

A more biblical cosmology

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Genesis 1 contains three strong clues that the speed of light in the heavens was extremely high during the first four days of creation. Relativity says the speed of light controls the 'speed of time'. Earth days were of normal length (Exodus 20:11), so the speed of light on Earth was normal. The high speed of light in the heavens means that billions of years' worth of events would occur there before the end of the fourth day on Earth. If at that time the speed of light in the heavens dropped suddenly to normal, then we would see no difference between things closer or farther than 6,000 light-years away. The heavens would have an apparent history of billions of years, allowing them to declare the glory of God (Psalm 19:1).

1. Introduction

Taking the Hebrew text of Scripture at face value, without inserting gaps or revising the meanings, the universe is only about 6,000 years old. Creationists have proposed various theories to explain how we could see distant heavenly bodies with such a short time available for the light to get here. Creationist cosmologies should also explain three other observed features of the universe: (1) the increasing red shift of light with increasing distance, (2) the Cosmic Microwave Background radiation, and (3) the seemingly great age of the distant cosmos (see figure 7 for an example of such data). Some creationist theories only explain a few of these additional features.

Many of the recent theories build on Einstein's general theory of relativity, particularly the idea of gravitational time dilation. I have offered two such theories myself, one in 1994¹ and one in 2008.² But I have never been satisfied with such theories, even my own, because they did not rest upon a firm biblical foundation. Most of the authors, including myself, seem to have first gotten a physics idea and then tried to see if the idea could fit into Scripture. In this paper, I am mainly pointing out what God says He did, especially in the first chapter of Genesis. Along the way I will point out a few of the scientific consequences. I will not try to develop the physics (if it was not completely miraculous) of how He did what He said, but this paper may give a basis for later research into that question. Some elements of my first two cosmologies may surface at that point. One element, the idea that the earth is approximately at the centre of the cosmos, is remaining here.

2. The first day

The first line of the Bible tells us:

"In the beginning God created the heavens and the earth" (Genesis 1:1).

Right away, we must grapple with a difficulty (it will not be the last one) for many people: does 'heavens' here mean the sun, moon, and stars, or the *space* that will later contain those bodies? I vote for 'space', first because chapter one says God made the heavenly bodies at a later time, on the fourth day.³ Secondly, because many Scriptures⁴ refer to the heavenly bodies specifically as 'the host of heaven'. Third, if 'the heavens', in verse 1, were to include the heavenly bodies, then that verse would have to become a summary statement covering the whole chapter. Then there would be no verse specifically describing the creation of the earth, which pops up suddenly in the second verse. Having 'the heavens' in verse 1 mean 'space' seems to make the narrative more straightforward. Other creationists take different views of this verse.^{5,6} Their views would not affect the main points I make here. The next verse reads:

"And the earth was formless and void; and darkness was on the face of the deep. And the Spirit of God moved on the face of the waters" (Genesis 1:2).

According to one of my favourite lexicons, the most general meaning of the Hebrew noun *ṭhom*, translated 'deep', seems to be 'a large body of water'.⁷ This is consistent with the last part of the verse, 'the face of the *waters*'. The face (surface) of the deep is the interface of the waters with the heavens. Within the deep is the earth. The earth could be 'formless and void' (or 'unformed and unfilled'⁸) simply by being scattered atoms (unconsolidated into a solid) within the water, or it could simply be an unmarked region of water within the deep which God would later transform into the solid earth, on the third day.

To read Scripture straightforwardly,⁹ I take the water of the deep to be ordinary liquid water, not ice, or steam, or hot plasma, or other materials, as some creationists propose. There are good Hebrew words for those alternatives. For example, several Hebrew words for 'fire' would be good for 'plasma'. Yet God did not use any of the alternative words,

so I suggest that He really did mean H₂O molecules in the liquid state.

The Spirit of God moving ‘on’ (or over, or above, Hebrew, ‘*al*’) the face of the waters suggests that there was an ‘up’ and a ‘down’; i.e. gravity was working even at that early stage of creation. In an otherwise empty space, the self-gravity of the mass of water would pull it into a spherical shape, even if God had not created it that way at the outset. So the deep was, or became, a ball of water.¹⁰

The next three verses tell us the darkness did not continue:

“And God said, ‘Let there be light’; and there was light. And God saw that the light was good, and God separated the light from the darkness. And there was evening and there was morning, one day” (Genesis 1:3–5).

Taking the account at face value, the source of this light could not have been the sun, because the sun, along with the other heavenly bodies, was not made until the fourth day. (There is no physical requirement for the light source, or sources, to have been a sun; light can have a lot of different kinds of source.) My picture of what happened is this: the light first shone on the deep from all directions, and then it shone from only one direction. A psalm which appears to refer to the days of creation supports this:

“Covering Yourself with light as with a cloak ...”
(Psalm 104:2).

In other words, God could have gathered the light around Himself and become a localized source for the light, as He will do in the future.¹¹ The deep, now being illuminated from only one direction, has a dark side and a light side. This is my suggestion for how God “separated the light from the darkness”.

As soon as the light and dark sides appear, the deep appears to be rotating. If we were to drop a marker buoy on the surface of the waters, it would take a period of time to be rotated completely around the sphere. That would mark off an evening and a morning, and God called the period, ‘one day’.¹²

A part of the Ten Commandments tells us how long those rotation periods were:

“For in six days the Lord made the heavens and the earth ...” (Exodus 20:11).

Surrounding this verse are verses using the same word translated ‘day’ (Hebrew *yom*) to mean an ordinary-length day of the week, such as, “Six days you shall labor ... but the seventh day is a sabbath ...”¹³ Nowhere in the passage does God use the Hebrew words or phrases for ‘long age’ (*‘olam*), “to a thousandth generation” (*le’eleph dor*), or “thousands of myriads” of years (*alephei revavot shanim*). Since we know that God is very precise in His use of words,¹⁴ we can take Him at His Word to mean that the entire period (as measured

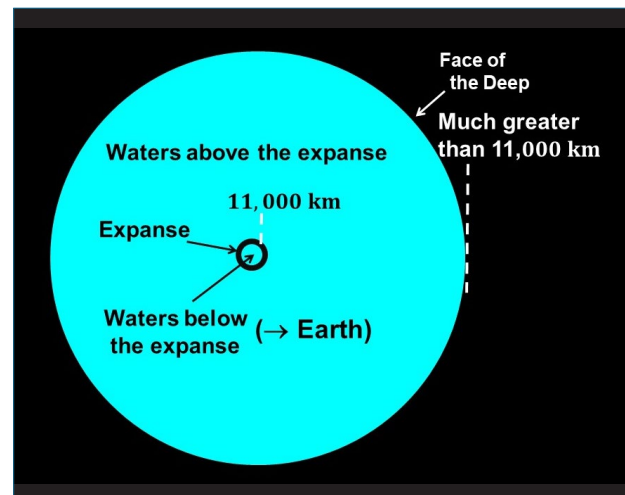


Figure 1. “In the midst of the waters” implies the expanse was near the centre of the deep.

on Earth) in which He made the universe was six ordinary-length days of the week. Time on Earth during Creation Week proceeded at its normal rate. As I will explain in the seventh section, the speed of light is directly connected to the ‘speed of time’. So the normalcy of time on Earth means the speed of light on Earth during the first six days was at its normal value, 186,000 miles per second, or 300,000 km/sec.

3. The second day

Next, we have a verse that is especially important in building a cosmology:

“And God said, ‘Let there be an expanse in the midst of the waters, and let it separate the waters from the waters’” (Genesis 1:6).

The Hebrew word *raqia*’, translated ‘expanse’,¹⁵ is a very unusual one to find in this context. Its most literal meaning seems to be *something solid spread out by hammering thin*.¹⁶ Examples of that usage (and of the associated verb *raqa*’) are: copper or bronze being hammered out into sheets to plate the altar of sacrifice,¹⁷ gold being spread out on an idol,¹⁸ gold being hammered out into thin sheets to be cut into gold threads,¹⁹ and silver being beaten into plates.²⁰ In verse eight, God calls the *raqia*’ ‘heavens’. For millennia, scholars appear to have worried about the literal meaning, apparently thinking they must somehow reconcile a nearly two-dimensional solid and a three-dimensional seemingly empty space. More recently, scholars who take a low view of the accuracy of Scripture have claimed that God was merely ‘accommodating’ ideas of the ancient Near East by presenting the heavens as a thin metal dome above the earth.²¹ More conservative scholars have sought to find wider meanings of *raqia*’, such as ‘expanse’.^{5, 22}

I suggest that the scholars have been making problems for themselves by (1) thinking the heavens have only *three* dimensions, and (2) thinking that solids are always *impenetrable*. There is Scriptural and scientific evidence that space is, or is filled with, a solid material which is thin in a fourth spatial direction.²³ We cannot perceive our motion through the solid (or its motion through us), nor can we (usually) perceive the fourth direction.²⁴

So my proposal is that the *raqia'* is a solid physical material which God hammered thin in one of its four dimensions, causing it to expand in its three larger dimensions. Thus, the Hebrew word suggests that at some time *the expanse was expanded*. The rest of Genesis 1 will show that the expansion was enormous and fast, taking place over the second through to the fourth days at the longest.

There is another cosmologically significant phrase in the above verse: “in the midst of the waters”. In Hebrew, the phrase is *b'tok*, which is the preposition *b'e*, ‘in’, combined with the noun *tavek*, the primary meaning of which is ‘midst, middle’.²⁵ With the preposition, it means, “in the very heart and midst of”.²⁶ Examples are “the tree of life in the midst of the garden”,²⁷ and “the tree in the midst of the garden”.²⁸ So the *raqia'* was near the centre of the deep, as figure 1 shows. It was not quite at the centre, because there were waters below the *raqia'* which God transformed into the solid earth on the third day.²⁹

Many people, including myself at one time, have pictured the deep as being much smaller, a relatively thin skin (an ocean) a few miles deep atop a solid earth of the same size as it now is. They, and I at one time, have imagined the *raqia'* as being the earth's atmosphere, dividing the deep into roughly equal parts, the waters above and the waters below. The waters above, a canopy of water vapour, would later collapse upon the earth, furnishing much of the waters of the Genesis Flood.³⁰ But I found there were problems with that picture:³¹

1. Later on in the account,³² on the fourth day, God says three times that He placed the heavenly bodies “in the expanse (*raqia'*) of the heavens”. This implies that by the fourth day, the *raqia'* was much larger than the atmosphere, large enough to contain all the stars. If the canopy theory were correct, it seems that it would have been clearer for God to say He placed the heavenly bodies above (different Hebrew preposition) the *raqia'*, or even more clearly, “above the waters above”.
2. The waters above the expanse still exist, according to a psalm written long after the Genesis Flood: “Praise Him highest heavens, and the waters that are above the heavens.”³³ Therefore those waters could not have been a vapour canopy which collapsed upon the earth during the Flood. Instead, it appears they are now a much higher canopy of water beyond the most distant galaxy.

3. I think there is a better word than *b'tok* (‘in the midst’) to describe the idea of a thin, spherical *raqia'* dividing a thin, spherical shell of waters into two thinner parts. That word is *chatsi* (pronounce *ch* as in ‘chaos’), meaning ‘divided’, ‘half’, or ‘halfway’.³⁴ An example is in Exodus 27:5, where a horizontal bronze net was placed halfway up the bronze altar, dividing it into upper and lower parts. The fact that God did not use this word in Genesis 1:7 is evidence against the canopy theory's picture of a thin deep being divided into two thinner parts.

So, I am persuaded that figure 1 is the correct view. On the third day, the waters below the expanse turn into the solid earth, as suggested by 2 Peter 3:5.³⁵ The present radius of the earth is about 6,400 km. If God conserved mass during the transformation, then on the second day, the radius of the waters below the expanse would have been about 11,000 km.³⁶ We do not know how thick the expanse was initially, but to make the relative dimensions more definite, let us assume it was less than 100 km. So, in order for the expanse to have been “in the midst” (i.e. near the centre) of the waters, the outer radius of the waters would have to have been very much greater than 11,100 km. Let us say it was at least 10 times greater, 110,000 km at the least.

Later on, I am going to offer a theoretical reason for thinking the mass of the deep was greater than the total mass of all the stars in all the galaxies the Hubble Space Telescope can observe. That would mean that the radius of the deep was at least one light-year,³⁷ about 10 trillion km. That is 1,700 times bigger than our solar system. It is billions of times smaller than the observed cosmos is today, but it is still a great distance, about one quarter the distance to the nearest star. So if my yet-to-be-explained theory is right, the deep was enormously deep!

4. The fourth day

The next item of cosmological significance is on the fourth day:

“Then God said, ‘Let there be lights in the expanse of the heavens ... and let them be for lights in the expanse of the heavens ...’ God made the two great lights ... and the stars. God placed them in the expanse of the heavens ...” (Genesis 1:14–17).

It is significant that God repeated this exact phrase, “in the expanse of the heavens”, three times, probably so we would not miss it. All the words are important: ‘in’, not ‘above’; ‘the expanse’, so we would know it is the same *raqia'* He made on the second day; ‘of the heavens’, so we would not miss the identification He had made between the *raqia'* and the heavens. The above verses tell us that by the fourth day the expanse was big enough to contain all the stars. The

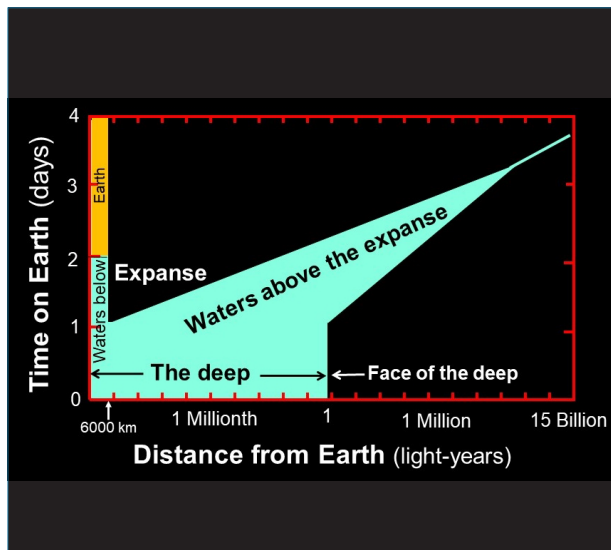


Figure 2. Expanding the expanse and raising the waters.

psalm I mentioned in the third section, point (2), says that there are waters above the expanse:

“Praise the Lord! Praise the Lord from the heavens;
praise Him in the heights! Praise Him, all His angels;
praise Him all His hosts! Praise Him, sun and moon;
praise Him all stars of light! Praise Him, highest
heavens, and the waters that are above the heavens!”
(Psalm 148:1–4).

So, between the second day and the fourth day (on Earth), the top of the expanse and the waters above the expanse expanded outward enormously.³⁸ Let us put numbers to the amount of expansion. The light from the most distant object yet observed is estimated to have travelled about 13.5 billion light years across expanding space to get to us.³⁹ The waters were above the object. So at present, the waters above the expanse have to be at a greater distance, say at least 15 billion light years. (It could be much greater.)

Figure 2 shows, in a simplified way, the expansion of the expanse and the raising of the waters above the expanse. The horizontal axis shows the distance from Earth’s centre on a very compressed (logarithmic) scale, going from a few kilometres on the left out to 15 billion light-years on the right. (Remember that a light-year is a unit of distance, about 10 trillion km.) The vertical axis is the time after creation as measured on Earth, from zero up to 4 days.

From creation to 1 day, the face of the deep stays at 1 light-year, after which it begins moving outward. The blue triangle represents the waters above the expanse moving outward and getting thinner as they are spread over a wider and wider area. They reach 15 billion light-years late in the fourth day. The sides of the triangle would not be straight as I have shown for simplicity; in reality, they would be curved.

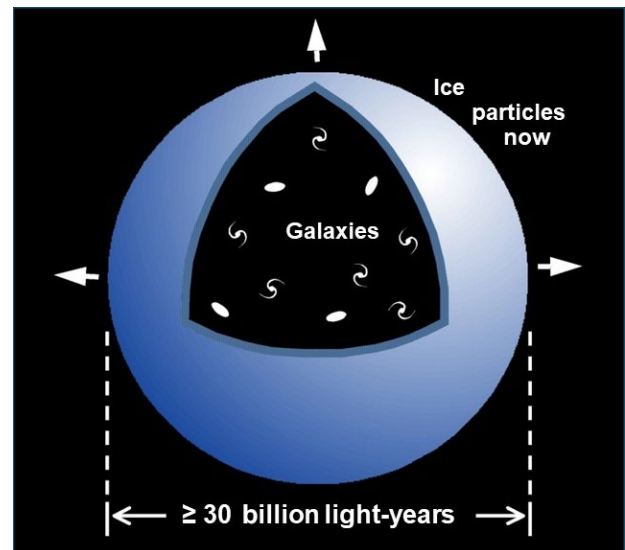


Figure 3. The waters above the heavens should be very tenuous. Planet-sized bodies would be water covered with ice; smaller bodies should be only ice by now.

To keep the volume and mass of the water constant during the expansion, the *average* thickness of the waters late in the fourth day would have thinned out to only 0.015 mm, having been spread out over an enormous area. During the expansion, the waters would have been pulled apart to form widely separated bodies of assorted sizes, from planet-sized on down to small sizes. The larger bodies would have ice exteriors and water interiors; the smaller bodies would be all ice by now. So in figure 3, the waters above would be far more tenuous and widely spread than the rather solid-looking shell I must show for purposes of illustration. If our telescopes were eventually able to see out that far, the waters above would probably be too tenuous to detect. We would merely see that there were no more galaxies beyond it.

5. The speed of the expansion and the speed of light

Now let us do a simple calculation of how fast the top of the expanse and the waters above the expanse moved. They moved outward (riding above the expanding *raqia*’) at least 15 billion light-years within three ordinary-length days on Earth, so their average velocity, v , as measured by time on Earth, would have been at least:

$$v \geq \frac{15 \times 10^9 \text{ light-years}}{3 \text{ days}} = 5.5 \times 10^{17} \frac{\text{km}}{\text{sec}}. \quad (1)$$

That number is 1.8 trillion times the normal speed of light, 300,000 km/sec. If God desired to accomplish this extremely fast movement in the heavens according to the same laws

of physics that He has given us for today (keep in mind that He was under no obligation to do so), He could have set the value of c (the speed of light in a vacuum and zero gravity) in those laws at least 1.8 trillion times higher than what we regard today as normal. This high value of c would have existed *in the heavens* during the first four days. As I said at the end of the second section, Scripture implies that *on Earth*, c had its normal value during Creation Week.

I can only guess at how God controlled c . The speed of light is determined by the properties of the space⁴⁰ through which it moves, so I think God controlled those properties, probably miraculously. I showed in another publication⁴¹ how c could be determined by the tension, τ , and the mass density, ρ , of space:

$$c = \sqrt{\frac{\tau}{\rho}} \quad (2)$$

In another section of that publication, I derived from my model the present mass density of space, an exceptionally large number that is consistent with modern estimates of the density of the quantum vacuum.⁴² It is possible that God varied that density, perhaps miraculously, perhaps by a thermodynamic state change (as between liquid water and ice), which may have also been miraculous.

The important thing to keep in mind is that, regardless of physics speculations, the biblically stated fast expansion of the expanse implies an extremely high speed of light in the heavens, as measured by time on Earth.

In the Day 4 account, there is another indication of a high speed of light in the heavens as measured by time on earth:

“... and let them be for lights in the heavens to give light on the earth; and it was so ... there was evening and morning, a fourth day” (Genesis 1:15, 19).

God made the lights (sun, moon, planets, and stars) during the fourth day. The “and it was so” implies that, somehow, God got the light to Earth before the end of the fourth day. A high speed of light in the heavens would accomplish that.⁴³

We can set a better lower limit for the value of c in the heavens than eq. (1) allows by noting that the stars became luminous on the fourth day and that the light from the most distant galaxy reached Earth within the same day:

$$c \geq \frac{15 \times 10^9 \text{ light-years}}{1 \text{ day}} = 1.6 \times 10^{18} \frac{\text{km}}{\text{sec}} \quad (3)$$

That is more than 5.5 trillion times the normal speed of light.

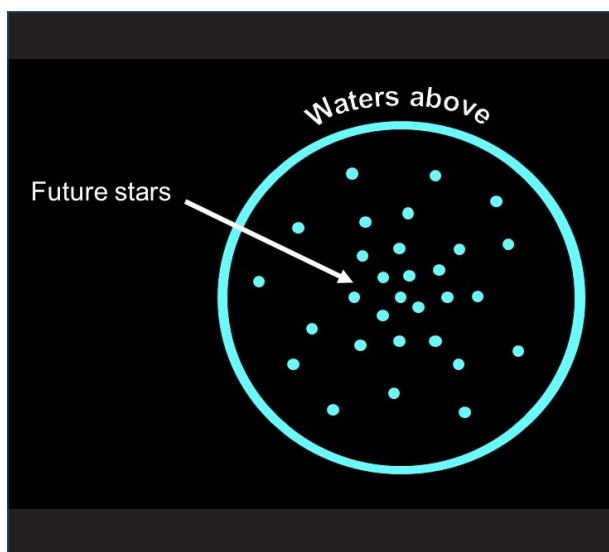


Figure 4. Balls of water of various sizes left behind as the waters above the heavens rolled outward

6. Theory: balls of water stayed behind

Some readers might be wondering, “Why would God go to all the trouble of expanding the expanse and the waters above it? Why not simply make them big to begin with?” My theory is that he wanted all the heavenly bodies to be made from the waters of the deep. I favour this view because I have another theory: that God made the magnetic fields of the heavenly bodies by creating them as water to begin with, and by creating the hydrogen nuclei in that water with their spins all pointing in the same direction. That produces a magnetic field strong enough to explain the presently observed magnetic fields of the bodies. The magnetic fields would preserve themselves as God transformed the bodies into the materials of which they now consist.³⁵ This theory has had remarkable success in explaining and predicting the strengths of the magnetic fields of solar system bodies and stars.⁴⁴

I am suggesting that as God rolled the waters outward ahead of the expanse, He left behind various-sized balls of water, as figure 4 shows. Then on the fourth day He transformed (miraculously, I think) the water into planets and stars. The light from the stars would have its wavelengths shifted toward the red side of the spectrum due to the expansion of the expanse continuing through the fourth day.⁴⁵ The amount of redshift would be proportional to the distance the light travelled through the expanding expanse.⁴⁶ This would explain the redshift-distance effect observed in the spectra from galaxies.

Since the water had an initial temperature, and since the *raqia*’ also must have had an initial temperature, there

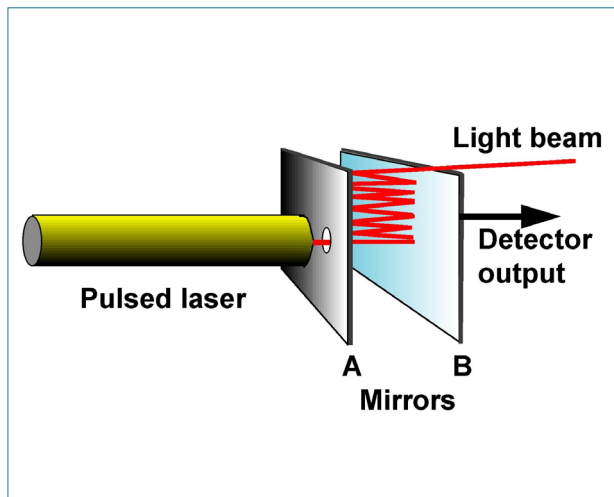


Figure 5. Light-and-mirror clock

is a possibility that the Cosmic Microwave Background is simply red-shifted thermal radiation from either one of those materials.⁴⁷

For this theory to work, the initial radius of the deep would have to be one or more light-years, in order to account for the mass of all the galaxies observed in the cosmos, as I remarked at the end of the third section.

7. The speed of light and the speed of time

One of the simplest clocks we can imagine is a light beam bouncing between two mirrors, figure 5.⁴⁸ This clock ticks with a frequency, f , that depends on the mirror spacing, d , and the speed of light, c , in the space between the mirrors:

$$f = \frac{c}{2d} . \quad (4)$$

If the spacing stays constant and the speed of light changes, the frequency of the clock will change in direct proportion to c . This clock is typical of all the clocks we could make based on any physical process: atomic vibrations, orbiting planets, nerve impulses in the brain, etc., because the rates of all physical processes appear to depend on the speed of light.⁴⁹

So, during the first four days in deep space, where the speed of light was trillions of times higher (as measured by clocks on Earth) than normal, the light from atoms would have had trillions of times greater frequency (as measured by Earth clocks), and planets would have orbited trillions of times faster (as compared to the earth in its orbit). Yet if we had been out there in deep space during the first four days (as measured on Earth), all physical processes would have appeared to be happening at their normal rates. The cosmos

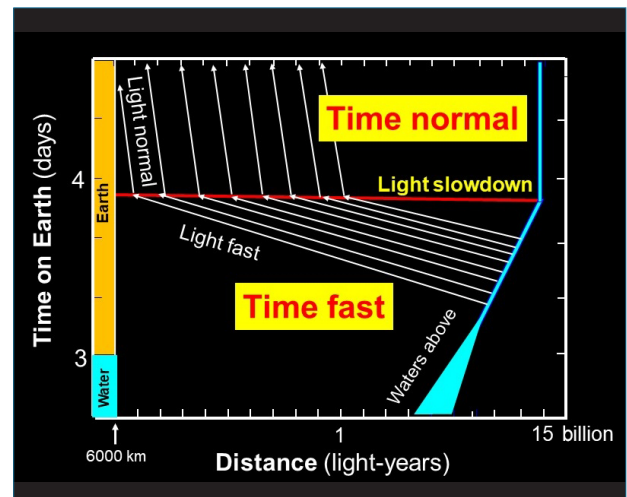


Figure 6. Light paths, shown as straight for convenience, with instant slowdown

would appear to have had a history of billions of years, as measured by the fast clocks out in deep space. If we measured the speed of light out there with clocks out there, the speed would be just 300,000 km/sec. Looking back to the earth, it would appear to be almost completely stopped, both in its rotation and its orbit (assuming the speed of light has always been normal within the whole solar system).

So, since the speed of light controls the ‘speed of time’, billions of years’ worth of events would take place in the heavens within four ordinary-length days on Earth, as I remarked at the end of the second section. As far as I can see, this is an inevitable consequence of the high speed of light in the heavens that the Genesis 1 account implies.

8. The great slowdown

Today, the speed of light in the cosmos appears, by all our observations, to be the same as it is here on Earth. So, at some time, God would have dropped the speed of light in the heavens to normal. I propose that He did this instantaneously throughout the cosmos late on the fourth day. It is possible, of course, that He did it non-instantaneously, at different times in different places, but that possibility is harder to analyze and may have fewer benefits than the first.

Figure 6 shows the main consequences of an instant slowdown everywhere. Again, the horizontal axis shows distance from Earth on a very compressed scale. The vertical scale is the time after creation as measured on Earth, from 2.7 days up to 4.6 days. Again, the blue triangle at the lower right represents the waters above the expanse moving outward and getting thinner.



Figure 7. The Antennae Galaxies took millions of their years to collide. (Image Credit: Hubble Space Telescope, NASA.)



Figure 8. The Whirlpool Galaxy, NGC 5194, 31 million light-years away (Image credit: Hubble Space Telescope, NASA)

The horizontal red line represents the instant God slows light down several trillionfold (as measured with Earth clocks). The slanting lines labelled ‘light fast’ represent the paths of pulses of light from a regularly pulsing star near the bottom of the waters above. If I could show things on a much finer scale, the slanted lines could represent the paths of wave crests from a single atom emitting light at a constant frequency. When the white lines hit the red line, they increase their slopes in accordance with the new, slower speed of light. The horizontal distances between each white line (representing, for example, the wavelength of light from an atom) stay the same. (Imagine a line of pulses all moving at a high speed, and then instantly all slowing to a lesser speed; the distance between the pulses will stay the same.) In accordance with the simple relation between the frequency, f , the wavelength, λ , and the speed of light, c :

$$f = \frac{c}{\lambda}, \quad (5)$$

the frequency of the light will decrease.⁵⁰ (Imagining again the line of pulses now travelling slower—they will successively hit the earth at a lower frequency, with longer time intervals between them.) In all this, I am talking about frequency and speed as measured with Earth clocks. As measured with clocks in deep space, the frequencies of atoms and the speed of light would be normal. So the frequencies of atoms in deep space would be high if we could measure them with our clocks on Earth, but after the great slowdown, the frequencies we receive would be normal.

The bottom line is that the instantaneous slowdown of light guarantees that stars beyond 6,000 light-years from us would look exactly the same as closer stars. It is as if there were a spherical window 6,000 light-years away from us⁵¹

through which we can see more distant objects perfectly well. It is perfectly transparent. As seen by us, the distant objects would behave normally (for example, the periods of binary stars would be normal), but they would appear to have had a longer history than 6,000 years. The events we observe at great distances would really have happened. As far as I can tell, all the laws of physics would transform in lockstep with the speed of light, so that we would not see a difference.⁵²

9. The rotation of the deep

I have not yet spoken about the third clue (in my abstract) in Genesis 1 for a high speed of light in the heavens for the first four days. In the second section of this paper, I commented that as soon as the light and dark sides of the deep appear, the deep appears to be rotating, and that God uses this rotation to mark off ‘one day’ in Genesis 1:5, as measured at the centre of the deep, where the earth will be on the third day.⁵³ This definition would be unambiguous if the deep rotated as a whole, with the same angular velocity, ω . The (classical, but maybe not much different for relativistic calculations) peripheral velocity, $v(r)$, of the water at a distance, r , from the rotation axis would be:

$$v(r) = \omega r. \quad (6)$$

For a rotation period of one day (Earth time), $\omega = 2\pi / (1 \text{ day}) = 7.3 \times 10^{-5}$ radian/sec. For the surface of the deep at the equator, let us take $r = 1$ light-year = 10^{13} km. That gives us a peripheral velocity of 730 million km/sec, about 2,400 times the normal speed of light. In order for the normal laws of physics to be in operation, the speed of light at that distance had to have been greater than that value. I suggest

that, in order to have no physical discontinuities in the deep, the speed of light (as measured by Earth's clocks) increased smoothly with increasing distance from the earth. So the rotation of the deep gives us some insight into the transition with distance from a normal speed of light on Earth to a high speed of light out in the cosmos, during the first four days.⁵⁴

Conclusion: why God did it that way

Why would God have wanted to have fast light and fast time out in the cosmos during the first four days? A well-known psalm says He intended the heavens to be a showcase for His glory:

“The heavens are telling of the glory of God; and their expanse is declaring the work of His hands” (Psalm 19:1).

He evidently wanted Adam and Eve to see that glory on the sixth night. They would see a lot of stars, the Milky Way, and perhaps even the Andromeda galaxy, visible to the naked eye on clear dark nights as a faint patch in the northern sky. The nearest star is four light-years away; parts of the Milky Way are 50,000 light-years away; and Andromeda, our nearest neighbour galaxy in the northern hemisphere, is about two million light-years away. God did not want our first parents to wait for years to see the nearest star. Fast light for most of the way and then arriving on Earth by the end of the fourth day was a way for Him to present the whole night sky to their view.

As for time being fast in the distant cosmos, I think He wanted us to see how things developed in the distant sky. Big objects like galaxies take billions of years to mature. See figure 7.⁵⁵ From what we see out there, we can deduce a lot of the laws of physics that He set up. That glorifies Him, too. He gave us some hints in Scripture that time was fast in the heavens:

“So that your days may be multiplied ... as [the] days of the heavens above the earth” (Deuteronomy 11:21, from the Hebrew).

“... and his throne as [the] days of [the] heavens” (Psalm 89:29, from the Hebrew).

“... that [the] heavens existed from long ago ...” (2 Peter 3:5, from the Greek).

So the heavens are ancient (as measured by their clocks), even though they are actually young (as measured by Earth clocks—the ones God set up to delineate time for us⁵⁶). The issue of time has prevented many people today from appreciating the Author of the beauty and power on display in the night sky. I want this paper's exploration of what Scripture says, about how God built His cosmos, to help every person be in awe of God's glory and handiwork in the heavens, of which figure 8 is a small sample.

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- Genesis 2:1, Deuteronomy 4:19, Nehemiah 9:6, Isaiah 34:4, etc. Host = army. Sometimes ‘the host of heaven’ means the angelic army, and sometimes ‘the heavens’ means both space and the heavenly bodies in it, so ‘the host of heaven’ part of my argument is not ironclad.
- Faulkner, D.R., Thoughts on the *rāqia* and a possible explanation for the Cosmic Microwave Background, *ARJ* 11(5):1–9, 2016.
- Fouts, D.M., *Right from the Start! Calling evangelical leadership to faith in Genesis 1–2*, Amazon Services, self-published, 2015.
- Harris, R., Archer, G. L., and Waltke, B. K. (Eds.), *Theological Wordbook of the Old Testament*, Moody Press, Chicago, IL, vol. 2, p. 965, 1980. In some cases, *rhōm* appears specifically to mean ‘ocean’; in others, ‘underground waters’, but these cases are included in the general meaning, ‘large body of water’.
- Fields, W., *Unformed and Unfilled: A critique of the gap theory*, Master Books, Green Forest, AR, 2005. This book gives good Scriptural evidence that there is no gap of time between the first two verses of chapter one.
- Humphreys, ref. 1, pp. 55–57.
- We have no way of knowing whether gravity was as strong then as it is today. If God made it strong later on in the week, it could simplify things.
- Isaiah 60:19–20; Revelation 21:23, 22:5. Notice that the Spirit of God apparently localized Himself in Gen 1:2. Also note that many other verses in Psalm 104 refer to specific events.
- Scholars have long debated why God said ‘one day’ (which is how the Hebrew reads) instead of ‘first day’ (which is how some translations mistakenly put it), in contrast to ‘second day’ (Genesis 1:8), ‘third day’ (Genesis 1:13), etc. But some scholars suggest that He was setting forth the definition of a day, namely one full rotation of the deep (and later the earth). See Steinmann, A.E., *עֶחָד [echad] as an ordinal number and the meaning of Genesis 1:5*, *J. Evang. Theol. Soc.* 45(4):577–584, 2002.
- Exodus 20:9–10.
- Psalm 12:6.
- In the LXX, *stereoma* (something firm, hard, solid, strong); in the Vulgate, *firmamentum* (something firm, strong, stout), which latter Wycliffe simply transliterated as ‘firmament’. The King James scholars followed Wycliffe's lead, making the word well-known in English.
- Harris, ref. 7, pp. 861–862.
- Numbers 16:38–38 in English versions; Numbers 17:3–4 in the Hebrew text.
- Isaiah 40:19.
- Exodus 39:3.
- Jeremiah 10:9.
- Lamoureux, D.O., *I Love Jesus & I Accept Evolution*, Wipf & Stock, Eugene, OR, pp. 47, 57–61, 64–65, 2009.
- Mortenson, T., The firmament: what did God create on day 2? *ARJ* 9:57–65, 2020.
- Humphreys, D.R., New view of gravity explains cosmic microwave background radiation, *J. Creation* 28(3):106–114, 2014; creation.com/new-view-of-gravity. See esp. sections 1 and 3. Modern physics calls the material the ‘quantum vacuum’, and Einstein's theory of general relativity becomes easier to understand if the material can be bent in a fourth direction. Section 5 also offers a cause for the Cosmic Microwave Background radiation.
- It is not necessary that the original readers recognize a fourth spatial dimension or that the *raqia* could be a solid. They could, however, observe that many heavenly bodies apparently move freely through the *raqia*.
- Gesenius, W., *Gesenius' Hebrew-Chaldee Lexicon*, Baker Book House, Grand Rapids, MI, p. 858, 1979.
- Brown, F., *The New Brown-Driver-Briggs-Gesenius Hebrew and English Lexicon*, Hendrickson Publishers, Peabody, MA, p. 1063, 1979.
- Genesis 2:8.
- Genesis 3:3.
- Genesis 1:9–10.

30. Dillow, J.C., *The Waters Above: Earth's pre-Flood vapor canopy*, Moody Press, Chicago, IL, 1981.
31. Humphreys, ref. 1, pp. 58–65.
32. Genesis 1:14, 15, 17.
33. Psalm 148:4.
34. Harris, ref. 7, vol. 1, p. 313.
35. In 2 Peter 3:5, “the earth was formed out of water and by water”, the word translated ‘formed’ is from the Greek verb *sunistēmi*, which can mean ‘to put or place together’. That suggests to me that God took apart the atoms and nuclei of the water molecules, re-assembled them into other atoms and nuclei, and then assembled those into molecules, minerals, rocks, etc. Humphreys, D.R., The creation of the earth’s magnetic field, CRSQ 20(2):89–94, Sep 1983; p. 90; see creationresearch.org/crsq-1983-volume-20-number-2_the-creation-of-the-earths-magnetic-field.
36. Estimate based on the average density of the earth and the density of uncompressed water.
37. Humphreys, ref. 1, p. 70.
38. I suggest that this expansion is the stretching out and spreading out of the heavens mentioned in Job 9:8, Psalm 104:2, Isaiah 40:22, Jeremiah 10:12, Zechariah 12:1, 2 Samuel 22:10, Job 37:18, Psalm 18:9, Psalm 144:5, Isaiah 42:5, Isaiah 44:24, Isaiah 48:13, Isaiah 51:3, Jeremiah 51:15, and Ezekiel 1:22.
39. Bryner, J., Astronomers just discovered the farthest object in the known universe—but what is it? *Live Science Newsletter*, 7 April 2022, livescience.com/farthest-astronomical-object-ever-seen. The object may be a massive galaxy. The estimated distance depends somewhat on which cosmological model one uses, but I have no doubt that it is truly many billions of light-years.
40. The ‘quantum vacuum’, see ref. 23 and the comments in that part of the third section.
41. Humphreys, ref. 23, eq. (9).
42. Humphreys, ref. 23, eq. (15). Section 4, item 5 of that paper offers a reason that the high mass density of space would not be detectable gravitationally.
43. Thus, the speed of light in the heavens would be high going both from and to the earth. This is distinct from some creationists’ ideas, which concern a possible difference in the speed of light in different directions.
44. Humphreys, D.R., The creation of cosmic magnetic fields, in *Proceedings of the Sixth International Conference on Creationism*, Creation Science Fellowship, Pittsburgh, PA, pp. 213–230, 2008; see digitalcommons.cedarville.edu/icc_proceedings/vol6/iss1/20/.
45. Humphreys, ref. 1, pp. 120–122.
46. In conventional theory, the ‘cosmological’ redshifts are due to the stretching of space (or distances) as the light travels to us. Doppler redshifts due to the motion of the emitting objects with respect to the space in their locality simply add to the cosmological redshifts, as do gravitational redshifts.
47. Humphreys, ref. 23, sect. 5.
48. Humphreys, ref. 2, pp. 86–87.
49. Process rates depend on the four fundamental forces of physics, electromagnetism, gravity, and the strong and weak nuclear forces. The electromagnetic force depends on the permittivity, ϵ_0 , and the permeability, μ_0 , of space, the product of which is $1/c^2$. The following consideration requires pure electric forces to be directly proportional to c , as do purely magnetic forces. Two electrically charged particles held motionless in their rest system by an equal and opposite force due to one of the other three forces must not move together or apart when we transform to another, moving, coordinate system, in which the magnetic force comes into play. Since relativity applies to the electromagnetic force, it must also apply in the same way to the other three forces. Because relativity, which very much depends on c , thus applies to all the forces, then they all must depend on c the same way as the electromagnetic force does. So all process rates are directly proportional to c .
50. As in eq. (4) with $2d = \lambda$.
51. The window is moving out from us at the speed of light, so that in 100 years it will be 6,100 light-years away.
52. The energy of a photon is $E = hf$, where f is the frequency and h is Planck’s constant. The simplest way I can imagine to have consistency between the laws of physics in the two regions is to have the energy, E , stay constant as the photon passes through the slowdown interface. That would require h in deep space to be much lower than normal as measured by earth clocks. A reviewer points out a reference which relates c and h : Backerra, A.C.M., Relation between Planck’s constant and speed of light, predicting proton radius more accurately, *Applied Physics Research* 11(5):1–9, 2019 | doi.org/10.5539/apr.v11n5p1. I do not vouch for the reliability of this article, but it may at least be right on h and c .
53. For one who shares my rather idiosyncratic views on space and relativity, the rotation is with respect to the space in Earth’s locality. A more conventional reader could consider the rotation as relative to the Spirit of God in Genesis 1:2.
54. The angular momentum of a massive rotating body like the deep would be very large. A reviewer asks how that would be transferred to various celestial bodies, like galaxies. I don’t know in detail, but I imagine that each watery ball left behind by the expansion of the waters above would be spinning. The spin axes would be tilted and precessed by various forces in the locality. Not only that, but there would be a very slow general rotation of the cosmos as a whole with respect to the fabric of space. The total angular momentum would be conserved (the same as the initial deep had), and it would have a spin axis in a particular direction. Various observers have found some evidence for such an axis, and also a preferred average direction of the galaxies’ rotations. There is plenty of room for some creationist theorist to work out the details and make some quantitative predictions.
55. For a computer simulation video of the Antennae Galaxies collision see youtube.com/watch?v=QcDtJ_-jdMw.
56. Genesis 1:5, 14.

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