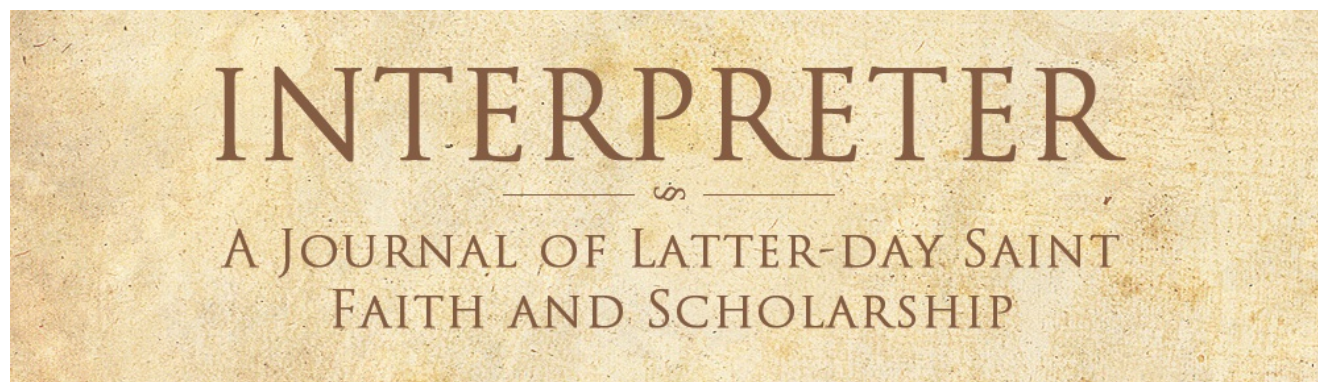


Times of Reckoning and Set Times in Abraham 3

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Abstract: *The third chapter of Abraham considers two types of times regarding the moon, the earth, and the planets: “times of reckoning” and “set times.” A straightforward interpretation of these two times, if correct, sheds light on the cosmology known to Abraham. “Times of reckoning” may be understood as the times of celestial movements directly observed or reckoned by someone standing on the surface of the earth. These times would most likely be synodic, meaning the motion being considered is referenced to the sun, but they could also be sidereal, meaning referenced to the stars. Observed from the earth’s surface, times of reckoning would naturally have a geocentric perspective. “Set times,” on the other hand, may refer to times of motion established or set by God. These would be the orbital motions intrinsic to the bodies themselves. They would be sidereal and, with the exception of the moon — which would still be geocentric, would be from a heliocentric or even wider galactocentric point of view. With this interpretation, Abraham 3:5–10 may be an account of God elevating Abraham’s knowledge of heavenly motions from that which is seen and measured by looking at the sky to that which actually exists in space. Such knowledge, likely possessed by the prophet Mormon as well, provided a natural means for Abraham to teach Pharaoh of the supremacy of God.*

It is well established that the prophet Abraham, as well as being the father of nations revered by Christians, Jews, and Muslims alike, was described by ancient historians as a man who studied and understood the heavens.¹ For example, the Jewish historian Josephus in *Antiquity of the Jews* — Book 1 7:2, writes,

[Page 2][The Babylonian historian] Berosus mentions our father Abram without naming him, when he says thus: “In the tenth generation after the Flood, there was among the Chaldeans a man righteous and great, and skillful in the celestial science.”

In *Book 1*, 8:2 he speaks of Abraham teaching mathematics and astronomy to the Egyptians:

He [Abraham] communicated to them [the Egyptians] arithmetic, and delivered to them the science of astronomy; for before Abram came into Egypt they were unacquainted with those parts of learning.

Josephus may be giving too much credit to Abraham. The prophet lived in Mesopotamia around 2,000 BC. Studies of the Pyramid Texts show that the Egyptians were practicing observational astronomy hundreds of years before this time.² Temples and pyramids built before 2,000 BC were aligned with north by use of astronomical techniques as well, so the Egyptians clearly knew enough of the heavens before 2,000 BC to accomplish this feat.³ Therefore it is likely that the Egyptians already [Page 3] had a significant knowledge of the heavens before Abraham arrived.⁴ In fact, their interest in the heavens may be one reason why Abraham, having a reputation as a man learned in such things, was able to gain an audience in Pharaoh's court to confer.

Joseph Smith's translation of the Book of Abraham enlarged what we know of Abraham's knowledge of astronomy and what he communicated to the Egyptians. Within it, Abraham talks of many things in the heavens, including the stars and Kolob, planets and stars being above one another, and these planets and stars having different times.

For a greater understanding of the Book of Abraham itself, I refer the reader to any of several illuminating works by scholars proficient in ancient scripture or Egyptology.⁵ As a professional astronomer, I myself am particularly intrigued by the references to astronomy in Abraham chapter 3. Science in general is not considered in scripture, nor should it be. Thus the material on astronomy in the book of Abraham is singular, worthy of a closer look to understand why it is there and what it is communicating.

Astronomy in Abraham's Day

Abraham records that he obtained knowledge from "the records of the fathers":

But the records of the fathers, even the patriarchs, concerning the right of Priesthood, the Lord my God preserved in mine own hands; therefore a knowledge of the beginning of the creation, and also of the planets, and of the stars, as they were made known unto the fathers, have I kept even unto this day. (Abraham 1:31)

Knowledge "made known unto the fathers" could come from several sources and therefore might be secular, revelatory, or both. Knowledge [Page 4] of the priesthood and creation would surely come through inspired revelation. Since knowledge of the planets and stars is mentioned in the same phrase, it is reasonable to suppose that the knowledge of planets and stars referred to here is inspired as well.

But the first chapter of Abraham makes quite clear that the immediate fathers of Abraham were wicked and idolatrous and even allowed human sacrifice to idols (Abraham 1:5–15). Such thinking is clearly *not* inspired. This raises the possibility that other knowledge passed down to Abraham, such as that of the heavens, might also have been infused with the secular learning of the day or apostate and therefore false understanding, or both. We cannot know if such learning influenced Abraham. But it seems reasonable to assume that Abraham’s knowledge of the heavens may have included secular learning as well.

What was the astronomical learning of Abraham’s day? As far as we know, no fully developed physical theory of cosmology was ever produced in Mesopotamia or the surrounding areas at the time Abraham lived.⁶ The earliest known myth-based cosmological writings are found in the *Enuma Elish*, which dates to the First Babylonian Dynasty (1894–1595 BC).⁷ The earliest writings concerned with observations of motion in the heavens are found in the *Enuma Anu Enlil* and MUL.APIN. These most likely date from the 17th century BC for the astronomically significant tablet 63 of the *Enuma Anu Enlil* and 1400–1100 BC for MUL.APIN.⁸ Therefore these records were either contemporaneous with Abraham or were written several hundred years after him. Either way, they give us the best idea of what people observed in the heavens in this time period, and [Page 5]how they interpreted those observations. These records are concerned with celestial phenomena like solar and lunar eclipses, planetary motions, and weather, which were thought to bring omens from deity.⁹ The omens were recorded and interpreted by priests schooled in celestial observing as a natural extension of their religious training.

The regular circling of the stars once around the sky every 24 hours was an obvious rhythmic motion which they explained through myths. The *Enuma Elish* says the sun, moon, planets, and stars were embedded in the body of a defeated goddess, Tiamat, who formed the “roof” of the sky. They moved around the earth¹⁰ under the control of the sun god Shamash.¹¹

Planets, because they moved *through* the stars, had to be a different sort of phenomenon, worthy of careful study. Planetary movements recorded in the *Enuma Anu Enlil* and MUL.APIN included the times when planets (especially Venus) were most distant from the sun or when they rose and set.¹² The records reveal that Babylonian astronomers knew that Venus and Mercury moved rapidly enough to swing about the sun in a few weeks or months. They knew that Mars, Saturn, and Jupiter moved more slowly, traversing the entire band of the zodiac in years or decades. The Babylonians used mathematics to model these motions and predict future positions. But not having a physical model of planetary movement, they would not have known why planets moved at different rates.

While there may not have been an exact planetary model embraced back then, the mathematics interpreting planetary motion still had the earth fixed and immovable.¹³ Eventually the Babylonian astronomical [Page 6]records would make their way to Greece. In the days of Ptolemy they would help in creating a geocentric model that had the planets

and the sun moving in circular paths placed somewhere between the surface of the earth and the realm of the stars.¹⁴

Distance, Times of Reckoning, and Set Times

It is apparent, then, that Babylonian astronomers, as with anyone familiar with planetary motions, knew that some planets drift through the background of stars faster than others. This is also true of the moon and the sun: they move through the background stars but at rates different from each other. This general idea is reflected in Abraham 3:5:

And the Lord said unto me: The planet which is the lesser light, lesser than that which is to rule the day, even the night, is above or greater than that upon which thou standest in point of reckoning, for it moveth in order more slow; this is in order because it standeth above the earth upon which thou standest, therefore the reckoning of its time is not so many as to its number of days, and of months, and of years.

Schooled in astronomy, Abraham would have known the moon and planets moved at different speeds. He could see that with his own eyes. Of course, if he had no model to refer to, he would not know why. This verse reads as if Abraham is being given a model. The moon is above the earth, as opposed to being embedded in a nearby object like Tiamat's body, and as a result it moves slower. In other words, perhaps in this scripture Abraham is being taught by God that not all objects in the heavens are the same distance away. And their speeds of movement are related to their distance, with more distant objects moving more slowly. Next consider verses 7–9:

Now the set time of the lesser light is a longer time as to its reckoning than the reckoning of the time of the earth upon which thou standest. And where these two facts exist, there shall be another fact above them, that is, there shall be another planet whose reckoning of time shall be longer still; And thus there shall be the reckoning of the time of one planet above another.¹⁵

[Page 7]These verses have the same flavor as verse 5, only extended to planets. Taking the word *above* to mean “more distant,” they are saying that planets are at different distances. If a planet is more distant, it moves more slowly, and thus it has a longer reckoning of time.

Verses 16 and 17 reinforce the idea that the objects in the heavens are at different distances:

If two things exist, and there be one above the other, there shall be greater things above them. ... Now, if there be two things, one above the other, and the moon be above the earth, then it may be that a planet or a star may exist above it; and there is nothing that the Lord thy God shall take in his heart to do but what he will do it.

These verses talk of how, for any two things in the heavens, one will be above or more distant than the other. In other words, the objects in the heavens are spread throughout space. And it is all because God took it in His heart to do it that way.

Time, in verses 7–9, is mainly qualified as being a *time of reckoning*. But verse 7 describes one of the times as being a *set time*. Verse 6 adds considerably to this:

And the Lord said unto me: Now, Abraham, these two facts exist, behold thine eyes see it; it is given unto thee to know the times of reckoning, and the set time, yea, the set time of the earth upon which thou standest, and the set time of the greater light which is set to rule the day, and the set time of the lesser light which is set to rule the night.

Abraham is given to know both times of reckoning and set times. Why the difference, and what might it mean?

To anyone standing on the earth’s surface, the movements of the planets in the sky are recorded from his or her point of view. *Times of reckoning* may simply refer to the times a person sees or reckons. For example, Venus is seen to swing side to side around the sun in a regular pattern. The farthest it can ever get from the sun is about 45 degrees. The time it takes for Venus to go from 45 degrees east of the sun to the west of it, then back to 45 degrees east again is about 19 months. This would be its orbital period around the sun as seen from the earth — the *orbital time of reckoning*, if you will. The modern terminology for this is the *synodic period*, or the period with respect to the sun. Although it is with respect to the sun, it is measured as if the earth were fixed and immovable at [Page 8]the center of the universe and so gives a geocentric perspective. Synodic periods of the eight planets and the moon are given in Table 1.

Planet	Synodic Period (Years)	Sidereal Period (Years)
Mercury	0.3173	0.24085
Venus	1.599	0.61521
Earth	—	1.0000
Mars	2.135	1.88089
Jupiter	1.092	11.8653
Saturn	1.035	29.6501
Uranus	1.012	83.7445
Neptune	1.006	165.951

Moon	29.5 days	27.3 days
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Table 1: Synodic and sidereal periods of the planets and the moon

Other times of reckoning recorded by ancient astronomers include the interval of time between when planets aligned together in the sky with each other, with the moon, or with bright stars. These times are not synodic, since the sun is not used as a reference, but they are still geocentric.

Tracking synodic orbital times and positions and the times between planetary and lunar alignments was a major function and duty of ancient astronomers. Abraham, as an ancient astronomer, would have known about these and probably observed and tracked them himself. This is something he could see with his own eyes (Abraham 3:6).

All times considered above are reckoned from the earth's surface, which is, again, a geocentric perspective. If planet Earth were fixed and immovable at the center of the universe, they would be the only times to speak of. But Earth is not immovable; it orbits the sun. Removing Earth's motion from the synodic periods of the planets recovers the *sidereal* periods or periods with respect to the stars. This is the perspective of being lifted off Earth's surface and letting Earth move along in its own orbit without us. Being untethered from Earth, we can now place ourselves in the center of the solar system at the location of the sun and look at how solar system bodies move through the background of stars.

This change in orientation makes a large difference. With Earth's orbital motion taken out, the synodic period of 19 months for Venus becomes a sidereal period of seven and a half months. Sidereal periods of the eight planets are shown in Table 1 to illustrate this difference and [Page 9]to show how planets move more slowly with greater distance from the sun. The synodic periods get closer to one year as planets get farther away because they move so slowly that the observed synodic period is increasingly just the orbital motion of Earth.

A sidereal period is the period derived as if the sun were stationary at the center of the universe and so is heliocentric. Understanding how to go from observed synodic periods to inferred sidereal periods was the revolutionary triumph of Copernicus, Kepler, and Galileo, who established that Earth is a planet that orbits the sun.

The sidereal periods can be thought of as being the real periods set forth by God.¹⁶ Therefore, they are good candidates for the *set times*. They can be calculated from the observed synodic orbits, or they can be observed directly from the surface of the body they orbit, should a person happen to be there. One can say the set time for the moon is 27.3

days and is geocentric, since the moon orbits the earth. The set times for the planets would be *heliocentric*, since they orbit the sun. The set time of the sun would refer to the time it takes for it to orbit about the Milky Way galaxy. This perspective would be *galactocentric*.

The sun's orbital motion is similar to that of the stars. Regarding stars, Abraham 3:10 states:

And it is given unto thee to know the set time of all the stars that are set to give light, until thou come near unto the throne of God.

This refers to the set times of the stars but not to their times of reckoning. In fact, nowhere is a time of reckoning mentioned for stars, and this may be significant. Like the sun, the stars in the heavens move in individual orbits about the center of the Milky Way galaxy.⁴⁷ From our perspective they move so slowly that this orbital motion cannot be measured without modern instrumentation. Because they look fixed with respect to each other, observers of Abraham's day would not associate times of reckoning with stars as they would with planets, which drift *through* the background of stars. But in reality, like the planets, they are [Page 10]still individual bodies and still orbit as individual bodies with set orbital times. Saying the sun has a set time (verse 6) is the same as saying it is not immovable at the center of the universe, but instead has an orbit in its own right. The same is the case with the stars. If they have set times, then they are bodies in their own right with orbits of their own. As with the sun, the star's set times would be from a galactocentric perspective.

Abraham's Perspective

Interpreting *set times* as sidereal orbits means Abraham had to know the earth was a planet that orbited the sun. As far as we know, this was considered probable as far back as the Hellenistic Greeks. However, it was not generally accepted by scholars at large until the days of Copernicus and Galileo in the 16th and 17th centuries. There is no evidence it was an accepted idea in Abraham's day. Should we expect Abraham to have understood that the earth indeed moved about the sun?

Let us digress a moment to the prophet Mormon. In Helaman 12:13–15, Mormon illustrates the power and majesty of God as follows:

Yea, and if he say unto the earth — Move — it is moved. Yea, if he say unto the earth — Thou shalt go back, that it lengthen out the day for many hours — it is done; And thus, according to his word the earth goeth back, and it appeareth unto man that the sun standeth still; yea, and behold, this is so; for surely it is the earth that moveth and not the sun.

The spin of the earth on its axis causes the sun to appear to move about the sky. Thus, 1,100 years before Copernicus published *De revolutionibus orbium coelestium* proclaiming a heliocentric solar system, Mormon knew the earth spins. His parenthetical observation “it is the earth that moveth and not the sun” might also mean that the earth moves in an orbit about the sun as opposed to the sun moving in an orbit around the fixed, immovable earth. In other words, it seems likely that the prophet Mormon knew of the true organizational structure of the solar system, with the earth and the planets orbiting a central sun. Indeed, it is reasonable to suppose this would be one of the things a prophet of antiquity would *want* to know because it helps in understanding mankind’s place in God’s universe. If such knowledge is part of the divine schooling of ancient prophets, then surely Abraham, of all the prophets, knew of this same structure.

Abraham 3:7, in speaking of the earth’s reckoning time, compares it to the set time of the moon, which is about a month. The earth does not [Page 11]have a synodic period as do the other planets because we are on it and do not observe it in the sky. So what would be its time of reckoning?

As with the sun, the observed motion of the stars about the sky is caused by the spin of the earth on its axis. It seems reasonable to take the earth’s time of reckoning to be the time of one spin, or a day of 24 hours, as has been previously suggested.¹⁸ This agrees with the moon’s sidereal period of one month being longer than a day. This also supports the definition of *times of reckoning* being any time or period reckoned when viewing objects in the sky instead of being strictly a synodic orbital period.

Interpreting *times of reckoning* as observed periods and motion and *set times* as the true orbital periods and motions has a significant implication. Much in Abraham 3 is consistent with a geocentric cosmology,¹⁹ but many aspects are also congruent with a heliocentric point of view.²⁰ If the thesis of this paper is correct, then Abraham 3:1–13 may be a record of how Abraham’s knowledge transitioned from a geocentric viewpoint, known to him and his fathers, to the heliocentric or even galactocentric cosmology revealed to him by God.²¹ In other words, verses 6 and 10 mean that Abraham, who had contemporaneous knowledge of how planets move as reckoned from the surface of the earth, was privileged to have God reveal to him how they truly move through space.

[Page 12]The Purpose of the Knowledge

Finally, consider that knowledge revealed to man always has a purpose. To what end might the Lord have revealed astronomical knowledge to Abraham? Abraham 3:15 makes clear one purpose:

And the Lord said unto me: Abraham, I show these things unto thee before ye go into Egypt, that ye may declare all these words.

Abraham is given this knowledge to declare it to Pharaoh. But again, why? Is the Lord departing from the purpose of saving souls to dabble in astronomy? Has He sent one of His greatest prophets to the dominant ruler of the day to help that ruler comprehend basic solar system physics? There must be a greater purpose than this, one related to the work and glory of bringing “to pass the immortality and eternal life of man” (Moses 1:39).

Pharaoh did not know of Jehovah and instead recognized multiple gods. Let us recall that Abraham was nearly killed in a sacrifice to one or more of the false gods of Shagreel, Elkenah, Libnah, Mahmackrah, Korash, and Pharaoh (Abraham 1:9, 12–17, and facsimile #1). As he was rescued from death, he heard the voice of Jehovah proclaiming that He was to lead Abraham from his father’s house into a strange land (Abraham 1:16). This God would give Abraham a posterity as numerous as the stars, but first He was to send him to Pharaoh to teach Pharaoh a few truths about deity.

What is the best way to do this? Teachers teach best when they can expand upon the knowledge their students already have. The realm of the gods is an idea with which Pharaoh could relate. It therefore makes sense for Jehovah to give Abraham knowledge of the realm of the gods — the heavens — to use in teaching Pharaoh truths about God. ²² In Abraham 3:16-20 we read:

If two things exist, and there be one above the other, there shall be greater things above them; therefore Kolob is the greatest of all the Kokaubeam that thou hast seen, because it is nearest unto me. Now, if there be two things, one above the other, and the moon be above the earth, then it may be that [Page 13]a planet or a star may exist above it. ... as, also, if there be two spirits, and one shall be more intelligent than the other. ...

And the Lord said unto me: These two facts do exist, that there are two spirits, one being more intelligent than the other; there shall be another more intelligent than they; I am the Lord thy God, I am more intelligent than they all. The Lord thy God sent his angel to deliver thee from the hands of the priest of Elkenah.

The flow of the logic here is from stars to spirits to God. There are many different stars in the heavens, organized such that greater bodies are above others. Kolob is greatest because it is nearest to God. Now extend that reasoning to spirits. They, too, have a distribution of greatness or intelligence. Just as stars are above each other, in comparing two spirits, one will be more intelligent than the other. It is as if Abraham were saying, “The Lord thy God is more intelligent than any of the other spirits. In fact, Pharaoh, He sent an angel to rescue me from the hands of a priest who represented one of your gods. So reason with me, Pharaoh. Does it make sense to worship these lesser deities rather than the greatest of them all? Understand that there is one God above them all. He delivered me from your gods. Forget your gods and worship Jehovah.”

Once this point is made, astronomy is no longer considered in the book of Abraham. Being primarily a vehicle for teaching Pharaoh about the God of the universe in language he could understand, its usefulness has been fulfilled. After establishing there is one god above them all, the dialog shifts to that God and to creation. Ultimately, Abraham's knowledge of the universe, given to him by both God and man, was used as a tool for saving souls, and nations.

1. Jared W. Ludlow, "Abraham's Visions of the Heavens," in *Astronomy, Papyrus, and Covenant*, ed. John Gee and Brian M. Hauglid (Provo, UT: FARMS, 2005), 57-73. This is an excellent summary of Abraham as an astronomer from extracanonical sources, such as *The Apocalypse of Abraham*. Specific writings on this topic from Artapanus, Eupolemus, Eusebius, Josephus, George Syncellus, and Ioannes Zonaras are found in John A. Tvedtnes, John Gee, and Brian M. Hauglid, eds., *Traditions About the Early Life of Abraham* (Provo, UT: FARMS, 2001), 7-10, 48-49, 225, 261.
2. The classic reference is Rolf Krauss, *Astronomische Konzepte und Jenseitsvorstellungen in den Pyramidentexten* (Wiesbaden: Harrassowitz Verlag, 1997). This article presents astronomical concepts in the Pyramid Texts, which date from 2600 -2200 BC. As it is written in German, I instead consulted the following work that draws upon it: Yasser A. Abdel-Hadi and Maha Yehia, "Astronomical Interpretation of the Winding Canal in the Pyramid Texts," *NRIAG Journal of Astronomy and Astrophysics*, Special Issue (2008), 317-40. Despite its title (which refers to a specific celestial feature, likely the Milky Way), this article considers many astronomical aspects, including circumpolar stars and constellations.
3. Much has been written on the orientation of Egyptian temples and pyramids to celestial bodies or to the compass points defined by stars. A summary of recent work on the orientations of 330 temples, many of which were built before 2000 bc, can be found in Juan Antonio Belmonte, "In search of cosmic order: Astronomy and culture in Ancient Egypt," *The Role of Astronomy in Society and Culture, Proceedings of IAU Symposium No. 260*, ed. D. Valls-Gabaud and A. Boksenberg (Paris: UNESCO, International Astronomical Union, 2009), 74-86. For pyramid alignments, see Kate Spence, "Ancient Egyptian chronology and the astronomical orientation of pyramids," *Nature* 408 (2000), 320-24. See also Hugh Thurston, "On the Orientation of Early Egyptian Pyramids," *DIO* 13.1 (December 2003), 4-11, and references therein.
4. Annette Yoshiko Reed, "Abraham as Chaldean Scientist and Father of the Jews: Josephus, Ant. 1.154-68, and the Greco-Roman Discourse about Astronomy/Astrology," *Journal for the Study of Judaism* 35.2 (2004), 119-58. Reed analyzes writing from Josephus in Ant. 1.154-68 together with astronomy/astrology from the Hellenistic age. She lays out the conflicting views regarding the flow of astronomical knowledge into and out of Egypt. In doing so she presents evidence that Josephus may have embellished Abraham's role as being the first to bring astronomy to Egypt (see pp. 140-42).

5. A good recent publication is John Gee, *An Introduction to the Book of Abraham* (Provo, UT: Religious Studies Center, Brigham Young University/Salt Lake City: Deseret Book, 2017).
6. Francesca Rochberg, "Mesopotamian Cosmology," *Cosmology: Historical, Literary, Philosophical, Religious, and Scientific Perspectives*, ed. Norriss S. Hetherington (New York: Garland Publishing, 1993), 37-38.
7. Alexander Heidel, *The Babylonian Genesis: The Story of Creation* (Chicago: University of Chicago Press, 1951), 13-14. The Enuma Elish honors Marduk as the champion of the gods and the creator of the heavens and the earth.
8. These dates draw upon research presented in Russell Hobson, "The Exact Transmission of Texts in the First Millennium B.C.E." (PhD thesis, University of Sydney, 2009); M. J. Geller, "Astronomy and Authorship," *Bulletin of the School of Oriental and African Studies, University of London* 53:2 (1990), 209-13, <https://www.jstor.org/stable/619229>; Bradley E. Schaefer, "The Latitude and Epoch for the Origin of the Astronomical Lore in MUL.APIN," *Bulletin of the American Astronomical Society* 39 (2007), 157. These references all rely on Hermann Hunger and David Pingree, *MUL APIN: An Astronomical Compendium in Cuneiform* (Archiv für Orientforschung 24; Horn: Ferdinand Berger & Söhne Gesellschaft, 1989). The general idea is that the oldest records date to about 1,000 BC but contain aspects written within them that date to the Old Babylonian period of 1950-1595 BC.
9. Hermann Hunger and David Pingree, *Astral Sciences in Mesopotamia*, (Leiden, NDL: Brill, 1999). Chapter 1 is dedicated to discussing omens of all kinds, but especially astronomical omens.
10. Capitalization of the word *earth* is confusing. *The Chicago Manual of Style*, followed here, does not capitalize *earth* when preceded by *the*. However, it requires *earth* to be capitalized when *the* is not used. This latter form is a more exact reference to the planet rather than its soil or surface, i.e., "Venus, Earth, and Mars," as opposed to "the earth beneath our feet." Scripture in the Book of Abraham refers to planet Earth as "the earth." In this paper I use the phrase "the earth" when considering it alone or with the moon or the sun because this is the scriptural format. When considering it clearly as a planet or with other planets, then "Earth" is used.
11. Rochberg, "Mesopotamian Cosmology," 44.
12. Hunger and Pingree, *Astral Sciences in Mesopotamia*, 5-7, 12-20; John North, *The Norton History of Astronomy and Cosmology* (New York: W. W. Norton and Company, 1995), 25-30.
13. North, *Norton History of Astronomy and Cosmology*, 19-58. These pages summarize Babylonian planetary observations and the mathematical methods applied to make sense of them. The viewpoint of the math is geocentric.
14. Rochberg, "Mesopotamian Cosmology," 45.
15. Verse 9 continues, discussing the reckoning of Kolob's time. I reluctantly refrain from including Kolob in my discussion because its location and nature are as yet unknown.

Anything I might conjecture at this time would be too speculative and would distract from the main points being addressed here.

16. Jesus Christ is referred to in the Book of Abraham as “the Lord,” “Jehovah,” “God,” and a few variants of “the Lord God,” such as “the Lord my God,” “the Lord thy God,” etc. I use the term *God* throughout this paper unless the context needs to be clarified by a different reference.

17. Stellar orbital speeds are slowest near the galactic center. They increase linearly outward until they reach a maximum orbital speed a few kiloparsecs from the nucleus. From here, there is a stabilization of speeds at around 220 km/sec. How far out from the nucleus stars retain this speed is unknown and relates to the mystery of dark matter.

18. Gee, *Introduction to the Book of Abraham*, 116.

19. John Gee, William J. Hamblin, and Daniel C. Peterson, “‘And I Saw the Stars,...’ The Book of Abraham and Ancient Geocentric Astronomy,” in *Astronomy, Papyrus, and Covenant*, ed. John Gee and Brian M. Hauglid (Provo, UT: FARMS, 2005), 1-16. The authors discuss how the astronomy in Abraham 3 relates to a geocentric cosmology.

20. Michael D. Rhodes and J. Ward Moody, “Astronomy and Creation in the Book of Abraham,” in *Astronomy, Papyrus, and Covenant*, ed. John Gee and Brian M. Hauglid (Provo, UT: FARMS, 2005), 17-36. The authors argue that descriptions of stars in Abraham 3, particularly after verse 12, are congruent with a heliocentric cosmology.

21. Kerry Muhlestein, “Encircling Astronomy and the Egyptians: An Approach to Abraham 3,” *The Religious Educator* 10, no. 1 (2009), 33-50. Reprinted as Kerry Muhlestein, “Encircling Astronomy and the Egyptians: An Approach to Abraham 3,” in *By Study and by Faith: Selections from the Religious Educator*, ed. Richard Neitzel Holzapfel and Kent P. Jackson (Provo, UT: Religious Studies Center, 2009), 149-67. This article presents the point of view that Abraham’s astronomy centers on Kolob. Note that stars orbit about the center of the Milky Way more slowly as you get nearer to the galaxy center. So if Kolob is near the galactic center, the view that stars move more slowly as you approach Kolob is consistent with how stars orbit in the Milky Way. With this interpretation, a Kolob-centered cosmology is also a galactocentric cosmology.

22. The idea of the stars being used to educate Pharaoh in spiritual matters is well made by Muhlestein, “Encircling Astronomy and the Egyptians,” 34-37; and supported by Gee, *Introduction to the Book of Abraham*, 117. Stars as a metaphor of spirits and Kolob as a metaphor for Christ was presented by Joseph F. McConkie, “The Heavens Testify of Christ (Abraham 3:1-21),” in *Studies in Scripture, Vol. 2: The Pearl of Great Price*, ed. Robert L. Millet and Kent P. Jackson (Salt Lake City: Deseret Book, 1985), 239-40.