

# The Anisotropic Synchrony Convention model as a solution to the creationist starlight-travel-time problem

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This paper reviews Lisle's cosmological model, which uses the Anisotropic Synchrony Convention (ASC). That model claims the ASC is that of the language used in the Bible, and has special relevance to the creation account. Events are time stamped by the moment they are first observed on Earth. Lisle contends that the stars really were made on the fourth day of Creation Week, and that their light reached Earth instantaneously due to the way clocks are synchronized.

Jason Lisle has expanded on his solution to the creationist starlight-travel-time problem in "Anisotropic Synchrony Convention—A Solution to the Distant Starlight Problem".<sup>1</sup> The concept in his new paper is essentially the same as he has previously published,<sup>2</sup> except he explains the concept using light cones. The following is a short summary of his model, followed by a more in-depth review.

In order to determine the outcome of any experiment one has to assume a 'convention' on simultaneity, which one is forced to assume; there is no rigorously compelling choice. Choosing a simultaneity convention means you have to decide what conditions you will accept to define that two signals you receive are from 'simultaneous' events. Lisle is saying that by using his ASC, which we are free to choose, we can regard the speed of light coming to us as 'infinite'. If so, we see the light from the stars and galaxies 'at the same time' the light left them. That is, the ASC *defines* the phrase 'at the same time' to mean 'adjusting the clocks all along the path of the light beam so that they will all read the same time'.

The ASC model, the model incorporating the ASC, claims that it is what God used in the Bible, when, for example, God said in Exodus 20:11, "For in six days the LORD made the heavens and the earth ... ." From the ASC model it follows that in a galaxy far, far away, the biblical text must mean that the first four days occurred, in our usual way of thinking about time, a long, long time ago.

As viewed from the Einstein Synchrony Convention (ESC), which is the standard used in most physics textbooks today, the ASC has light travelling for billions of years prior to, and all arriving on, the fourth day for the first time. This means placing the earth at the centre of a truly vast spherical universe, where the most distant galaxies were first created tens of billions of years before the first day of creation of Genesis 1 (figure 1),<sup>3</sup> and subsequently created closer and closer towards Earth at the constant speed of light  $c$  such that the light from all

the galaxies arrived at the earth on the fourth day, for the first time.

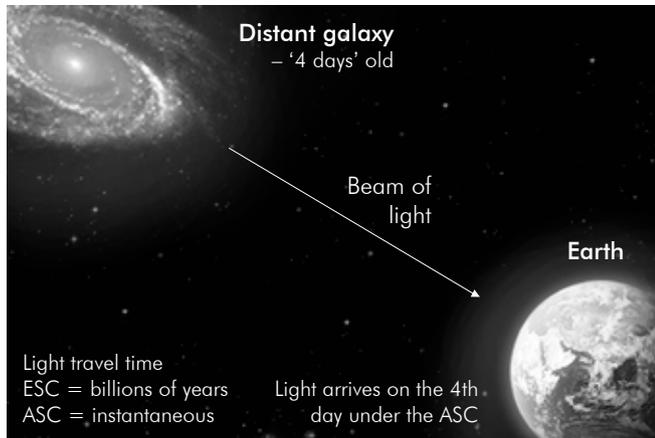
The ASC is a convention that defines the occurrence of an event at the moment it is observed. The ESC defines the occurrence of an event, at a past moment in time, allowing for the finite speed of light. Lisle is saying that the common man's idea is the ASC, not the ESC. For example, "I see the sun rise 'now'" is true under both ASC and ESC. In the latter one could calculate, at speed  $c$  for light, the sun actually 'rose' 8.3 minutes earlier, because of the finite travel time of the light from the sun. So in that case, one actually sees the sun as it was 8.3 minutes earlier. In the ASC, one sees the sun not as it was but as it is at the moment it is observed. The event of the sunrise would be defined from that observation.

Lisle's claim is that the language of the Bible is that of the ASC. In the ASC, events are time stamped by when they are observed for the first time. Before the 1600s, no one subtracted light-travel time from any celestial event. The ASC was universally accepted before the 1600s.<sup>4</sup>

## The review

Lisle's solution is innovative and internally consistent with our understanding of physics today.<sup>5</sup> It solves the creationist starlight-travel-time problem by redefining what 'now' means. The ASC is a possible convention among many that one could choose, even though it is not the convention used by relativity experts, other physicists or lay people today. The remaining question is whether it is that of the language of the Bible.

The ASC can be treated as either language of appearance (a phenomenology<sup>6</sup>) or the actual state of the physical universe—the laws of physics that describe what we observe. And this convention is applied to the earth's frame of reference. And relativistic physics does not preclude the possibility of a special frame, a unique place in the universe. What it precludes is that there is any special frame of reference for the laws of physics.

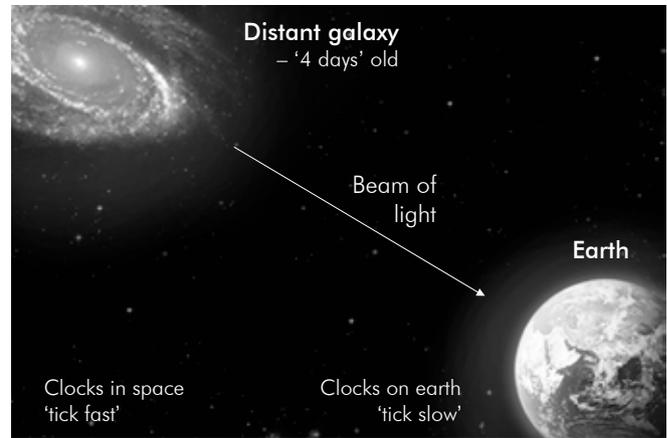


**Figure 1.** Distant galaxies are created ‘mature’ in the ASC model. Light that was first seen on the earth on the fourth day of Creation took billions of years to travel to Earth under the usual ESC, but can be considered instantaneous under the ASC.

That means that in order to find the correct formulation for the laws of physics, we should look for one that does not depend on the frame of reference of the observer.<sup>7</sup> This is one of the fundamental assumptions from which Einstein derived his theory.

Crucial to the ASC model is its notion that the ASC is the synchrony convention that the Bible uses. Whether or not this is true, at least the phenomenology of that convention may be chosen as that of the language of the Bible, because we are free to choose any convention we like. In his latest paper, Lisle makes his strongest statement yet, saying that he believes it is not *just* phenomenology but *is the very nature* of the universe. This means that the ‘one-way speed of light’ towards any observer can be regarded as infinite,<sup>8</sup> regardless of the observer’s location. Hence the outgoing speed would need to be half that of the measured *two-way* speed of light. Since the *one-way* speed of light is not a measurable quantity, this concept does not violate the known laws of physics in any way. Previously, the credibility of this idea<sup>9</sup> was questioned. However, no matter how one constructs an experiment, one cannot measure the *one-way* speed of light. As observers in the universe we are free to choose that speed to reflect the synchrony convention we adopt. This may sound counter-intuitive, but in the same way, there are other aspects of modern physics that seem counter-intuitive but they have been eventually borne out by many successful laboratory tests.<sup>10</sup> See the Appendix for further discussion on this.

In itself the ASC is acceptable, though not necessarily helpful, in relativistic physics. The open question is, “Is this the convention used in the Bible?” Particularly, in Exodus 20:9–11, did God mean 24-hour days based on the ASC or 24-hour days based on what is the modern, almost universally accepted view of timing events, which would mean one has to include the light-travel



**Figure 2.** Time-dilation models: a generic picture. Different models are proposed, but ultimately they depend on a difference in clock rates between those on Earth and those in the cosmos. At least hundreds of millions of years are available for process in the cosmos during the fourth day of Creation.

time of the photons from the stars to the observer? Also is this the convention that God had in mind when He penned, through Moses, “In the beginning God created the heavens and the earth”? Genesis 1:1—meaning the whole universe of space and time. This was all on the first 24-hour day.

Lisle contends that throughout history men have imagined some form of simultaneity consistent with the ASC and that as mankind developed a knowledge of the finite speed of light, so the starlight-travel-time problem developed. Rather, what everyone naturally imagines is that the present is what an infinite speed of light would show us. The recently acquired knowledge that light has a finite speed does not change people’s intuitive feeling of what the present should be. For example, a TV reporter, commenting recently on the live signals from the Mercury *Messenger* spacecraft as it was being inserted into orbit, said, “Of course the signals that we’re hearing don’t show *Messenger*’s status right now, but as it was eight minutes ago.”

### Mature creation

The ASC model, like many other creationist models, needs some sort of ‘mature’ creation in the cosmos. I agree with Lisle when he says ‘age’ is not a measureable quantity, but is only determined in comparison to some other criteria, which must be assumed. In his paper, however, he says that his model makes certain predictions, but (and I am being pedantic here) he does not make any. The cited examples are not predictions at all but are known parameters (observations) that are consistent with his model. For his model to be falsifiable it must make new predictions against which it can be tested.<sup>11</sup> He uses the expression “indications of *youth* of the universe (in contrast to billions of years) [emphasis added]”, but that

also presupposes one knows what youth looks like. A claim is made about the youth of spiral galaxies based on the supposed speeds of rotation of constituent stars within the galaxies. But how does one know what youth is? An unwound spiral? Is not this also begging the question?

I questioned Lisle<sup>12</sup> on this and other issues regarding his model. Lisle contends that nothing truly ‘looks’ old or young as there is no basis for comparison and that one cannot tell the age of something by its appearance. However, when we look at processes, using certain assumptions about their initial conditions, we can arrive at a maximum age for something. For example, spiral galaxies, based on their observed spiral structure and the measured speed of the stars, cannot be older than a billion years (at an absolute maximum). This result then cannot be taken as the true age but an age indicator showing an inconsistency with the secular model. But taking all maximum-age estimators in the universe, the lower boundary should be close to 6,000 years. In the ASC model, such age estimates should yield roughly the same lower boundary for all regions of the universe.

As an example of this, Lisle cited planetary magnetic fields. From measured decay rates of these fields in the solar system, they indicate unrealistically high field strengths in the past, less than hundreds of thousands of years ago. These are on the low end of age estimates, since magnetic fields apparently decay exponentially. As technology improves, and we eventually are able to measure planetary magnetic fields in other, more distant, solar systems, he expects that many will give similar results. And it follows that strong planetary magnetic fields will not be found in the distant universe if it is genuinely old. The systematic absence of distant planetary magnetic fields would falsify the ASC model, and would lend strong support for time dilation (figure 2).<sup>13</sup>

### Comparison with time-dilation models

In regards to Humphreys<sup>14</sup> and my own time dilation models,<sup>15</sup> Lisle does not insist on anything like that because he believes the ASC can solve the starlight-travel-time problem without such. However, with mature creation, which is needed, why stop there? Why accept *anything* on face value; that the universe is expanding, for example?<sup>16</sup> The expansion of the universe is not verifiable, even though he suggests it is. No experiment has ever measured cosmological expansion. So a static universe is just as compatible with a mature creation and an infinite *one-way* speed of light.

The concept itself of the infinite *one-way* speed of light (not the *two-way* speed) has similarities in the Carmelian cosmology, which I have explored and have explained in my book *Starlight, Time and the New Physics*.<sup>17</sup> That cosmology is based on the notion that we can see the galaxies and that one can construct a 4D

universe of space and velocity—called *spacevelocity*, instead of Einstein’s *spacetime*. Carmeli originally posited that because we observe the galaxies in the universe like in a still photograph, it is as if we observe them frozen in time, at a definite instant in time.<sup>18</sup> The assumption Carmeli made is the same as saying all events in our past light cone are simultaneous.<sup>19</sup>

In the Hartnett-Carmeli model, it is equivalent to saying that the local observer would calculate (cannot measure) a *one-way* speed of light that is practically infinite. It does not have to be infinite, in practice, to observe redshifted galaxies in an expanding universe.<sup>20</sup> No blueshifts, due to high clock rates in the past, are observed, because the effect can be understood not only as an extremely fast *one-way* speed of light but also as a massive acceleration of the expansion of the cosmos, as measured by local atomic clocks. In that case, the latter neatly cancels out the time dimension when one looks at the whole universe, and what remains is an equation describing the expansion, a version of the Hubble Law.<sup>18</sup>

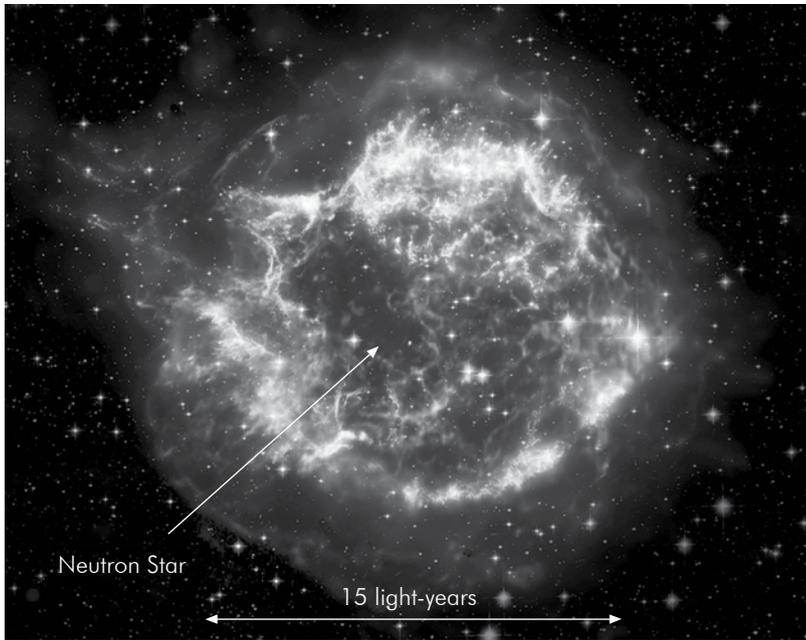
In the model the universe is expected to look pretty much like Lisle describes for his; it can have very similar stages for processes in galaxies at all redshifts (or distances) throughout the universe. The minor difference is that the Hartnett-Carmeli model permits hundreds of millions of astronomically measured years of change (or process) in galaxies at all epochs except those near the very beginning. A mature creation of large distributions of matter is not necessarily assumed, but can be understood to have originated from ejections of new galactic matter from the hearts of other active parent galaxies, in a gigantic light show, which all happened during the fourth day of Creation Week. In Lisle’s ASC model mature creation of all structures with apparent process age greater than 6,000 years is absolutely required.

### Process in observed structures

How much time does it takes for structures in the cosmos to form based on assumptions of their current measured expansion rates, like in supernova remnants, for example? And how much is necessary to be assumed as created mature by God?

In the ASC model, since we are observing astronomical sources with no light-travel time under the ASC (this is true for either form), it must mean that most of the structures were created in place as a mature creation. Then if a structure has more than 6,000 years of ‘process’,<sup>21</sup> Lisle must assume some significant mature creation content. For example, since we observe the object in real time (i.e. no light-travel time) in the ASC model a supernova remnant that looks a million years old based on assumptions of the size of the cloud and the measured expansion rate of the cloud must have been created with nearly that much apparent ‘age’ at its creation and could

Photo courtesy of NASA and J. Blakeslee (JHU)



**Figure 3.** Cassiopeia A, designated SN 2008D and located 11,000 light-years away in the constellation Cassiopeia, is among the best-studied supernova remnants. If no neutron star was found at the centre of this object, under the ASC, this would not be called a supernova remnant. It was first seen in the late 1600s, so it cannot be more than 6,000 years old by any biblical interpretation. This image blends data from NASA's Spitzer, Hubble and Chandra observatories.

have accumulated only 6,000 years worth of process after that (figure 3).

Lisle is not sure that there are any supernova remnants, for which we can actually measure the expansion rate, that are estimated to be anywhere near a million years old. Though some secular astronomers do claim that some supernova remnants are very old, perhaps half a million years or so. But the determination of age is not from expansion rates. The ASC model needs to assume significant created process. Lisle would not even call an object a supernova remnant unless a neutron star was identified at its centre. It would be simply an expanding cloud of hydrogen gas. Nevertheless his model can accommodate a creation model that proposes rapid process during Creation Week, to allow for significantly more process than 6,000 years.

Is there a problem here? If a neutron star was observed at the center of an expanding cloud that 'looks' like it is much older than 6,000 years, that would falsify the model; or else a mature creation argument would also have to include the creation of the neutron star. Does that mean we are being deceived into believing an explosion took place in the past when essentially the structure was created with the neutron star there? Wouldn't that be equivalent to a mature tree created in the Garden at the beginning? But ultimately the ASC model would have light first reaching Earth from anywhere in the universe on the fourth day, therefore in whatever state Adam saw (or in principle could have seen)

the source on the sixth day is the original state (plus two days) in which it was created. But Lisle wouldn't call it a supernova remnant under those circumstances, since there was no actual supernova. It's an expanding nebula that sort of resembles a supernova remnant. Of observed supernova remnants, for which age has been estimated from actual expansion rates, all are less than about 10,000 years or so.

Only time dilation could overcome an assumption of initial mature creation, especially if you can make an argument that the expanding cloud really did come from a star that exploded, and that the process (at today's rates) would vastly exceed 6,000 years. Then you've got a good argument for time dilation. For example the antennae galaxy is a colliding pair of galaxies that, at constant measured rates, would have taken many millions of years to merge to the observed state. If that process is real, only a time-dilation model could account for the required time, assuming the galaxies were not created in a colliding condition.

In the ASC model the 'appearance of a process' must come from mature creation on the fourth day and real process after that. The light first arrives at Earth on the fourth day, hence there is no time at the source to allow for any process, whether expansion of a cloud, winding of a spiral galaxy or merging of galaxies. The model is really a very mature creation model with the ASC used to eliminate a light-travel-time problem.

Lisle's position is that the problem of appearance of age is philosophical, not scientific. God could have made the universe using a lot of process or very little. Where the Bible doesn't specifically tell us, it can be difficult to discern. He would argue that God would *not* have created the light in transit because it leads to some philosophical/theological difficulties. Namely, God created our eyes to interpret what we see as really existing; so it would be inconsistent for Him to make fictional movies in beams of light in space. Light in transit undermines a precondition of intelligibility: the basic reliability of the senses. But fully mature trees and spiral galaxies do not. However, there is no problem with the inclusion of time dilation for structure formation if that is found to be necessary.

### Other processes

A related topic to this is processes which are not related to the size of a structure, like the time it takes for a product of fusion to reach a star's surface, which applies to all stars, including our own sun. How could the ASC model explain that without the actual time being there in that star's own frame of reference?

Lisle's position is that the energy now being released from the surface of the sun was not produced in the core by fusion. Rather, it is part of the internal energy the sun had when it was created, which has just now reached the surface. God didn't make the sun as an icicle: it had a temperature/energy gradient upon creation. The energy being produced in the core by fusion has not yet reached the surface. He contends that we have a problematic tendency to think naturalistically. But if we drop the assumptions of naturalism and uniformitarianism, is there any reason to think that energy now coming from a star's surface was ever produced in the core? The fact that it would eventually happen doesn't mean that it has already happened that way. And since creationist time dilation models don't have a lot of time-dilation within the solar system, presumably they would all give this explanation, at least for the sun.

So it seems that regardless where the star is located in the universe, it must be mature creation in the ASC model that explains this. In a time-dilation universe it can include time-evolved processes of billions of years. The exception is the sun and stars in the galaxy. The sun has had no time dilation in the solar system so we must assume mature creation also, as long as we assume the stellar physics correct. Stars in the galaxy can have some time-dilation effects, depending on the model, but I think some mature creation is needed also.

### Falsifiability

If one uses mature creation to explain any 'deficit' between the model and the observations, then doesn't it make it non-falsifiable? Is that an escape clause? Not according to Lisle. There is no 'deficit' between the ASC model and observations. But really the question is a philosophical issue. The scientists among creationists have had training in secular science, and thus, to some extent, have been trained to think about science from an unbiblical point of view. We must stop and reflect on any unstated secular presuppositions that may influence our thinking. For example, our normal tendency is to prefer naturalistic and uniformitarian explanations for any event in question. And this works well for present processes since today God normally seems to accomplish His will through natural law, and with generally consistent rates. That's what natural law is: the normal way God upholds the universe today.

But when we think of Creation Week, God was working in a supernatural way, speaking new things into existence, for example. And we cannot automatically assume that naturalistic explanations are the best ones, even if they happen to give the right answer. Lisle says that he disagrees with the approach of finding as much naturalistic explanation as possible for Creation Week. On the other hand, he also disagrees with the approach<sup>22</sup>

where Creation Week is considered 'holy ground' and cannot be explained at all by any natural processes. These are two extremes, and reality is somewhere in between. We cannot arbitrarily assume that God would not make galaxies as spirals any more than we can arbitrarily assume that He would. We must make arguments both ways. And Lisle does not believe that God would make light-beams already on their way, so distant starlight needs an explanation beyond simply *God made it mature*.

However, in his mind mature creation is falsifiable, but the concept is philosophical in nature, and therefore its falsification will be along the lines of a logical/philosophical/biblical argument rather than observations of the universe. Though, of course, observations of the universe may be helpful in forming such an argument. For example, that light was not created 'mature' in the sense of it being created in transit. It follows that it is inconsistent for God to make pictures of supernovae that never happened. But the argument is philosophical in nature, not scientific. And there is no *scientific* argument against God making the beams of light in transit. In the same way, the ASC model is definitely falsifiable. What this means is that the ASC model is a mature creation model with an explanation for the light-travel time. It has definite advantages over those models of a mature creation where *God did it but we can't know how*.

### Causality

As already mentioned, the ASC model can be divided into two different forms:

1. the phenomenological view, meaning merely an agreed-upon convention on time stamping of events
2. the real nature of the universe, i.e. the actual physics of spacetime.

When Lisle wrote his first paper on this several years ago,<sup>2</sup> he was more open to option 1. That is, he was inclined to think that the *one-way* speed of light might be meaningful apart from a man-made synchrony convention. And maybe we could discover what the preferred convention for God's universe is. But he is now convinced of option 2: that the *one-way* speed of light simply is not meaningful apart from a synchrony convention; and there is intrinsic flexibility in how we choose to define a synchrony convention. Unlike the *two-way* speed of light, the *one-way* speed of light is not a property of the universe, but is a matter of agreed convention in order to arrive at a definition of simultaneity.

Let us now consider the Curse. God curses the whole universe, which He could have done universally, simultaneous with that time on Earth, i.e. at infinite speed, simultaneously throughout the whole universe. God is not limited by His creation, and hence the effects of the Curse would not necessarily be limited to a wave

spreading out at the speed of light from the earth either. This is a position that both Humphreys and I agree with.

To Lisle, the key here is the word ‘simultaneously’. If God cursed the entire universe simultaneously (which he believes He did), then we must ask, simultaneously *by what synchrony convention* and in what reference frame? Implicitly we are therefore forced to choose a value for the *one-way* speed of light in order to arrive at a synchrony convention. Presumably, if the Bible uses the ASC throughout, then the Curse occurs simultaneously from Earth’s position by the ASC time-stamping. So he would not take the position that the Curse is simultaneous by the ESC because he does not believe the Bible ever uses the ESC.

According to Lisle, if you take option 1, that ASC is merely phenomenological (but nonetheless used in the Bible), and that the true and proper time-stamping of events must be done by the Einstein convention, then you have the situation where we have the Curse occurring before Adam sinned. For the events of the Curse in the cosmos to be simultaneous by the ASC (and Earth’s reference frame), then they would not be simultaneous by the ESC. By the ESC, you would have God cursing the outermost regions of the universe first and working inward at the finite *two-way* speed of light such that it reaches Adam at the time God pronounces the Curse upon Adam. If the Curse were accomplished by natural means, this would present a problem, but he does not think this is necessarily a problem since God is beyond time. And since he does not hold to option 1, it’s not really relevant.

If you take option 2, causality cannot be an issue, if one chooses the one-way incoming speed to be infinite by using the ASC coordinates. It should be noted that the ASC and the ESC are merely different coordinate systems. There is no physical difference in the light cones between one and the other. But the past light cone, when plotted using the ASC, becomes flattened into a horizontal plane (as per convention, we draw time on the vertical axis), and all events of the Curse throughout the universe are simultaneous.

Lisle would contend that whatever the effects of the Curse in the cosmos are, we can see them now, even in the most distant regions of the universe, because the Curse is simultaneous by the ASC. But the Curse was actually *caused* by God (as the appropriate reaction to Adam’s sin), so causality really isn’t a problem here since the Curse is *not accomplished by natural means*. Nevertheless, it is not so clear to actually know what events in the cosmos, beyond Earth, have resulted from the Curse. And *that* I definitely agree with.

According to Lisle there would only be a problem if the Curse was a natural effect produced by Adam’s sin. It would take time for the outgoing information to reach the distant regions of the universe. But since the Curse

was instigated by God, it could have been instantaneous. And under the ASC, the effects are visible on Earth immediately.

## Conclusion

Lisle’s ASC model is a useful addition to the creationist literature but I believe its validity hinges on whether Exodus 20:9–11 uses that convention. To suggest otherwise may well be begging the question, as he suggests. Maybe one cannot conceive of a universe, the true nature of which is described by an anisotropic speed of light, but there is no scientific argument against it. The theological question needs to be satisfied, “Is the ASC really implicit in the language of the Bible?” The onus is really on Lisle to produce strong scriptural evidence for what can only otherwise be construed as an unscriptural view, by placing the creation of stars and galaxies in the cosmos well before the creation of the earth, when we read the Bible with our usual notion of a sequence of events. And great claims need great evidence. However, if he is correct, there certainly is no starlight-travel-time problem. It was never really there.

## Appendix

On the subject of the *one-way* speed of light, there are a number of experiments that are called *one-way* speed of light measurements.<sup>23</sup> But, really, they are a differential one-way measure (Ives-Stilwell type experiments<sup>24</sup>), which measure Doppler shifts in light and are  $v/c$  dependent.<sup>25</sup> These experiments do not appear to have the clock synchronization problem, as would proper one-way measurements, because the clock drops out of the analysis.

According to Lisle, they all have a clock-synchronization problem, though sometimes it is harder to spot. All one-way experiments either explicitly or implicitly assume a synchrony convention (and thus the *one-way* speed of light). In some cases, this occurs because the time-dilation term is ignored (e.g. Romer’s method). Under the ASC, time dilation has a linear term and cannot be neglected, even at slow speeds. (That’s why slow-clock transport fails.)

The Ives-Stilwell experiment is really measuring Doppler shifts, not velocity directly. Granted, you can derive velocity from Doppler shift, but only if you assume a synchrony convention. The relationship between Doppler shift and velocity is different under the ASC than the ESC because the time-dilation terms are different.<sup>26</sup> So when you convert from Doppler shift to velocity, you must implicitly assume a synchrony convention. The clock synchronization problem is still there, buried in the Doppler-to-velocity conversion.

Nowadays the best results are still pretty limited because of the difficulty of constructing such experiments. Nevertheless, they give weight to the notion that the speed of light (even in this limited one-way sense) is the constant  $c$ . But this is only true if you have implicitly assumed Einstein synchrony somewhere in the analysis, which begs the question. Otherwise, the results will be perfectly consistent with the ASC as well.

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- Here I have used the usual language that we use today in science. That means if there were some sort of universal clocks, all synchronized together, then they would measure the first creation of the first galaxies billions of years before the first day of Creation, so there is all that time available for the light to travel at constant speed  $c$ .
- Humphreys believes that the ancient readers of the Bible would not have used the ASC for two reasons: (1) it would have been counter to their intuitive idea of ‘now’ and (2) because some of them already had the concept of delayed events. For example, they see a lightning flash and after some delay hear the sound of thunder. The sound travels slower than the light. Though they may not have conceived of a finite speed of light at that time, they would have had the notion that events are not timed by when they heard the sound but by an earlier moment when they observed the flash. He suggests, contrary to Lisle, that the ESC is the more natural choice.
- If correct, it would provide a neat simple solution to the problem, and it may in fact be the most important ever produced by a creationist, but, as stated here, it is not clear to me that it is what the language of the Bible implies.
- A phenomenology does not have to apply to appearance only; it could also mean something that we observe without yet being able to explain its underlying principle.
- That comes from the principle of relativity, which is best explained as a mathematical symmetry.
- Or sufficiently fast that there is no problem seeing the distant sources in the cosmos within the 6,000 years since Creation.
- Hartnett, J.G., Distant starlight and Genesis: is ‘observed time’ a physical reality? *J. Creation* 16(3):65–68, 2002.
- Einstein’s relativity and also quantum theory are examples.
- Most of cosmology is essentially untestable. Cosmology ultimately comes down to probability arguments because one cannot run any control experiments or interact with the universe like one can in the lab. See [creation.com/cosmology-is-not-even-astrophysics](http://creation.com/cosmology-is-not-even-astrophysics).
- Jason Lisle, personal communication.
- The details of any time-dilation cosmology will vary and therefore affect this comparison.
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- This meant that in the 5D Minkowski-type metric,  $ds^2 = c^2 dt^2 - dr^2 + \tau^2 dv^2$  connecting events in the spherically symmetric spacetime,  $dt = 0$ . From this he deduced his 4D cosmological special relativity theory. There is no angular spatial dependence in the metric ( $d\phi = d\theta = 0$ ). Hence  $dr$  represents the radial distance to the source in the Hubble sense. And  $dv$  represents the velocity of the expansion of the universe as observed from the redshifts of galaxies in the Hubble flow. You can see, then, that for null 4-vectors in this spacevelocity ( $ds = 0$ ) the metric becomes the differential form of the Hubble Law  $dr^2 = \tau^2 dv^2$ , where  $\tau \approx 1/H_0$ ,  $H_0$ , the Hubble constant.
- This fact is one of the major objections to the theory by theoretical physicists. They say it results in tachyon fields, i.e. particles which travel faster than the speed of light,  $c$ . But this would only be true if it applied to the *two-way* speed of light.
- The expanding universe is the main assumption in that cosmology.
- This means what appears to have happened from current measured ongoing changes and assuming it started at a point. In the case of a supernova remnant, the assumption is that the gas and dust all began in the progenitor star.
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- See: [en.wikipedia.org/wiki/Ives-Stilwell\\_experiment](http://en.wikipedia.org/wiki/Ives-Stilwell_experiment).
- The parameter  $v$  represents the speed of the source with respect to the laboratory and  $c$  the measureable *two-way* speed of light.
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