Westminster Abbey
Learning

Does Science Need God? lecture: Religious Education Masterclass 2020 teachers' notes

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Watch the lecture here: https://youtu.be/aleaI6ontP4

Follow-up discussion questions

After watching this lecture, your students could debate one of these questions verbally or provide a written response for homework.

- Which aspects of religion are most compatible with science?
- Does Plato's allegory of the cave have any relevance to understanding the universe?
- Could we ever travel through space and time to get to a place we could call Heaven?
- Will science ever explain religious concepts such as angels?
- How does science correlate with Augustine's belief of us being born with original sin?
- To what extent do you think God is discoverable in the natural world?
- If God lives outside of time, does the order of things matter?
- Is science necessary for humans to understand, or potentially prove, the existence of God?

Transcript

Hi I'm Brother Guy Consolmagno, the Director of the Vatican Observatory. I'm a Jesuit and a scientist. You're probably not surprised to learn that I have no problem living a life of science and a life of faith but I'm going to make a stronger statement than that today. I'm going to insist that my life of faith is essential to my life as a scientist. My science depends on God. Even more I'm going to insist that at root everybody's science depends on God, even those scientists who don't think they believe in God.

Science is a system of logic but every logical system must start out with axioms; starting points that you accept on faith and I can identify three axioms that you have to accept on faith before you can do any kind of meaningful science. And as it happens these are axioms that come from religion, indeed they depend on one's religion.

First, you have to believe in reality, the universe exists it's not just a dream. Second, if you're going to go looking for the laws of nature, you have to believe that there are laws of nature there to be found in the

first place. And third, you have to believe that it's worthwhile to spend your time and your fortune in the pursuit of discovering those laws.

Now I maintain that all three of these axioms are religious in nature, by that I mean there are some religions that do not accept one or another of these axioms. These axioms are supported only by a small subset of religions and so your choice of religion may affect your faith in these axioms. As a result, only certain religions are going to give you the necessary conditions for science to flourish. And atheism of course makes no comment about these axioms one way or another.

First, the assumption of realism I'll consider the famous story of the Chinese Taoist Zhuangzi. Once Zhuangzi dreamt he was a butterfly, a butterfly flittering and fluttering about happy with himself doing as he pleased, he didn't know he was Zhuangzi. Suddenly, he woke up and there he was solidly and unmistakably Zhuangzi. But he didn't know if he was Zhuangzi who had dreamt he was a butterfly or a butterfly dreaming he was Zhuangzi.

He's got a point of course. Maybe everything is an illusion. The idea of the existence of a physical reality is something we've got to assume on faith, knowing full well that our ability to perceive that reality is strongly limited by the limits of our senses.

But you know even quantum physicists have to accept that the physical manifestation of their experiments in the macroscopic world are real, even as they ponder whether or not the nature of reality they're studying in the subatomic universe is that kind of reality. But if they don't believe that, they've got nothing to study; or at least what you wind up studying isn't physics anymore but metaphysics.

Second, you have to believe that nature follows regular laws. You have to believe in the existence of those laws before you can even consider to look for them. And again not every religion thinks the universe works that way.

Consider the nature gods of ancient Greece and Rome, like you find depicted here in this Chalcidian painted vase from around 550 BC. This illustrates a scene from an ancient legend that was made famous 100 years later in the play *Prometheus Bound* by the Greek poet Aeschylus.

To quote from the scene, “the earth-born dweller of the Cilician caves…impetuous Typhon…withstood all the gods, hissing out terror with horrid jaws, while from his eyes lightened a hideous glare, as though he would storm by force the sovereignty of Zeus. But the unsleeping bolt of Zeus came upon him…”

So, in the picture you’ve got Zeus, with the word Zeus next to him, and then you’ve got the lightning bolts, and then you’ve got Typhon the monster who lives in the caves under the mountains of Cilician.

So, where’s Cilicia? It’s an ancient kingdom in present-day Turkey. It’s located between the Carpathian Mountains and the sea. And notice what you find in those mountains, lots of volcanoes. This is Google’s map of active volcanoes in Turkey. Now, think volcanoes and listen again to the description of the monster. “Hissing out terror with horrid jaws, while from his eyes lightened a hideous glare, as though he would storm by force the sovereignty of Zeus”. Fire and smoke rising up into the sky challenging the sky realm of Zeus. And what do you see when volcanoes erupt? Lightning bolts.

Now to us, lightning follows Maxwell's equations and Ampère's Law, it's a flow of electricity that's promoted by the presence of dust in the atmosphere. To the ancients, it was a battle between Typhon the monster under the mountain and Zeus, the god in the air who threw the lightning bolts. If you think that volcanoes erupt because there's a monster under the mountain and that lightning strikes the mountain because there's a god in the air throwing the bolts, well you've got an explanation for all these spectacular natural events. Things happen because the nature gods decide to make it happen.

But if you deny the existence of nature gods, then you have to come up with some other explanation for volcanoes and lightning. If you don't reject the nature gods, it would never occur to you to look for that other explanation. One religion allows for science, the other has no room for it.

And there's one final religious axiom that makes science possible. Science only happens when you're convinced that science itself is worth doing. Now by you, I don't just mean you the individual, though that's not something to take for granted, but the you that's in a community that agrees with you that science is worth supporting. Now science, like faith, is done as part of a big community and if you don't have the support of the community, it's not going to happen. It can't happen. And without the community, it can't be passed on to the next generation.

It makes a difference what your society about the things you choose to do. You know there's a lot of mountains and snow in India and more people live in India than in the US and Europe combined, but how many Indians do you see competing in the Winter Olympics? Sports like that at that level; it's just not generally supported by that society. If the society you live in doesn't think that doing science is the kind of thing that's going to make your mother proud, you're not going to find very many kids who choose to go into science. And you're not going to find anybody who can teach you how to do it and you're not going to find anybody who will hire you to teach the next generation.

Who was the first person to think there might be laws to describe nature? Who is the first person to go searching for those laws? Who was the first to find laws that we think are still true today? You might argue it's Aristotle but it's interesting for a thousand years after him, there was no further progress made in physics. When did science get started? Obviously, you can't expect a society to support a culture of science unless it's big enough and rich enough to afford it because it takes a village to do science. You need a community of people willing to waste their time asking these kinds of questions about rocks and leaves and their origin and their motion. And you also need a space where it's safe to ask those questions. A place where you can be free to admit you don't already have the answers, you know whether it was the pagan gods or the physics of Aristotle. If you think you already know how nature works, you're not going to ask any further questions.

The medieval universities for the first time had the magic combination. They were a place where scholars could gather, where the conversation could take place. They were supported by a culture that was big enough and rich enough to let a few smart monks you know Albert the Great one of the first, Roger Bacon may be the most notable, so they could collect leaves and rocks and perform experiments and ask questions and look for patterns and describe those patterns in terms of rules. As monks they had the education and the free time to pursue these studies. As Christians they had a belief system that cleared away the easy answers of both the pagans and the ancient philosophers.

Now, the universities were places funded by the Church to train leaders of the Church in philosophy and theology, but before you could study philosophy, you needed to know how to write and how to think. Those were the trivial courses. And you needed a background in the tools of analysis, including astronomy the quadrivium. Of course, you know our modern universities are very very different, It's not as if we dress up in long black clerical robes anymore or aspire merely to the degree of Doctor of Philosophy. Wait a minute, that a PhD, that's the doctorate I've got…

Ok, so our religion allows us to assume that the universe is real and by rejecting nature gods, it gives us room to look for other explanations of how nature works. And it begins in a place supported by people who were convinced that science and knowledge was something godly, something worth doing.

So, that's how a belief in God, and in particular a god of scripture, historically gave rise to science. But what about today? What about scientists who think they don't believe in God? There are some sceptics who reject all religion precisely because they reject all authority. But there are other sceptics who reject all religion because in their minds, religion is a rival to the authority that they want to accept instead which is the authority of science. Because even science depends on authority and of course, those of us in science are familiar with authority. We respect authority precisely because we are authorities ourselves. But what's curious about modern atheism is that it actually arises out of an attempt to use the authority of science as a way to prove the existence of God.

When it comes to understanding atheism, there's two books by the Jesuit Michael Buckley that I use. One is *At the Origins of Modern Atheism*. It's his great work, it's widely read, widely quoted and the other *Denying and Disclosing God* is a later book, a thinner book but in some ways more approachable with some key insights. One of his insights is that to be an atheist, you must have a clear idea of the God it is you don't believe in.

Let me give you an example. Here's one of the world's most famous atheists, Richard Dawkins. Himself an authority in evolutionary biology and he's posing here before the advertising he had put on some London buses as a publicity stunt a few years back. But notice the idea of God that Richard Dawkins assumes here. He refuses to believe in a God who's primarily a source of worry, someone who would get in the way of you enjoying your life. But you know if that's your idea of God, then he's got a point. I don't believe in that God either. Also notice that his idea of enjoying life is to have a babe on his shoulder and her idea is to have a famous sugar daddy, you know there's more than one kind of advertising going on here.

But actually Newton, the father of modern science, would not have appreciated being called an atheist. He was a strong believer in God; he considered himself primarily a theologian. So why does the popular culture like Dawkins and his friends equate science with atheism? Buckley attempts to answer this question, historically. He argues that modern atheism can be traced to the very attempts to use the presumed certainties of modern science as a means to prove that God really did exist. For example, Newton was able to describe how the sun controls the motions of the planets by pulling on them with the force that he called gravity and gravity arose from its mass. But he also recognised that there are gaps in this theory because after all along with the sun's mass each of the planets has a mass and they should also be pulling on the other planet's masses. Why didn't that upset the stability of the planetary motions? This

was a gap in Newton's laws and he posited this was a demonstration of why we needed a necessary and benevolent action of God.

There's also the bigger question, you know, where did all those suns and planets come from in the first place? Aristotle had argued that since there was motion in the universe there must be a prime mover, the ultimate source of all motion. And medieval theologians had identified the prime mover but the creator, the creator God described in Genesis. Nothing in Newton's physics argued against that. Newton didn't attempt to come up with a different answer.
His physics did however suggest that once the universe was set in motion, its laws inexorably described its future course. And okay so it was difficult I argue against the existence of a creator God but it was equally difficult to argue in favour of a personal God who intervened in nature once it had been set in motion. From this the Enlightenment theologians came up with the idea of deism. To the deists, God is a clockmaker who designs and assembles the gear of the universe, winds them up, sets them going and then does nothing more than maybe keep an eye on them once in a while and reset things like the positions of the planets if they got out of line.

But a hundred years later the French mathematician Pierre-Simon Laplace developed a much more advanced mathematical description of planetary orbits. And the story goes when Laplace described the results of his calculations to Napoleon, the Emperor interrupted and said "Well, what about God?" because that's where Newton had inferred God. And Laplace is said to have replied "I have no need for that hypothesis". In other words, Newton was able to show that planetary orbits could be stable without depending on God intervening. So that intervention was no longer needed and the God who was proved of that intervention was no longer needed and he was right. You don't need God to keep the planets in line. Of course, that doesn't prove there is no God, just that Newton's proof of God doesn't work.

There was actually a more subtle problem with Newton's mechanics. His laws of physics depended on knowing the forces acting on a body, like the force of gravity, and knowing the exact position and velocity of each of the pieces in your universe. But while you could apply his equations of gravity to a particular body, given the body's mass in the position at a given time, Newton had to spell out in some detail a lot of strange and unfamiliar new notions of mass and space in time in an inertial framework. And that was what the Principia was all about. Eventually his physics got to be accepted and routinely taught, and so his new way of understanding mass and space and time became the new common sense. Common sense at least for scientists and engineers not common sense at all when he first introduced it because it was new and strange and unfamiliar. And as any physics teacher can testify, it remains strange and difficult to comprehend to every new generation of students when you encounter Newtonian physics for the first time. It takes a lot of time and a lot of effort before these concepts can be incorporated into a student's intuitive common sense understanding about the universe and how it works. You know to paraphrase the mathematician John von Neumann, you never really understand physics, you just get used to it.

And then in the early 20th century Einstein's theory of relativity showed that a lot of Newton's assumptions basically weren't correct. Einstein presented a new way of dealing with them, involving curved space time. According to Einstein what appears to be the measure of mass and time and space in one frame of reference can look really different in a different frame of reference. You know, every event may be fixed in space and time but its location in space and its location in time can have different measures as seen from different frames of reference, and this isn't even going into quantum mechanics

where the whole idea of a precise place in a precise time has to be thrown out. Indeed, according to general relativity what we call mass can be thought of as the warping of the geometry of space-time. So, time is part of space and mass is now warping of both of them.

So, on the left in this picture you've got the astronomer Arthur Eddington when he observed starlight passing near the sun during an eclipse in 1919 he was the first to confirm Einstein's predictions of how the mass of the sun would warp space and time around it. But if mass warps space and time, then you might expect that the mass of the universe its total gravity should be pulling together every other piece of the universe. Now, Newton had argued that the same laws of gravity that worked on earth operated in the stars and planets and he had this cosmological principle that there is no place in the universe that's different from any other place and that implies that the universe doesn't have any bounds otherwise you might expect the boundaries where the universe ends to be different from the central regions.

So, the universe must be infinite, and the same logic is taken to imply that it's boundless in time. So, if you have infinite amounts of time to play with then surely all the gravity of all the matter in the universe should have pulled everything together into one singular point a long time ago. And then comes along George Lemaître - he's the fella in the right he is a Belgian mathematician who worked with Eddington. He realized that if the universe were uniformly expanding then this initial condition of uniform expansion could counter the force of gravity trying to pull everything back in one space. But if you've got a universal expansion of the universe to where it is now, that implies at an earlier time all the spaces between the masses in the universe were much smaller and this dense universe would still have the same amount of energy but in a smaller volume, so it would be much hotter. And if you extrapolate back to an initial point, you'd have extremely high energy density, infinite energy density, in a very very tiny point and Lemaître referred to this point as the primeval atom which then exploded outwards. Space and time itself compressed into a tiny point. What he called the primeval atom other people referred to as Lemaître's Big Bang theory.

Now the Big Bang violates the cosmological principle because it has a time which is different from all other times - the starting point. And worse, it smacks of identifying the starting point with the Genesis story of creation, and the fact that Lemaître happened to be Catholic, in fact a Catholic priest, made this notion even more suspect. Lemaître himself of course was very careful never to identify the Big Bang with Genesis. But other people did, and other people didn't like it for that reason. Then Edwin Hubble actually observed galaxy clusters moving away from each other in a way that exactly matched what Lemaître proposed, and a lot of other things that came out of this theory were eventually proved by the evidence of astronomy since then, like the cosmic white microwave background radiation, and the primordial abundances of hydrogen and helium. Today we don't have any better explanation for the way the universe works than Lemaître's Big Bang theory.

So, there's a beginning point, there's a primeval atom. Does that demonstrate the necessary of a creator God? Maybe not. Stephen Hawking a few years ago worked on a theory suggesting that quantum fluctuations in the primordial vacuum could provide a setting that by itself, by chance, might produce the initial singularity of space-time. He and his colleagues have suggested that the universe could have been produced spontaneously by a random fluctuation of the cosmic wave function. Now, Hawking is as good as anybody working in this field and it's beyond my abilities or this talk to critique his physics. There's no reason to suppose he's got it wrong. Does that mean that if the universe can spontaneously form itself,

we don't need to postulate a god as the creator of the universe? Actually, if you define God as the entity that started the Big Bang and then say that fluctuations that we describe as, you know, warping of space and time - in other words gravity - are what started the Big Bang, logically you don't say there is no God you say that God is gravity, which is kind of a weird thing to think. Maybe Hawking thinks if gravity really is God, that's why Catholics celebrate Mass. Never mind. We call that kind of god the god you invent to fill the gaps in the physics that you don't understand yet the 'God of the Gaps', and just like Newton's God, like Dawkins idea of God, that's so far removed from the God described in scripture, the God of love. And here's the essential point - God in scripture is not some force within the universe alongside gravity and electricity that you know sets off the Big Bang or keeps the planets in orbit, because if it was that would just be another nature god, you know, like the god of lightning and the god of volcanoes. God is not one element in the laws of physics. God is *why* the laws of physics exist. The supernatural God of scripture is outside of space and time. That God doesn't create the universe at some point in time 13.8 billion years ago. God maintains the universe in its existence with all of its laws with all of its space and time at every space and every time.

And here's another point. You know, I've argued that science wouldn't have come about without a certain belief in a certain kind of god, but God can certainly exist without science. You know, there were saints and sinners long before Newton or Einstein or Dawkins or Hawking.

Let's look back at the Genesis story and how it describes creation. It's 2,500 years old, it's based on the best science of its day - the science of ancient Babylon. But the lesson of Genesis isn't to insist that Babylon's science with a flat earth covered by a dome is correct. Rather the important part of Genesis is where it *departs* from the Babylonian creation story that everybody accepted at the time. You know, the Babylonians thought the physical universe was made by accident when gods and dragons were fighting. In Genesis there's only one God, no dragon, and that God is outside of nature, already there in the beginning before there was a beginning. So, this God is not part of nature – this God is supernatural, outside of space and time. In Genesis we see that creation is described in a systematic way, step by step as inevitable as day follows night, over a period of you know six days, and this tells us that there is a system to how the universe works. It's not the collection of arbitrary whims of nature deities and even more striking, we are told in Genesis at every step that creation is good. The creator is not a spiritual entity encouraging us to rise above a dangerous inherently evil and sinful physical universe. Rather we are told that creation is inherently good. You know, chocolate is not a creation of the devil to lure you into gluttony and acne, it's a foretaste of the goodness of God.

The work of the six days of creation is the necessary work of survival, producing, preparing, distributing food clothing and shelter, and those are good, but the six days of creation are leading up to the seventh day, the climax - the Sabbath. And it is dedicated to resting and in resting, contemplating creation. The act of contemplating nature is a form of prayer because it's telling us that a human is more than an animal who lives only to eat and reproduce. The spiritual and intellectual aspects of the human person are the pinnacle of what makes us human. The Genesis story of creation makes activities like contemplating the science of cosmology possible, enlisted and encouraged. God made us to be astronomers.

In fact, science and faith are in a conversation with each other. Faith tells me that the universe matters, that our lives matter, that good and evil in our daily life matters. We can't say, 'oh what happens on earth doesn't matter, we're all destined for heaven', because you know Socrates thought that he could die

peacefully because he believed in an immortal soul. Jesus *wept* at the prospect of his death. This universe, we are told, is so precious and important that God sent his only Son to rescue it. Science shows me that the universe is understandable, but more my experience of science is that it's understandable in a beautiful way because not only is the universe beautiful, so are our theories about the universe. They're unexpectedly, unreasonably, indescribably beautiful. In fact, we can use the relative elegance of competing theories to choose which one we think is more likely to bring us closer to the truth. Beauty is fundamental to both creation and creator, and of course beauty cannot be quantified or calculated, it takes a human soul to recognize it. And finally, the universe is fun. God has a distinct personality including a wicked sense of humour.

For those of us who are called to be scientists the exploration of God's creation is a response to an invitation to spend time with the creator. We get to play with him so to speak, you know, uncovering the delightful puzzles he sets for us and marvelling at the ways the laws of the universe fit together with a logic that is harmonious and elegant, and that's how you get to see a side of God's personality.

But even if we're not professional scientists we can still be fascinated by the workings of the universe that the professionals share with us. In that way anyone can take part in the game at least as a spectator. Faith not only makes it possible for me to do science, it is what makes me *want* to do science. Science wouldn't happen if nobody wanted to do it. God is what makes that possible. The God whose presence is shown by the presence of joy, and that is the faith of this scientist.

Biography

Brother Guy Consolmagno SJ, is the Director of the Vatican Observatory. A native of Detroit, Michigan, he studied planetary sciences at MIT and the University of Arizona, specialising in meteorites and asteroids. Along with more than 200 scientific publications and a monthly column in The Tablet, he is the author of several popular astronomy books, most recently with Fr Paul Mueller, “Would You Baptize an Extraterrestrial?".

Context of the event

Westminster Abbey’s Learning Department hosted the free, online event “Does Science Need God?” on 14th October 2020. Brother Guy Consolmagno SJ, one of the world’s most experienced and engaging astronomers explored the power and limitations of Science in a pre-recorded lecture that students were able to watch and submit questions before the live event. On the 14th October 2020, Madeleine Davies of *The Church Times* chaired a live question and answer session with Brother Guy, during which students’ questions were answered.

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