Response to Danny Faulkner

From Robert Sungenis

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Geocentrism: History and Background

by Dr. Danny R. Faulkner on August 29, 2020

D. Faulkner: Introduction to Geocentrism: Most people today believe the heliocentric theory, that the earth is one of eight planets orbiting the sun. This has been the dominant cosmology for four centuries. However, there has been a geocentric movement among biblical creationists dating back at least to the 1980s.

R. Sungenis: Actually it dates back to the 1960s, along with the creationist movement. For the Christian evangelicals, Henry Morris started the creationist movement with his book *The Genesis Flood*. The geocentric movement was started by Walter van der Kamp in his periodical, "Bulletin of the Tychonian Society" around 1967. After Walter died in 1988, Gerhardus Bouw took over the periodical and renamed it "The Biblical Astronomer" and backdated issues can be found at http://geocentricity.com. Bouw has a Ph.D. in Astronomy from Case Western University near Cleveland.

Although the arguments from these two geocentrists were formidable, Henry Morris, the leader of the evangelical movement of creationists, decided not to "fight a war on two fronts" with secular scientists. It was tough enough, he claimed, to fight a war against secular evolutionists, much less secular Copernicans. In Morris' view, his evangelical science movement would be ridiculed beyond reason if they supported geocentrism. So the decision was made to abandon geocentrism and adhere to creationism alone. Danny Faulkner, among others, are products of Morris' decision, which is why today one cannot find any support from the numerous creationist organizations for geocentrism

> **D. Faulkner:** The term geocentric theory, or geocentrism, usually refers to the belief that the earth does not revolve around the sun each year but rather that the sun orbits the earth. However, there is a secondary meaning to geocentrism: that the earth also does not rotate on its axis each day. Like geocentrists of old, modern geocentrists are divided as to whether the earth rotates, but they are united in belief that the earth does not revolve. Modern geocentrists usually pursue two lines of arguments: scientific and biblical. Here I will examine both.

R. Sungenis: Although it is true that there are two camps, those believing the earth rotates are very few. The reason is simple. There would be no seasons for the earth, unless the universe were allowed to undulate (i.e., move vertically or up and down) by 47 degrees every six months but not rotate around the earth. If so, they would need to explain how the universe undulates without rotating, which would be nigh impossible according to present laws of physics.

Van der Kamp and Bouw promote “geocentricity,” the concept that the earth is the center of mass for the universe, and as such, the earth neither revolves around the sun nor rotates on an axis; rather, the whole universe rotates around its center of mass, which happens to be occupied by the earth, which in Newtonian mechanics would necessitate that the Earth doesn’t move, either translationally or rotationally. Instead, the universe rotates and undulates, forming a spiral movement around the earth each day or each year, depending on how one dissects it. This spiral movement allows for the seasons and the year.

Additionally, when in 1616 and 1633 the Catholic Church condemned Copernicanism and Galileo it stated that the earth neither translates around the sun nor rotates on an axis, but is perfectly still in space. The Church realized that you cannot have one without the other.

> **D. Faulkner:** Before embarking on the discussion, I ought to acknowledge that the modern flat-earth movement has absorbed many geocentric arguments to the extent that flat-earthers often conflate the two, thinking that an argument for geocentric theory is an argument for the earth being flat. This is news to those who have been geocentrists for some time because they believe that the earth is spherical. I shall not discuss the flat-earth movement here; for a refutation of the flat-earth movement, please see my recent book on the subject. Thus, all flat-earthers must be geocentrists, but not all geocentrists are flat-earthers. For the purpose of my discussion here, I will use the term geocentrist to refer to geocentrists who are not flat-earthers.

R. Sungenis: Danny is correct here. Many flat-earthers tried to get me to endorse their movement. I, in turn, told them that the resurgence of flat-earthism was designed to make geocentrism look ridiculous. It was not hard to notice that the flat-earth movement began to thrust itself into the spotlight when our movie, The Principle, came out in 2014.

> **D. Faulkner:** The Nature of Motion: We define motion as the time rate of change in position. Therefore, if an object does not change position, it is at rest and hence does not move.
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> We define motion as the time rate of change in position. Therefore, if an object does not change position, it is at rest and hence does not move. How do we detect motion? In a qualitative sense, this is very easy: we watch an object to see if it changes position. Or is it so easy? When riding in a vehicle, objects outside the vehicle, such as trees, change position. So, are those objects moving? Hardly. We readily recognize that it is we in the vehicle that are moving; objects outside the vehicle merely appear to be moving. But can we be certain about that? Anyone who has driven a manual transmission vehicle has very much been fooled by the following experience, as I have been several times. While stopped at a traffic signal with multiple lanes on a slope, I was momentarily distracted by something inside the car, such as tuning the radio, when in my peripheral vision I saw the car next to me begin slowly moving up the hill. My instinctive reaction was not that the other car was moving, but that my foot had slipped on the brake pedal, and I was rolling backward. Without hesitation, I stomped on the brake to avoid rolling into the car behind me. But every time I did this, a quick look around revealed that I was wrong: it was the car next to me that was moving. So, determining what is at rest and what is moving is not as easy as it first appears.

The problem is that we can't observe or measure absolute motion. Rather, the only motion we can detect is relative motion. We generally assume that there is some absolute standard of rest against which all motion can be measured. In the case of an automobile, we usually assume that the road and the rest of the earth are at rest. But this does not mean that the earth truly is at rest. If we move with the earth, then the earth being at rest is an illusion. Still, though we tend to think that there must be some standard of rest outside of the earth, keep in mind that this is an assumption. Once one makes this assumption, then one must further assume what that standard of rest is. Some geocentrists make this point and conclude that since an absolute standard of rest must be assumed, then the question of what is moving and what is not moving is not a scientific one. I have no quarrel with this, because any system of thought must begin with certain assumptions, which are usually expressed as definitions, axioms, and postulates. Therefore, one can postulate about whether an absolute standard of rest exists and, if it does, what that standard of rest is. However, many of the same geocentrists who make this distinction often end up concluding that science proves geocentrism. But how can science prove that the earth is not moving if the question of what is moving and what is not moving is not a scientific one?

R. Sungenis: Just because science cannot prove absolute motion, science can still help in arriving at absolute motion. Step one is to listen to what Scripture says about that very question. Its answer is, the Earth is the absolute reference frame to measure all motion, whether motion on Earth or motion in deep space (we would use triangulation with the Earth for deep space objects). Historically, there have been several experiments that confirm the earth is not in motion (e.g., Arago 1818; Airy 1871; Michelson 1887). So in this way science can confirm what we read in Scripture about the Earth. The Church, which is led into all truth by the Holy Spirit, then confirms Scripture's attestation, which she did in the trials against Galileo in 1616 and 1633. So here is a case in which Science, Scripture and the Church all agree that the Earth is the only fixed object in the universe.

D. Faulkner: The History of Man's Understanding of Motion: In many ancient cultures, and until four centuries ago, most people assumed that it was the sun that moved. However, most people today think that it is the earth's rotation on its axis that accounts for what we see each day.

The sun rises every morning, moves across the sky, and sets each evening, only to repeat the same process the next day. That observation is plain enough, but is it the sun that is moving around the earth, or is it the earth that is turning each day? In many ancient cultures, and until four centuries ago, most people assumed that it was the sun that moved. However, most people today think that it is the earth's rotation on its axis that accounts for what we see each day. Even in some ancient cultures, there were people who believed that the earth rotated daily. Either possibility can explain what we see. And since all we can observe is relative motion, in a very real sense, both possibilities are true. This is not post-modern thinking. Rather, it is an acknowledgment that motion is a far trickier thing than most people realize. Let me say it again: since all we can detect is relative motion, in a very real sense the sun moves across the sky each day, even though it is the earth's rotation that accounts for that motion. But, again, the daily motion of the sun is not what most people think of when they think of geocentrism. Geocentrism

usually refers to the question of whether each year the earth revolves around the sun or the sun orbits the earth.

R. Sungenis: Actually, it is not altogether correct to say "all we can detect is relative motion," since if we cannot tell whether the object we are observing is moving or fixed, then we cannot assume it is moving. If we have prior knowledge (from Scripture) that an object does not move, then we can judge motion absolutely, not relatively.

D. Faulkner: The effect of the earth's rotation is not restricted to the sun. Each night the stars appear to spin around the earth as does the sun during the day. The difference is that the two motions are slightly mismatched, with the stars taking nearly four minutes less to complete a rotation. This has the effect of the sun appearing to move with respect to the stars, taking one year for the sun to complete one circuit. We call the annual path of the sun through the stars the ecliptic. Most ancient societies assumed that it was the sun moving through the stars once a year that explained this, though there were a few exceptions, such as Aristarchus (310–230 BC). For the past four centuries, the dominant belief in the West has been that it is the earth's orbital motion that explains the sun's annual motion along the ecliptic. Again, either possibility explains what we see.

The situation gets trickier as we consider other celestial bodies. The moon moves through the stars once per month along a path inclined about five degrees to the ecliptic. Even in ancient times, this generally was interpreted as the moon orbiting the earth, as it is understood today (the exception would be flat-earthers). But the motion of the five naked-eye planets, Mercury, Venus, Mars, Jupiter, and Saturn, are much more difficult. These planets appear as bright stars that move along paths inclined to the ecliptic by only a few degrees. Their observed periods of motion with respect to the sun ranged from 116 days for Mercury to 780 days for Mars. We refer to these as the synodic periods of the planets. What makes planetary motion peculiar is that planets generally move west to east through the stars like the sun and moon do, but from time to time the planets halt their eastward motion and move backward, east to west, through the stars before resuming their normal eastward motion. For a long time, this retrograde motion defied a rational explanation.

The heliocentric theory explains retrograde motion in a simple and straightforward way. The planets closer to the sun move more quickly than planets farther away from the sun. Hence, the earth travels more quickly than the superior planets, planets that are farther from the sun than the earth. Moving more quickly and traveling on a smaller orbit, the earth overtakes superior planets each synodic period. From the perspective of the earth as this occurs, the superior planets appear to move backward. In the same way, as one car passes other cars, the passed cars appear to move backward. In a similar manner, inferior planets, planets orbiting closer to the sun than the earth does, go through retrograde motion as they overtake the earth each synodic period. Note, per the previous discussion, this is relative, not absolute motion, but how can we tell which is which?

There is no simple geocentric explanation for retrograde motion,

R. Sungenis: There is a simple explanation. Apparently Danny doesn't know about it or is deliberately not revealing it. See below. Instead, Danny goes into a treatise about Ptolemy's model, but nobody uses his model and hasn't since at least the 1500s. I've had the simple geocentric model of retrograde motion up for years in animations and snap shots in my books for almost 20 years, as have other geocentrists who have put theirs on Youtube. How is it that Danny Faulkner with a degree in Astronomy doesn't know about them? The name of the model is the Tychonic or Neo-Tychonic. It explains retrograde motion as simple as or better than the Copernican/Keplerian model.

In fact, allow me to quote from one of my books, Geocentrism 101 (a book that Danny has not read, and, to my knowledge, has read none of my books on geocentrism, even though they have been out for over 15 years):

Retrograde Motion

> Around the same time, other claims of proof for the heliocentric system were being advanced. For example, the retrograde motion of Mars and various other planets were touted as definitive proof of the Earth's motion. But this turned out to be specious as well.
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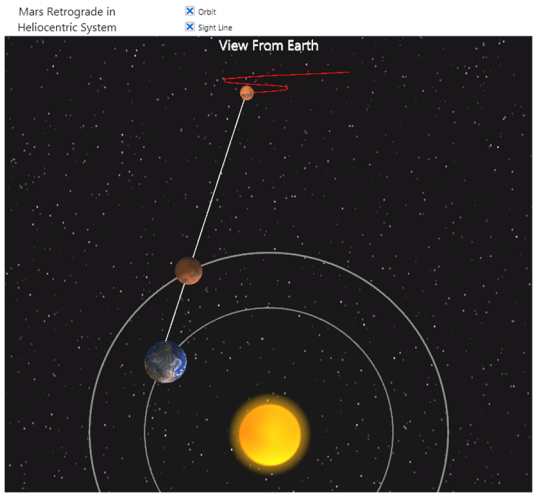
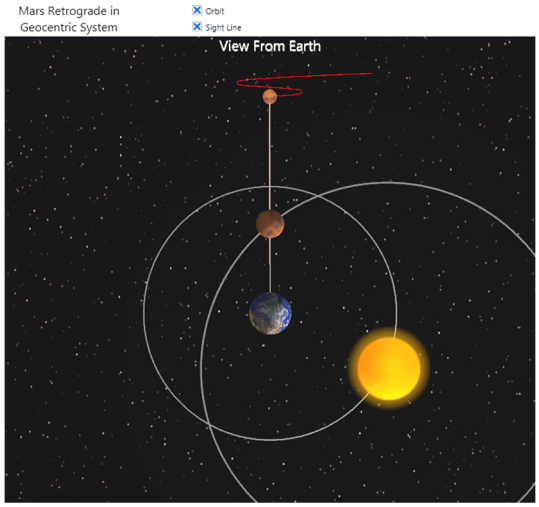
> Over the course of several months, Mars, as viewed from Earth, appears to make an S-shape in its orbit. Although Mars, in reality, never reverses its course, there must be a reason for the apparent reversal when viewed from Earth. Heliocentric advocates held that the only way this apparent retrograde motion of Mars can be explained is, since the Earth moves faster around the sun than Mars moves, the angle from which we view Mars from Earth changes abruptly during those times of the year when the two are very close to each other.



For animation see CD-ROM, p. 1, Helio Retrograde)

> However, since Tychonic geocentrism is just an inversion of the Copernican system, the same retrograde motion of Mars will be seen if the Earth is fixed and the sun and Mars are revolving around the Earth. Unfortunately, this simple illustration is never shown in astronomy textbooks.



For animation see CD-ROM, p. 1, Geo Retrograde

D. Faulkner: …but Claudius Ptolemy (AD 100–170) developed a geocentric explanation in the second century. Ptolemy had each planet move uniformly on a circle called an epicycle. The center of each planet's epicycle, in turn, moved uniformly around the earth along a larger circle called the deferent. Both motions were counterclockwise as viewed from above the earth's North Pole. As a planet moved along the side of its epicycle closest to the earth, the planet appeared to retrograde. By adjusting the sizes of each planet's epicycle and deferent, as well as the speed on either, Ptolemy was able to produce a good fit to the observational data of each planet. However, Ptolemy had to add a few adjustments to make the fit perfect. First, Ptolemy added a second, smaller epicycle perpendicular to the first for each planet. This accounted for the slight inclination of planetary orbits to the ecliptic, which caused planets to bob up and down slightly with respect to the ecliptic as they moved. Second, Ptolemy had to move the earth slightly off center of each deferent and have the planets move on their epicycles at a uniform rate around a second off-center point called the equant. This was to account for the fact that planetary orbits are ellipses, not circles, as the Ptolemaic model assumed. Of course, Ptolemy didn't know about elliptical orbits or that the orbits of the planets were inclined to the earth's orbit around the sun. Because the earth's orbit around the sun and the moon's orbit around the earth are ellipses, Ptolemy had to add some small epicycles to the motions of the sun and moon.

With these refinements, the Ptolemaic model did a good job of explaining and predicting planetary positions, so this model remained the dominant cosmology in the West for 15 centuries. However, over those centuries, small discrepancies between the predicted and observed positions of the planets arose. What to do? People found that additional small epicycles would bring predictions back into alignment with observations. But after 1500 years,

> the number of necessary refining epicycles exceeded a hundred. To some, the increasing complexity of the Ptolemaic model argued against it being true, causing them to cast about for other alternatives. One of those people was Nicolaus Copernicus (1473–1543). Shortly before his death, Copernicus published his work, but he had been discussing it for many years. Copernicus' work attracted much attention. Many people think that Copernicus invented the heliocentric theory, but he didn't, because the heliocentric model had been around since ancient times. Copernicus did, however, reintroduce the heliocentric model, and he gave arguments for the simplicity of the model compared to the Ptolemaic model. But his most important contribution was to use observational data to work out the true orbital periods (sidereal periods) and relative sizes of the planetary orbits within the heliocentric model. Apparently, no one had done this before, and this information was key in making further improvements to the heliocentric model.

R. Sungenis: Danny has a lot of misinformation here. Not that I accept the Ptolemaic model, but I will defend it from being misunderstood or overly maligned.

First, unlike Copernicus who believed that the planets revolved around the sun in perfect circles and their speeds never changed (the same concept originated with Aristarchus in 300 BC from which Copernican obtained his model), Ptolemy knew this didn't work from observing Aristarchus' model and he compensated by making the planets go at different speeds in their circular orbits by using his off-center equant. This model produced a relatively accurate account of what was occurring in the sky each year. Later, Kepler did more or less the same thing as Ptolemy except that the different speeds of a planet were controlled by an elliptical path on two foci, not an equant. In fact, we have an animation that superimposes Ptolemy's equant model over Kepler's model so that one can see how close they are in their results.

Second, Danny says, "But after 1500 years, the number of necessary refining epicycles exceeded a hundred." Now, I know there are discrepancies in the historical record on the issue of Ptolemy versus Copernicus, but I've never run across a figure as high as "a hundred" for Ptolemy's epicycles. As I did the research for this in my book, *Galileo Was Wrong: The Church Was Right*, what I found was Ptolemy had to use, at most, 40 epicycles. Moreover, Ptolemy had already put these epicycles into his model, and I am aware of no one who added epicycles to Ptolemy's model in order to compensate for future discrepancies. The discrepancies in the calendar came mainly from the differences between the pre-Julian, Julian, and Gregorian calendars. Other causes, such as the perturbations of the planets, also affected Ptolemy's model, but would also be true of the Copernican and Keplarian models.

In fact, this is where Copernicus made his mistake. When he was asked to fix the calendar by the pope, Copernicus thought the problems had occurred because of Ptolemy's model. So he set out to "correct" Ptolemy's model in 1510 and his first attempt was the book, *Commentariolus*. As he continued his study, however, he found that discovering the true path and speeds of the planets was a daunting task. In the book, Copernicus admits he had to use 34 epicycles. Copernicus writes in the *Commentariolus*: "Then Mercury runs on seven circles in all; Venus on five; the earth on three, and round it the moon on four; finally Mars, Jupiter, and Saturn on five each. Altogether, therefore thirty-four circles suffice to explain

the entire structure of the universe and the entire ballet of the planets," (translated by E. Rosen in *Three Copernican Treatises*, 1971, cited in Barbour's *Absolute or Relative Motion*, p. 255).

Not surprisingly, it was Copernicus himself that began the rumor that Ptolemy had twice as many epicycles as Copernicus did, claiming that Ptolemy had "80." Cohen remarks on Robert Palter's coining of the "80-34 syndrome" of those who desired to place Copernicus above Ptolemy. Owen Gingerich adds that the myth of having to put up with Ptolemaic epicycles perpetuated itself like an out-of-control gossip chain. He writes: "The legend reached its apotheosis when the 1969 *Encyclopedia Britannica* announced that, by the time of King Alfonso, *each planet* required 40 to 60 epicycles! The *Britannica* article concluded, 'After surviving more than a millennium, the Ptolemaic system failed; its geometrical clockwork had become unbelievably cumbersome and without satisfactory improvements in its effectiveness.' When I challenged them, the *Britannica* editors replied lamely that the author of the article was no longer living, and they hadn't the faintest idea if or where any evidence for the epicycles on epicycles could be found" (*The Book that Nobody Read*, pp. 56-57). Elsewhere Gingerich adds: "the Copernican system is slightly more complicated than the original Ptolemaic system" ("Crisis versus aesthetic in the Copernican revolution," *Vistas in Asrtonomy*, 17, p. 87, 1975).

This gives us a strong hint that perhaps Copernicus was not in this game merely to give the world a better model of cosmology; rather, he thought of it as an historic competition that allowed him to inflate his opponent's errors. As Barbour notes: "In fact, there are far fewer circles in the Ptolemaic scheme presented in the *Almagest* than many accounts would lead one to believe; Ptolemy was remarkably economic in his use of circular motions" (Julian Barbour, *Absolute or Relative Motion*, p. 184).

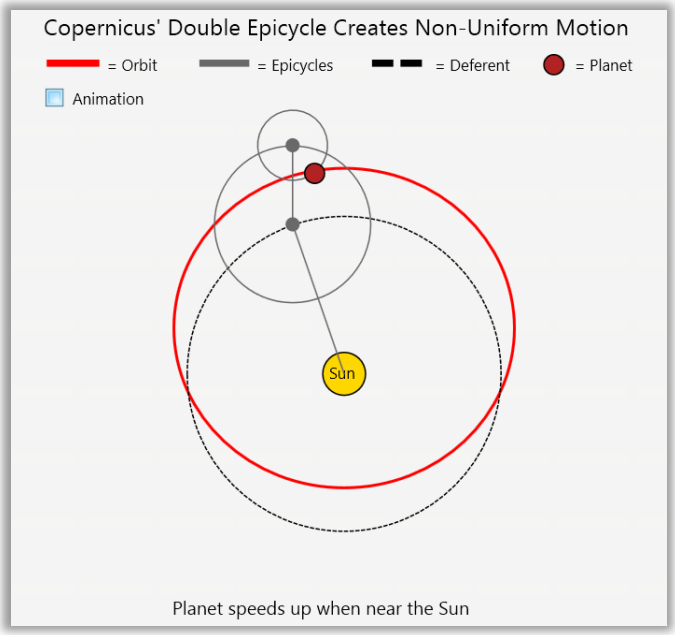
Copernicus didn't publish his second book until 1543, which was titled *De revolutionibus orbium coelestium*. By that time he found that his Aristarchian heliocentric model needed more epicycles than Ptolemy's model to keep up with what the sky was showing. Copernicus needed 48, whereas Ptolemy needed 40.

Contrast Between Copernicus' 1510 *Commentariolus*
and the 1543 *De Revolutionibus* Regarding the Number of Epicycles

Object	Motion Problem	*De Revolutionibus*	*Commentariolus*
Earth	Diurnal rotation	1	1
	Motions in longitude	3	1
	Conic motion of Earth's axis for its fixed direction	1	1
	Two rectilineal oscillations for precession and obliquity	4	3
Moon	Motions in longitude	3	3
	Motion in latitude	1	1
Three Outer Planets	Motions in longitude 3 × 3	9	9
	Oscillations in latitude 3 × 2	6	6
Venus	Motions in longitude	3	3
	3 oscillatory motions in latitude to 6 circular	6	2
Mercury	Motions in longitude	5	5
	Motions in latitude	6	2
Total		**48**	***34**

As it stands, Ptolemy's equant made his model much more economical. Copernicus had to add a second circular epicycle (or epicyclet) to do what Ptolemy's equant had accomplished; and Copernicus was

compelled to do so because he believed Ptolemy, by introducing the equant, had departed from strict circular motion. As noted earlier, Ptolemy's equant was so versatile that it would rival Kepler's ellipse, for it allowed the planets to sweep out the same area per unit time of revolution that Kepler's famous Second law of motion (the "equal area law") would eventually accomplish a millennia and a half later.



The complexity of Copernicus' heliocentric system stems in part from the fact that most of the charts and figures in *De revolutionibus* were not original. Copernicus merely borrowed from the Greeks and then reworked the figures to fit his heliocentric model:

> Canon Koppernigk was not particularly fond of star-gazing. He preferred to rely on the observations of Chaldeans, Greeks, and Arabs – a preference that led to some embarrassing results. *The Book of the Revolutions* contains, altogether, only twenty-seven observations made by the Canon himself; and these were spread over thirty-two years!…Even in the position he assumed for his basic star, the Spica, which he used as a landmark, was erroneous by about forty minutes' arc, more than the width of the moon (Koestler, *The Sleepwalkers*, p. 125).

> **D. Faulkner:** Some of the most significant refinements were those of Johannes Kepler (1571–1630) about 75 years after the publication of Copernicus' book. Kepler attempted to fit empirical data of the five naked-eye planets to the heliocentric model. It took Kepler a long time, but he finally found success when he scrapped circular orbits for elliptical orbits, resulting in his three laws of planetary motion.

R. Sungenis: For the record, I think people should know that Kepler was not the first to propose elliptical orbits. As the scholar Owen Gingerich found, elliptical orbits were probably from the work of Jerome Schreiber. Gingerich writes:

> "On folio 143 [of Kepler's copy of *De revolutionibus*] there appears the single Greek word elleiyiV – that is, ellipse – together with the same sort of emphasis marks that Schreiber used to highlight the passage on folio 96. When I first saw that book in Leipzig, I assumed that it was Kepler who had written elleiysiV in the margin, and I hadn't made a color slide of it. Later, when I had discovered more information about the double layer of annotations and the evidence that it was likely Schreiber's handiwork, I had to worry about which one wrote it….Eventually I obtained excellent transparencies, which left no doubt that it was indeed Schreiber's ink in the book Kepler had inherited" (*The Book that Nobody Read*, p. 165).

> **D. Faulkner:** The next step was Isaac Newton (1642–1727), who derived Kepler's three laws of planetary motion from his own three laws of motion, law of gravity, and the newly invented calculus. By the time of Newton, most people in the West had become convinced of heliocentrism, and Newton's work seemed to put last nails in the coffin of geocentrism.

R. Sungenis: Yes, it seemed to do so, especially since it was the only real dynamic model that incorporated mass and acceleration into a force that moved the planets to escape the sun's gravity. Newton didn't have an explanation for what caused gravity or exactly what mass was, but he could put them into an equation and tell you how fast an object would fall to the earth. Kepler also had somewhat of a dynamic model, but with no equations. He believed the sun was a big magnet that swept the planets into orbits, the closest planets feeling more of the magnetism from the sun than the outer planets, which thus made the inner planets orbit faster than the outer. But the story was not over with Newton. Science had a great big surprise in store for Newton two hundred years later when Newton was basically put on the proverbial shelf.

> **D. Faulkner:** The transition from geocentrism to heliocentrism in the 17th century was not easy. An early proponent of Copernicus' model was Galileo Galilei (1564–1642). While Galileo became convinced of heliocentrism due to its relative simplicity as compared to the geocentrism, it was his telescopic observations that buried the Ptolemaic model. Though often incorrectly attributed with the invention of the telescope, Galileo was the first to use the telescope for astronomical study. He found that Venus went through a series of phases similar to lunar phases. This required that Venus orbit the sun, but the Ptolemaic model did not allow for this. In the Ptolemaic model, Venus was restricted to a lower orbit around the earth than the sun's orbit. Furthermore, Venus was constrained to be in the same general direction of the sun. This would allow for crescent phases, but not for half-lit or nearly fully lit phases. One could achieve half-lit and nearly fully lit phases by moving Venus to a higher orbit above the sun, but that would preclude crescent phases.

R. Sungenis: While it is true that Ptolemy's model could not accommodate the phases of Venus, Ptolemy reveals in his *Almagest* that not knowing the distances of the planets had handicapped his model, but he also reveals that he left six variables in his model to account for the distances if and when they were discovered. Considering he did his observations by the unaided eye, his variables say a lot about his intellectual and astronomical acumen.

> **D. Faulkner:** Galileo also overcame another objection to the heliocentric theory. Based upon Aristotelian theory of motion, it was thought that if the earth moved around the sun, the moon would be left behind in its orbit around the earth. However, Galileo saw four satellites, or moons, orbiting Jupiter with periods between 1.8 and 16.7 days. It was clear even in the Ptolemaic model that Jupiter moved, yet its four Galilean satellites, as they are called, had no difficulty keeping up. Hence, Aristotle's ideas about motion were incorrect, and this objection to the earth's movement was unfounded. Galileo went on to challenge other aspects of Aristotelian thinking.

R. Sungenis: I would only add that much of the disagreement over Aristotle is based on the origin and application of inertia. Aristotle tried to find a physical reason for inertia. He claimed that the ether behind the object pushed the object. Newton rejected Aristotle's theory but he didn't really have one to replace it, except to say that inertia was inherent in all objects so that inertia was defined as the tendency for an object to stay at rest or stay at a uniform speed unless acted upon by a net external force. But this did not answer the question of why a body had inherent inertia. It would not be for another two hundred years that science began to probe this question. As noted, Newton could tell you how fast gravity or inertia moved an object, but he couldn't tell you the physical cause for gravity or inertia.

> **D. Faulkner:** This challenge to the Aristotelian/Ptolemaic worldview did not go unnoticed, and it inevitably led to what is known as the Galileo affair. I will not fully discuss the Galileo affair here; instead, I will summarize it. Much of the Galileo affair has been misinterpreted as religion sticking its nose where it didn't belong. For instance, it is usually reported that theologians immediately pounced upon Galileo's heliocentric teachings as being contrary to Scripture. However, heliocentrism initially received welcome from theologians as an interesting topic of discussion. The complaints at first came from other scientists who thought that Galileo was attempting to upend science as then known. That was true. Since these scientists, like Galileo, mostly worked within the confines of church institutions, and with the blessing of church authorities, it was legitimate to raise these concerns within the church. Being early 17th century Italy, these officials were all Roman Catholic. A trial was convened, and a decision was handed down that forbad Galileo to continue teaching the heliocentric theory as truth. In many respects, this was nothing new, because those had been the conditions already in force. Remember that this squabble wasn't about religion: it was a scientific controversy.

R. Sungenis: Not quite. Galileo believed the Bible did not have to be interpreted literally. He lays it all out in his interpretation of Joshua 10. The Church, however, said that unless it was not possible to interpret literally or that the language was clearly symbolic, we are required to take Scripture at face value and interpret it literally. The Church had traditionally interpreted Scripture literally, which is how she arrived at things like baptismal regeneration, transubstantiation, confession, the papacy, etc. To be Catholic

meant that you interpreted Scripture literally (as even most Protestants do, including Danny Faulkner, when they interpret Genesis 1-2 literally to defend creationism against evolution). In Galileo's day, the Catholic hierarchy simply applied the same literal hermeneutic to the Bible's geocentric passages that it applied to the creation passages in order to be consistent). This remains a formidable challenge to Protestants today since their position begs the question: how can you be so insistent on a literal interpretation of the creation passages but be so against a literal interpretation of the geocentric passages, some of which are placed right next to creation passages?

Galileo also claimed that he had scientific proof for heliocentrism, but he did not. If his proofs for heliocentrism were presented to universities today, they would have been outrightly rejected.

> **D. Faulkner:** The controversy lay dormant for nearly two decades, upon which Galileo resurrected it by publishing a book on the subject. But it need not have erupted as it did. Galileo had to get permission from the Pope to publish the book, which he received.

R. Sungenis: That is false. Galileo was given no permission by any pope to write his book. First, Galileo was given a legal injunction by the magisterium under Paul V not to write, speak, or teach heliocentrism after he was reprimanded in 1616. Second, Cardinal Barberini (who eventually became Pope Urban VIII and the pope who condemned Galileo and heliocentrism in 1633) had befriended Galileo in the early 1620s. Galileo thought that because of this friendship he could start writing his book, *The Dialogo*, which he did in 1623. By 1632, Galileo secretly tried to get an imprimatur for his book in Florence, and used his friendship with the Medici family to put pressure on the Cardinal in Florence (Riccardi) to grant the imprimatur. The Vatican found out about Galileo's plot and Urban VIII called him to trial in 1633. Meanwhile, Urban was writing letters to the Medici family and telling them that Galileo was teaching heresy with his heliocentrism. At the 1633 trial, Urban VIII used the 1616 decree that heliocentrism was a "formal heresy" against Galileo and concluded that, at the least, Galileo was guilty of being "suspect" of that heresy. The Church didn't convict him of formal heresy because it wasn't sure whether in his *The Dialogo* that he really believed in heliocentrism.

> **D. Faulkner:** The only stipulation was that Galileo include discussion of the Pope's position (geocentrism) in the book.

R. Sungenis: That is also false. In fact, Cardinal Barberini was leaning toward heliocentrism, which is the very reason he befriended Galileo in the 1620s. But when Barberini became Pope Urban VIII, there was a drastic change in his view. He realized that the pope of 1616, Paul V, had already condemned heliocentrism as a formal heresy, and Urban VIII was going to continue that condemnation against Galileo in 1633.

> **D. Faulkner:** Rather than writing the book in Latin, which was the custom of such treatises at the time, Galileo chose to write it in Italian to gain a much wider audience. His book was a dialogue between three individuals, one a geocentrist, one a heliocentrist, and the third a neutral moderator. But as it turned out, the moderator was hardly neutral. Furthermore, the arguments put forth by the geocentrist made him look foolish. Finally, Galileo named the geocentrist Simplico, which roughly translates into English as simpleton. Since the Pope had

insisted that Galileo include the Pope's position (geocentrism) in his book, this made the Pope look foolish. The Pope was rightly furious, and all support Galileo had enjoyed rapidly evaporated.

R. Sungenis: Most Galileo scholars have concluded that the alleged anger of Pope Urban VIII for allegedly being portrayed as a simpleton in Galileo's book is nothing but a myth. It is clear from the historical record the Urban VIII was completely against heliocentrism and that his revolve was the motivation for his declaring Galileo guilty of following it. For those interested, I have done thorough research on this allegation against Urban VIII and it can be found in Galileo Was Wrong, Vol. 3.

D. Faulkner: A second trial was convened, but the fix was already in. The court found Galileo guilty of insubordination and heresy.

R. Sungenis: Not quite. Galileo was not convicted of heresy. He was convicted of being "suspect of heresy," a much more lenient charge. As for "insubordination," in actuality, in his 1633 trial Galileo acquiesced to the Church's filing of the 1616 canonical injunction Galileo received from Pope Paul V in 1616 that he should not "teach, speak or write on heliocentrism." Hence Galileo was not "insubordinate." He was fully cooperative at his 1633 trial. He was insubordinate for writing his book in 1623.

D. Faulkner: Occurring in the aftermath of the Protestant Reformation, the latter charge could have carried very serious consequences. Fortunately, the church deemed that Galileo had not challenged theological dogma, but Galileo, now advanced in age, was required to recant and spent the rest of his life in house arrest.

R. Sungenis: That is false. The very reason Galileo was brought to trail in 1633 was because he challenged what the Church had "declared and defined as heresy" regarding heliocentrism in 1616. Again, the Church had declared heliocentrism a "formal heresy" in 1616, and this was reiterated in the trial of 1633. Urban VIII had these words read to Galileo:

> Invoking, then, the most holy Name of our Lord Jesus Christ, and that of His most glorious Mother Mary ever Virgin, by this our definitive sentence we say, pronounce, judge, and declare, that you, the said Galileo…. having believed and held a doctrine which is false and contrary to the sacred and divine Scriptures – to wit, that the sun is in the center of the world, and that it does not move from east to west, and that the earth moves, and is not the center of the universe; and that an opinion can be held and defended as probable **after** it has been declared and defined to be contrary to Holy Scripture.

After being approved by Pope Urban VIII, these words were sent out to all the papal nuncios and universities of Europe, letting all know what the Church had decided in the Galileo case.

D. Faulkner: One consequence of the Galileo affair was that the teaching of heliocentrism was officially banned by the Roman Catholic Church, a ban that was only lifted in the late 20th century.

R. Sungenis: That is false. The ban against heliocentrism has never been officially lifted by the Church. The decrees of 1616 and 1633 still stand today, officially speaking. But there is an UN-official belief in the Catholic Church at large today that no one is required to believe in geocentrism. That belief stems from an incident in 1820-22 in which a Catholic Church canon, Giuseppe Settele, received an imprimatur under the reign of Pius VII for Settele's book on heliocentrism; and also because in 1835, Pope Gregory XVI took Copernicus' and Galileo's books off the Index of Forbidden Books. The truth is, Pope Pius VII was deceived into approving the imprimatur by a heliocentric cardinal, Cardinal Olivieri, who lied to the pope about why Galileo was originally convicted in 1616 and 1633. He told the pope that Galileo was condemned only because he had the wrong *version* of heliocentrism (the Copernican version) and not the right one (the Keplerian version). His cohort in this deception was Cardinal Cavellari, who eventually became Pope Gregory XVI and who eventually took Copernicus and Galileo off the Index of Forbidden Books in 1835. None of these maneuvers, even if they were legit (which they were not because of the malfeasance of Olivieri and Cavellari), could overturn the 1616 and 1633 formal decrees against heliocentrism. Only a formal and official recission of those decrees by a future pope could overturn them, and that has not happened, and probably will never happen.

D. Faulkner: But this was a ban in name only;

R. Sungenis: That is false. It was an official and formal ban, issued under the full weight of the Catholic magisterium, not once, but twice.

D. Faulkner: within a few years even Roman Catholic institutions abandoned geocentrism in favor of heliocentrism.

R. Sungenis: It wasn't within "a few years." Not until the 1820 issue with Canon Setelle – almost 200 years later – was there a substantial movement toward heliocentrism.

D. Faulkner: Also, keep in mind that prior to the ban instigated by Galileo's actions, there had been no ban on teaching heliocentrism since Copernicus had reintroduced it 75 years earlier.

R. Sungenis: That is false. In the very decade that Copernicus published his book, *de Revolutionibus*, Bartolomeo Spina, the Master of the Sacred Palace from 1542 until his death in 1547, sought to have Copernicus' book banned, which was eventually carried out by his Dominican colleague Giovanimaria Tolosani. Tolosani wrote a detailed geocentric treatise in 1546, which he dedicated to Paul III and which included an endorsement from Spina. In it Tolosani vehemently rejected Copernicus' universe and declared it an extreme danger to the faith precisely because of its attempt to deliteralize Sacred Scripture. The work's title is: *On the Highest Immobile Heaven and the Lowest Stable Earth, and All Other Movable Heavens and Intermediate Elements*. Tolsani insisted Copernicus' teaching "could easily provoke discord between Catholic commentators on Holy Scripture and those who have resolutely decided to follow this

false opinion. It is in order to avoid such scandal that we have written this short work" (English translation of the French translation *Aux origins*, p. 708, cited in *The Church and Galileo*, pp. 15-16).

Likewise, Rheticus, a good friend of Copernicus who helped get Copernicus' book published by the Lutheran, Andreas Osiander, had his book banned, including his earlier pro-Copernican work, *Narratio prima*. They were both placed on the *Index of Forbidden Books* published between 1559-1593, with a subsequent suppression of *Narratio* ordered by the Inquisition in 1598. As the 16th century reached the midway point, the staunchest anti-Copernican of the day was the Jesuit Christoph Clavius (d. 1612). He writes in his highly esteemed work:

> "We conclude, then, in accordance with the common doctrine of the astronomers and the philosophers, that the earth lacks any local motion, either rectilinear or circular, and that the heavens themselves revolve continually round it…. Holy Scripture is also in favor of this doctrine, stating in a great number of places that the earth is stationary. It also bears witness to the fact that the sun and the other heavenly bodies are in motion" (*In Sphaeram Ioannis de Sacro Bosco Commentarius*, Rome 1570, pp. 247-248, cited in *The Church and Galileo*, p. 18, 31. Clavius uses Psalms 19:5-6; 104:5 and Ecclesiastes 1:4-6 for his main support. See also: James Lattis' *Between Copernicus and Galileo*: *Christoph Clavius and the Collapse of Ptolemaic Cosmology*, University of Chicago Press, 1994.

Pope Pius V had already affirmed, in four separate places of the 1566 Tridentine catechism, that geocentrism is the teaching of the Church. Prior to that, Thomas Aquinas and all the medieval theologians taught geocentrism, as did all the Fathers of the Church, without exception.

> **D. Faulkner:** Keep in mind that the Galileo affair was a scientific squabble, not a battle between the Bible and science. Most of the refutation to Galileo came not from Scripture, but from Aristotle and Ptolemy.

R. Sungenis: As noted, that is false. It was precisely a battle between the Bible and what Galileo purported as "science." When Bellarmine confronted Foscarini in 1615 and Galileo in 1616, his arguments were based almost solely on Scripture and the Fathers, and Bellarmine told Galileo he had no scientific proof for heliocentrism to reject the testimony in Scripture. Besides, the science of that day was in its infancy and could hardly handle the battle. The science was based on geometric models, not dynamic models. Although Galileo showed that Ptolemy's model could not show the phases of Venus, Tycho's geocentric model could, and thus the debate was at a standstill, at least until Newton came along some 70 years later.

> **D. Faulkner:** Biblical references, such as Joshua 10:12–14, played a much smaller role, and they were interpreted in terms of geocentrism.

R. Sungenis: That is false. Joshua 10:12-14 played a pivotal role, which is why Galileo submitted his private interpretation of Joshua 10 to Bellarmine, and Galileo's version was not geocentric.

D. Faulkner: And the affair might have had a very different outcome had Galileo behaved himself. Galileo's insulting approach alienated those who had been on his side. Unfortunately, these facets of the Galileo affair are hardly discussed.

R. Sungenis: Galileo's irascible personality may have played some part in the opposition against him, especially the Pigeon League in Florence, but it was minor compared to the dubious proofs Galileo was presenting for heliocentrism, as well as the distortions of Scripture he was making in his exegesis.

D. Faulkner: Geocentrists often respond that the Copernican model had more epicycles than the Ptolemaic model. This is technically true, but hardly significant. While Copernicus was able to eliminate the large epicycles required by the Ptolemaic model to explain retrograde motion, he still was stuck in the Aristotelian concept that motions of heavenly bodies must exhibit perfect, circular motion. Given that planetary orbits are ellipses with non-uniform motion, Copernicus used the available fix of small epicycles to match observations.

R. Sungenis: It is significant, because when Copernicus began his model in 1510 he claimed he didn't need Ptolemy's epicycles, and he was angry at Ptolemy for adding the equant since it departed from circles. But when Copernicus used circles, he found that his model was not simpler than Ptolemy's. It was actually more complicated and not as accurate.

As for epicycles, there is a lot of hype. The truth is, any closed figure that departs from a perfect circle is defined as an ellipse, so an ellipse has a lot more room with which to work. Hence any orbit of the planets that is not a perfect circle is considered an ellipse, and so everyone says that the planets orbit in ellipses, as if that is some great discovery. In actuality, the planets' orbits are very close to circles, much closer to circles than the ovals that are often used to illustrate Keplerian orbits.

D. Faulkner: Also keep in mind that the original Ptolemaic model contained relatively few epicycles. But by the time of Copernicus, the discrepancies were so large as to require many more epicycles, so the comparison between the original Ptolemaic model and the Copernican model is hardly fair.

R. Sungenis: That is false. Copernicus hardly made any independent observations of the planets and stars in order for him to discover more "discrepancies." He used Aristarchus model with only slight modifications. As noted, the complexity of Copernicus' heliocentric system stems in part from the fact that most of the charts and figures in *De revolutionibus* were not original. Copernicus merely borrowed them from the Greeks and then reworked the figures to fit his heliocentric model. The great scholar on early astronomy, Otto Neugebauer, writes:

> The popular belief that Copernicus' heliocentric system constitutes a significant simplification of the Ptolemaic system is obviously wrong. The choice of the reference system has no effect on the structure of the model, and the Copernican models themselves require about twice as many circles as the Ptolemaic models and are far less elegant and adaptable. (Otto Neugebauer, *The Exact Sciences in Antiquity*, 1957, p. 204).
>
> Modern historians, making ample use of the advantage of hindsight, stress the revolutionary significance of the heliocentric system and the simplification it had introduced. In fact, the actual

> computation of planetary positions follows exactly the ancient patterns and the results are the same. The Copernican solar theory is definitely a step in the wrong direction for the actual computation as well as for the underlying kinematic concepts. (Otto Neugebauer, "On the Planetary Theory of Copernicus," *Vistas in Astronomy* 10, p. 103, 1968).

Koestler adds:

> Alexandrian astronomers can hardly be accused of ignorance. They had more precise instruments for observing the universe than Copernicus had; Copernicus himself hardly bothered with star-gazing; he relied on the observations of Hipparchus and Ptolemy. He knew no more about the actual motions of the stars than they did. Hipparchus' Catalogue of the fixed stars and Ptolemy's Tables for calculating planetary motions were so reliable and precise that they served, with insignificant corrections, as navigational aids to Columbus and Vasco da Gama. Eratosthenes, another Alexandrian, computed the diameter of the Earth as 7,850 miles with an error of only ½ per cent. Hipparchus calculated the distance of the moon as 30¼ Earth diameters – with an error of only 0.3 per cent. Thus, insofar as factual knowledge is concerned, Copernicus was no better off, and in some respects worse off, than the Greek astronomers of Alexandria who lived at the time of Jesus Christ. (Arthur Koestler, *The Sleepwalkers*, p. 73).

NB: Before the invention of the telescope, an accurate measurement of the distance between the sun and the Earth was not possible. Ptolemy had estimated the distance to be 610 Earth diameters, while Copernicus estimated it to be 571 Earth diameters. The actual distance is 11,500 Earth diameters.

Along these lines, Thomas Kuhn reveals the modern misconception of Copernicus:

> But this apparent economy of the Copernican system, though it is a propaganda victory that the proponents of the new astronomy rarely failed to emphasize, is largely an illusion….The seven-circle system presented in the First Book of the *De revolutionibus*, and in many modern elementary accounts of the Copernican system, is a wonderfully economical system, but it does not work. It will not predict the position of planets with an accuracy comparable to that supplied by Ptolemy's system. (Thomas S. Kuhn, *The Copernican Revolution: Planetary Astronomy in the Development of Western Thought*, 1957, 1959, p. 169. N. R. Hanson adds: "…in no ordinary sense of 'simplicity' is the Copernican theory simpler than the Ptolemaic" (*Constellations and Conjectures*, Dordrecht, D. Reidel, 1973. Cited in Imre Lakatos' *The Methodology of Scientific Research Programmes*, p. 175).

To drive home the point, Kuhn adds:

> …this brief sketch of the complex system of …Copernicus…indicates the third great incongruity of the *De revolutionibus* and the immense irony of Copernicus' lifework. The preface to the *De revolutionibus* opens with a forceful indictment of Ptolemaic astronomy for its inaccuracy, complexity, and inconsistency, yet before Copernicus' text closes, it has convicted itself of exactly the same shortcomings. Copernicus' system is neither simpler nor more accurate than Ptolemy's. And the methods that Copernicus employed in constructing it seem just as little likely

> as the methods of Ptolemy to produce a single consistent solution of the problem of the planets. The *De revolutionibus* itself is not consistent with the single surviving early version of the system, described by Copernicus in the early manuscript *Commentariolus*. Even Copernicus could not derive from his hypothesis a single and unique combination of interlocking circles, and his successors did not do so….Judged on purely practical grounds, Copernicus' new planetary system was a failure; it was neither more accurate nor significantly simpler than its Ptolemaic predecessors" (Thomas S. Kuhn, *The Copernican Revolution: Planetary Astronomy in the Development of Western Thought*, p. 171).

Herbert Butterfield adds:

> "[Copernicus] was puzzled by the variations he had observed in the brightness of the planet Mars…Copernicus' own system was so far from answering to the phenomena in the case of Mars that Galileo in his main work on this subject praises him for clinging to his new theory though it contradicted observation…." (*The Origins of Modern Science: 1300-1800*, p. 37).

All in all, Copernicus book, *de Revolutionibus*, was choppy, obtuse, and pedantic. The thrust of the theory fills fewer than twenty pages at the beginning of the book, roughly five percent of the whole treatise. More than half the book is filled with useless charts that prove nothing for Copernicus' case. When the book reaches its end, there is little left of the original teaching, and thus Copernicus can offer no concluding statement, even though it was promised many times in the text. Truth be told, the main reason for its unpopularity was that it offered no real improvement over Ptolemy's system.

We should also note that Copernicus lied to the pope about his model. In the *Introduction*, Copernicus claims to have rid cosmology of Ptolemy's somewhat cumbersome epicyclical system, which had been in use for over a thousand years. To Paul III he writes:

> For some make use of homocentric circles only, others of eccentric circles and epicycles, by means of which however they do not fully attain what they seek. For although those who have put their trust in homocentric circles have shown that various different movement can be composed of such circles, nevertheless they have not been able to establish anything for certain that would fully correspond to the phenomena. But even if those who have thought up eccentric circles seem to have been able for the most part to compute the apparent movements numerically by those means, they have in the meanwhile admitted a great deal which seems to contradict the first principles of regularity of movement" (*On the Revolutions of Heavenly Spheres*, p. 5).

D. Faulkner: At any rate, Kepler's refinement to Copernicus' model eliminated the need of any epicycles.

R. Sungenis: To some extent, yes, but overall, Kepler's epicycles do not give us a perfect representation of the movement of the planets, and to this day no one has come close to figuring out how the moon moves as it does, it is so complicated. There are many factors that go into why the planets move as they do, and some remain unexplained to this day. All we can really say is that putting the planets in elliptical orbits gives a more accurate picture than putting them in perfect circular orbits.

D. Faulkner: Since the 17th century, it is doubtful that anyone has believed the Ptolemaic model. A few years prior to the Galileo affair, Tycho Brahe (1546–1601) introduced a compromise cosmology. In the Tychonic model, the other planets orbit the sun, but the sun in turn orbits the earth each year. The other planets are carried along with the sun as it orbits the earth. The Tychonic model amounts to a coordinate transformation from the sun being the center to the earth being the center. The Tychonic model is the preferred model of modern geocentrists.

R. Sungenis: Actually, the Neo-Tychonic model has replaced the Tychonic model, since the original Tychonic model could not demonstrate stellar parallax or stellar aberration. Whereas the Tychonic model had the Earth in the geometric center of the universe, the Neo-Tychonic model puts the Earth at the center of mass of the universe and the sun at the geometric center. Since the stars are aligned with and move with the sun, this allows the whole stellar mass to revolve around the Earth on a 1AU cam, thereby producing stellar parallax and stellar aberration as observed on Earth.

D. Faulkner: Evidence That the Earth Moves vs. Geocentrism: While the heliocentric model became the dominant cosmology by the second half of the 17th century, this acceptance came without any direct proof. The phases of Venus disproved the Ptolemaic model and amount to evidence for the heliocentric model. But modern proponents of geocentric theory are keen to point out that the phases of Venus do not disprove the Tychonic model. Since the Tychonic model was published prior to the discovery that Venus exhibited phases, the observation that Venus has phases amounts to evidence for the Tychonic model. However, as we shall see, the Tychonic model did not predict other observations. It's not that the Tychonic model cannot be altered to accommodate these things. But it is a fact that the Tychonic model didn't predict these things and hence must be amended to account for them.

R. Sungenis: Nobody really "predicted" anything by their models. At best they found mistakes in each others' models, which then led to improvements by both sides to answer the discrepancies. The Aristarchian/Copernican model has been "amended" many times since its invention. The Pythagorean Greeks had several models of heliocentrism. The Indians proposed about a half dozen models in the 7-9th centuries. Copernicus' model didn't last for even a century before it was modified by Kepler, and even today Kepler's model has to be "amended" by Fourier analysis to make it track with the actual orbits of the planets.

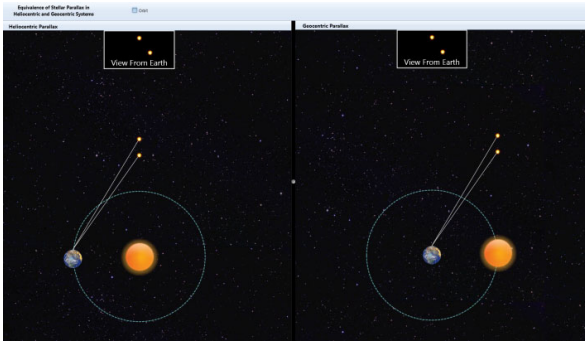
D. Faulkner: The first direct evidence for the heliocentric model came in 1727 when James Bradley (1693–1762) discovered aberration of starlight. Imagine standing in rain with no wind

blowing. Holding the umbrella vertically will maximize protection against the falling rain. But what happens when one walks in the rain? To maintain proper protection from the rain, one must tilt the umbrella in the direction of travel. How much the umbrella must be tilted depends upon the walking speed and how fast the rain is falling. In similar manner, as the earth orbits the sun, one must tilt a telescope slightly in the direction of the motion of the earth. The amount of tilt depends upon the earth's orbital speed and the speed of light. The tilt is about 20 arcseconds (this is the apparent diameter of a dime at 660 feet).

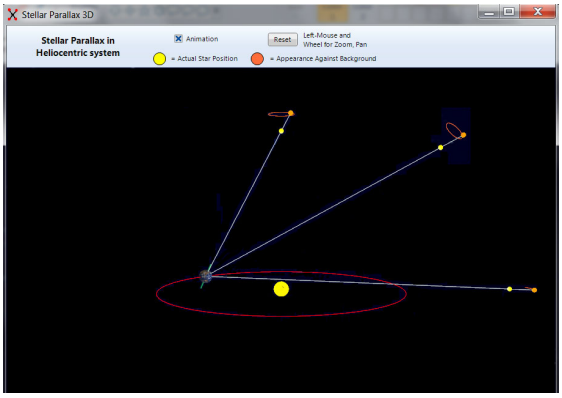
R. Sungenis: Apparently, Danny is not up to snuff on geocentrism since a model for geocentric stellar aberration has been available for at least 30 years or more. We address this issue in *Galileo Was Wrong* and in our flash drive that contains over 60 geocentric animations. (See Chapter 2, Objection #3: Doesn't Stellar Aberration Prove the Earth is Revolving Around the Sun?). In fact, the geocentric explanation for stellar aberration is much simpler than the heliocentric explanation, and the heliocentric explanations (plural) actually conflict with one another.

D. Faulkner: The second direct evidence for the heliocentric model came more than a century later when Friedrich Bessel (1784–1846) measured the parallax of the star 61 Cygni. Stellar parallax is the apparent shift in position that stars undergo as we view them from different sides of the earth's orbit. There are similarities between stellar parallax and aberration of starlight. For a given star, the displacement throughout the year of both parallax and aberration of starlight are ellipses, with the shapes and orientations of the ellipses depending on the celestial coordinates of the star defined by the ecliptic. For stars at the ecliptic poles, the ellipses have zero eccentricity, while the ellipses for stars on the ecliptic collapse to lines. However, there are two differences. First, the two ellipses are at right angles to one another. The shift due to aberration is in the direction of the earth's orbit, while the shift due to parallax is toward the sun. Second, the amplitude of the stellar aberration is 20 arcseconds for all stars, but the amplitude of stellar parallax depends upon how far a star is. The amount of stellar parallax is inversely proportional to distance. Consequently, nearby stars have the greatest parallax, and distant stars have the smallest parallax. The star Proxima Centauri has the greatest parallax – 0.77 arcseconds. Notice that this is only 4% of the amplitude of aberration of starlight, which is why it was more than a century after the discovery of aberration of starlight that the first parallax measurement was made. The parallaxes of other stars soon followed Bessel's first measurement. Today we have quality measurements of the parallaxes of millions of stars.

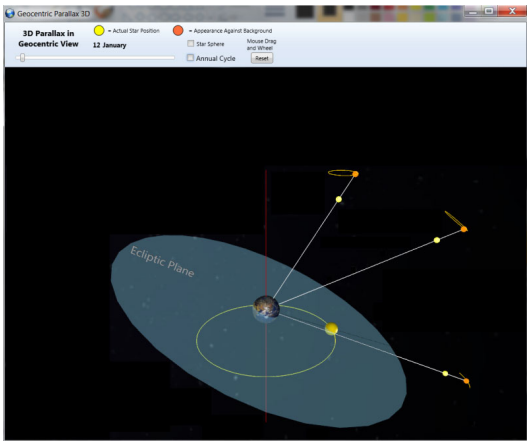
R. Sungenis: Yes, but none of them prove heliocentrism. Again, Danny is apparently not up to snuff on geocentric stellar parallax (or worse, he knows about it and is deliberately keeping it out of the discussion). Geocentric parallax illustrations are all over the internet, and they are quite simple. All that needs to be done is a geometric inversion of the heliocentric model. We cover this in *Galileo Was Wrong*, and the two other books, *Geocentrism 101* and *Geocentrism for Dumskies*. For *Galileo Was Wrong*, see Chapter 2, Objection #2: Doesn't Stellar Parallax Prove the Earth is Moving?



Heliiocentric and Geocentric Stellar Parallax



Three-dimensional perspective of heliocentric stellar parallax. Earth is revolving around the sun and viewing three different stars at three different latitudes. (See the flash drive for the animation).



Three-dimensional perspective of geocentric parallax. Sun and star field are revolving around Earth where three different stars are viewed from three different latitudes. (See the flash drive for the animation).

D. Faulkner: In 1887, Herman Carl Vogel (1841–1907) and Julius Scheiner (1858–1913) were the first to measure annual periodic Doppler motion of stars. Doppler motion is the spectra of stars containing absorption lines due to various elements at specific, measurable wavelengths. If there is relative motion between the earth and the star, there will be a shift in the observed wavelength of absorption lines. Let λ0 be the wavelength when there is no relative motion (determined in the lab) and let λ be the observed wavelength. Then the relative velocity, v, will be

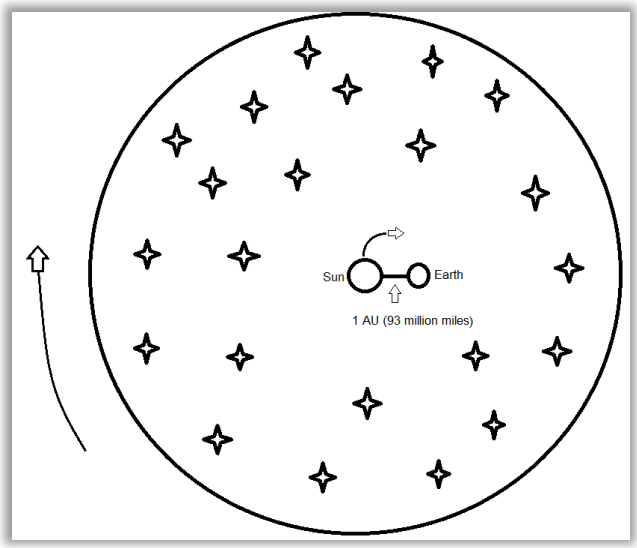
Equation:

$$v = \left(\frac{\lambda - \lambda_0}{\lambda_0} \right) c,$$

where c is the velocity of light. When relative velocity is toward the observer (earth), λ – λ0 will be negative, so the velocity will be negative. The observed amplitude of annual periodic Doppler motion of a star is 30 km/s (the orbital speed of the earth) times the cosine of ecliptic latitude of the star. The time variation of the Doppler shift goes as the sine of the angle between the difference in ecliptic longitude of the star and the sun. This is exactly what is expected if the earth orbits the sun once a year on an orbit with a 150 million kilometers radius.

R. Sungenis: This is another one of the heliocentrist's explanations that looks impressive, at least for the uneducated, but it's nothing but a shell game. Danny should know better. Giving him the benefit of the doubt based on his ignorance of the Neo-Tychonic system, we can use the same equation above and show that it corresponds to geocentrism, as we show in *Galileo Was Wrong*, Chapter 2, Objection #10: Doesn't the Doppler Effect Prove Earth is Moving?:

> Heliocentrists have claimed that since the Earth revolves around the sun at about 19 mps, this movement causes the Doppler shift of stars. As one author puts it, "Classical physics, but not Special Relativity, predicts different Doppler shifts for the source moving versus the observer moving, allowing one to 'determine' whether the earth moves or a 'fixed star' moves….To conclude, Mach did not consider the difference between the Copernican and Ptolemaic/Brahean systems and the observations falsifying the latter." (Herbert I. Hartman and Charles Nissim-Sabat, "On Mach's critique of Newton and Copernicus," *American Journal of Physics* 71(11), November 2003, p. 1167). The truth is, however, that the Neo-Tychonic geocentric system can easily explain Doppler shift. As we have noted previously, the Neo-Tychonic system has the star field rotating around the Earth on a 1 AU radial hub. As such, on one hemisphere of the star field the stars will be receding away from the Earth and on the opposite hemisphere the stars will be advancing toward the Earth. Those advancing toward the Earth will create a Doppler blue shift and those receding will create a Doppler red shift.



The stars are aligned with the sun, and the sun revolves around the Earth on a 1 AU radial pivot

> **D. Faulkner:** A similar phenomenon occurs when considering precise timing of stellar events, such as the times of minimum light of eclipsing binaries (something I have done for more than four decades). The amplitude is a little more than eight minutes (the light-travel-time radius of the earth's orbit) multiplied by the cosine of ecliptic latitude. The time variation goes as the cosine of the angle between the difference in ecliptic longitude of the star and the sun.

R. Sungenis: Well, if Danny knew the geocentric explanation of the Doppler shift of stars, he could then apply it to the "timing of stellar events" and he would have a geocentric answer. Unfortunately, it appears Danny is not aware of how the geocentric model works, yet he continues to create his own straw man in order denounce it. Danny needs to study the geocentric model, and my guess is that he has never read a page of *Galileo Was Wrong* before he started on his question to discredit modern geocentrism.

> **D. Faulkner:** Conclusion: There Is a Wealth of Data Indicating That the Earth Revolves Around the Sun: Historically, the earth's rotation has been less controversial than the earth's revolution. Prior to wide acceptance of the heliocentric theory, there were many people who didn't think that the earth orbited the sun but believed that the earth rotated each day (even some geocentrists today think that the earth rotates).

R. Sungenis: As I said earlier, very few, if any, geocentrists today believe the Earth is rotating since everyone is found out that such a model cannot explain the seasons.

> **D. Faulkner:** It is almost inconceivable that one could believe that the earth orbits the sun but also that the earth does not rotate on its axis, so most people readily accepted the earth's rotation once they came to believe the heliocentric theory. Consequently, the earth's rotation was widely accepted long before there was direct evidence for it. In 1851, Léon Foucault (1819–1868) provided the first direct evidence for the earth's rotation. Foucault constructed a simple

pendulum consisting of a large mass suspended by a long wire. The support at the top of the wire was free to spin in a horizontal plane. When the pendulum was set in motion swinging in a vertical plane, there were no external torques, so the plane of swing remained fixed. However, the earth's rotation carried the earth around the plane of swing. Hence, to an observer on the earth, the plane of oscillation precessed clockwise in the Northern Hemisphere (counterclockwise in the Southern Hemisphere). The period of precession was the sidereal day (23hr 56m 04s) divided by the sine of the latitude. Foucault consistently found results matching the prediction of the earth's rotation. This experiment has been successfully conducted many times since. Though there is other indirect evidence for the earth's rotation, the Foucault pendulum remains the best direct evidence for it.

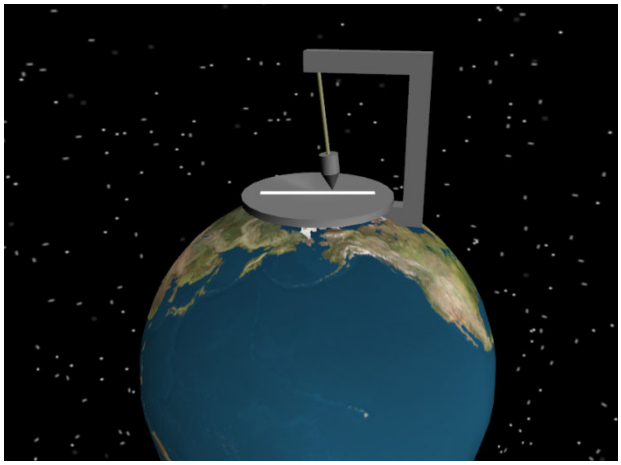
R. Sungenis: If this is the "best direct evidence" that the Earth rotates, then Danny is in a real quandary since geocentrism, ever since the time of Ernst Mach in the 1880s, could explain the Foucault pendulum by using geocentrism (and Mach wasn't even a geocentrist!). We cover this in *Galileo Was Wrong*, Chapter 2, Objection #4: Doesn't the Foucault Pendulum Prove the Earth is Rotating? Below is the section on this issue:

One can begin the critique by asking this simple question: if the pendulum is constantly swinging in the same plane (while the Earth is rotating beneath it), what force is holding the pendulum in that stationary position? In other words, if the plane of the pendulum is stationary, with respect to what is it stationary? This is understood as an "unresolved" force in physics. The only possible answer is: it is stationary with respect to the rest of the universe, since it is certainly not stationary with respect to the Earth. With a little insight one can see that this brings us back to the problem that Einstein and the rest of modern physics faced with the advent of Relativity theory: is it the Earth that is rotating under fixed stars, or is it the stars revolving around a fixed Earth? As Einstein said: "The two sentences: 'the sun is at rest and the Earth moves,' or 'the sun moves and the Earth is at rest,' would simply mean two different conventions concerning two different coordinate systems" (*The Evolution of Physics: From Early Concepts to Relativity and Quanta*, Albert Einstein and Leopold Infeld, 1938, 1966, p. 212). As such, it would be just as logical and scientifically consistent to posit that the combined forces of the universe which rotate around the Earth are causing the plane of the pendulum to rotate around an immobile Earth. In other words, in the geocentric model the movement of the pendulum is not an illusion – it really rotates. Modern physics has no argument against this reasoning since according to Einstein, there is no difference between the two models. Ernst Mach, from whom Einstein developed many of his insights, stated much the same. Critiquing Newton's "absolute space" as the pivot upon which the Foucault pendulum would turn, Mach writes:

> If the earth is affected with an absolute rotation about its axis, centrifugal forces are set up in the earth: it assumes an oblate form, the acceleration of gravity is diminished at the equator, the plane of Foucault's pendulum rotates, and so on. [In Newton's view] all these phenomena disappear if the earth is at rest and the other heavenly bodies are affected with absolute motion round it, such that the same relative rotation is produced. But if we take our stand on the basis of facts, we shall find we have knowledge only of relative

> spaces and motions. Relatively, not considering the unknown and neglected medium of space, the motions of the universe are the same whether we adopt the Ptolemaic or the Copernican mode of view. (Ernst Mach, *The Science of Mechanics*, 4th edition, Merchant Books, pp. 231-232).

Hence, the Foucault pendulum offers no proof for heliocentrism; rather, it only proves how presumptuous modern science has been for the last few hundred years. The same goes for the appeal to the oblateness of the Earth as proofs of the Earth's rotation. The only fact these particular phenomena prove is that there is a force causing the effect, not that a rotation of the Earth is causing the force.



The Foucault Pendulum: turning Earth or turning space?

The force that is moving the pendulum to change the plane of its swing is the Coriolis force. As we noted in the discussion of Newton's laws, Coriolis force is created not only by a rotating Earth in a fixed universe, but also by a rotating universe around a fixed Earth. As Assis notes, the rotating galaxies also create a Coriolis force that turns the Foucault Pendulum on a fixed Earth.

> …diurnal rotation of distant masses around the earth (with a period of one day) yields a real gravitational centrifugal force flattening the earth at the poles. Foucault's pendulum is explained by a real Coriolis force acting on moving masses over the earth's surface in the form $-2m_g\vec{u}_{me} \times \vec{\omega}_{Ue}$ where $\vec{u}_{me}$ is the velocity of the test body relative to the earth and $\vec{\omega}_{Ue}$ is the angular rotation of the distant masses around the earth. The effect of this force will be to keep the plane of oscillation of the pendulum rotating together with the fixed stars. (Andre K. T. Assis, *Relational Mechanics*, pp. 190-191).

Einstein admitted the same in a June 25, 1913 letter to Ernst Mach:

> Your happy investigations on the foundations of mechanics, Planck's unjustified criticism notwithstanding, will receive brilliant confirmation. For it necessarily turns out that inertia originates in a kind of interaction between bodies, quite in the sense of your considerations on Newton's pail experiment. The first consequence is on p. 6 of my paper. The following additional points emerge: (1) If one accelerates a heavy shell of matter S, then a mass enclosed by that shell experiences an accelerative force. (2) If one rotates the shell relative to the fixed stars about an axis going through its center, a Coriolis force arises in the interior of the shell, that is, the plane of a Foucault pendulum is dragged around. (Facsimile of this June 25, 1913 hand-written letter of Einstein to Mach available in *Gravitation*, pp. 544-545).

Although Einstein is supposing that the stars are "fixed" and that the Earth rotates, according to Relativity theory the above paragraph can just as easily be applied to a rotating star-system (the universe) around a fixed Earth. In such a case, the universe would be the "heavy shell of matter S," which, as it rotates, will create "an accelerative force" on the "mass enclosed by that shell," the "mass" being any heavenly body. The "accelerative force" is understood by Einstein to be the "Coriolis force," which is the force commonly cited to explain why "a Foucault pendulum" rotates. In other words, a universe of stars rotating around a fixed Earth will cause the peculiar movement of the Foucault pendulum just as a rotating Earth in a "fixed star" system. Like a leaf in a whirlpool, the pendulum would be carried around and around. It has inertia because it is caught in the gravitational draft of the stars' diurnal circular movement. As Martin Selbrede notes:

> In a letter that Einstein sent to Ernst Mach in 1913, he showed what happened to a Foucault Pendulum in the event that you have a shell of matter rotating around the pendulum, and consequently, he said if it is a relatively small mass, we are going to see drag on the plane of oscillation of the pendulum, and it will start to precess. If the mass is large enough, we eventually get perfect frame-dragging, which is completely in synchronization with the rotating mass. So if the rest of the Universe is, in fact, rotating around us, then the Foucault Pendulum will still stay in synch with it and move its axis along with the Universe. That creates the inertial field, but the inertial field itself is in rotation. We have perfect frame-dragging, because everything out from Saturn and beyond looks like infinite mass to the Earth, since it is traveling faster than the speed of light, so it satisfies the Schwarzschild criterion. It is that inertial field that is interpreted as why we send rockets heading due east from Cape Canaveral because we take advantage of plowing right into that inertial field and maximizing the value of it. It is the reason that north-south train tracks wear on one side more than the other. Again, because this force is a real force. It is not a fictitious force. Now, fictional and fictitious are two different words. I didn't say fictional force, but a fictitious force, one that is described as, it appears to be the case, because of how things are moving. Centrifugal forces and Coriolis forces are alleged to be fictional forces that are due to the alleged rotation of the Earth. But if the Earth is fixed, then modern science, the serious ones that are doctrinaire and hold to the general principle of covariance, those are no longer fictitious forces, but are real forces that are actually present on the Earth's surface that are induced by the rest of the Universe's motion around us.

Under the heading "dragging of inertial frames," Misner, Thorne and Wheeler posit that the angular velocity of the Foucault pendulum would be equal to that of the rotation of the stars. They write:

> Consider a bit of solid ground near the geographic pole, and a support erected there, and from it hanging a pendulum. Though the sky is cloudy, the observer watches the track of the Foucault pendulum as it slowly turns through 360º. Then the sky clears and, miracle of miracles, the pendulum is found to be swinging all the time on an arc fixed relative to the far-away stars. If "mass there governs inertia here," as envisaged by Mach, how can this be?
>
> Enlarge the question. By the democratic principle that equal masses are created equal, the mass of the Earth must come into the bookkeeping of the Foucault pendulum. Its plane of rotation must be dragged around with a slight angular velocity, ω_{drag}, relative to the so-called "fixed stars"….The distant stars must influence the natural plane of vibration of the Foucault pendulum as the nearby rotating shell of matter does, provided that the stars are not so far away…that the curvature of space begins to introduce substantial corrections into the calculation of Thirring and Lense. In other words, no reason is apparent why all masses should not be treated on the same footing….Mach's idea that mass there determines inertia here has its complete mathematical account in Einstein's geometrodynamic law. "Point out, please," the anti-Machian critic says, "the masses responsible for this inertia." In answer, recall that Einstein's theory includes not only the geometrodynamic law, but also, in Einstein's view, the boundary condition that the universe be closed….This mass-energy, real or effective, is to be viewed as responsible for the inertial properties of the test particle that at first sight looked all alone in the universe. (Misner, Thorne and Wheeler, *Gravitation*, pp. 547-549).

It would be no surprise to find the same reasoning in Einstein's thinking. I will interject explanations in brackets so the reader can follow Einstein's flow of thought in concrete terms:

> Let K [the universe] be a Galilean-Newtonian coordinate system [a system of three dimensions extending to the edge of the universe], and let K′ [the Earth] be a coordinate system rotating uniformly relative to K [the universe]. Then centrifugal forces would be in effect for masses at rest in the K′ coordinate system [the Earth], while no such forces would be present for objects at rest in K [the universe]. Already Newton viewed this as proof that the rotation of K′ [the Earth] had to be considered as "absolute," and that K′ [the Earth] could not then be treated as the "resting" frame of K [the universe]. Yet, as E. Mach has shown, this argument is not sound. One need not view the existence of such centrifugal forces as originating from the motion of K′ [the Earth]; one could just as well account for them as resulting from the average rotational effect of distant, detectable masses as evidenced in the vicinity of K′ [the Earth], whereby K′ [the Earth] is treated as being at rest. If Newtonian mechanics disallow such a view, then this could very well be the foundation for the defects of that theory… (Hans Thirring, 1918, "On the Effect of Rotating Distant Masses in Einstein's Theory of Gravitation).

In other words, Einstein has confirmed that a universe in rotation around the Earth would produce the same centrifugal and Coriolis forces attributed to a rotating Earth in a fixed universe. Advocates of his theory confirm our understanding. C. Møller writes:

> …if we consider a purely mechanical system consisting of a number of material particles acted upon by given forces…Newton's fundamental equations of mechanics may be applied with good approximation in the description of the system. On the other hand, if we wish to describe the system in an accelerated system of reference, we must introduce, as is well known, so-called fictitious forces (centrifugal forces, Coriolis forces, *etc*.) which have no connexion (sic) whatever with the physical properties of the mechanical system itself….It was just for this reason that Newton introduced the concept of absolute space which should represent the system of reference where the laws of nature assume the simplest and most natural form….Therefore Einstein advocated a new interpretation of the fictitious forces in accelerated systems of reference: instead of regarding them as an expression of a difference in principle between the fundamental equations in uniformly moving and accelerated systems he considered both kinds of systems of reference to be completely equivalent as regards the form of the fundamental equations; and the 'fictitious' forces were treated as real forces on the same footing as any other force of nature. The reason for the occurrence in accelerated systems of reference of such peculiar forces should, according to this new idea, be sought in the circumstance that the distant masses of fixed stars are accelerated relative to these systems of reference. The 'fictitious forces' are thus treated as a kind of gravitational force, the acceleration of the distant masses causing a 'field of gravitation' in the system of reference considered…. Previously the effect of the celestial masses had been considered to be negligible; now, however, we must include the distant masses in the physical systems considered….It can, however, be assumed that all systems of reference are equivalent with respect to the formulation of the fundamental laws of physics. This is the so-called general principle of relativity. (*The General Theory of Relativity*, Christian Møller, Oxford, Clarendon Press, 1952, pp. 219-220).

Here is another description of how the strong principle of relativity works:

> As an illustration…for the validity of the strong principle of relativity, we consider the Moon orbiting the Earth. As seen by an observer on the Moon both the Moon and the Earth are at rest (disregarding the observed spin of the Earth, which is of no concern here). If the observer solves Einstein's field equations for the vacuum space-time outside the Earth, he might come up with the Schwarzschild solution and conclude that the Moon should fall toward the Earth, which it does not. So it seems impossible to consider the Moon as at rest, which would imply that the strong principle of relativity is not valid. This problem has the following solution. As observed from the Moon the cosmic mass rotates. The rotating cosmic mass has to be included when the Moon observer solves Einstein's field equations. Doing this he finds that the rotating cosmic mass induces the rotational nontidal gravitational field which is interpreted as the centrifugal field in Newtonian theory. This field explains to him why the Moon does not fall toward the Earth. As we have shown above, corresponding results are valid for observers with accelerated

translational motion. ("Translational Inertial Dragging," Oyvind Grøn and Erik Eriksen, *General Relativity and Gravitation*, Vol. 21, No. 2, 1989, pp. 117-118).

As we can see, Einstein's system can have no objection to a geocentric universe. As Fred Hoyle noted, instead of denying geocentrism Relativity actually goes the other way and shows how much better a system it is. This is quite bothersome to those trying to promote the "Copernican Principle." Not surprisingly, attempts have been made to distinguish them. In 1904, August Föppl designed an improvement on the Foucault pendulum experiment by using a carefully suspended gyroscope whose precessional motion would reveal the disposition of an inertial frame of reference. Föppl hoped his experiment would decide whether "…the terrestrial phenomena of motion is itself influenced by the rotation of the earth in such a way that, for these motions, the rotation of the earth does not coincide with that rotation with respect to the fixed star heaven" (Essay by John Norton in *Mach's Principle from Newton's Bucket to Quantum Gravity*, eds., Julian Barbour and Herbert Pfister, Vol. 6, Birkhäuser, 1995, p. 31). Föppl believed that the two systems would be different due to a "special influence of the rotation of the earth." But Föppl reported that he could detect no deviation between the two systems within the accuracy of his experiment. This, of course, meant that the Foucault pendulum did not prove the Earth rotates but merely that there was relative motion between the Earth and the stars. On November 5, 1904 Föppl concluded that an inertial system "obtains its orientation from the masses of the system of the universe in some kind of law governed manner." The inertial forces are determined by all the bodies in the system which will then be disclosed by rotation, and the rotation will appear as a Coriolis force, which in turn moves the Foucault pendulum.

D. Faulkner: In 1852, a year after he demonstrated his pendulum, Foucault invented and named the gyroscope. There had been similar devices previously, but Foucault's design is how we know the gyroscope today. Foucault's motivation was to test whether a spinning gyroscope also appears to precess as the earth rotates. Indeed, a spinning gyroscope does this, though, because of so many other effects, much more care must be taken than with the Foucault pendulum.

Given the abundant evidence that the earth is both rotating and revolving, how is that some people today believe in the geocentric model? In a subsequent article I will discuss the rise of the modern geocentric movement.

R. Sungenis: I hope it is much better than this article, since this one is little more than a misrepresentation of both the history and the science of geocentrism.

May 2021