



In their newest book, *The Grand Design*, Stephen Hawking and Leonard Mlodinow attempt to turn Douglas Adams's jest about being able to explain "life, the universe, and everything" into reality. This slim 181-page book gives us a tour of all that is—and some that might be—showcasing the considerable insights that physicists have gained since Newton in their search for the holy grail of a unified field theory, one theory of physics that explains everything.

If judged solely on its ability to make the increasingly abstract and counterintuitive field of physics accessible to everyone, the book a great success. However, the book has something of an identity crisis. It declares on page one that "philosophy is dead," yet the authors set their work within the context of philosophical and theological questions.

So I want to enter a theological dialogue of sorts with the book.



Stephen Hawking, who is shown here, is a theoretical physicist. He probably is Britain's most renowned scientist, not so much for the eminence of his work, but because of his ability to do world-class physics despite a very debilitating disease.

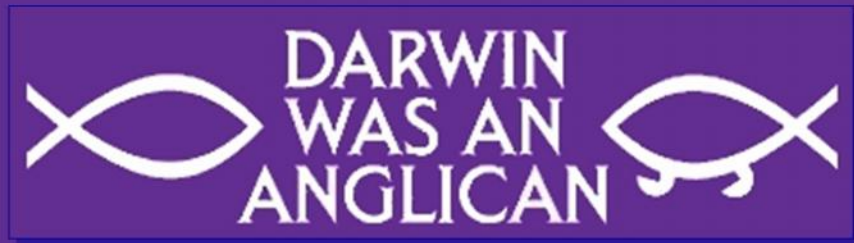
Hawking's newest book, "The Grand Design," was published last fall and it stirred up quite a controversy in both theological and scientific circles. My goal here is to touch very superficially on the main points that Hawking makes in his book and to tell you how other physicists and Christian thinkers have responded to it. My aim isn't so much to debunk Hawking's claims, but to remind us that science and faith are compatible.



Before I get to Hawking's book, I want to give you some background that will be important in understanding what Hawking is saying.

As Christians, we know how the world was created, how we and everything in our universe came to be, "**In the beginning when God created the heavens and the earth...**" The book of Genesis goes on to give not just one, but two accounts of creation. The important thing to remember about these accounts is that they are a dialogue about how things came to be, not a history of creation and not a scientific account of how God accomplished creation. Sometimes we get confused about this and our faith gets shaken when we realize, for example, that our world is 13.7 billion years old and the Bible only accounts for some 4,000 years of it. This does not make the Bible "untrue," but it adds another partner in the debate about what the Bible means.

## ***No disconnect between God and science***



From a Christian perspective there is no dichotomy, no disconnect between God and science. This is especially true for us Anglicans. Our mark of faith is right actions—corporate worship, loving God and loving our neighbor as ourselves—rather than right belief.

**I join most Anglicans in contending that science is the study of how God does the things that God does.**

We will see in a minute, when we turn to Stephen Hawking's newest book, problems arise when science tries to venture into the world of philosophy and even theology. The question that physicists are good at answering is "Why are the laws of nature the way that they are?" In other words, "Why do things work the way that they work?"

On the other hand, theologians and philosophers are good at answering questions like, "Why are we here, why do we exist?"

Things generally don't work well when physicists and theologians try to answer the other discipline's questions.

This point is important because if we tie our understanding of God to any scientific theory, we are bound to be disappointed later when the theory changes.





## ***Thomas Aquinas on creation***

- God is the absolute creator of all things
- Creation as an instantaneous whole
- Creatures utterly dependent upon God
- Creaturely characteristics (complex)
- Goodness of creation (vs. sin and evil)
- Creation is unimaginable (must be revealed)
- Creation was voluntary (not necessary on God's part)

Thomas Aquinas, in the 13<sup>th</sup> century, articulated Christianity's position on creation that still is the basis of our faith. Thomas said that God is the absolute creator of all things. There was no time, no material, no energy of any kind, or even the structure of emptiness, except for God. In modern terms, we would say that there were no subatomic particles to pop into and out of existence until God created them.

Thomas says that creation was an instantaneous whole, a single act, NOT a multi-stage process. Today we talk about the "unfolding of creation," "emergent creation," and even "evolution" as part of a continuous creative process. The Christian view is that these things are secondary causality, but not creation itself. In Aquinas' account all of God's creation is totally dependent upon God for its existence. The true reality is God, and we receive our reality from God.

God is simplicity of being, with no parts, but God's creation is utterly complex. Thomas says that we need all of creation to represent the totality of God. Genesis tells us that God approved of his creation, that it was "very good." Humans have disordered all of creation, by our choice of evil.

There is nothing that lets us know that God created us, except for the account in Genesis. Thomas says that it is therefore in Genesis that we should look for revelation. We cannot intuit it or know it in another way, except that God reveals it to us. Curiously, some modern physicists and many of our fellow modern human beings are finding revelation of God as creator in nature itself, in the order of things.

Lastly, Thomas said that creation was totally voluntary on God's part, not because God was lonely or lacked anything in any way. God's purpose in creation was friendship with (and to be in right-relationship with) the created.



What Thomas posited fits very well with the Big Bang theory. For those who have not been in high school science classes in awhile, I will summarize that theory.

Big Bang is the prevailing scientific theory about how our universe came to be. This theory says that the universe was once in an extremely hot and dense state that expanded rapidly (a "Big Bang"). According to recent measurements, this happened around 13.7 billion years ago. The Big Bang theory relies on Albert Einstein's 1905 general relativity theory. It is informed by Edwin Hubble's observation in 1929 which confirms that the universe continues to expand.

There are many Christian physicists who subscribe to the Big Bang theory. However, Christians know if there was a Big Bang it would have been the RESULT of creation, not the cause of it. God spoke and all that is came to be, AND (if Big Bang is correct), as the result of creation, Big Bang occurred.

You will notice that I say "if Big Bang occurred." Right now Big Bang is how physicists talk about the beginning of our cosmos. But our faith is not tied to any particular scientific theory about how our world began. ((For example, on 9/22/11, scientists in Europe announced they may have observed a neutrino moving faster than the speed of light. If this is confirmed, this will have profound implications for Einstein's theory.))

Scientists, by the way, have a name for the state of things before Big Bang occurred. They call it a "singularity." Science cannot model a singularity. The closest they can come to understanding the beginning of our universe as we know it is  $10^{-43}$  seconds after the singularity exploded, which is when time seems to have begun.

## “Laws of nature”

- Why to they exist?
- Why do they exist the way that they do?

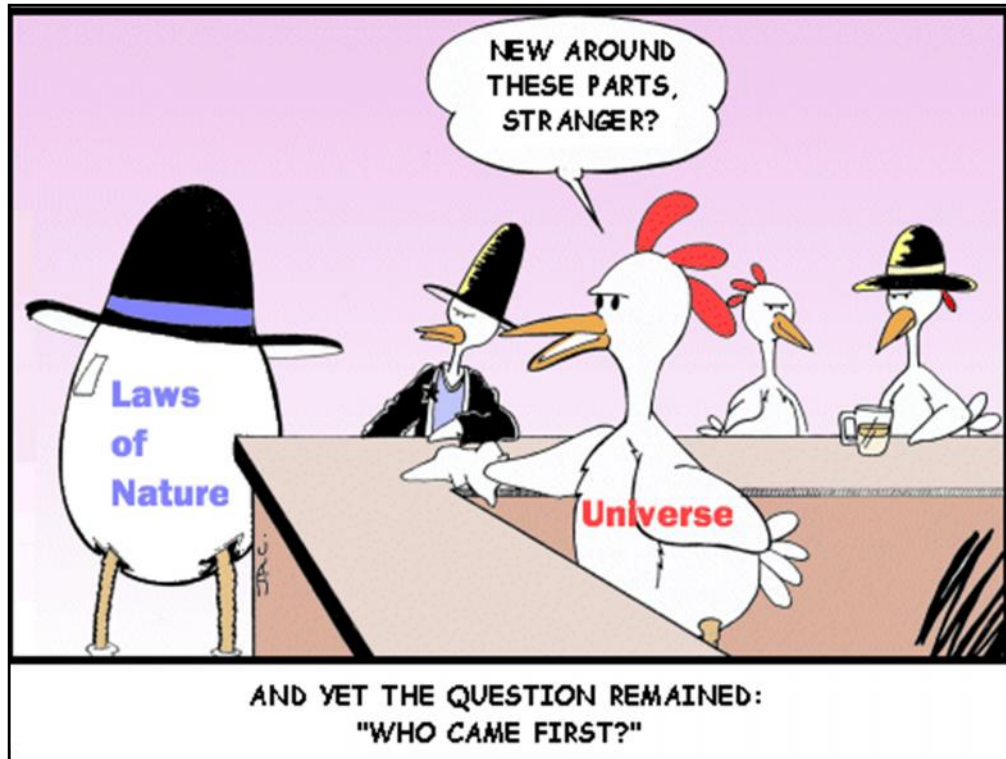


“I know we can’t repeal the laws of nature, but I don’t see why we can’t amend them a little.”

Concerning our universe, both the Bible and what we have observed about our world attest that there are “laws of nature” which govern how our world operates. Our laws of nature are how God chose for our universe to function. We observe that things work in a more-or-less orderly way. This is important, because if things did not function in an orderly and predictable way, then there would be—could be—no science. The function of science is to determine what the laws of nature are. Examples of laws of nature are gravity, electromagnetism, weak and strong nuclear forces, entropy, and the like.

There are two aspects of the laws of nature that are perplexing to scientists. **First**, they don’t know why laws of nature exist the way that they do. Why ARE there rules which govern the operation of things which make our universe run, or work? **Second**, scientists wonder why the laws of nature exist the way that they do.





One of the big questions for science is “Which came first, the universe, or the laws of nature which govern the universe?” The very orderliness of our universe presents something of a problem for scientists because they haven’t been able to account for how the laws of nature came to be. Many scientists who don’t believe in a creator God are not as happy with “laws of nature” which pre-exist our universe’s existence.

Of course, the **ultimate questions** are behind all such quest for knowledge. We all want to know, “Why are we here?” and “What is our purpose?” These are the big questions, the cosmological questions. As we shall see, science isn’t so good at answering these questions. We Christians know that we are here because God willed it, and our purpose is to give thanks for life and worship God.



## Book Summary 1

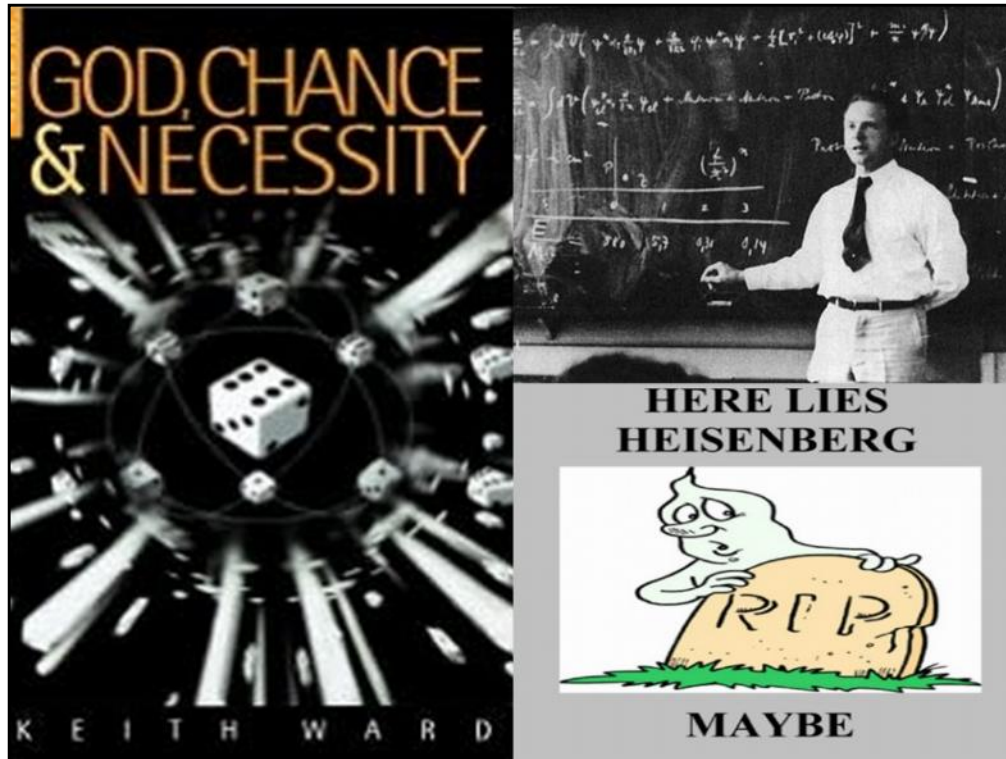
- Physics is **on the verge of** identifying and modeling the mathematical laws of nature which underlie/govern how our universe functions.
- These laws—say the authors—do more than explain and allow us to predict what we observe in our universe, they **call into question** whether there is an objective reality that exists independently of the observer who perceives it.

With that background in mind, here are the three major things that *The Grand Design* says.

**First**, Hawking claims that physics is on the verge of identifying and modeling the mathematical laws of nature which underlie and govern how our universe functions. Most physicists would AGREE with this statement, more or less, depending on how near-term you envision the phrase “on the verge of” to be. That is because physics can model each of the individual laws (gravity, electromagnetism, strong and weak nuclear forces and the like). However, physics is nowhere near discovering a UNIFIED FIELD THEORY that adequately explains all the laws of nature in relation to each other.

Hawking surmounts this difficulty by claiming what he calls **M-theory**, or “model independent realism.” The claim is that a collection of theories can explain how everything works, rather than a single unified theory. Most theoretical physicists would suggest that with M-theory Hawking is out on or even beyond the edge of his field. Hawking, though, says that we are very close to having a unified field theory, and further, that this theory will “call into question” the whole concept of a shared objective reality.

This is where, as Christians, we begin to get a bit uncomfortable, because we know that there IS an objective reality underlying all of creation, and that reality is God.



Hawking arrives at this conclusion because of the probabilistic nature of our world; for those of you who might have taken physics, think of Heisenberg's Uncertainty Principle here. In quantum mechanics the Uncertainty Principle states that at the subatomic level, certain pairs of physical properties, like position and momentum, cannot both be known with precision. That is, the more precisely one property is known, the less precisely the other can be known.

Werner Heisenberg is pictured, by the way, in the upper right corner of this slide, showing the mathematics proving his principle. According to this equation, subatomic particles pop into and out of empty space, and science has actually observed this. Despite what you might have heard, in quantum physics we can actually "get something from nothing."

During their fleeting existence, the particles interact with each other and allow new things to happen. That's what scientists say about it, anyway. Christians theorize that quantum physics—to the extent that it accurately depicts how our world operates—is the mechanism that God used to give us free will. Keith Ward's 1996 book, *God, Chance & Necessity* gives one account of this line of thought. Ward says that if our universe were not probabilistic, outcomes would be certain and we, the created, would not have the freedom that God loved us enough to have given us.

## Book Summary 2

- “**Spontaneous creation from nothing** is the reason why there is something rather than nothing exists, why the universe exists, why we exist...”
- Although our universe is intricate, **our universe is just one of an infinite number of universes**, the one in which we happen to find ourselves.



Some theorists—including Hawking—now think they can go even further, and use quantum physics to explain the origin of literally everything. They claim that the Big Bang from which the entire universe emerged was the result of **convulsions in the quantum vacuum**. The theory is the Big Bang occurred spontaneously, due to subatomic particles popping into existence from nothing, as a direct consequence of gravity. ALL that is left for scientists to do is to explain how it is that subatomic particles and gravity can pop into existence from nothing, complete with their own “laws of physics” (laws of nature) embedded in their very being.

Hawking uses this theory to account for the fact that our world seems ideally suited for life. He acknowledges that since our world contains life, of course it is ideally suited for life. However—and here’s the important thing—many physicists, including Hawking, now think that our world is not the only universe which exists. They say that there is a “multiverse,” a collection of ALL POSSIBLE UNIVERSES, all of which came into existence by **quantum fluctuations from nothing**.

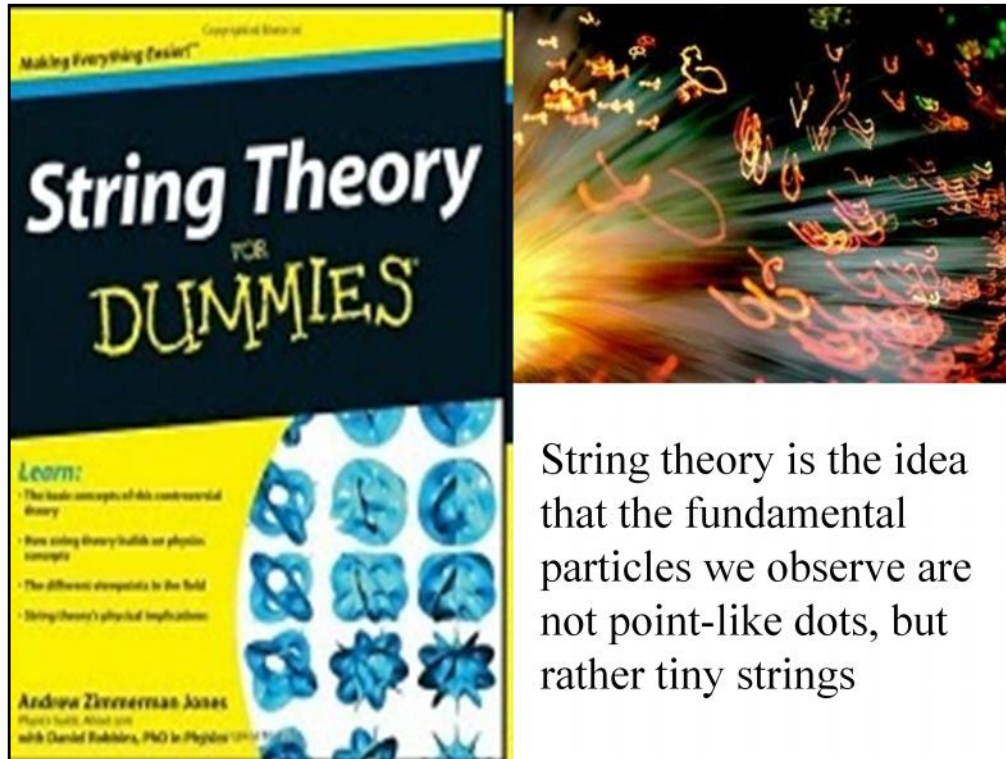


Here is an artist's conception of the multiverse, the collection of an infinite number of universes. In this depiction, just one of these bubbles would contain our own cosmos. Think of it: our galaxy, all other galaxies that we have discovered, and those that we haven't, all of our space and time, past, present, and future, is in just one of these bubbles. The other bubbles each contain other universes.

The season premier of the television show *Family Guy* two years ago featured an episode where the characters discovered how to travel to parallel universes in the multiverse. In one adventure there was a dog walking a beautiful woman. This type of show isn't new, because of course *Star Trek* and other sci-fi genre books and programs have featured alternate universes for a long time. However, in our reality the multiverse theory has moved beyond sci-fi into the realm of serious physics.

Those who wish to discount the possibility of the existence of a creator-God use the multiverse theory to discount the arguments for God based on our uniqueness in the cosmos. Of course, those who believe in a creator God **could embrace** a multiverse; we would probably have some serious arguments among ourselves about whether OUR universe was the only one in which God had become incarnate.





String theory is the idea that the fundamental particles we observe are not point-like dots, but rather tiny strings

The last point I want to make about Hawking's theories is how he gets around the "pre-existent laws of nature" problem. He uses a special form of "string theory," a theory that instead of three space dimensions and one for time, our universe has a lot more dimensions. Traditional string theory says that there are nine physical dimensions plus time, whereas Hawking says that there is one more dimension.

The "extra" dimension is very small and curved, curled up into the reality that we can perceive in a way that is hidden to us. And yet Hawking says that in any particular universe the number of space-time dimensions which are large and thus observable, and the exact configuration of the small dimensions, determine the laws of nature which are in effect in that universe.

In case I lost you there, what Hawking is saying is that each universe which pops into existence from nothing just happen to come equipped with its own laws of nature embedded into its very structure. I say, "If that is how God ordered creation, great!" There is, of course, no practical way to test this theory because we cannot observe more than the three space dimensions which are apparent to us. Those who measure the success of science by its ability to explain observations based on empirical and measurable evidence would find string theory speculative. However, it too is in vogue in some realms of physics and even in popular culture, although its popularity in physics is waning. Many—if not most—physicists would NOT agree with Hawking about his particular take on string theory, or about M-theory.



There is no new PHYSICS in *The Grand Design*, just Hawking's newest interpretation of what physics is telling us. Here's where Hawking got everyone's attention. The book argues that invoking God is not necessary to explain the origins of the universe, and that the Big Bang is a consequence of the laws of physics alone. Hawking says, "One can't prove that God doesn't exist, but science makes God unnecessary."

I would counter that "One cannot prove that God exists, but science continues to show how God does what God does in our world."

I think that *The Grand Design* is well worth reading, if for no other reason than it can make readers feel that they can understand physics. But don't rely on Hawking for theology; he's terrible at it.

## Questions

- Does it matter to your faith that our world is 13.7 billion years old, not about 4,000 (as can be accounted for in the Bible)?
- What difference, if any, would it make in your faith if ours was not the only universe that existed?

## Questions

- All major scientific discoveries seem to cause doubt at the time about faith; examples:
  - Heliocentric view of the solar system (Copernicus, 1543)
  - Invention of the microscope (early 16<sup>th</sup> century)
  - Evolution (Darwin, 1848)
  - Quantum mechanics (1925, Schrödinger)
- Do any recent scientific discoveries seem inconsistent with your understanding of God?
- What about “miracles,” as portrayed in scripture?
- Are there scientific discoveries that *reinforce* your faith? In what way?