uncovering truth, and as such, both disciplines can work together. One of the things theology can do is put science into a bigger picture. Theology is able to frame science’s “how” with theology’s “why.”

This paper takes a theological look at the quantum world’s famous “double slit” experiment. Here, it was found that a subatomic particle collapses from being a “cloud of potential” that is in superposition with itself, into being a tiny piece of matter only when it is observed. In other words, consciousness, either on the part of the observer, or the subatomic particle, is required for matter to exist in physical form. This presents problems for atheism. An atheist should not exist as a physical reality unless his or her constituent particles have first been intentionally observed.

And for that to happen, you would need God.

If God exists, and is rightly described in the Bible, then scientists and theologians could well benefit from looking at each other’s work. Of course, neither discipline should be controlled or bullied by the other. Humankind largely got over that sort of silliness centuries ago. Both disciplines are concerned with uncovering truth. And as such, both have something to contribute. Put bluntly, science can stop theology from making stupid claims; and theology can help free science from its narrow, empiricist prison.

If Christianity is right, God has drawn progressively closer to us in four steps. First, he shows us the probability of his existence in the wonders of creation (Romans 1:20; Acts 17:24–27). The order, beauty, and rational accessibility of the universe can be appreciated by anyone, but the details of its workings are understood by science, not theology. God then comes closer, and reveals something of his nature to his chosen prophets in the Old Testament. They record their experiences in documents that begin to make up Scripture. Then, God comes closer—and now comes to us in person, as Christ Jesus. Jesus is the perfect “icon” (representation) of God, because he is God (Colossians 1:15-20). He shows

us what God is like, and he pays the price for our sins so we can be with God. Finally, God comes even closer: he comes within us by his Spirit—to empower his followers for mission, and to build a godly character in them.

If this is true, then Christianity is well positioned to put science into a bigger picture. Theology is able to frame science’s “how” with theology’s “why.” As such, the two disciplines should at least be civil enough to raise their hats to each other. Sometimes they can do more. The recent discoveries of quantum physics are very exciting and should be of great interest to theologians—not least because they show that atheism (which says that there is no god) is a worldview that is scientifically unlikely. Let’s look at two things:

- how theology can point out issues relevant to science, which would help scientists understand the order they see in the universe.
- how science can enrich theology, by showing how quantum physics makes atheism highly implausible.

Order

First, let’s turn to a remarkable feature of the universe—its extraordinary order; and explore how theology can point out a possible truth concerning this order to science.

The Judeo-Christian Scriptures teach that God has chosen to reveal himself—at least in part, in creation. This idea was given prominence in seventeenth-century England by the concept of there being “two books,” which were able to point people to God. These were a) the Bible and b) the wonders of creation. The idea was that something of God’s nature could be understood through the study of the natural world. The famous seventeenth-century scientist, Robert Boyle, wrote:

When with bold telescopes I survey the old and newly discovered stars and planets ...
when with excellent microscopes I discern nature’s curious workmanship, when with the
help of anatomical knives and the light of chemical furnaces I study the book of nature ... I
find myself exclaiming with the psalmist, “How manifold are thy works, O God, in wisdom
hast thou made them all!” (1997, 32)

Boyle was able to celebrate the two disciplines of science and theology, declaring, “as the two great books of nature and Scripture have the same author, so the study of the latter does not at all hinder the inquisitive man’s delight in the study of the former” (Boyle, 1674).

Thomas Brown, physician and author (1605–1682), was another who was convinced of the veracity of both the Bible and nature in revealing God. He wrote:

Thus are there two books from whence I collect my divinity: besides that written one of
God, another of his servant nature, that universal and publick (sic) manuscript, that lies

expanded to the eyes of all. Those that never saw him in the one have discovered him in the other. (1642, sec. 16.18–19).

This seventeenth-century sentiment continues to be voiced today. Francis Collins, who directed the thirteen-year project that identified the 3.1 billion letters of the human genome, says:

I have found there is a wonderful harmony in the complementary truths of science and faith. The God of the Bible is also the God of the genome. God can be found in the cathedral or in the laboratory. By investigating God's majestic and awesome creation, science can actually be a means of worship. (Collins, 2007)

Mathematics has been another tool used by scientists to lay bare the order of the universe. One of the areas this has occurred has been in the field of quantum physics.

Quantum physics seeks to understand the world of subatomic particles. The scientific laws of this branch of physics are very different from those that operate in Einstein's world of "special relativity." Whilst quantum physics looks at very small objects, special relativity looks at objects which are very fast. The discontinuity between these two branches of physics caused the English physicist, Paul Dirac, to wonder what would happen if the two sets of laws were brought together, and an electron was accelerated so that it went very fast. He worked out from mathematics that the only way the two branches of physics could be resolved, was if a totally new object existed—a positively charged, mirror image of the electron. He called this theoretical particle a "positron." The positron was the anti-matter counterpart of an electron. Four years later, the American Physicist, Carl Anderson, discovered the positron using a cloud chamber. The significant thing about all this is that a particle was discovered by mathematics—before it was discovered in reality.

Paul Dirac later reflected on the power of mathematics, and why the universe was constructed along beautiful mathematical lines. He said: "God is a mathematician of a very high order, and he used very advanced mathematics in constructing the universe" (1963, 208:45–53). The Hungarian-American theoretical physicist, Eugene Wigner, expressed a similar thought. He spoke about the "unreasonable effectiveness of mathematics in the natural sciences" (1960, 13:1).

A more recent example of the faith scientists have in the power of mathematics occurred when their calculations persuaded a research team to spend \$4.75 billion to build the Large Hadron Collider, near Geneva. Their faith in mathematics was rewarded in 2012 when they found the Higgs boson, a subatomic particle they reasoned must exist as a result of mathematics.

Mathematics is the scientific language of the universe—and this is only made possible because the universe is so incredibly ordered. Quite simply: order is the big surprise of the universe.

Order in chaos

Scientists are starting to discover that order can sometimes even be found in chaos. It seems that some chaotic systems can behave in non-chaotic ways. If you plot the successive events of a chaotic system on a three dimensional graph, you would expect to end up with a chaotic mess. Often, you do. However, you sometimes end up with a beautiful pattern in which the sequence of events seems to circle around one particular point for a long time. These favoured possibilities have been dubbed “strange attractors.” In other words, there appears to be orderly disorder in some chaotic systems (Polkinghorne, 1991, 36). It’s even possible for a chaotic system to have more than one strange attractor. Others don’t seem to have any.

Imagine that a mathematical physicist studying strange attractors is having coffee with a Christian theologian. What might the theologian say on hearing about strange attractors? That theologian might nod their head and say: “As a theologian, what you say doesn’t surprise me at all. God is the one who brings order out of nothing, and creates. I therefore suspect you will never find perfect disorder in any physical system that God has been responsible for. If you’ve not found strange attractors in some chaotic systems, perhaps you’ve not run the experiment for long enough. After all, long periods of time are no problem to a God, who exists both within and beyond time.”

The theologian might pause for a moment, before adding: “The only place where theologians would expect to find chaos, would be where there is evil. All Satan can do is destroy. He can only ‘kick down God’s sandcastles.’ He can never build them.”

That might make for a mutually enriching discussion.

The theological question prompted by the order we see in creation is this: Does this order illustrate a quality of God? In other words: Is the order of creation a language God has used to point to his essential nature? Was King David right when he wrote the following Psalm 3,000 years ago?

The heavens declare the glory of God;
the skies proclaim the work of his hands.
Day after day they pour forth speech;
night after night they reveal knowledge.
They have no speech, they use no words;
no sound is heard from them.

Yet their voice goes out into all the earth,
their words to the ends of the world (Psalm 19:1–4 NIV)

If God is whispering something about his nature through his creation, then perhaps theologians and scientists might benefit from having an occasional cup of coffee together. Of course, scientists must be careful to maintain the integrity of scientific method, but this doesn't mean they can't let theologians look over their shoulder, and hear them say, "Yes. That makes sense."

This brings to mind the closing comments of the astronomer and physicist, Robert Jastrow, in his book, *God and the Astronomers*. He writes:

At this moment, it seems as though science will never be able to raise the curtain on the mystery of creation. For the scientist who has lived by his faith in the power of reason, the story ends like a bad dream. He has scaled the mountains of ignorance; he is about to conquer the highest peak; as he pulls himself over the final rock, he is greeted by a band of theologians who have been sitting there for centuries. (Jastrow, 1978, 116)

Understanding God in science

Christian theologians fully expect that something of God's nature will be understood from science—and are therefore able to rejoice when new scientific findings are discovered. However, theologians also have to look beyond the order they see in the cosmos, and make sense of suffering, chaos, and evil. They understand that whilst the universe is "God-breathed," it is also something which has been corrupted by sin and suffering (Romans 8:20–21). Theologians understand that this universe is not God's "end game." They speak of a fulfilment that lies beyond it—which each of us is invited to participate in.

It must also be said that God is infinitely more than that which can be determined simply by the order of creation. Nonetheless, the order of the cosmos does point us to something of the character of God. It tells us that God is rational.

Theologians understand that God is not a fraudster. By this, they mean that God reveals himself as he actually is. God does not wear a mask to misrepresent himself because we can't cope with the reality of who he is. To do that would be relationally dishonest. So, when God reveals himself through the order of the universe, he is revealing himself as he actually is. God's strategy is to reveal as much of himself as we can comprehend. He does not overpower us with so much self-revelation that it quashes our "free choice" and removes our need for faith.

This "honesty" of God in his self-revelation is a consistent feature. For example, God allows us to see his essential reality in Jesus (Colossians 1:15–20). Similarly, when God

showed us that he lives in community within himself as Father, Son, and Holy Spirit, this was not a mask. God was allowing us to see his essential being.

If this self-revelation of God is difficult to comprehend—good. It has to have aspects of mystery. God must logically be beyond our understanding if he is to be more than something created by our imaginings.

“Order” as the fingerprint of God

Theologians understand that God is inherently creative. God brings order from nothing. This means that wherever we see order in created systems, we see the fingerprint of God. The order we see in creation therefore suggests that faith in God is reasonable.

Physicist and cosmologist, Paul Davies, says that scientists also have to share this faith. They have to have faith “that the universe is governed by dependable, immutable, absolute, universal, mathematical laws of an unspecified origin ... [To] think that such laws exist without reason is anti-rational” (2007, A17). These understandings suggest that there is room for theologians to talk to scientists about the order they see.

The scientific problem for atheism posed by quantum physics

The universe is made up of tiny subatomic particles that are governed by physical laws quite unlike the normal Newtonian physics that operates in the macro world. Quantum physics is the field of physics that studies this strange subatomic world—and, believe me, it is strange. The Danish physicist, Niels Bohr, says that those who are not shocked when they first come across quantum physics cannot possibly have understood it (1971, 206). The American physicist, Richard Feynman, agrees. He says, “I think I can safely say that nobody understands quantum mechanics” (1965, 129).

So let’s retreat back to the safety of theology for a moment.

The Bible speaks of God being the one who brings order out of nothing. The theological stories that teach this truth are contained in the creation accounts at the very beginning of the Bible. They speak of God seeing something in his mind’s eye—and of him then calling creation out of nothing. Please remember that phrase: “God seeing something in his mind’s eye.” Now let’s go back to the world of quantum physics.

Imagine that a ray gun (shooting subatomic particles, like an electron) is aimed at a barrier. This barrier has two vertical slits cut into it. There is a back wall some distance behind the barrier which stops those particles that pass through the slits. This back wall has the ability to measure where these particles hit. When all is in place, the scientists fire the gun. The result amazes them.

Scientists discovered that the electrons didn’t behave like tiny marbles, but behaved like waves. When the electrons passed through the slits, they fanned out in semi-circular

ripples. The two sets of curving ripples (from the two slits) interfered with each other, before hitting the back wall in a wave pattern. Scientists then wondered what would happen if they fired the particles one at a time. Doing this meant there was no chance of particles being able to interfere with each other. However, a wave pattern still formed on the back wall.

The scientists were stunned. Each particle had apparently split itself into two, gone through two slits simultaneously, and interfered with each other, before hitting the back wall. As particles don't do this, it was concluded that each particle must exist as a "wave of potential" which allowed it to pass through both slits, yet still be physical enough to interfere with itself.

If that wasn't strange enough, things soon became even more complicated. Scientists then placed a measuring device near the slits so they could observe which slit an individual electron actually passed through. They then fired the electron gun, shooting one particle at a time towards the two slits for a period of one hour.

The result of this was stranger than anyone could have imagined. When the electrons were being "observed," they stopped behaving like a wave and began behaving like tiny marbles. The electrons now hit the wall behind the slits in two vertical lines.

So there we have it: Subatomic particles, such as electrons, don't actually exist as physical particles until they are observed. Which brings us back to God.

The first three verses of the Bible say: "In the beginning God created the heavens and the earth. Now the earth was formless and empty, darkness was over the surface of the deep, and the Spirit of God was hovering over the waters. And God said, 'Let there be ...'" (Genesis 1:1–3 NIV). In other words, God saw something in his mind's eye—and that caused what he saw to come into being. This is consistent with quantum physics. The act of God "observing" caused something that was once just a wave of potential to become physical reality.

This truth should be of some interest to us because you and I exist within physical reality. We are composed of subatomic particles that someone has observed, causing us to become a physical reality. This truth calls to mind the words God spoken to Jeremiah in the Old Testament: "Before I formed you in the womb I knew you" (Jeremiah 1:5 NIV). Perhaps these words have a significance we've not been able to appreciate until now!

The idea that subatomic particles need to be observed before they become a tiny package of matter is a discovery that leaves the atheist in a difficult position. Quantum physics makes it clear that an atheist should not exist, except as a wave of potential that is in superposition with itself—because no God has observed them into physical reality. Your existence requires someone to observe you into being. In other words, your existence needs someone outside of you who is capable of intent.

The quantum "double slit" experiment raises a number of questions:

- What would happen if you switched off the instrument that was doing the observing?
- If you dismantled the observing instrument, and just put its component bits in place, what would you see?
- How far away would you need to put the observing instrument, before the image on the back wall changed from two horizontal lines back to a wave pattern?

I don't know the scientific answers to these questions because I haven't done the experiments. (Someone probably has.) But I think I can give you an answer theologically. A theologian would expect the image on the back wall to be that of two horizontal lines—only when the instrument functionally measures, and the results are seen by someone with the ability to cognate. This begins to suggest some highly significant things about the existence of God. Let's explore this further and expand on what it means to "observe." Here are a few definitions:

- To observe means to view with the expectation of understanding the reality of something.
- To observe is to honour the reality of something and bring it to consciousness.
- To observe means to seek to understand and establish a relationship with the physical reality of something.
- To observe is to bring something into significance in the consciousness of the observer.
- To observe is to establish a cognitive relationship with something.

At first look, this language conjures an image of something that is conscious enough to be relational. So, let's explore further.

Some leading scientists working in the field of quantum physics are now beginning to speak of matter itself being a "content of consciousness." One of the scientists making this claim is the Nobel prize-winning physicist, Eugene Wigner. He says: "Study of the external world leads to the conclusion that contents of consciousness are the ultimate reality" (1967, 171). His view is shared by John von Neumann (also a Nobel prize-winning physicist). He says: "All real things are contents of consciousness" (2011, 21).

It has to be said that not all quantum physicists agree with these scientists. The issue at stake is this: Is it the electron that is conscious and is observing the instrument watching it? Or is it the reverse? Is it the consciousness of intelligent observers, metered through the observing instrument, which is exerting power over the electron? It is difficult to imagine how an electron could be conscious, for it would not be enough for it to simply be conscious; it would also have to be intelligent. The electron would need to be intelligent enough to recognise that a measuring instrument was in place, and was working.

It is interesting to speculate what might happen if scientists were to add complexity to the measuring device. How complex would they have to make it before it was beyond the comprehension of the electron to recognise that the device was observing it—if that were even possible? It therefore seems more likely that it is the cognitive intent of the observer that collapses the electron from being a wave of potential, into being a tiny particle of matter. Whilst this conclusion seems reasonable, it is not an “open and shut” case—particularly given the existence of another strange feature of the quantum world: the phenomenon of “entanglement.”

Entanglement

Physicists have discovered that if two subatomic particles have connected with each other and then flown off to different parts of the universe, the particles will still act as if they are connected. What you do to one particle will instantly be mirrored in the other. The Irish physicist, John Bell records Einstein’s disparaging reference to quantum entanglement when Einstein described it as “spooky action at a distance” (Bell 1987, 143).

This feature of the quantum world suggests a level of connectedness between subatomic particles that is independent of the physical strictures imposed by the speed of light. Perhaps this could be “consciousness.” So let’s digress, and consider what it might mean if it was the consciousness of the subatomic particles, and not the observer, that caused the particles to collapse into tiny bits of matter.

It would suggest that all matter is imbued with consciousness. That conclusion would sit well with the convictions of Eugene Wigner and John von Neumann. If it were true, such a finding would have enormous impact as it would break science out of its empiricist prison, and force it to consider a wider reality. It would certainly present a challenge to atheism. Conversely, it would make perfect sense to theologians, for it would suggest that all creation exhibits, in part, the consciousness of God.

It might be reasonably pointed out that the fact that atoms and molecules exist as tiny particles doesn’t mean that their electrons are behaving as tiny particles. They may still be behaving as waves of potential. This is true—to a point. The fact remains that if anything physical is to exist in the universe subatomic particles need to build it. Nothing physical can be built just by collecting a whole bunch of “waves of potential” together. An unbound particle that exists as a wave of potential somehow needs to transition into being a “bound” particle, that is, one that links with other particles, if it is to build an atom. An unbound particle will allow itself to become “bound” because it allows the particle to exist in a lower energy state. (All matter rolls downhill when it comes to energy.) However, energetics cannot explain why a cloud of potential collapses into a physical particle that can cooperate with others. The only mechanism physicists are currently aware of that causes anything like

this to happen is “consciousness.” One way or another, it seems that consciousness lies behind the existence of all physical things. Subatomic particles in the quantum world only collapse into physical bits of matter when observed.

This phenomenon, of course, does not occur in the larger world of biology. There is no evidence that a person collapses into a physical form only when another person observes them; and this is significant. It appears that all the subatomic particles that constitute physical things in the universe have *already* been observed—and so exist as physical realities.

And this also poses a very real problem for atheists.

The atheist’s dilemma

Atheists generally fall into two camps when asked the question: “Why does anything exist?” Some say that the universe has always existed. The great English physicist and atheist Fred Hoyle desperately tried to believe this for many years, until evidence for the “Big Bang” became overwhelming.

The idea that the universe has always existed has recently been resurrected by those positing the idea that there are an infinite number of universes that collapse and give rise to new ones. A moment’s thought, however, shows that this doesn’t solve the question. It just shifts it to another level. Where did the infinite number of universes come from? No scientist of any worth will lazily invoke the term “infinite” to magically make anything they want to happen, happen. Fundamentally, the idea that the universe has always existed falls foul of the second law of thermodynamics, which says, in essence, that everything that exists is slowly sliding down an entropic slope into disorder.

Other atheists believe that the universe has come from nothing. One of these is Lawrence Krauss who wrote a book called: *A Universe from Nothing* (2012). His book evoked a sharp response from the American Orthodox philosopher, David Bentley Hart, who wrote: “it would be a very poorly trained theologian indeed who produced anything as philosophically confused or as engorged with category errors as Lawrence Krauss’s, *A Universe from Nothing*” (2018). This calls to mind a wry comment made by Einstein, who said “the man of science makes a very bad philosopher” (1936). A look at the diatribes against religion emanating from the English biologist, Richard Dawkins, would also bear this out.

The essential difficulty with believing that the universe came from nothing is this: It requires you to believe that everything came from nothing, as a result of nothing, as the result of a mechanism that has never been discovered, and which has no precedent. It also fractures the law of “cause and effect,” which underpins all science. As such, it is not tenable.

Conclusion

So what can we conclude?

Science and faith have important things to say to each other, and can be mutually enriching. It is also fair to say that the findings of quantum physics raise big issues for atheism—and Christian apologists would do well to understand these issues. Until very recently, atheists have claimed to be the ones standing on the high ground of evidence—and have looked down at theologians with disbelief and barely concealed derision. Now it seems it is the theologian who is standing on the high ground of evidence.

However, there are many reasons for atheism—and not all of them have much to do with truth. So, whether or not the findings of quantum physics present a mortal blow to atheism is something only you can decide.

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