

Students: Write an extended essay (or term paper) that critiques the four essays/commentaries as related to applicable insights of the linked items in “the Human Lenses” section.

STEPHEN HAWKING’S *THE GRAND DESIGN* AND SOME RESPONSES 2010

BOOK EXCERPT, SEPTEMBER 4, 2010.

There is a sound scientific explanation for the making of our world—no gods required.

By STEPHEN HAWKING And LEONARD MLODINOW

According to Viking mythology, eclipses occur when two wolves, Skoll and Hati, catch the sun or moon. At the onset of an eclipse people would make lots of noise, hoping to scare the wolves away. After some time, people must have noticed that the eclipses ended regardless of whether they ran around banging on pots.

Ignorance of nature's ways led people in ancient times to postulate many myths in an effort to make sense of their world. But eventually, people turned to philosophy, that is, to the use of reason—with a good dose of intuition—to decipher their universe. Today we use reason, mathematics and experimental test—in other words, modern science.

Albert Einstein said, "The most incomprehensible thing about the universe is that it is comprehensible." He meant that, unlike our homes on a bad day, the universe is not just a conglomeration of objects each going its own way. Everything in the universe follows laws, without exception.

Newton believed that our strangely habitable solar system did not "arise out of chaos by the mere laws of nature." Instead, he maintained that the order in the universe was "created by God at first and conserved by him to this Day in the same state and condition." The discovery recently of the extreme fine-tuning of so many laws of nature could lead some back to the idea that this grand design is the work of some grand Designer. Yet the latest advances in cosmology explain why the laws of the universe seem tailor-made for humans, without the need for a benevolent creator.

Many improbable occurrences conspired to create Earth's human-friendly design, and they would indeed be puzzling if ours were the only solar system in the universe. But today we know of hundreds of other solar systems, and few doubt that there exist countless more among the billions of stars in our galaxy. Planets of all sorts exist, and obviously, when the beings on a planet that supports life examine the world around them, they are bound to find that their environment satisfies the conditions they require to exist.

It is possible to turn that last statement into a scientific principle: The fact of our being restricts the characteristics of the kind of environment in which we find ourselves. For example, if we did not know the distance from the Earth to the sun, the fact that beings like us exist would allow us to put bounds on how small or great the Earth-sun separation could be. We need liquid water to exist, and if the Earth were too close, it would all boil off; if it were too far, it would freeze. That principle is called the "weak" anthropic principle.

The weak anthropic principle is not very controversial. But there is a stronger form that is regarded with disdain among some physicists. The strong anthropic principle suggests that the fact that we exist imposes constraints, not just on our environment, but on the possible form and content of the laws of nature themselves.

The idea arose because it is not only the peculiar characteristics of our solar system that seem oddly conducive to the development of human life, but also the characteristics of our entire universe—and its laws. They appear to have a design that is both tailor-made to support us and, if we are to exist, leaves little room for alteration. That is much more difficult to explain.

The tale of how the primordial universe of hydrogen, helium and a bit of lithium evolved to a universe harboring at least one world with intelligent life like us is a tale of many chapters. The forces of nature had to be such that heavier elements—especially carbon—could be produced from the primordial elements, and remain stable for at least billions of years. Those heavy elements were formed in the furnaces we call stars, so the forces first had to allow stars and galaxies to form. Those in turn grew from the seeds of tiny inhomogeneities in the early universe.

Even all that is not enough: The dynamics of the stars had to be such that some would eventually explode, precisely in a way that could disperse the heavier elements through space. In addition, the laws of nature had to dictate that those remnants could recondense into a new generation of stars, these surrounded by planets incorporating the newly formed heavy elements.

By examining the model universes we generate when the theories of physics are altered in certain ways, one can study the effect of changes to physical law in a methodical manner. Such calculations show that a change of as little as 0.5% in the strength of the strong nuclear force, or 4% in the electric force, would destroy either nearly all carbon or all oxygen in every star, and hence the possibility of life as we know it. Also, most of the fundamental constants appearing in our theories appear fine-tuned in the sense that if they were altered by only modest amounts, the universe would be qualitatively different, and in many cases unsuitable for the development of life. For example, if protons were 0.2% heavier, they would decay into neutrons, destabilizing atoms.

If one assumes that a few hundred million years in stable orbit is necessary for planetary life to evolve, the number of space dimensions is also fixed by our existence. That is because, according to the laws of gravity, it is only in three dimensions that stable elliptical orbits are possible. In any but three dimensions even a small disturbance, such as that produced by the pull of the other planets, would send a planet off its circular orbit, and cause it to spiral either into or away from the sun.

The emergence of the complex structures capable of supporting intelligent observers seems to be very fragile. The laws of nature form a system that is extremely fine-tuned. What can we make of these coincidences? Luck in the precise form and nature of fundamental physical law is a different kind of luck from the luck we find in environmental factors. It raises the natural question of why it is that way.

Many people would like us to use these coincidences as evidence of the work of God. The idea that the universe was designed to accommodate mankind appears in theologies and mythologies dating from thousands of years ago. In Western culture the Old Testament contains the idea of providential design, but the traditional Christian viewpoint was also greatly influenced by Aristotle, who believed "in an intelligent natural world that functions according to some deliberate design."

That is not the answer of modern science. As recent advances in cosmology suggest, the laws of gravity and quantum theory allow universes to appear spontaneously from nothing. Spontaneous creation is the reason there is something rather than nothing, why the universe exists, why we exist. It is not necessary to invoke God to light the blue touch paper and set the universe going.

Our universe seems to be one of many, each with different laws. That multiverse idea is not a notion invented to account for the miracle of fine tuning. It is a consequence predicted by many theories in modern cosmology. If it is true it reduces the strong anthropic principle to the weak one, putting the fine tunings of physical law on the same footing as the environmental factors, for it means that our cosmic habitat—now the entire observable universe—is just one of many.

Each universe has many possible histories and many possible states. Only a very few would allow creatures like us to exist. Although we are puny and insignificant on the scale of the cosmos, this makes us in a sense the lords of creation.

—Stephen Hawking is a professor at the University of Cambridge. Leonard Mlodinow is a physicist who teaches at Caltech. Adapted from "The Grand Design" by Stephen Hawking and Leonard Mlodinow, to be published by Bantam Books on Sept. 7.

STEPHEN HAWKING CAN'T USE PHYSICS TO ANSWER WHY WE'RE HERE Modern belief in God is not about covering the gaps in our knowledge, but about answering different types of questions

guardian.co.uk, Friday 3 September 2010

Eric Priest holds the Gregory Chair of Mathematics and is a Bishop Wardlaw Professor at St Andrews University, Scotland.

'Stephen Hawking may be able in future to say how the universe started, but as a physicist he cannot answer why'

Stephen Hawking makes the claim that it is not necessary to invoke God as the creator of the universe and the assertion that physics alone made it.

He may be correct in his first statement, but to rule out a possibly important role for God is in my view unjustified. It is certainly possible that God sets up and maintains or underpins the laws of physics and allows them to work, so that being able to explain the big bang in terms of physics is not inconsistent with there being a role for God.

As a scientist, you are continually questioning, rarely coming up with a definitive answer. The limitations of your own knowledge and expertise together with the beauty and mystery of life and the universe often fill you with a sense of profound humility. Thus, unequivocal assertions are not part of a genuine scientific quest.

Mathematics as applied to physics may be the queen of sciences according to Carl Friedrich Gauss, but it does not answer every scientific question. Chemistry, biology, psychology and the social sciences have their own ways of analysing the nature of reality which are complementary to those of physics and mathematics: indeed, they are not reducible to physics but their insights emerge at their own level of complexity.

Furthermore, many of the questions that are most crucial to us as human beings are not addressed adequately at all by science, such as the nature of beauty and love and how to live one's life – often philosophy or history or theology are better suited to help answer them.

The complementary nature of different questions and in particular of the difference between how and why are important. If M-theory does indeed turn out to enable a unified theory, Hawking may be able in future to say how the universe started, but as a physicist he cannot answer the question "why?"

This is well illustrated by John Polkinghorne's story about boiling a kettle: I can describe with physics how it boils in terms of the stove making its temperature rise; but why it is boiling is a different type of question altogether – most probably in my case because my wife is thirsty!

The so-called "God of the Gaps" is not part of modern religious faith. In this view, you invoked God to explain the inexplicable – at one time this would have been the weather or common diseases, and for Hawking apparently until recently the origin of the universe. Thus, when an alternative explanation arises, there is no longer any need for God.

The God followed by many people of a religious faith is not a God of the Gaps at all – rather a God who helps answer other nonscientific questions about why the universe and its amazing life exists and how to lead a good life. Also, they welcome the advances in understanding that modern science brings, since they reveal more of the incredible beauty, diversity and wonder of the nature of the universe.

You cannot prove whether God exists or not. But you can ask whether the existence or nonexistence of God is more consistent with your experience. It is up to each of us to reach our own conclusion, but for many of us it is and can make a profound and enriching difference to our lives.

THURSDAY, 2 SEPTEMBER 2010 – THE CHURCH MOUSE BLOG

Stephen Hawking and God - lazy reporters make up stuff

OK, perhaps that's a bit strong, but the news today that Stephen Hawking thinks creation does not require God is not a new sentiment, and Mouse is pretty shocked that it is being reported as such. Some are even suggesting this is a turn-around from Hawking's previous views. Not so.

Here's what Hawking said in 1989:

What I have done is to show that it is possible for the way the universe began to be determined by the laws of science. In that case, it would not be necessary to appeal to God to decide how the universe began. This doesn't prove that there is no God, only that God is not necessary. [Stephen W. Hawking, Der Spiegel, 1989]

Compare the quote from 1989 with the one which has caused the headlines today:

"Because there is a law such as gravity, the universe can and will create itself from nothing. Spontaneous creation is the reason there is something rather than nothing, why the universe exists, why we exist. It is not necessary to invoke God to light the blue touch paper and set the universe going."

If anyone can spot a difference, please let Mouse know.

His position is and always has been that you could explain pretty much everything through scientific enquiry, and without the need to appeal to a God to fill in the gaps, and that has been his view since childhood. Why on earth every newspaper and broadcaster in Britain would think this some change in position and startling new revelation is beyond Mouse.

Perhaps none of the reporters bothered to spend five minutes on Google before they wrote their stories.

There is a question for Christians in how to respond. Mouse suggests simply agreeing. If you try to claim you know more about the science of creation and the big bang you will instantly make yourself a laughing stock. And nothing that Hawking has said rules out the possibility of God.

STEPHEN HAWKING'S BIG BANG GAPS

The laws that explain the universe's birth are less comprehensive than Stephen Hawking suggests

Paul Davies The Guardian, Saturday 4 September 2010

Dr. Davies is a theoretical physicist and cosmologist by profession, but also works in astrobiology, a new field of research that seeks to understand the origin and evolution of life, and to search for life beyond Earth.

Cosmologists are agreed that the universe began with a big bang 13.7 billion years ago. People naturally want to know what caused it. A simple answer is nothing: not because there was a mysterious state of nothing before the big bang, but because time itself began then – that is, there was no time "before" the big bang. The idea is by no means new. In the fifth century, St Augustine of Hippo wrote that "the universe was created with time and not in time".

Religious people often feel tricked by this logic. They envisage a miracle-working God dwelling within the stream of time for all eternity and then, for some inscrutable reason, making a universe (perhaps in a spectacular explosion) at a specific moment in history.

That was not Augustine's God, who transcended both space and time. Nor is it the God favoured by many contemporary theologians. In fact, they long ago coined a term for it – "god-of-the-gaps" – to deride the idea that when science leaves something out of account, then God should be invoked to plug the gap. The origin of life and the origin of consciousness are favourite loci for a god-of-the-gaps, but the origin of the universe is the perennial big gap.

In his new book, Stephen Hawking reiterates that there is no big gap in the scientific account of the big bang. The laws of physics can explain, he says, how a universe of space, time and matter could emerge spontaneously, without the need for God. And most cosmologists agree: we don't need a god-of-the-gaps to make the big bang go bang. It can happen as part of a natural process. A much tougher problem now looms, however. What is the source of those ingenious laws that enable a universe to pop into being from nothing?

Traditionally, scientists have supposed that the laws of physics were simply imprinted on the universe at its birth, like a maker's mark. As to their origin, well, that was left unexplained.

In recent years, cosmologists have shifted position somewhat. If the origin of the universe was a law rather than a supernatural event, then the same laws could presumably operate to bring other universes into being. The favoured view now, and the one that Hawking shares, is that there were in fact many bangs, scattered through space and time, and many universes emerging therefrom, all perfectly naturally. The entire assemblage goes by the name of the multiverse.

Our universe is just one infinitesimal component amid this vast – probably infinite – multiverse, that itself had no origin in time. So according to this new cosmological theory, there was something before the big bang after all – a region of the multiverse pregnant with universe-sprouting potential.

A refinement of the multiverse scenario is that each new universe comes complete with its very own laws – or bylaws, to use the apt description of the cosmologist Martin Rees. Go to another universe, and you would find different bylaws applying. An appealing feature of variegated bylaws is that they explain why our particular universe is uncannily bio-friendly; change our bylaws just a little bit and life would probably be impossible. The fact that we observe a universe "fine-tuned" for life is then no surprise: the more numerous bio-hostile universes are sterile and so go unseen.

So is that the end of the story? Can the multiverse provide a complete and closed account of all physical existence? Not quite. The multiverse comes with a lot of baggage, such as an overarching space and time to host all those bangs, a universe-generating mechanism to trigger them, physical fields to populate the universes with material stuff, and a selection of forces to make things happen. Cosmologists embrace

these features by envisaging sweeping "meta-laws" that pervade the multiverse and spawn specific bylaws on a universe-by-universe basis. The meta-laws themselves remain unexplained – eternal, immutable transcendent entities that just happen to exist and must simply be accepted as given. In that respect the meta-laws have a similar status to an unexplained transcendent god.

According to folklore the French physicist Pierre Laplace, when asked by Napoleon where God fitted into his mathematical account of the universe, replied: "I had no need of that hypothesis." Although cosmology has advanced enormously since the time of Laplace, the situation remains the same: there is no compelling need for a supernatural being or prime mover to start the universe off. But when it comes to the laws that explain the big bang, we are in murkier waters.

THE HUMAN LENSES, FILTERS, PRESUPPOSITIONS, AND PARADIGMS OR “BLIKS” WHICH LEAD REASONABLE PEOPLE TO DIFFERENT CONCLUSIONS OR “SCHOOLS OF THOUGHT”

<http://www.philosophy-religion.org/handouts/blik.htm>

<http://www.philosophy-religion.org/handouts/pdfs/Evidence-Blindness.pdf>

<http://www.philosophy-religion.org/handouts/uncertainty.htm>

<http://www.philosophy-religion.org/handouts/pdfs/ch11-science.pdf>

<http://www.philosophy-religion.com/reflections/easter.htm>

[http://www.philosophy-religion.org/world/pdfs/Tom Wright Lecture.pdf](http://www.philosophy-religion.org/world/pdfs/Tom_Wright_Lecture.pdf)

<http://www.philosophy-religion.org/handouts/pdfs/Dilley.pdf>

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