Genesis 1 and the Metaphysics of Time

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Our culture assumes that there is a conflict between science and scripture, a conflict between secular truth and theological truth. Science tells us that "the earth and the heavens and all that is in them" are billions of years old. Genesis 1 tells us that our universe was made in six days. Genealogies in Genesis 5 and 11 imply that the six days of Genesis 1 happened only a few thousand years ago. Those very different historical time scales of science and Genesis have led to an ideological tension between "Young Earth" believers who regard all of Scripture as inspired by God and "Old Earth" believers who have been convinced by science to regard Genesis as allegorical or mythological.

The Young Earth/Old Earth dissension has stimulated a debate that was originally brought to widespread attention by the observations of geology (the study of the rocks that form our Earth) and paleontology (the study of fossilized remains of living creatures) roughly 150 years ago. The key elements of the debate have not changed greatly since it first began over a century ago; modern participants still quote ideas and arguments first proposed in the 1800's by Charles Darwin and William Paley (with some refinements).

There have been a few changes in our scientific knowledge since Darwin and Paley discussed the issues. Some of those changes might affect our understanding of Genesis in ways that would allow the longer time scale of science to fit comfortably into the narrative in Genesis 1. In particular, the suggestion here is that the apparent discrepancy between science and Scripture might be the result of a widespread misunderstanding of how time works in this Creation.

The general understanding of Creation seems to be that the matter of our universe, the galaxies, stars, planets, and, especially, the Earth, was spoken into existence *ex nihilo* by God into a preexisting space at some past moment in time; a space and a time that He shares with us. Even for those who accept the modern Big Bang cosmology, it seems to be a common perception that it was the matter of our universe that was originally condensed into a tiny ball and that has since expanded through space over time.

Modern physics and cosmology give us a very different picture.

There will be more details in the rest of this article, but, in summary, modern physics tells us that space and time are inextricably bound together in a four-dimensional reality called spacetime. Spacetime (space and time together) bends and stretches to produce the gravity that holds our universe together. In the Big Bang cosmology, it is not matter that started out in a single, tiny point, it is spacetime itself. Our universe started out as an infinitesimally small point with zero space and zero time; spacetime has since expanded to the size and duration that we see around us today. Most of the enormous distances between stars and galaxies are due to spacetime expansion, not to the movement of matter in space.

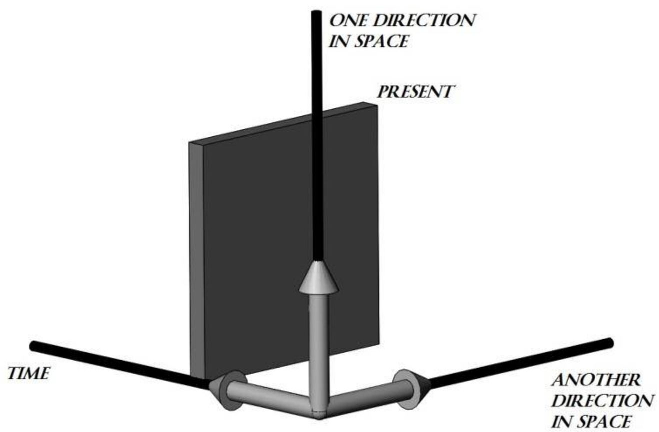
There are many implications for theology, especially for our interpretation of Genesis 1, in the spacetime/Big Bang perspective. The most basic assertion is that, according to modern physics, our space is not infinite and our time is not eternal. They are both really, really big, but they are limited in size and duration. Which implies that our space and our time are not compatible with an infinite, eternal God; He is probably not here in spacetime with us.

Modern physics also tells us that time, the physical nature of time, may not be anything like how we perceive it. We experience time as an ever changing present. We see a universe that is full of material objects now. But a physicist or, especially, a philosopher might ask, "Wait a minute. How does it do that? What about the past, does it physically exist or has it vanished in a puff of smoke? What about the future? How does it get here and where does it come from?"

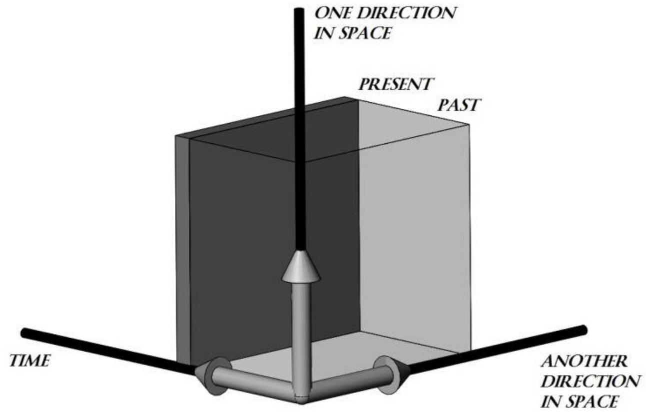
Physics and philosophy do not currently have firm answers to all questions about time, so considerations of the physical nature of time are, for now, more philosophical speculation than they are settled science. In the rest of this article I will be taking one of the philosophical speculations about the nature of time, called eternalism, and using it to develop a slightly different interpretation of Genesis 1. Physics informs us that we live in a four dimensional Minkowski spacetime (explained later). Philosophy suggests that we might live in an eternalist, four dimensional Minkowski spacetime. The idea here is that, if we actually do live in an eternalist, four dimensional Minkowski spacetime, a Genesis 1 that is true would probably describe the creation of an eternalist, four dimensional Minkowski spacetime.

Because most of the terminology used to discuss the physical nature of time comes from philosophy, we'll start the discussion with a brief overview of some of the major ideas in the metaphysics of time. Metaphysics is a branch of philosophy that focuses on the nature of our physical reality; metaphysics practitioners speculate about existence, objects and their properties, space, time, cause and effect, and possibility (definition from Wikipedia). The main area of interest for this article is the physical existence and properties of objects in time.

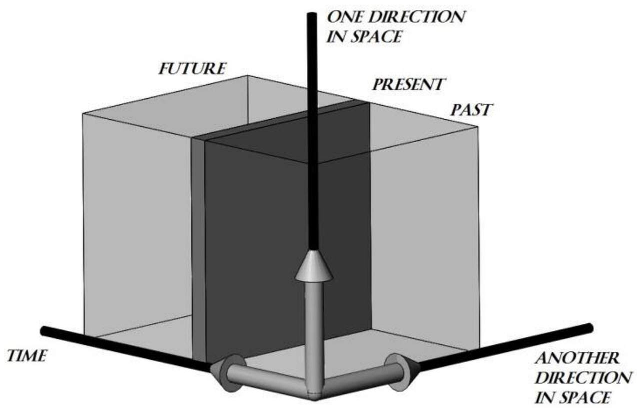
Philosophical speculation regarding the physical nature of time usually considers two broad categories with many nuanced variations in each. The main categories are called presentism and eternalism. In presentism, only objects in the present instant of time have a real physical existence. There may or may not be an existing past and there is definitely no existing future. For eternalism, objects can have a real physical existence anywhere and everywhere in eternity; past, present, and future all physically exist.



Philosophers have suggested many different models for how time works and how objects maintain their existence in time. Here, we'll take a brief look at three of the more prominent perspectives: strict presentism; another variety of presentism called growing block theory; and the block theory version of eternalism. The illustration above shows a representation of the simplest form of strict presentism, which is simply the way that we experience time. It shows the present as solidly existing while the past and future do not exist at all. In this view, the slice of reality is called a foliation. In the various nuances of strict presentism there is either a single foliation that sweeps forward in time or a stack of foliations like the pages of a book, each existing for a brief instant. Objects can exist in the single foliation, shifting and changing as it moves through time, or they can come into existence for each individual foliation and be replaced by a similar object in the next foliation.

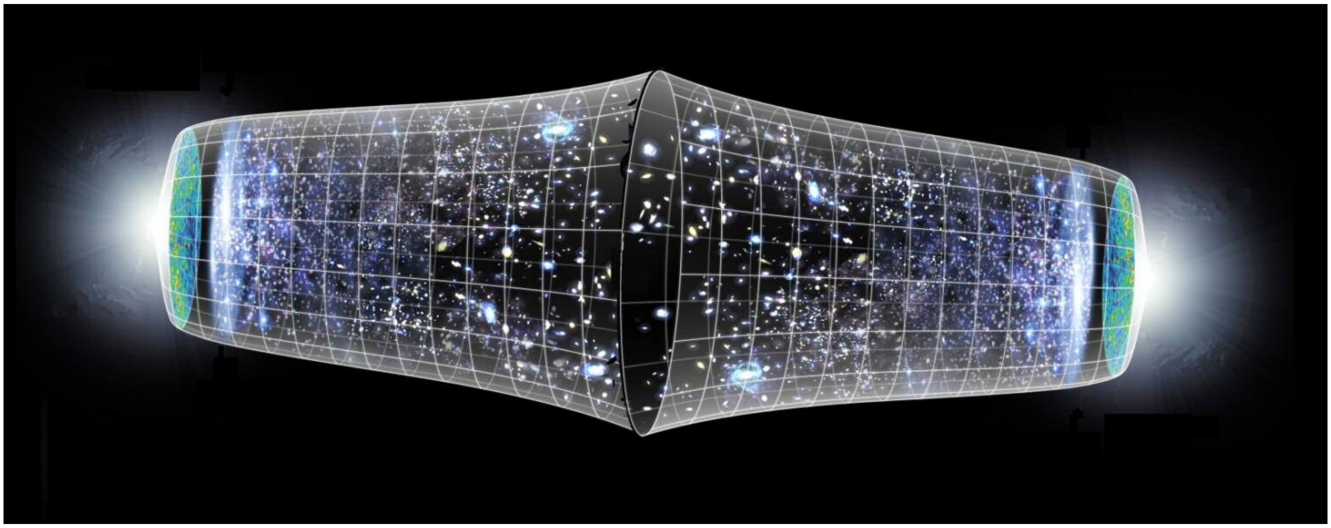


The next illustration shows a more complex view of time that has the past physically existing. This modification of presentism still has the foliation of the present but the foliations of the past persist, they do not vanish as they do in strict presentism. Here, objects come into existence in the present instant of time and are left behind in the past, like a trail of statues. This version of presentism is called the growing block theory of time.



The last illustration portrays eternalism where past, present, and future all physically exist. Here, objects exist throughout all of time, twisting like vines as they shift and change. Only our perception moves through time, showing us bits and pieces of reality like a flashlight in a cave. This view of time, this version of eternalism, is called the block theory.

If we assume for the moment that the scientific picture of history is approximately correct and if we imagine someone outside of our spacetime looking in, eternalism means that all of history would be right there in front of our imaginary spectator (like the illustration below): the Big Bang; the slow development of galaxies, stars, and planets; the first small creatures in the seas and on land; the dinosaurs; our ancestors, us, and our descendants; and the end of time when the sun brightens and then goes dark and the stars fall from the sky. All of it would be real and all happening simultaneously.



Spacetime. Image adapted from *Timeline of the Universe*, by NASA/WMAP Science Team and Ryan Kaldari, 2010, https://en.wikipedia.org/wiki/Big_Bang. Public domain.

Philosophy guesses and debates the nature of our world. Physics is the study of how the world actually does work. Currently, the practice of physics is focused on applying mathematics to the study of how the world works. Physics, and the mathematics of physics, are often divided into two broad areas: classical physics and modern physics. Classical physics essentially began with Galileo and Newton roughly 400 years ago. They and others were able to develop mathematical models that could accurately predict the behavior of objects. The industrial revolution was largely based on insights provided by the mathematical models of classical physics.

Classical physics was and still is based on some very commonsense assumptions about how this world works. Among the basics of classical physics are the ideas that physical objects are made of solid material that has mass and occupies space, physical objects move in response to forces that push or pull on them, and time progresses instant by instant the same for all objects everywhere.

Classical physics began to stumble into becoming modern physics about 160 years ago. Physicists began to run into situations where the mathematical models of classical physics just did not work. The first of many such surprises was that the mathematical models that described electromagnetic behavior did not work properly in a space where time progresses instant by instant the same for all objects everywhere. Over the next 50 years, many physicists developed mathematical models to describe a space where electromagnetics would work. The models are called special and general relativity, and the space they describe is called Minkowski space. Literally thousands of subsequent observations and experiments have confirmed that we actually do live in a Minkowski space.

In Minkowski space, time bends. Objects (or people) moving relative to each other each see time for the other progressing more slowly. Distances contract in the direction of motion. Sequences of events can change the order in which they happen (the last becomes first and the first, last). Time slows when objects (or people) increase their rates of motion. Time also passes more slowly for objects (or people) that are near massive things like planets or stars.

Because time, distance, and motion are all interdependent in Minkowski space, physicists call it a four dimensional spacetime instead of the three dimensional space plus time of classical physics. Minkowski spacetime has a few other quirks: no physical object can move faster than the speed of light; all material objects in this spacetime, from particles to planets, are made of energy and nothing but energy, nothing is truly solid; time and space bend together near matter to produce gravity; as was mentioned before, the Minkowski spacetime that we live in is finite; it has a large but limited size and, apparently, a large but limited duration (so far).

One other odd behavior in Minkowski spacetime, just as an example, results in black holes. Spacetime bends in the presence of mass. With enough mass, spacetime can be twisted into a knot that is called a black hole. Black holes are usually described as objects so massive that light cannot escape them. They also show up frequently in science fiction stories that involve time travel. The reason black holes are portrayed in that way is that time and space exchange their natures inside black holes. Outside of black holes objects (or people) can wander freely in space but they are stuck in time, carried inexorably from moment to moment. Inside a black hole, objects (not it!) can wander freely in time but are stuck in space and are carried inexorably to the center of the black hole.

If one happens to regard physics as a valid argument in philosophy, which some philosophers don't but I do, Minkowski spacetime provides a very strong argument against presentism. Both of the presentist theories mentioned above, strict presentism theory and growing block theory, depend on the physical existence of a present instant of time to define the reality of objects. For strict presentism theory the present instant is the only instant when any object can exist. For growing block theory, the present is the only time that any object can come into being. In a Minkowski spacetime, every particle in the universe has a different rate of time progression. The differences can be very small, but they are not zero. Sequences of events such as particle interactions can shift almost randomly depending on the relative speeds of particles. Practically speaking, it is not possible to define a present instant of time in a Minkowski spacetime.

For the sake of accuracy, I should mention that the above argument against presentism based on special and general relativity is a strong argument but it is not conclusive. There are several proposals for alternative physics that would allow presentism but, as far as I know, none of them have been verified by experiment yet.

In addition to special and general relativity, the transition from classical to modern physics included another body of mathematical models of physical behavior that are, as a group, called quantum mechanics. Quantum mechanics models currently describe the behavior of subatomic particles, electromagnetic interactions, and the forces that bind subatomic particles into atoms and molecules.

It wouldn't be modern physics if it wasn't weird, so here are a few examples of the implications of quantum mechanics just for entertainment. Particles can physically exist in either of two states: a classical state with point-like, specific values of properties or a quantum state where properties like position, velocity, and time have spread out, wave-like possibilities of values. Particles spend nearly all of their time in quantum state. Quantum state particles seem to transition to classical state when we interact with them; all that we ever see are classical state particles. One might wonder here why we need quantum mechanics if all that we ever see are classical state particles that behave in accordance with classical physics. The answer is that only the mathematical models of quantum mechanics can predict where, when, and how those classical particles will show up; classical physics theories are useless.

Quantum state particles that interact with each other can become entangled: when one entangled particle transitions to classical state, the wave-like possibilities of the other entangled particle change to accommodate the newly classical particle. Information about the newly classical particle gets to the entangled quantum state particle at speeds much faster than the speed of light. Remember that relativity informed us that no physical object can move faster than the speed of light; whatever it is that carries information between entangled quantum state particles, it is not a physical part of our reality.

The aspect of quantum mechanics that is of interest for this article is called the Feynman-Stueckelberg interpretation of antimatter. One of the early verifications for the mathematical models of quantum mechanics was that the existence of antimatter was predicted mathematically before it was observed experimentally. The prediction for antimatter came about because the mathematical model for electrons involved a square root which, as square roots do in algebra, had two solutions: a positive solution and a negative solution. The negative solution worked well for normal matter but the positive solution did not. The positive solution turned out to be associated with antimatter. Roughly 20 years later (in 1949) Stueckelberg and Feynman reformulated the mathematical model to describe antimatter as traveling backward in time. Their reformulation solved a lot of problems with the model and, mathematically, is still used today.

Again for the sake of accuracy, I should mention here that virtually all physicists regard the Feynman-Stueckelberg interpretation as a mathematical convention and do not believe that antimatter particles actually do travel backwards in time. So far, however, there is no experimental proof one way or the other. Both interpretations, either mathematical convention or backwards time, are just opinions.

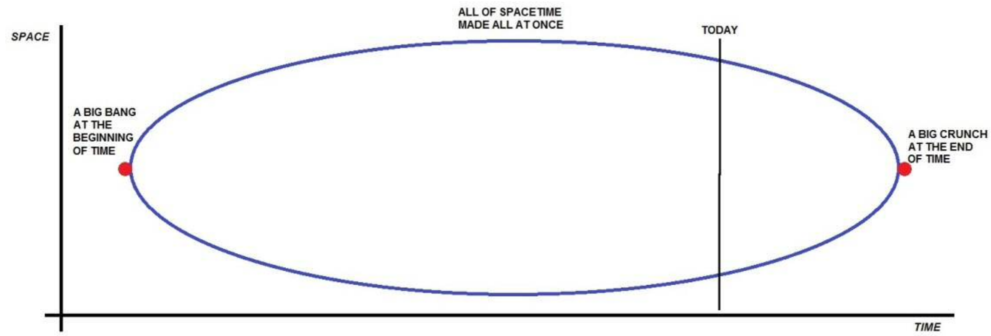
That said, the idea that antimatter particles might travel backwards in time has some dramatic implications for the physical nature of time. Antimatter particles have a real physical existence that we can measure. They routinely show up in physics experiments. The mathematical models of quantum mechanics tell us that antimatter particles are an indispensable constituent of all matter and always have been (check out vacuum fluctuations and renormalization if interested). In short, antimatter particles always share our now with us.

Just as normal matter traveling forward in time that shares our now came from the past, antimatter that travels backwards in time that also shares our now must have come from the future. If there is real, physical matter coming from the future, there has to be a real physical future for the matter to come from. Just as relativity argued strongly against presentism, quantum mechanics argues strongly in favor of eternalism as the most likely theory for the physical nature of time.

If our reality actually is an eternalist four-dimensional Minkowski spacetime, we should consider what effect that perspective might have on our interpretation of Genesis 1. The most dramatic impact is on our perception of the time scales of Genesis 1 and spacetime. If Genesis 1 describes the creation of an eternalist, four dimensional Minkowski spacetime, then spacetime was likely made all at once on the first day of creation. All at once here means from bottom to top, side to side, front to back, and beginning to end; the whole duration of time would have been just as much a part of the initial creation as the distances must have been.

If spacetime was made all at once with the entire 14 billion years or so of duration that science sees in our universe coming into being on the first day of creation, then all of the events described in Genesis 1 could have happened at any time in our history (or future) or at all times. Our picture of the events of creation described in Genesis 1 change if they could happen at any date in our time or at all dates in our time:

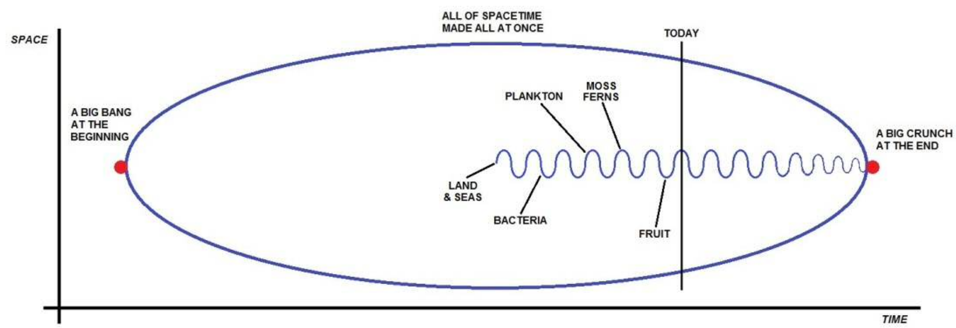
First day: Spacetime is made and then stretched out to “separate the light from the darkness.” That means all of spacetime from beginning to end, all 14 billion years of it.



All of space and time is made on the first day of Creation

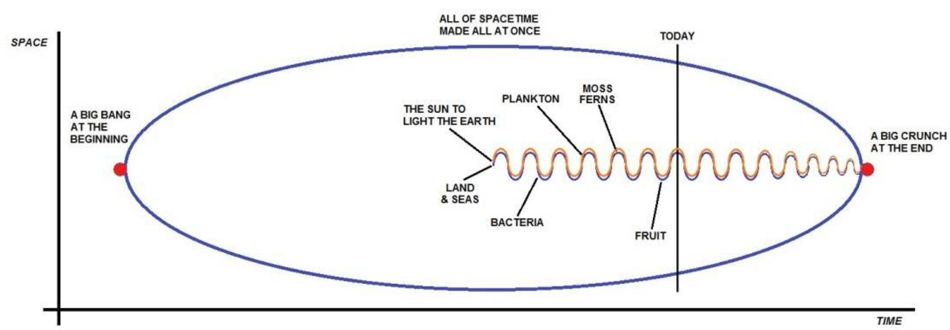
Second day: The stuff of creation (whatever that might be) is divided with a bit in the middle that will become the sky.

Third day: The part of creation below the sky is made into land and seas. Plants are made in the land, not just a few plants long ago in our time, but all of the plants in all times: from the earliest mosses to the plants that we see around us today to whatever vegetation grows at the end of time.



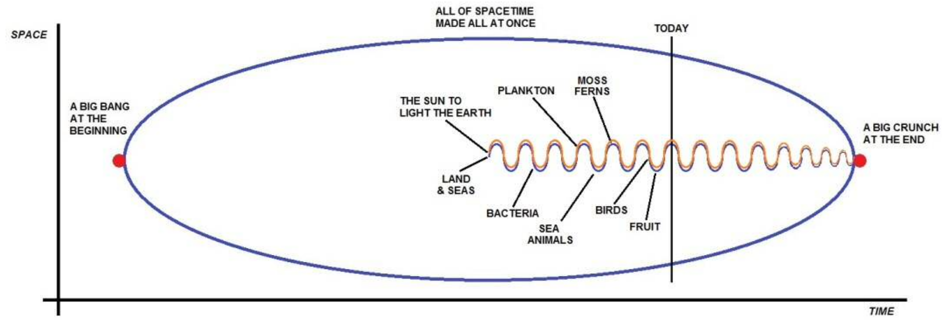
Land and seas with plants scattered through time are made on the third day of Creation

Fourth day: Galaxies, stars, and planets are made, including the sun and moon. Once again, this is not just at some time in our past, but all of the stars and planets throughout all of time, from the earliest stars long ago to the stars we see around us today to whatever stars fall from the sky at the end of time.



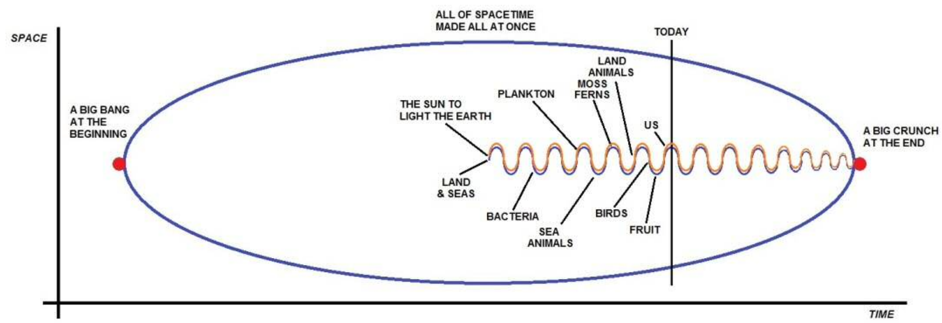
Galaxies, stars, and planets scattered through time are made on the fourth day

Fifth day: All of the fish of the seas and the birds of the air throughout all of time are made.



The fish of the seas and the birds of the air scattered through time on the fifth day

Sixth day: All of the land animals throughout all of time, from the first centipedes to the dinosaurs to our ancestors, us, and our descendants and to whatever creatures creep upon the Earth at the end of time are made.



Land animals and us scattered through time are made on the sixth day of Creation

The above description of the possible events in Genesis 1 takes the astronomical and geologic time of secular science at face value. The main advantage of considering Genesis 1 in this way is that it might reduce or resolve the time scale difference between science and Scripture. If spacetime was made all at once, then the duration inside spacetime has nothing to do with how long it took to make or how long it has been since it was made; the six days of creation and, possibly, the lifetimes given in the genealogies of Genesis 5 and 11 may not be in our time at all. The timescale of secular science would be irrelevant to the truth of Genesis 1.

As another example, Genesis 1 describes the creation of plants, including plants with seed-bearing fruit, on the third day of creation, the creation of marine animals and birds on the fifth day, and the creation of larger land animals on the sixth day. If we take the fossil record at face value the order of appearance for those organisms is very different: marine animals appear first; marine and land plants come next roughly 100 million years later; land animals appear shortly after the first land plants; birds and plants with seed-bearing fruit finally show up 200-300 million years after the land animals. For an eternalist spacetime where all of time has a real, physical existence there is no discrepancy between Scripture and science here. God would have been able to sprinkle plants and animals into spacetime at whatever dates suited his purpose. It would only have been necessary to put plants into the creation first so that the animals would have something to eat when they got here.

How does the idea of an eternalist Minkowski spacetime made all at once on the first day of creation fit with Scripture? It fits well enough with Genesis 1, but that may only be because there is not very much detail in Genesis 1. To begin with, the idea implies strongly that God, at least the Father, is not stuck here in spacetime with us. Paul tells us in Acts 17:27-28 that we live and move and have our being in God, indicating that this creation is probably a part of God. He is, therefore, outside of the creation but, as far as Paul tells us here, he may or may not be outside of spacetime.

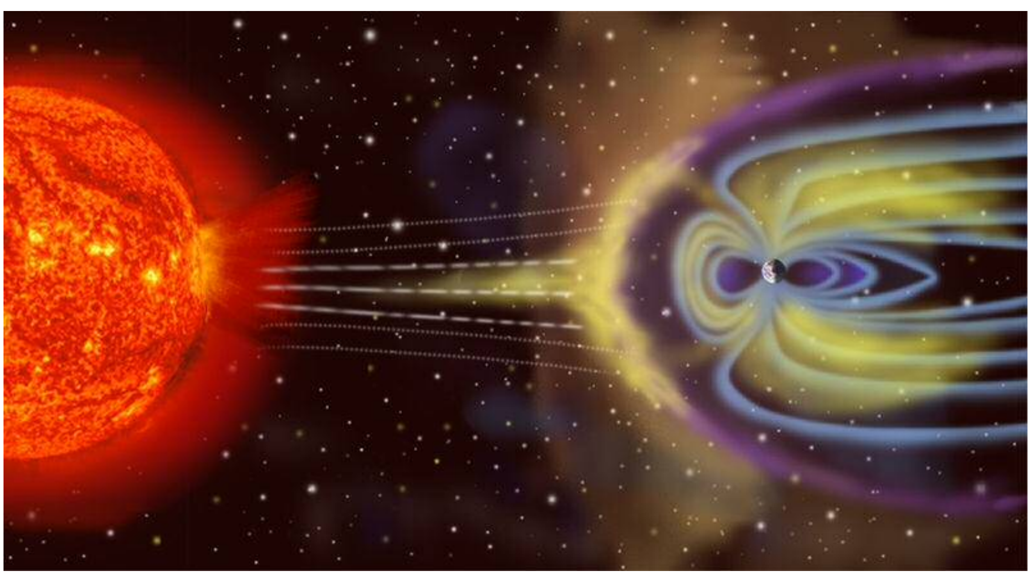
Scripture quotes God in several places (Isaiah 42:5, 45:12, 51:13, Jeremiah 10:12) as saying that he stretched out the heavens. In the Big Bang cosmology spacetime has a very rapid expansion at the beginning of time followed by a continuing expansion that, as far as we know, has spacetime still growing today. As was mentioned earlier, the Big Bang expansion is not matter flying apart after some huge explosion; it is spacetime itself stretching with large distances growing between points that were originally right next to each other. If the stretching referred to in Scripture is the Big Bang expansion, it would imply strongly that God is outside of spacetime.

Scripture also tells us that the Father knows the future as well as he knows the present and the past. There are many ways that an omniscient, all-powerful God could know the future. One of the simplest for us to understand would be if he were on the outside of an eternalist Minkowski spacetime looking in. Past, present, and future would all be right there in front of him, easy to see.

Scripture may not contradict the idea of Genesis 1 describing the creation of an eternalist Minkowski spacetime and it might even support the concept in a mild, offhand way. There is another question that is, I think, relevant to the credibility of this view of creation. That is, why are relativity and quantum mechanics necessary at all for a creation made by God? In a creation, everything is done for a reason. We may or may not be able to figure out the reason, but there probably always is one. Is all of this modern physics weirdness really necessary?

There are a couple of reasons that relativity and quantum mechanics might be handy in a creation like the one we live in. They may or may not be correct and they might not be the real reasons, but they do fit in rather well. Basically, relativity might be a requirement for life on Earth and quantum mechanics might be necessary for flexibility.

The illustration below shows the Earth's magnetic field shielding the surface of our planet from solar cosmic rays. Without the protection provided by our planet's magnetic field, radiation levels on the surface of the Earth would be far too high for carbon-based organic life to survive on land. The sun's magnetic field provides us with the same kind of protection from galactic background radiation. In order for planets to be close enough to stars to melt ice into water, they have to have radiation shielding, like our magnetic field, for life to survive.



Magnetosphere rendition.jpg, from https://commons.wikimedia.org/wiki/File:Magnetosphere_rendition.jpg, 2005, by NASA, public domain.

Remember that the mathematical models of special and general relativity were originally developed as a speculation regarding the type of space that would be required for the mathematic models of electromagnetics to work properly. The message here is that this creation has to have electromagnetics and relativity for life to survive on the surface of any planet.

Remember also that because of the scrambled sequences of interactions for particles moving at different velocities in Minkowski spacetime, because there is no definable present instant of time, relativity probably requires that time be eternalist. If creation has to be eternalist, then it would have to be a web of possibilities to allow us to have free will or for there to be any uncontrolled events at all anywhere or at any time. It would have to be a web of possibilities brought into actuality by interactions or events as they occur. Providentially, that is exactly the behavior that we see in quantum mechanics with quantum state particles, entangled particles, and particles that transition from quantum state to classical state whenever we interact with them.

Physics and philosophy, therefore, might persuade us to alter our view of the possibilities for the physical nature of time. If we apply that new perspective to the interpretation of Genesis 1, we can imagine a reality where science and Scripture, secular truth and theological truth, are compatible. We can speculate that there might be a reality where the astronomical and geologic times of science fit easily into Genesis 1. We can imagine a reality, moreover, where some very odd physics is exactly what we would logically expect to see in a creation made by God. These ideas are discussed in much more detail in my book *Quantum Genesis, Speculations in Modern Physics and the Truth of Scripture* from Deep River Books (quantumgenesisbook.com).

We do not know what the truth is. We do not know how time really works. We do not know why time shifts with velocity and acceleration. We do not know why our subatomic world behaves as if it is made of possibilities. Physics and philosophy can, for now, only provide us with speculations, with guesses. But among those speculations there is at least one that, once again, gives us a creation that attests to the existence of God.

Additional Reading:

Quantum Genesis, Speculation in Modern Physics and the Truth of Scripture, 2019, Stuart Allen. This book, by me, discusses the themes of this article and some other themes in apologetics in much greater detail. It is written for anyone interested in the topic. More information is available at quantumgenesisbook.com.

The Oxford Handbook of Philosophy of Time, 2011, edited by Craig Callender. This is a very thorough presentation of many of the perspectives in the philosophy and metaphysics of time. The book is written for an advanced audience (physicists and philosophers) but is still very readable.

Relativity, Gravitation and Cosmology, 2010, Ta-Pei Cheng. This book is a very thorough presentation of relativity and the application of relativity to cosmology. It is written for an advanced audience (college level physics students) but has a good non-mathematical section that is very readable. It also has a mathematical section for people who enjoy tensors.

QED, the strange theory of light and matter, 1985, Richard Feynman. This is a very readable introduction to quantum mechanics written for anyone interested in the subject. It includes some discussion of the backwards time nature of antimatter.

Deep Down Things, the Breathtaking Beauty of Particle Physics, 2004, Bruce Schumm. This book has an excellent presentation of particle physics including the Feynman-Stueckelberg interpretation of antimatter. It is written for anyone interested in the subject.