Geocentrism and Creation

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Some creationists believe that the scientific assault on the Bible did not begin with biological evolution, but with the acceptance of the heliocentric (or more properly, geokinetic) theory centuries ago. These people believe that the Bible clearly states that the Earth does not move, and hence the only acceptable Biblical cosmology is a geocentric one. Modern geocentrists use both Biblical and scientific arguments for their case. We examine these arguments, and find them poorly founded. The Scriptural passages quoted do not address cosmology. Some geocentrists draw distinctions that do not exist in the original autographs or even in translations. In short, the Bible is neither geocentric nor heliocentric. While geocentrists present some interesting scientific results, their scientific arguments are often based upon improper understanding of theories and data. Much of their case is based upon a misunderstanding of general relativity and the rejection of that theory. While geocentrists are well intended, their presence among recent creationists produces an easy object of ridicule by our critics.

Many critics of creationists attempt to malign by suggesting that what creationists teach is akin to belief in a flat Earth. This attack is easy to refute, because the Bible does not teach that the Earth is flat, and virtually no one in the history of the church taught this. In fact, the belief in a flat Earth is a 19th century myth that was concocted to discredit critics of Darwinism. The supposed lesson of this myth was that the Church got it wrong before, so the Church has a chance to redeem itself by getting it right on the issue of evolution. This false lesson has been indelibly impressed upon common perception.

However, the Church did support the wrong side of a scientific issue four centuries ago. That issue was the question of whether the Sun went around the Earth (*geocentrism*) or if the Earth went around the Sun (*heliocentrism*, which could be called *geokineticism* since the Sun is not regarded as the centre of the universe either, as discussed below). Being based upon real history, creationists in theory could be accused of repeating this mistake by rejecting evolution.

Alas, there are recent creationists in the world today who are geocentrists. They teach that the rejection of God's Word did not begin with Darwin's theory of biological evolution or even with Hutton and Lyell's geological uniformitarianism. Instead, they argue that the scientific rebellion against God began much earlier with heliocentrism.

Many evolutionists claim that disbelief in evolution is like disbelief that the Earth goes round the Sun. The obvious flaw is that the latter is repeatable and observable while the former is not. But geocentrists give evolutionists a target, so then it behoves the creation community to have a ready response.

So far, there have been few critiques of geocentrism in the creation literature. One example is Don DeYoung's defence of geokineticism in *Creation* magazine, where he presented some scientific arguments against a rigid geocentric view.[1] DeYoung has also debated a geocentrist called Martin Selbrede.[2]

Another is Aardsma's ICR *Impact* article, where he points out something well known to high-school physics students, but apparently not to bibliosceptics—that it's valid to describe motion from any reference frame, although an inertial one usually makes the mathematics simpler.[3] But there are many times when the Earth is a convenient reference frame; i.e. at some point we all use the geocentric model in one sense. For instance, a planetarium is a geocentric model. Calculation of rising, transiting, and setting of various celestial objects is calculated geocentrically. There are numerous other examples. Since modern astronomers often use an Earth-centred reference frame, it's unfair and anti-scientific to criticise the Bible for doing the same.

But this is hardly the issue, and the use of the geocentric model under these circumstances hardly makes one a geocentrist. I'm using the term to describe those who claim that the Earth is the **only** valid reference frame and oppose the use of **any** other reference frame. What we need is an examination of the claims of such geocentric creationists to see if there is any merit to what they claim. The claims will fall into three broad areas: 1) the Biblical issues 2) historical record and 3) scientific evidence.

Perhaps the best-known geocentrist in the world today is Gerardus Bouw, who has been a professor at Baldwin-Wallace College in Berea, Ohio for many years. He is founder and director of the Association for Biblical Astronomy, as well as editor of *Biblical Astronomer*. Both are organs for geocentrism. To distinguish modern geocentrism from ancient geocentrism, Bouw has coined the term 'geocentricity' for the former. Bouw has a Ph.D. in astronomy from Case Western Reserve University, so he certainly is in a position to know and understand the issues and literature involved. Given Bouw's stature as the chief champion of geocentricity, we will use his book by the same name as the primary source on the topic.[4] A much lesser source is a book by Marshall Hall.[5] This book is poorly written, and thus will not be treated as a primary source for discussing modern geocentrism. However, Hall's claims is examined in a separate book review in this issue (pp. 36–37).

Biblical issues

Early in his book Bouw quotes the atheist Bertrand Russell (1872–1970) and the supposedly agnostic[6] Augustus De Morgan (1806–1871) on the supposed geocentric nature of the Bible.[7] The appropriateness of quoting these two gentlemen apparently never occurred to Bouw. Since when did two mathematical logicians become authorities in Biblical exegesis (like most bibliosceptics, they were ignorant of Biblical languages and historical context[8])? Being antagonistic toward the Bible and Christianity, both[6] of these men had a vested interest in discrediting the Bible. What better way to do this than for them to falsely claim that the Bible says things that are patently not true? This straw man technique is a very common strategy in attacking the Bible. A good example is the supposedly incorrect value of π in 1 Kings 7:23–24 and 2 Chronicles 4:2, a topic that Bouw addresses very well.[9]

Bouw does quote[10] an anonymous evangelical source on the geocentric nature of the Bible, but one must ask if that is indeed what Scripture teaches. There are few Biblical texts that in any way even remotely address the heliocentric/geocentric question. In each instance there is considerable doubt as to whether cosmology is the issue. Some of these verses are in the poetic books, such as the Psalms. It is poor practice to build any teaching or doctrine solely or primarily upon passages from the poetic books, though they can amplify concepts clearly taught elsewhere. It is also important not to base doctrines upon any passage that at best only remotely addresses an issue. That is, if cosmology is clearly not the point of a passage, then extracting a cosmological meaning can be very dangerous.

The Galileo canard

In the middle ages and well into the Renaissance, the Roman Catholic Church did teach geocentrism, but was that based upon the Bible? The Church's response to Galileo (1564–1642) was primarily from the works of Aristotle (384–322 BC) and other ancient Greek philosophers. It was Augustine (AD 354–430), Thomas Aquinas (1224–1274) and others who 'baptized' the work of these pagans and termed them 'pre-Christian Christians'. This mingling of pagan science and the Bible was a fundamental error for which the Church eventually paid a tremendous price.

Confusion persists to today in that nearly every textbook that discusses the Galileo affair claims that it was a matter of religion vs science, when it actually was a matter of science vs science. Unfortunately, Church leaders interpreted certain Biblical passages as geocentric to bolster the argument for what science of the day was claiming. This mistake is identical to those today who interpret the Bible to support things such as the big bang, billions of years, or biological evolution.[11] Therefore, any evangelical Christian misinformed of this history who opines that the Bible is geocentric is hardly any more credible a source on this topic than an atheist or agnostic.

Flat Earth myth

In his second chapter Bouw discusses the allegation that the Bible teaches that the Earth is flat. His refutation is good,[12] except that he apparently accepts the notion that through the Middle Ages belief in a flat Earth was common, which is simply not true. The historian Russell demolished this idea,[13] and I have written on this as well.[14] This includes the urban myth that Columbus was a lonely voice for a round Earth, invented by Washington Irving in his 1828 book *The Life and Voyages of Christopher Columbus*, a self-confessed mixture of fact and fiction.

Biblical support for geocentrism?

In the second chapter, Bouw also develops what he considers a Biblical model of the Earth's structure.[15] Others would legitimately question the soundness of his Biblical argument here. Much of this model and what follows in the next chapter is based upon a distinction of the words 'world' and 'Earth' in the KJV. While this distinction is generally true, it is not obvious that the distinction is universal, and it is the original languages of Scripture that matter, not any translation.

'… it cannot be moved'

Bouw quotes part of Psalm 93:1 from the KJV, ' … the world also is stablished, that it cannot be moved'.[16] He claims that 'stablish' is the proper translation as opposed to 'establish', that is used in most modern translations. He states that the former word means to stabilize, while the latter means to set up. However, none of the English dictionaries (including the Oxford) I consulted support this distinction. All of the dictionaries revealed that 'stablish' is an archaic variation of 'establish'. Bouw further alleges that this subtle distinction is also present in the Hebrew. This is patently not true, as can be demonstrated with Strong's Concordance.[17] The Hebrew word used in Psalm 93:1 is *kûwn*, which is translated as 'stablish', 'stablished', and 'stablisheth' only one time each outside of Psalm 93:1. The same word is translated as 'establish', or 'established', 58 times elsewhere in the KJV. A closely related Hebrew word, *qûwm* is translated 'stablish' three times and as 'establish' or 'established' 28 times in the KJV. Indeed, *kûwn* appears twice in 2 Samuel 7:12–13, but is rendered 'establish' and 'stablish' in the same passage. Thus the distinction that Bouw claims in these two words does not exist in either Hebrew or English.

Bouw uses this unfounded distinction to draw some questionable meaning from 1 Chronicles 16:30 and Psalm 96:10,[18] where the word 'establish' is used in the latter verse. These passages declare that the world is not to be moved, from which Bouw concludes that the world does not move.

This is fallacious. The Hebrew word for 'moved' (*mowt*) is in the *niphal* stem, which often refers to the

passive voice, as indeed it does here. This is reflected in the English translations—to be moved or not to be moved suggests the action of an external or causative agent to bring about change in position, but does not exclude the possibility of motion apart from an external agent. Bouw frequently chides those who disagree with him on Biblical passages that speak of the rising of the Sun by claiming that they accuse God of being a poor communicator. Therefore, we may apply Bouw's standard to his own work: the Lord could have rendered these passages to read, '… the world does not move', if that is what He intended. As is, these passages are hardly geocentric.

It is important to note that the same Hebrew word for 'moved' (*môwt*) in the same *niphal* stem is used in Psalm 16:8, 'I shall not be moved'. Presumably even Bouw wouldn't accuse God of poor communication if he didn't believe that the Bible taught that the Psalmist was rooted to one spot! Rather, the passage teaches that he would not stray from the path that God had set for him. If that's so, then it's impossible to deny that 'the world … cannot be moved' could mean that Earth will not stray from the precise orbital and rotational pattern God has set for it.

In both 1 Chronicles 16:30 and Psalm 96:10, the word 'shall' appears, which Bouw obviously and correctly takes as an imperative. However, the next passage that he discusses, Psalm 104:5,[19] reads, ' … laid the foundations of the Earth that it should not be removed forever'.

Bouw notes that the word 'should' is a conditional that does not necessarily reflect things as they are. While it is true that many people today use the word 'should' in this sense, this is not the correct and original meaning of the word (the usual intended meaning when many people say 'should' is better conveyed by the word 'ought'). The word 'should' actually is the past tense of 'shall', and as such has the same imperative meaning that that word has. Here Bouw makes much ado about the dictionary meaning of the word 'remove', but he is very selective in the use of the dictionary, as he apparently did not bother to consult the meaning of the word 'should'. As an aside, the words for 'shall' and 'should' are understood but absent in Hebrew and were inserted into English to make the passages intelligible. As such, the choice of when, where, and which word to insert is a matter of preference or sense of the translator, and ought never be used as the basis for any doctrine.

Sunrise and sunset

Much of the case for geocentrism relies upon many Biblical passages that refer to sunrise and sunset. Geocentrists argue that since the Bible is inspired of God, then when He chose to use such terminology, the Lord must mean that the Sun moves. By this reasoning, virtually all astronomers and astronomical books and magazines are geocentric, because 'sunrise' and 'sunset' is exactly the language that such sources use. Anyone who has spent much time watching the sky can testify that each day the

In the same way in which we use the terms sunset and sunrise, so too does the Bible validly use the Earth as a reference frame.

Sun, moon, planets, and most stars do rise, move across the sky, and then set. Such observation and description do not at all address what actually causes this motion. However, the geocentrists will have none of it, insisting that language and usage must conform to their standards. For instance, Bouw has suggested the words, 'tosun' and 'fromsun'[20] for sunrise and sunset to better acknowledge what heliocentrists mean. It is extremely unlikely that these words will catch on, because the terms sunrise and sunset work so well.

The attempted coining of these new words demonstrates the desperate attempt to argue the point here. Quoting Bouw:

> 'Either God meant what he wrote or he did not mean what he wrote and would, presumably, revise his original writing as well as write differently if he were to write today.'[21]

No, He would not, because there is probably not a language now or ever in existence that has simple expressions that concisely and accurately describes the heliocentric rising and setting of the Sun. Why do we need such expressions when the ones that we now possess work so well and are understood in all cultures?

Elsewhere Bouw suggests that those who disagree with him are virtually accusing God of being a bad communicator or grammarian. Of course, we do not. However, Bouw has painted himself into a corner: if Bouw is wrong, then he is the one who has made this accusation against our Creator. What he misses is that cosmology is not being addressed at all in these passages. This extremely literal approach to the Bible is reverently intended, but it badly misses the mark. At some points it almost reads as a parody (and sadly it's not much different from those of biblioscepticsl).

Firmament

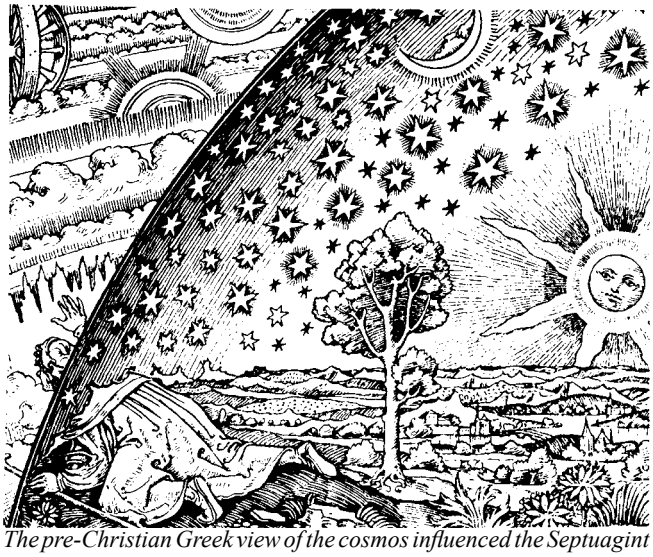
Bouw makes a similarly poor case for his Biblical model for space. Light is a wave. All waves require a medium. For instance, sound waves travel in air and water waves obviously use water as a medium. What is the medium in which light travels, given that light apparently can travel through empty space? In classical physics the medium for light is called the 'ether' or 'aether'. However, modern physics takes a different approach, which will not be discussed here.[22] Bouw maintains that modern physics is in error, and that the classical aether indeed does exist. He further insists that the firmament first mentioned in Genesis 1:6 is to be equated with the aether, going so far as to claim that the firmament is God's chosen name for the aether.

Physics aside for the moment, is this good exegesis? Hardly. First, there is a problem with the use of the word 'firmament' in the King James Version. The Hebrew word is *raqiya'*, which is a noun that comes from a verb that means to beat out as into a thin sheet. Gold is a good example of this process. Gold is so malleable that hammers and other tools can be used to flatten and stretch the metal into very thin sheets that can be applied to objects to gild them. The question is, what property or properties are intended by the word *raqiya'*? If one wants to get across the hardness of the object, usually a metal, being beaten out, then 'firmament' may not be a bad translation.

However, what if the intended property is the stretched out nature of the *raqiya'* rather than hardness? This is consistent with the terminology of Psalm 104:2, which speaks of the stretching out of the heavens, though admittedly the Hebrew word used there for heaven is *shamayim*. However, Genesis 1:8 explicitly states that God called the firmament (*raqiya'*) heaven(s) (*shamayim*). Therefore, there is contextual Biblical evidence for equating these two Hebrew words, at least in some cases. If the stretched out nature of the *raqiya'* is what is intended, then 'firmament' is a bad translation, while 'expanse' used in many modern translations is very good.

How did the KJV come to use 'firmament?' The Septuagint rendered *raqiya'* as *stereoma*, which gives the meaning of something very hard. This was an obvious incorporation of Greek cosmology current at the time of the Septuagint translation. That cosmology had the Earth surrounded by a hard crystalline sphere upon which were suspended the stars. In the Vulgate, Jerome followed the lead of the Septuagint and used the Latin equivalent *firmamentum*. The KJV translators merely anglicized this.

There are at least two ironies in Bouw's insistence of the correctness of the word firmament. The first is that Bouw severely criticizes both the Vulgate and the Septuagint as being terrible translations, going as far as to express doubt that the Septuagint even existed before the New Testament.[23] The second is that Bouw completely trashes ancient Greek philosophy, but blindly accepts the heavy influence of the same ancient Greek science on this point.



The pre-Christian Greek view of the cosmos influenced the Septuagint translation, the Latin Vulgate and later the KJV in translating raqiya' as 'firmament'.

A second problem with Bouw's equating the *raqiya'* (firmament) with the aether is how the firmament is further discussed in the creation account. The first appearance of the word is on Day Two of Creation Week when the waters were separated above and below and with the firmament between. On Day Four, the Sun, moon, and stars were set in the firmament. On Day Five, birds were made to fly in the firmament. It is quite a stretch to conclude that the firmament must be all of space or even any stuff that may fill space. The most obvious conclusion is that the *raqiya'* is the Earth's atmosphere or the sky. If this is true, then much of Bouw's case is destroyed.

The various issues briefly discussed here are just a few of the many examples of how poorly Bouw handles Biblical matters. But these key issues are enough for readers to question Bouw's credibility on Biblical matters and his insistence that the Bible is geocentric.

Historical issues

Bouw claims that heliocentrism has led to all sorts of moral degeneracy.[24] The example he discusses is astrology. This is a bizarre assertion, given that astrology flourished for millennia before the heliocentric theory became popular, and seems to have **decreased** where heliocentrism has flourished. Ironically, the dominant geocentric theory of history, the Ptolemaic system, was devised primarily as a tool to calculate planetary positions in the past and future as an aid for astrological prognostications.

Johannes Kepler (1571–1630)

Kepler comes under great criticism by the geocentrists because of the great role that he played in the acceptance of the heliocentric model. Some of this criticism is quite strained. He is blasted for having dabbled in astrology,

although it was common and, as shown, hardly confined to heliocentrists. He is also blasted for his supposed anti-Biblical beliefs[25] as well as the insinuation that Kepler was dishonest in his co-authoring the work of Tycho Brahe (1546–1601) after he had died.[26] This latter charge includes a hint of a plagiarism charge, even though a few pages earlier Bouw stated at the time this was an acceptable practice.[27] Bouw concludes that Kepler was not a Christian,[26] which places him at odds with many other creationists who claim that Kepler was indeed a Christian. For instance, Morris included a section on Kepler.[28] In addition, Morris listed Copernicus (1473–1543), Galileo, and Tycho at the conclusion of the chapter that briefly discussed Kepler as examples of people, though while they may have not have been true believers in Christ, at the very least were theistic creationists. Bouw rejects all, save Tycho, as Christians.[26]

Johannes Kepler (1571–1630)

Tycho Brahe

Bouw goes to great lengths to salvage the reputation of Tycho, whose cosmology he and modern geocentrists advocate. That is, other planets orbited the Sun, and the Sun and its retinue orbited the Earth. While admitting Tycho's well-known faults and failings during most of his life, he claims without documentation that in the last year of his life some who worked with Tycho noticed a change in his life.[29] Bouw concludes that this was salvation, though he has absolutely no evidence for this.

Bouw blasts the heliocentrists of four centuries ago as being ungodly and insinuates that it was their ungodliness that motivated their acceptance of the heliocentric theory. However, by *Bouw's own account* of the events of Tycho's life, his rejection of heliocentricity and the suggestion of his alternate Tychonian cosmology far predated Tycho's alleged conversion. Thus the model favored by modern geocentrists was hatched in the mind of an unregenerate man, even granting Bouw's own revisionist historiography. Therefore, modern geocentrists teach that the heliocentric model is wrong because ungodly men originated it, but fail to apply the same standard to their favored geocentric theory.

Nicolaus Copernicus

While Bouw finds little or no fault in Tycho, he relentlessly finds fault with every heliocentrist. For instance, Bouw takes a swipe at Copernicus' mathematical skills by noting that the best mathematicians of his day were consumed with the laborious task of calculating horoscopes. According to Bouw, Copernicus had the time to spend investigating alternate cosmological models, because Copernicus was not gifted enough to be in demand for astrological calculations.[30] With Bouw, Copernicus cannot win—if he had done horoscopes, Bouw would have castigated him as a mystic dabbling in the occult; but since he did not do horoscopes, it was because Copernicus was a poor mathematician.

A few decades after the death of Copernicus, the situation had not changed much, so it is not surprising that such a good mathematician as Kepler spent a good deal of time calculating horoscopes. Apparently it has never occurred to Bouw that the reason that Tycho was available to pursue astronomical measurements rather than produce horoscopes may have been the same reason that he claimed that Copernicus had time to pursue other matters. Indeed, late in life, Tycho realized that he was not the best mathematician around and needed help in making sense of his observations. This caused Tycho to seek the best mathematician available, who happened to be Kepler. The simultaneous sycophantic treatment of Tycho and harsh criticism of heliocentrists exposes some the logical flaws in Bouw's case.

Another criticism of Copernicus is that he opined that the 10,000 epicycles required to make the motions of the Sun, moon, planets, and stars was an 'unseemly' large number and 'unworthy' of the Creator.[31] Bouw takes Copernicus to task for failing to notice that the obvious flaw in his reasoning was the assumption that heavenly bodies must move in circles. However, the model under scrutiny at the time was the Ptolemaic model, thus this error came from the philosophical musings of the ancient Greeks, not from Copernicus. Copernicus merely discussed the only geocentric model of his day (the Tychonian model was still more than a half-century away). How Bouw can level this charge at a heliocentrist rather than at geocentrists where it properly belongs boggles the mind. It is as if the modern geocentrists wilfully ignore the Ptolemaic model. Indeed, that model is barely mentioned in Bouw's book.

Heliocentrist vs geocentrist comparisons

Another example of Bouw's poor logic is the observation that '… the first heliocentrists were pagans who did not hold the Bible in high esteem'.[32] While this statement is technically true, it plants a very false and misleading impression. Such a statement plants in the minds of many

people that the near converse is true, that is, that the first geocentrists were not pagans and held the Bible in high esteem. Of course this is nonsense. Virtually all that we know of ancient science and cosmology comes from the Greeks. Most of them were geocentrists. All of them were pagans. Claudius Ptolemy (fl. AD 127–145), who is credited with the longest-lived geocentric model of all time, was a pagan. *By Bouw's own 'reasoning'* (leaving aside the blatant *genetic fallacy*), geocentrism should be rejected, because it has a long pagan history.

Of course, Bouw would respond that the Bible is explicitly geocentric.[33] Since much of the Old Testament predates many of the secular sources, Bouw would claim that the earliest geocentrists were not pagan. But this begs the question—most of the quotes used to support the geocentricity of the Bible are from fellow geocentrists or from biblio-sceptics. Nearly all Bible-believing heliocentrists think that the Bible is neither geocentric nor heliocentric, but Bouw holds their opinions on the matter in low regard.

As another example of Bouw's poor logic, consider that at several locations Bouw states that the heliocentric theory came to be accepted in the seventeenth century without any proof. Here Bouw seems to be arguing against the legitimacy of heliocentricity, because it was prematurely accepted before there was any evidence. Yet, he also admits that by 1650 there was no solid proof for or against either the heliocentric or Tychonian models.[26] Therefore, by Bouw's standard we should reject **both** models in favor of the Ptolemaic model or some other alternative, but of course Bouw insists that only the heliocentric model be subjected to such scrutiny. This sort of double standard is common in geocentric arguments.

Bouw blasts the perceived arrogance of Kepler,[34] all the while overlooking or forgiving similar misgivings in Tycho. *Ad hominem* attacks are common in modern geocentric literature as well. As an example, Bouw spends some time trashing Kepler for alleged witchcraft and dabbling in the occult.[34] Even Kepler's mother and other family members are brought into the discussion. Bouw mentions that Marshall Hall, a fellow geocentrist, has speculated that Kepler may have poisoned Tycho.[35] It's a shame that two of the most prominent geocentricists feel that they need to resort to baseless inflammatory accusations.

Galileo Galilei

Galileo also comes under fire for his role in establishing the heliocentric model. While he did not invent the telescope, Galileo was apparently the first to put the telescope to use observing celestial objects. He found a number of things in the sky that ran counter to what the church, parroting ancient Greek ideas, said. Examples are the craters on the moon and spots on the Sun. Greek philosophers had reasoned that the moon and Sun, as celestial objects, had to be perfect. As such, they ought to have been free from blemishes such as craters and spots.

Galileo also claimed evidence for the heliocentric theory in his discoveries. One of them, the rotation of the Sun, was bogus as proof of heliocentrism, as Bouw states,[36] but it was a persuasive argument in the pre-Newtonian world (*cf.* Isaac Newton 1643–1727 Gregorian Calendar). However, Bouw's poisoned attitude toward all heliocentrists has prevented him from correctly discussing two other evidences for heliocentrism. One was the discovery of four satellites, or moons, that orbit Jupiter. Galileo used this to counter the objection to heliocentrism that the moon would be left behind if the Earth moved. It is obvious that Jupiter moves, and it is also obvious that its motion does not leave behind the satellites of Jupiter. Bouw is correct that this is an argument by analogy, but one cannot so easily dismiss this argument. The critics of heliocentrism must explain how the motions of Jupiter and its moons and the Earth and its moon are different.

However, Bouw misses one of the most important points of Galileo on this. The geocentric model of Galileo's day was that **all** celestial objects orbited the Earth. Here Galileo had found four celestial objects that did not directly orbit the Earth, but instead orbited something else. The geocentrists were not willing to give up an inch on this, because their already overly complicated Ptolemaic model had already endured a tremendous amount of tinkering. They feared that surrendering this would lead to the discovery of other objects that did not orbit the Sun, which would further chip away the geocentric model.

Bouw completely misconstrues Galileo's third evidence for heliocentrism, the phases of Venus.[37] The full set of Venereal phases can happen only if Venus passes both in front of and behind the Sun as seen from Earth (Figure 1). The Ptolemaic model placed Venus orbiting the Earth closer than the Sun, but always near to the Sun as constrained by observations, but that would preclude gibbous phases from being seen since that would require the Earth to be roughly between the Sun and Venus. On the other hand, moving Venus' orbit beyond that of the Sun would allow gibbous phases, but would not permit crescent phases to be seen.

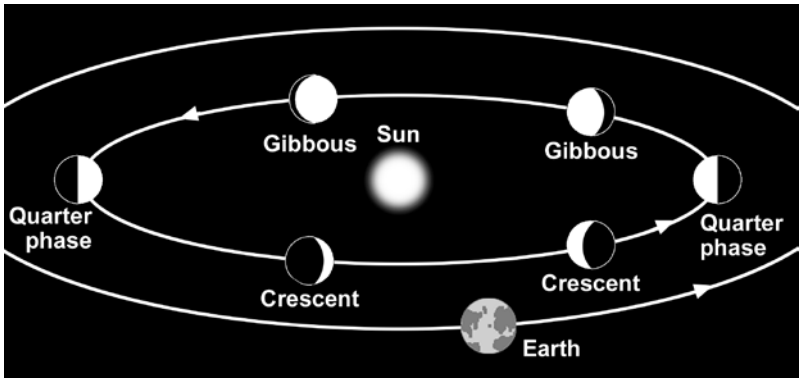


Figure 1. *The Phases of Venus as seen from the Earth.*

Tychonian vs Ptolemaic geocentric models

The Appendix contains a fuller comparison of these two geocentric models and the Copernican one, but it's important to point out a number of points in the main text.

Bouw suggests that the phases of Venus are a problem for the Ptolemaic model only if one insists upon using circles, and that Galileo's argument falls flat if ellipses are allowed. The only thing that falls flat here is Bouw's argument. The very reason that the Ptolemaic model existed was to preserve 'perfect' uniform circular motion, with the massive tinkering involving epicycles (circles on circles) and even more complex extensions. The introduction of ellipses would have destroyed the Ptolemaic model every bit as much as what Galileo was suggesting. Bouw's defence of the *status quo* Ptolemaic model here and elsewhere is puzzling. Throughout much of his book it is easy to draw the wrong conclusion that this is the model that Bouw is defending. Bouw does correctly point out that Galileo's argument about the phases of Venus does not distinguish between the heliocentric and Tychonian models, but this needlessly clouds the issue since the Tychonian model was not even being discussed at the time.

The truth of the matter is that the Tychonian model was a far less significant contender than either the heliocentric or the Ptolemaic theories than modern geocentrists would have us believe. The reason is that the Tychonian model was a sort of halfway house for geocentrists. Geocentrists could hold on to a stationary Earth while discarding virtually everything else that was in the Ptolemaic model. Like so many other compromises, the Tychonian model failed to satisfy many on either side. Nevertheless, Bouw does a clever slight of hand trick. He insists that heliocentrists of four centuries ago did not offer real proofs and further claims that they improperly attempted to shift the burden of proof to the *status quo*. That is, in the absence of a real challenge to the *status quo*, the *status quo* should prevail. Bouw claims that that *status quo* was geocentrism, so his favoured geocentric model, the Tychonian system, should prevail. This is preposterous. The Tychonian system was not the *status quo* then; the Ptolemaic model was. Again and again Bouw takes this sort of sloppy approach—he argues for the Ptolemaic model and then slips his model in as a substitute. This is most blatant when in a very late chapter in his book Bouw explicitly discusses geocentric models. There is no heading for the Tychonian model, but there is one for the Ptolemaic model.[38] The problem is, the discussion and diagram clearly represent the Tychonian model.

Scientific issues

As mentioned earlier, Bouw fails to apply the same rigorous standards that he applies to the heliocentric theory to his own pet model.

Parallax

For instance, while he correctly notes that the failure to detect stellar parallax was an argument against the heliocentric model, he quickly concludes that this was circumstantial evidence for geocentrism (or as he prefers, the Tychonian model).[39] Of course the heliocentric model can explain the lack of trigonometric parallax if the stars are at incredible distances. This turned out to be the case, and there is compelling evidence that even the nearest stars are more than 200,000 times farther from us than the Sun is. If lack of parallax was evidence against heliocentrism and for geocentrism, then one would expect that when parallax was finally detected in the 1830s, trigonometric parallax would be taken as evidence against geocentrism and for heliocentrism. However, this is not Bouw's conclusion. Instead, Bouw modifies the Tychonian model so that the Sun in its annual motion drags along the distant stars. In other words, Bouw cries foul whenever physicists change models (as with modern relativity theory) to correctly describe new data, but he feels free to tinker with his model at will to meet the challenge of new results. It is impossible to refute any theory with these kinds of rules.

Bouw uses the same skewed rules in discussing star streaming.[40] The Sun is moving through space, as can be deduced by proper motions (the gradual motion of stars across the sky) of many stars. The first measurement of this was done more than two centuries ago by the great German-born English astronomer William Herschel (1738–1822), though the measurement has been refined many times since then. When the proper motions of many stars are considered, we find that stars seem to stream out of a region called the solar apex, presumably in the direction in which the Sun is moving. Conversely, stars appear to stream toward a convergent point, called the solar antepex, diametrically opposed from the solar apex and presumed to be the direction from which the Sun is moving. This would appear to be strong evidence that neither the Sun nor the Earth is the centre of the universe, but Bouw baldly asserts that stars could be moving past the Sun rather than the other way around.

Rejection of Relativity

One geocentrist assumption is that modern relativity theory is wrong. Unfortunately, many creationists reject general relativity or at least are very suspicious of it, mainly because they misunderstand it. Common misconceptions include the beliefs that general relativity does not allow for a preferred standard of rest and that general relativity leads to moral relativism. Mach's principle, which is an important assumption of general relativity, postulates that the sum of all the mass in the universe offers the correct rest frame. This standard of rest is not very different from the concept of absolute space assumed by Newton. General relativity **does** posit that there are absolutes. Therefore, if two objects have relative motion, it is possible to determine which, if either, is at rest and as such has not undergone

acceleration. This explains the so-called twin paradox that Bouw mishandles.[41]

The speed of light is always a constant, regardless of one's motion. The laws of physics are invariant under transformation of coordinates. In fact, Einstein himself preferred the name 'Theory of Invariance' for his ideas, rather than 'General Relativity'.

Early in the 20th century, moral relativists misappropriated the widespread acceptance of Einsteinian relativity theory as support for their contention that there are no moral absolutes. Even aside from the scientific misunderstandings, this is an elementary blunder in ethical theory known as the *naturalistic fallacy*, i.e. trying to derive what we **ought** to do from the way the natural world **is**. We should not be repelled from relativity theory by this misapplication by the moral relativists.

Fortunately, there are many creationists who have no problem with relativity. For example, Humphreys accepts and uses general relativity as a physical basis for his cosmology and has offered a very brief defence of relativity.[42,43] A detailed defence of relativity from a creation perspective is badly needed. That will not be attempted here, but a few claims of those opposed to Einsteinian relativity in the context of geocentrism will be briefly discussed.

Many of the critiques of relativity are repeated arguments that are often out of date. For instance, Bouw is critical of the much acclaimed 1919 and 1922 total solar eclipse observations that was taken as the first evidence for general relativity.[44] Bouw calls the 1922 observations (the better of the two sets of data) 'an obvious sham' because there are 44 points below and 25 points above the curve supposedly fit to the data when a good fit should have about as many points above as below the curve. However when the reference quoted by Bouw on this point is checked, one finds that the curve is not a fit to the data at all. Rather, the curve is the prediction of general relativity with the data plotted for comparison. The data fit the curve pretty well, especially near the limb (edge) of the Sun, where gravitational deflection is most pronounced. Bouw further clouds the issue by claiming that other classical theories can explain the amount of deflection, though no plots comparing the predictions of general relativity and these classical theories are presented.

An even larger problem is that Bouw and other anti-relativists continue to bring up the 1919 and 1922 data as if the experiment has never been repeated or improved upon. Similar experiments have been conducted at many eclipses since 1922 with the same results. However, all of these experiments suffer from errors of measurements that are comparable in size to the amount of deflection.

The good news is that for years Very Long Baseline Interferometry (VLBI) has been used to make the same sort of measurements.[45] VLBI is the use of several radio telescopes separated by great distances to produce very accurate positions of point radio sources. Usually the point sources used for gravitational deflections due to the Sun are quasars. An advantage to this method is that it is not necessary to wait for a total solar eclipse. All one must do is observe during the brief time once per year that the Sun passes near a particular quasar(s) in the sky. The unprecedented positional accuracy of VLBI produces results that are in very good agreement with general relativity and not at all with classical predictions. These measurements even have allowed discrimination between variations upon general relativity. A related experiment involves time delays of radio signals of interplanetary probes as they pass behind the Sun. The results of these studies also agree with the predictions of general relativity. Anti-relativists never mention these experiments.

Bouw also discusses the perihelion advance of Mercury's orbit.[46] He claims that relativists tout Mercury's orbit, because that is the only orbit's precession for which relativity can account. While that may technically be true, it is very misleading in that it suggests to most readers that the predictions of general relativity do not fit the orbits of other planets. This is not true, as Bouw's own Table I shows. That table lists observed precession, the general relativity calculations, and residuals for the four innermost planets. The total precession of Mercury's orbit is actually quite a bit larger than what the table presents—the table's value is what is left after all perturbations of classical physics are removed. The >40 arc seconds per century remaining was an unsolved mystery of classical physics. Bouw implies that the relatively large O-C's (observed minus calculated) for Venus and the Earth demonstrates that relativity fails for those two planets. However, the residuals for those two planets are well within the errors of observation as given in the second column of the table. The fit is very good. In other words, if general relativity fails to account for all of the orbit precession of Venus and Earth, it is not because of any shortcomings of the theory, but because the observations are of insufficient precision to act as a discriminator.

Perihelion advance is most pronounced for strong gravity (near the Sun) and elliptical orbits. Mercury works so well because it is so close to the Sun and has a very elliptical orbit for a planet. The Earth and Venus are slightly farther from the Sun, but both have nearly circular orbits, so their perihelion advance is modest. The residual for Mars is slightly greater than the error, a fact for which I have no explanation at this time. Bouw did not bother to include data on the remaining planets, because, being so far from the Sun, the predictions of general relativity would have been virtually zero, regardless of the eccentricities of those orbits. This trend of decreasing effect with distance can be seen in the third column of Bouw's table.

Also, relativistic advance of periastron has been studied and confirmed in certain binary stars with elliptical orbits. Of particular interest are binary pulsars, where the stars are extremely close together and hence have very strong gravity. Here, both the measurements and calculations are very large and hence offer a good laboratory not only for testing general relativity but also for suggested variants.

The predictions of general relativity and the data agree well. Therefore, Bouw's claim on orbital precession is out of date, just plain wrong, or both.

Much of the rest of Bouw's writing on general relativity demonstrates a similar lack of understanding of the model. For instance, his question as to how a photon detects the gravity of an object that it just left reveals that he has overlooked the role of space-time curvature in general relativity.[47]

Orbital resonances?

Misconceptions abound elsewhere. Bouw claims alleged orbital resonances between the Earth and other solar system objects as evidence for geocentrism.[48] Venus is said to display the same face toward the Earth each time that the Earth and Venus are closest. However, the reference cited for this says something quite different. The reference acknowledges that an older value for the rotation period of Venus did suggest a resonance, but that the new measurement of the period does not.

The discussion of Mercury's alleged resonance is completely garbled. Bouw says that its rotation is weakly coupled to the Sun at 'roughly two-thirds of the length of its year'. It is coupled at a 2:3 ratio by a factor of nearly one part in 10,000, which is hardly rough agreement. Furthermore, any resonance with the Earth is illusory in that Mercury is not well placed for observations except during its brief greatest elongations near its aphelion. The aforementioned 2:3 ratio with the Sun assures that a similar side will face the Earth each time similar viewing opportunities present themselves.

While conceding that the outer (Jovian) planets do not appear to exhibit such resonances, Bouw also casts doubt upon the exact rotation periods of the these planets, because they are determined from motions of cloud tops in the atmospheres of these planets. However, Voyager data fixed the true rotational periods of these planets by the rotations of their magnetic fields. In each case these periods matched those determined from average cloud measurements quite well.

Many of these problems could have been avoided if Bouw's work had been peer reviewed. It appears that it was self-published without the benefit of outside review. Independent review could have caught other unfortunate lapses and poor use of terms even though they are not factual errors. These include the use of the word 'nebulae' to describe external galaxies,[49] a term that has been out of favour for decades, the misnaming and garbling of Kepler's third law of planetary motion,[50] and what appears to me to be the blurring of rotation and revolution.[51]

Only some of the problems with Bouw's scientific case for geocentrism have been discussed here. But they should be enough to show that Bouw's argument is poorly founded.

Conclusion

I have examined the claims of leading modern geocentrists and have found that their insistence that the Bible teaches geocentrism is not well founded. It would be helpful if someone with formal theological training could further explore and refute this claim.

Geocentric arguments are predicated upon a rejection of modern relativity theory, based on ignorance of what it teaches. Humphreys suggests that 'creationists who oppose relativity have mistakenly identified the "baggage" with the theory itself' and would like 'all creationists to see relativity as a somewhat odd and well-intentioned friend'.[43] A detailed contribution on general relativity by a creationist with expertise in the field would be most welcome.

Geocentrists improperly handle other scientific and historical information as well. While it is true that four hundred years ago most embraced the heliocentric theory a century before there was direct evidence for the theory, that does not mean that there was evidence against the theory. Acceptance of heliocentrism came about because of application of Occam's razor. The Sun-centred system was far simpler than the primary geocentric model, the Ptolemaic system. Note that William of Ockham was a Christian, and both Copernicus and Galileo believed that a simpler model glorified God who is 'simple' (theologically, this means not composed of parts).

The geocentrists' claim that the proper and logical alternative of the Tychonian model should have been accepted is not founded by the facts of history—the Tychonian theory was never a serious contender. Subsequent experiments, such as aberration of starlight and trigonometric parallax are better explained in the heliocentric model rather than any geocentric theory.

While the intentions of the geocentrists are good, they offer a very easy target of criticism for our critics. We should establish some distance between the mainstream creation movement and the geocentrists.

Appendix: Geocentric and Heliocentric models

To better understand geocentricism and heliocentrism, we should compare the models. In reality, there are three theories, two geocentric and one heliocentric.

The heliocentric model is easiest to explain and understand. This is the model described and/or diagrammed in almost every astronomy book: the planets orbit the Sun in nearly circular orbits. Nicolaus Copernicus (1473–1543), a Polish astronomer and mathematician (and a Canon in the Roman Church), is generally credited with the establishment of the heliocentric theory, though he did not originate the idea. Copernicus' great achievement was authoring a book, *De Revolutionibus Orbium Celestium* (*On the Revolutions of the Celestial Spheres*) published about the time of his death. In his book Copernicus put forth arguments for the heliocentric theory, but also worked out the relative sizes

of the orbits and the correct orbital periods of the planets for the first time.

Later, Johannes Kepler (1571–1630) refined the Copernican system by positing that the planets' orbits are actually *ellipses* with the Sun at one focus of each ellipse. This is the first of Kepler's three laws. His other two laws establish the rates at which planets move in their orbits (at all times in any planet's orbit, the planet-Sun vector sweeps out the same area per unit time) and a relationship between the periods and sizes of the planets' orbits (the cube of the radius (strictly the semi-major axis) is proportional to the square of the period). Kepler's three laws were empirically deduced using two decades of careful observations of planetary positions made by Tycho Brahe (1546–1601).

Decades after Kepler, Isaac Newton (1643–1727), using his newly discovered calculus and mechanics, was able to deduce Kepler's three laws of planetary motion theoretically. This was taken as a great triumph of Newtonian mechanics and verification of Kepler's work.

The most famous geocentric theory is credited to Claudius Ptolemy, an Alexandrian Greek of the second century AD, though it is unclear exactly how much of the model was original to him. Ptolemy wrote a lengthy book originally called 'Η Μαθηματικη Συνταξις (*Hè mathèmatikè syntaxis* = The Mathematical Collection). This became known as 'Ο Μεγας Αστρονομος (*Ho Megas Astronomos* = the great astronomer). 9th century Arabs used the Greek superlative μεγιστη (megistè) meaning 'greatest', then prefixed the Arabic definite article *al*, so the book is now best known to us as the *Almagest*. This is a compilation of all ancient Greek astronomy, and is the primary source of information on the subject. Also in the *Almagest* is a complete treatment of the Ptolemaic cosmology.

As seen from the Earth, the five planets visible to the naked eye slowly move through the stars, generally in a west-to-east direction. This motion is called direct, or prograde. However, from time to time the planets reverse direction and move east to west in what is called indirect or retrograde motion. This seemingly erratic behavior is easily explained in the heliocentric theory. Figure 2 is a diagram of the orbits of the Earth and a superior planet (those with orbits larger than those of the Earth), such as Mars. As both planets orbit the Sun, Mars usually exhibits direct motion. However, whenever the Earth passes between Mars and the Sun, Mars undergoes retrograde motion. Mercury and Venus are inferior planets, those with orbits smaller than the Earth's. Inferior planets undergo retrograde motion when they pass between the Earth and the Sun.

The ancient Greeks needed to explain planetary motion in a geocentric way, which would not have been difficult to do, but they also had a couple of artificially imposed constraints that greatly complicated the problem. They believed that objects in the heaven were perfect, and as such, followed perfect motion. To the ancient Greeks, the most perfect motion was uniform motion on circles. The Ptolemaic model explains planetary motion with these constraints, but it is not simple, as shown in Figure 3. A planet moves uniformly on a circle called an *epicycle*, and the epicycle in turn moves uniformly on a circle called the *deferent*.

For the time being we will assume that the deferent is centred on the Earth. By adjusting the sizes of the epicycle and the deferent, and the speeds with which the planet moves on the epicycle and the epicycle moves on the deferent, the planet will occasionally exhibit retrograde motion. Retrograde motion occurs whenever the planet passes

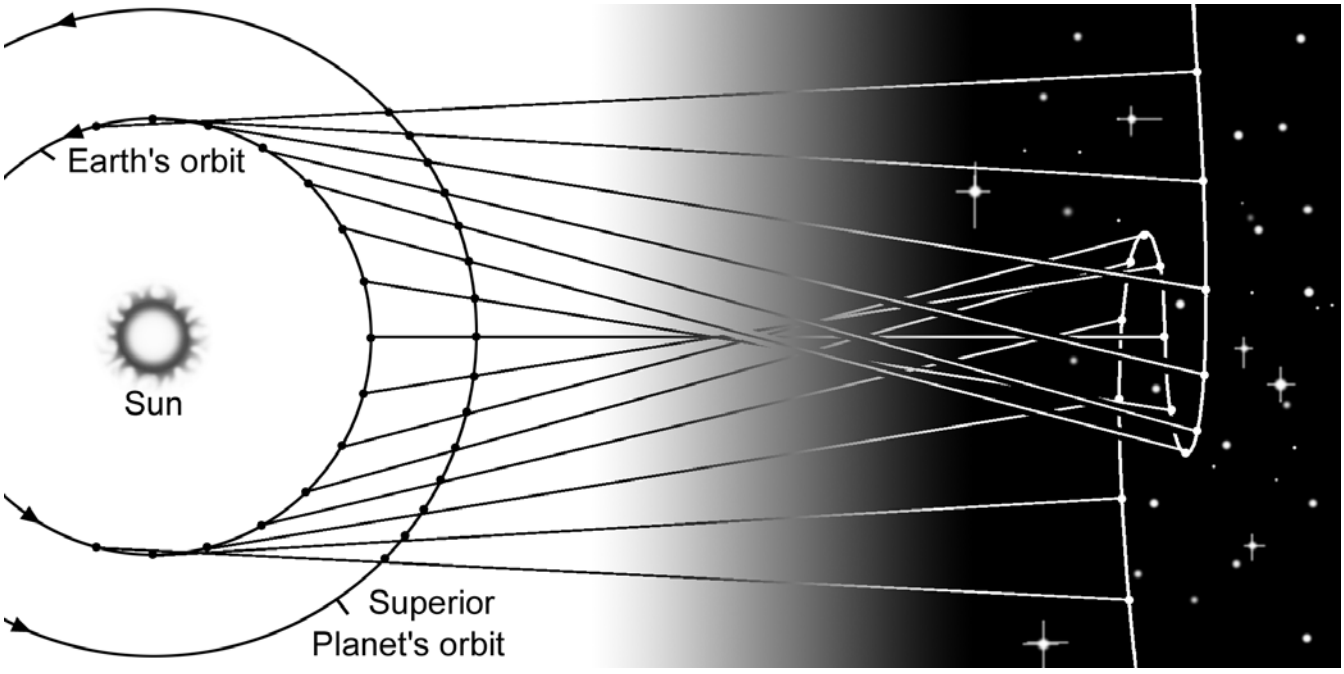


Figure 2. *How retrograde motion of a superior planet occurs in the heliocentric model.*

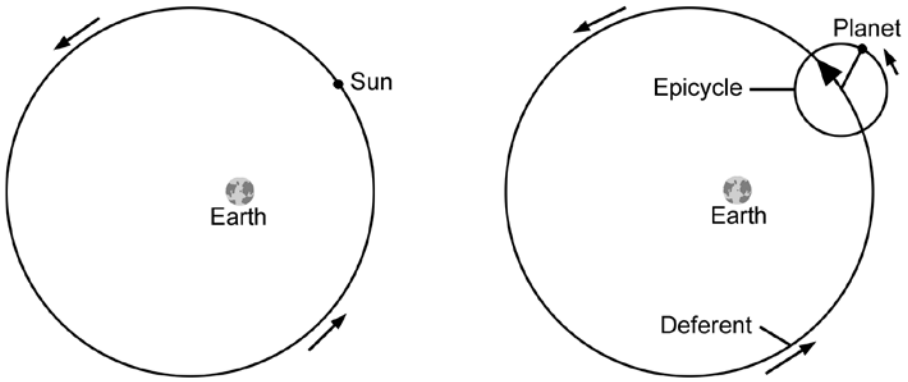


Figure 3. *The Ptolemaic model of solar motion (left) and planetary motion (right).*

close by the Earth between the Earth and the centre of the epicycle. At all other times the two motions will combine to produce direct motion.

While this relatively simple model will explain prograde and retrograde motion qualitatively, it fails on detail, so additional complications were added to improve the fit to reality. For instance, the Earth is not exactly at the centre of the deferent, but is a little off-centre. This actually is an attempt to approximate Kepler's first law, because the elliptical orbits of the planets deviate so little from a circle that off-centre circles can approximate them. Furthermore, the epicycle does not move at a uniform rate with respect to the centre of the deferent or the Earth. Instead, the epicycle moves at a constant rate with respect to a point called the *equant*. The equant is collinear with the centre of the deferent and the Earth and is at the same distance from the centre that the Earth is, but on the other side of the centre.

This refinement is an attempt to model Kepler's second law of planetary motion. While the epicycle is moving at a uniform rate with respect to the equant, it does not move at a uniform rate with respect to the centre of the deferent or even with respect to the Earth. Therefore the introduction of this concept is a desperate attempt to salvage uniform circular motion, all the while violating the spirit of that assumption.

Still other refinements were required. The planets do not follow orbits in the same plane of the Earth's orbit (the ecliptic). This causes the planets to alternately dip above and below the ecliptic. Ptolemy's model explains this by epicycles that are in a plane perpendicular to the plane of the other epicycles. While the Sun and moon do not experience retrograde motion, they do have inhomogeneities in their motions that required additional small epicycles to explain their motion around the Earth.

For nearly 1,500 years the Ptolemaic model was used, making it one of the most successful scientific theories of all time. Throughout the Middle Ages, small discrepancies between the predictions of the Ptolemaic model and reality were fixed by the addition of more epicycles. By the Renaissance, the Ptolemaic model had become very unwieldy, which led many people, such as Copernicus, to conclude that the model may not be correct. It is not clear if Ptolemy actually intended the theory to be taken as a statement of reality. It could be that he meant it merely as a method of calculating planetary positions. If so, this would have been a very modern view of what a theory is. Whether Ptolemy intended this or not is immaterial, because during the Middle Ages the Ptolemaic model was elevated to the status of truth, and even the Church had sublimated certain Biblical passages to fit this perceived truth.

Tycho realized the problems with the Ptolemaic model, but he could not bring himself to fully reject geocentrism. Therefore, Tycho proposed his compromise geocentric theory, as shown in Figure 4. In the Tychonian system the Sun orbits the Earth once per year, and the other planets orbit the Sun. In the modern Tychonian system, Keplerian and Newtonian principles are maintained, as in the heliocentric theory. Mathematically, the essential difference between the heliocentric and Tychonian models is a co-ordinate change from the Sun to the Earth. Apparently no one has believed the Ptolemaic model for a long time. Therefore, all modern geocentrists support the Tychonian model.

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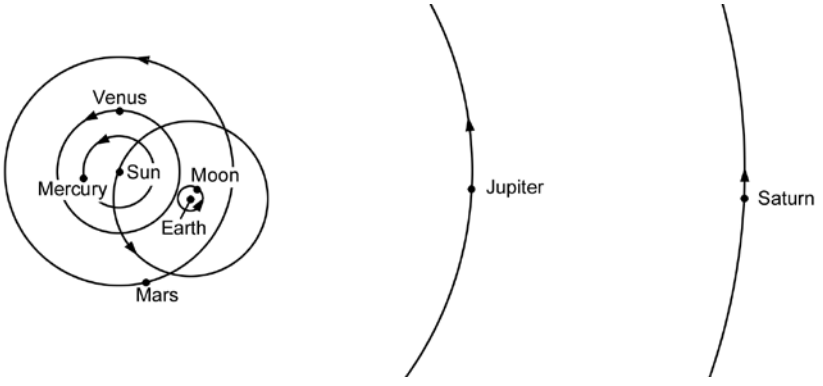

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