Karl Keating and the Geosynchronous Satellites:

How One Catholic's Ignorance of Science

Embarrasses the Whole Church

In the history of the debate between heliocentrists and geocentrists, the former have tried to use various and sundry celestial and earthly phenomenon in an effort to prove their system, but each one, as time went on, was eventually discredited. In the early going, Galileo attempted to use the earth's tides, the moons of Jupiter, and the movement of sunspots as his proof, only to be shot down almost as soon as they were proposed.

Newton attempted to prove the heliocentric system by confining his "laws of motion" to the solar system, which would make the Sun the most massive body and thus require the Earth to revolve around it. As he says in his 1684 *Scholium:*

> Thence indeed the Copernican system is proved a priori. For if a common center of gravity is computed for any position of the planets, it either lies in the body of the Sun or will always be very near it…

Newton also admitted, however, that the geocentric system would work just as well if there were appropriate celestial bodies outside the solar system to balance with the sun (e.g., the stars). Thus in Proposition 43 he stated:

> In order for the Earth to be at rest in the center of the system of the Sun, Planets, and Comets, there is required both universal gravity and another force in addition that acts on all bodies equally according to the quantity of matter in each of them and is equal and opposite to the accelerative gravity with which the Earth tends to the Sun…
>
> Since this force is equal and opposite to its gravity toward the Sun, the Earth can truly remain in equilibrium between these two forces and be at rest. And thus celestial bodies can move around the Earth at rest, as in the Tychonic system.[1]

About a hundred years later, Bradley claimed that his discovery of stellar aberration proved the heliocentric system, but this was later shot down when it was discovered that a rotating star-field that was set off from a fixed-Earth by 1AU produces the same precise aberration.

After another hundred years or so, stellar parallax was touted as proof of heliocentrism, until it was realized that a 1AU off-center rotating star-field revolving around a fixed Earth produces the same parallax for the geocentric system as in the heliocentric system.

About twenty years later, the Foucault Pendulum was claimed as proof for heliocentrism, until it was found by Mach that if Newton's space was put in rotation around a fixed Earth, it would move the pendulum in the same way as in the Earth-rotating system.

[1]Steven Weinberg, *To Explain the World: The Discovery of Modern Science*, HarperCollins, 2015, pp. 251-252.

A little later, the retrograde motion of Mars was touted as proof, until it was realized that the Tychonic geocentric system produces the same retrograde.

After this, Einstein put the kibosh on any alleged proof of heliocentrism when his co-variance and co-equivalence equations in his General Relativity theory gave equal viability to the geocentric universe. One of Einstein's more famous quotes along these lines is the following:

> The struggle, so violent in the early days of science, between the views of Ptolemy and Copernicus would then be quite meaningless. Either coordinate system could be used with equal justification. 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.[2]

As the above quote is a direct result of the *geometric* relativity in Einstein's theory, even more significant is that Einstein also insisted there is a *dynamic* relativity, that is, whatever forces are involved for a rotating Earth in a fixed universe are also present in a rotating universe around a fixed Earth. Once you get this principle, everything becomes clear as Einstein shows that Newton's attempt to confine the forces to our solar system and a rotating Earth was a mistake:

> 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 [the stars] as evidenced in the vicinity of K′ [the Earth], whereby K′ [the Earth] is treated as being at rest.
>
> <u>If Newtonian mechanics disallow such a view, then this could very well be the foundation for the defects of that theory</u>…[3]

In other words, Einstein 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 Einstein's theory said it even better. Physicist Christian 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

[2] *The Evolution of Physics: From Early Concepts to Relativity and Quanta*, Albert Einstein and Leopold Infeld, 1938, 1966, p. 212.

[3] Hans Thirring, "Über die Wirkung rotierender ferner Massen in der Einsteinschen Gravitationstheorie," *Physikalische Zeitschrift* 19, 33, 1918, translated: "On the Effect of Rotating Distant Masses in Einstein's Theory of Gravitation" (emphasis mine).

> 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 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.

In other words, Møller is telling us that if space is not rotating but is fixed, it is considered "absolute space," according to Newton. In such as system, the centrifugal (e.g., the outward force we feel on a spinning carousal) is not a real force but is merely the outward directional effect of two opposing orthogonal forces, inertia and gravity, working against one another. It is thus called a "fictitious" force.

But, as Møller says, if absolute space is made to rotate around a fixed Earth, it becomes an "accelerated system of reference" (NB: anything that rotates is accelerating). As such, the acceleration of the system creates a real centrifugal force on an object within that system as opposed to a "fictitious" one when the object accelerates against a non-accelerated system (i.e., a non-accelerated system is akin to "absolute space" that is not moving).

Møller then says,

> 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.[4]

Here Møller tells us the identity of what is "accelerating." It is not just the space of the universe, but the stars contained within the universe. If the stars rotate around a fixed-Earth, they create a "field

[4] *The General Theory of Relativity*, Christian Møller, Oxford, Clarendon Press, 1952, pp. 219-220.

of gravitation." Prior to Einstein, science had considered the effect of the stars to be negligible, perhaps because classical physics understood the stars to be motionless in "absolute space."

But when the Newtonian "absolute" frame of reference is rotated around a fixed-Earth, the "principle of general relativity" says that neither the space nor the stars within it are negligible, precisely because their acceleration (i.e., rotation) produces "a kind of gravitational force," which we know as the three inertial forces: centrifugal, Coriolis and Euler. Effectively, the new physics replaced Newton's inert "absolute space" with a dynamic "absolute gravity."

Although this new understanding of the universe was certainly an advancement, in effect, science had hand-cuffed itself with regards to demonstrating which of the two systems—heliocentric or geocentric—was the reality. What it had assumed for 500 years in touting the Copernican system as the reality could no longer be supported. For the 200 years between Newton and Mach, everyone thought that space was "absolute" and the Earth must rotate within that absolute space. But once Mach showed that Newton's "absolute space" was no longer absolute but must accommodate the alternate scenario that space rotates around a fixed Earth, Copernicanism could no longer be a proven reality but merely one of two possibilities.

Incidentally, not only did the new Machian/Einsteinian physics supersede the classical Newtonian view of the universe, Einstein found that the same "principle of general relativity" also superseded his first theory, Special Relativity, which, like "Newton's absolute space," had also depended on non-accelerated or uniform frames of reference. The reason is plain. If the universe is rotating around a fixed Earth, there can be no places of non-accelerated or uniformly moving reference frames, except the Earth itself. Any place outside the Earth is in acceleration, and the acceleration increases the farther the distance from the fixed Earth. As the acceleration increases, so the effect of that acceleration on material objects (*e.g*., light and matter) increases. Hence, "the general principle of relativity" would allow light and matter to exceed the speed of light which, in the uniformly moving reference frame of Special Relativity had been limited to c (300,000 km/sec), which, incidentally, answers the common objection to geocentrism regarding whether the universe and/or stars can travel around a fixed Earth at superluminal speeds. As G. V. Rosser notes,

> Relative to the stationary roundabout [the Earth], the distant stars would have…linear velocities exceeding 3×10^8 m/sec, the terrestrial value of the velocity of light. At first sight this appears to be a contradiction…that the velocities of all material bodies must be less than c [the speed of light]. However, the restriction $u < c = 3 \times 10^8$ m/sec is restricted to the theory of Special Relativity.
>
> According to the General theory, it is possible to choose local reference frames in which, over a limited volume of space, there is no gravitational field, and relative to such a reference frame the velocity of light is equal to c….
>
> If gravitational fields are present the velocities of either material bodies or of light can assume *any numerical value* depending on the strength of the gravitational field. If one considers the rotating roundabout as being at rest, the centrifugal gravitational field assumes enormous values at large

> distances, and it is consistent with the theory of General Relativity for the velocities of distant bodies to exceed 3×10^8 m/sec under these conditions.[5]

Interestingly enough, Rosser also notes that modern society is quite reticent to accept Einstein's "general principle of relativity" in regards to questions about whether the heliocentric or geocentric system should be promoted, since, as he admits, "…this would give the earth an omnipotent position in the universe which people had been loathe to accept since the time of Copernicus."[6]

Karl Keating and the Geosynchronous Satellites

One of those who is loathe to apply "the general principle of relativity" and "give the Earth an omnipotent position in the universe" is Karl Keating, former president of *Catholic Answers*. In a recent "Letter to the Editor" of *New Oxford Review*,[7] Karl Keating writes:

> Robert Sungenis writes, "Trust me, I wouldn't have even dipped my toe into this pool unless the science supported it." Not only does the science not support him but, despite the massive length of his pro-geocentrism books, he demonstrates that he doesn't understand the science.
>
> His thesis is that the earth not only is placed at the physical center of the universe but that it is locally motionless and doesn't rotate. How then, for example, do geostationary satellites float above one point on the equator?
>
> Sungenis serves up contradictory ideas of how that might occur (magnetism or gravity from the stars — with none of the math working out) while persistently confusing Global Positioning System satellites with geostationary satellites. He imagines, furthermore, that your mobile phone's GPS sends signals to GPS satellites. It doesn't and can't.
>
> In The New Geocentrists I point out many such misunderstandings, both his and those of other geocentrists, Catholic and Protestant. I argue that impressionable people shouldn't give credence to writers such as Sungenis because they repeatedly have shown themselves to be unreliable.

First, for those who want the skinny on Karl Keating, please get a copy of my book, *A Critical Review of Karl Keating and His New Book, The New Geocentrists*. It is available on Amazon, but you can get a free copy at our website.[8]

Second, let me clear up two issues. I do not believe, and have never said I believed, that "magnetism" affects a GPS satellite. This is merely an example of how Mr. Keating deliberately takes his opponent's statements out of context. Here's how it happened. At some point in my dealings with the GPS, I made a statement surveying all the possible forces available in the universe that

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[5] *An Introduction to the Theory of Relativity*, William Geraint Vaughn Rosser, 1964, p. 460. Rosser was the senior lecturer in Physics at Exeter University.
[6] Ibid., p. 58.
[7] http://www.newoxfordreview.org/issue.jsp?did=1016
[8] http://galileowaswrong.com/wp-content/uploads/2015/04/A-Critical-Analysis-of-Karl-Keating-for-GWW-site.pdf

might affect a celestial object. I listed gravity, electricity, magnetism, *etc*. But instead of taking this as a mere general statement, Keating extracted the word "magnetism" and claimed that I said the GPS are affected by magnetism. His intent was to make me look ignorant.

Additionally, I have never said nor believe that "your mobile phone's GPS sends signals to GPS satellites." Where Keating got this little sound bite I do not know. I have always said that GPS satellites send signals to one another and to the ground station, and they would, of course, send signals to your mobile phone, not vice-versa.

Let's move on and deal with the Geosynchronous satellites.

As noted, Keating believes that if the Earth doesn't rotate then the Geosynchronous satellites will not be able to hover over one spot on the Earth. We have already seen how Ernst Mach and Albert Einstein have discredited that belief. As Einstein put it: "If Newtonian mechanics disallows such a view, then this could very well be the foundation for the defects of that theory."

In other words, Mach and Einstein showed that:

(1) Newton had no right to confine the analysis to our solar system with an Earth rotating in "absolute" space;
(2) when Newton's space is made to rotate around a fixed-Earth, the forces akin to gravity that are needed to hold up a geosynchronous satellite are created.

So let's examine the Newtonian perspective a little deeper to find out why this is so. What precisely is this "defect" in Newton's system?

In the heliocentric or Earth-rotating system, the Earth is presumed to be spinning west-to-east at 1054 mph at its equator. A geosynchronous satellite, which is 22,264 miles above the equator, would thus need a velocity of 7000 mph in order to remain above one spot on the Earth.

Conversely, in the geocentric or Earth-fixed system, the Earth is not spinning; rather, space is rotating east-to-west around the Earth. Hence at the height of 22,264 miles above the equator, space is rotating at 7000 mph, east-to-west, against the geosynchronous satellite that remains in one spot above the fixed Earth.

Using the Newtonian perspective, and specifically Newton's second law of motion wherein Force equals mass times acceleration ($F = ma$), Keating believes that since in the geocentric system the Earth doesn't rotate, then a geosynchronous satellite will not be rotating around the Earth, and it will thus fall to Earth because, without angular movement, there will be no centrifugal force to hold the satellite in space.

Let's examine whether Mr. Keating's belief is correct

The centrifugal force (F_{cg}) on the satellite is calculated by the equation:

$$F_{cg} = mv^2/r$$

where m is the mass of the satellite, v is the velocity of the satellite, and r is the miles it is above the Earth.

Let's say for the sake of simplicity that the centrifugal force (F_{cg}) on the satellite is 1000 newtons. This means there must be an equal and opposite force, called the centripetal force (F_{ct}), pulling back on the satellite by a force of 1000 newtons in order for the satellite to stay in its orbit, so that F_{cg} minus $F_{ct} = 0$. In this case, the F_{ct} comes from the gravity of the Earth.

All well and good.

But does this mean, as Keating claims, that if the satellite isn't rotating around the Earth it won't have any centrifugal force against it and thus fall to Earth by gravity's centripetal force?

No.

First, let us remind ourselves from the earlier discussion that, in Newton's system, centrifugal force (F_{cg}) is not a real force. It is an "effect." The reason is that Newton said that an object in motion wants to travel in a straight line, and a straight line was defined as the shortest distance between two points in "absolute space."

But without "absolute space" as the reference frame within which the object travels, straight lines cannot be defined, and as such, as Henri Poincaré once noted, Newton could have no proof against geocentrism. Poincaré writes:

> Examined more closely, this simple idea acquires capital importance; there is no way of settling the question, no experiment can disprove the principle that there is no absolute space, all displacements we can observe are relative displacements. I have often had occasion to express these considerations so familiar to philosophers. They have even given me a publicity I would gladly have avoided. All the reactionary French journals have made me prove that the sun turns around the earth. In the famous case between the Inquisition and Galileo, Galileo should be all wrong.[9]

Essentially, we really don't know whether an object moving between two points is traveling in a straight line, since one or both of the two points may themselves be moving. If the two points are moving, then space is relative. If the two points do not move, then space is absolute. Newton, of course, wanted an absolute space so that he could say that objects travel in a straight line, but he had no proof (and without that proof, Einstein then went on to develop his idea of "curved space").

But, for the sake of argument, let's assume that moving objects want to travel in a straight line. As such, if we try to change its straight path we must put a force on that object, since we are forcing the object to do something it doesn't want to do.

If the force exerted on it is centripetal (such as the force of gravity on the satellite), then, as the satellite is trying to move in a straight line as it moves 7000 mph, gravity puts a force on it that causes it to move in a curved line. If the curve has the same arc as the Earth's surface, the satellite will stay above the Earth.

[9] "The New Mechanics," Henri Poincaré, 1913, *The Monist*, Vol. 23, pp. 385-395, translated by George B. Halsted.

But here is an important aspect to understand: In Newton's scenario, there is no centrifugal force (F_{cg}) on the satellite, since, as Newton understood it, the only two forces involved are the object's momentum to move in a straight line (otherwise known as inertia) and gravity's pull of the satellite toward the Earth.

Hence, in Newton's mechanics there are two opposing orthogonal forces:

1) moving in a straight line by means of inertia,

   and

2) moving inward by means of gravity,

Although the satellite appears to be trying to "pull away" from the Earth in a radial or outward direction, in reality, it is only trying to move in a straight line that is orthogonal (90 degrees from) to the radial direction. Since it is not a real outward radial force, it is called a "centrifugal effect" as opposed to a "centrifugal force." It could only be a real centrifugal force if it were entirely radial in its direction. So, as Newton described it, the satellite's resulting movement is the "effect" of the satellite trying to move in a straight line while being prevented from doing so by gravity.

If the "pulling away" were a real radial force, then we would have three forces involved: 1) inertia, 2) gravity, 3) centrifugal. But in the Newtonian system there are only two, inertia and gravity, which then create the "effect" or "appearance" of a centrifugal force.

The Two Different Forms and Applications of Newton's Second Law

Knowing the Newtonian parameters, we can now uncover the "defect" in the Newtonian system that Mach and Einstein pointed out. Let's do so by seeing what happens in a roulette wheel.

Scenario 1): The roulette wheel is stationary but the marble is flung around the inside rim of the wheel. The centripetal force on the marble that is caused by the inside rim of the wheel will keep the marble clinging to and rotating inside the wheel, at least until the marble slows down and falls into one of the slots near the center of the wheel.

Scenario 2): The roulette wheel is rotating rapidly and the marble is stationary, but, like Scenario 1, the marble is but clinging to the inside rim of the wheel due to the centrifugal force caused by the rotating wheel. When the roulette wheel slows down sufficiently, the marble will fall into one of the slots near the center of the wheel.

In the case of both the roulette wheel spinning or being fixed, the inside rim of the wheel will create a centripetal force on the marble. This causes the marble to have a centripetal acceleration which will force it to go against its inertial path (a straight line) and make it follow the circular path around the inside rim of the roulette wheel.

Note that there is no other force on the marble. In Newtonian mechanics, the marble is creating a centrifugal force on the rim of the roulette wheel but there is no centrifugal force on the marble itself, only a centripetal force caused by the inside rim of the roulette wheel.

At this point, we are going to focus on Scenario 2 to answer the issue about geosynchronous satellites, as well as discover the "defect" in the Newtonian system.

In Scenario 2, we are viewing the roulette wheel as a system of coordinates rotating around its center; and the marble as stationary with respect to the rotating system of coordinates.

In this case, the inside rim of the wheel is creating an inward centripetal force on the marble, yet, in terms of the rotating coordinate system, the marble is not accelerating since it is stationary!

The stationary marble that clings to the rim of the rotating roulette wheel is analogous to a geosynchronous satellite in the geocentric system in which space and its accompanying forces from the universe is like a system of coordinates that is rotating 7000 mph east-to-west; but with the satellite remaining stationary and thus able to hover over one spot above the Earth.

Like the geosynchronous satellite in the heliocentric system (Scenario 1), the satellite in the geocentric system (Scenario 2) is moving 7000 mph with respect to space at the same time the satellite is being pulled by gravity. The only difference to Scenario 1 is that while in Scenario 1 the satellite moves 7000 mph against a stationary space; in Scenario 2, space and its forces are moving 7000 mph against a stationary satellite.

Mathematically we can describe these two Scenarios as follows: In Scenario 1, the straightforward form of Newton's second law, $F = ma$, is operating. But in Scenario 2, the homogeneous form of the second law, $F - ma = 0$, is operating.

The problem for Newton is that he must account for both of these equations, not just the heliocentric version, and here is where we discover his "defect."

The homogeneous equation, $F - ma = 0$, shows there exists a direct proportion between the second derivative of the position coordinate and the time coordinate wherein $a = d^2v/dt^2$. But here is the kicker. $F - ma = 0$ cannot be used in systems that have incorporated "absolute space." The mathematical relationship demanded by $F - ma = 0$ is non-inertial, and thus not applicable to motions in inertial coordinate systems, or, as we noted earlier, systems of "absolute space" in which there is no acceleration.

Let's go back to the roulette wheel. Since the wheel is rotating (or accelerating), it cannot be an inertial coordinate system. As such, Newton's homogeneous equation cannot be applied to it. If it can't be applied, then the system, as Einstein said, has a "defect."

The "defect" shows up in Scenario 2, in which the marble is not moving and is thus not accelerating. If it doesn't accelerate then it cannot create a centrifugal force. But if it cannot create a centrifugal force, how does the marble cling to the roulette wheel since the marble is stationary?

This problem comes into play when one wants to make mathematical predictions concerning rotating coordinate systems using Newtonian mechanics. The predictions cannot be made unless a centrifugal force is added to the equations. As noted in one analysis, "In an inertial frame, fictitious forces are not necessary to explain the tension in the string joining the spheres. In a rotating frame, Coriolis and centrifugal forces must be introduced to predict the observed tension."[10]

Since Newton believed space was "absolute" and thus did not move, he had no source for the centrifugal force in the homogeneous form of his Second Law, $F - ma = 0$.

But as Mach and Einstein discovered, the source of the centrifugal force for Scenario 2 comes from the rotation of space and its combined mass and gravity.

In this case, the centripetal force on the satellite (the F of $F - ma$) is counterbalanced by the centrifugal force of the rotation of space (the a of $F - ma$), which, after the mass (m) is factored in, gives a result of 0 in the equation $F - ma = 0$.

It is this "0" that can be derived from the Newtonian equation that can then be applied to the geosynchronous satellite with respect to Earth.

In other words, there is "0" movement between a fixed Earth and the geosynchronous satellite.

The same is true of the marble and the roulette wheel in Scenario 2. A centrifugal force is added to the accelerated coordinate system of the rotating roulette wheel. As the centrifugal force is applied to the stationary marble, it will balance with the inward centripetal force (gravity) on the marble.

In this way, a stationary and non-accelerating marble is understood mathematically by the homogeneous form of Newton's second law. That is, we can say that the marble has zero acceleration (*i.e.*, is stationary in the rotating roulette wheel) because the net radial force (*i.e.*, the centrifugal force minus the centripetal force) is 0.

[10] https://en.wikipedia.org/wiki/Fictitious_force

In his book, Keating raises an objection regarding the gravity of the stars on the geosynchronous satellite. He writes:

> Here is it enough to note that if it is the gravitational force of the stars that holds a motionless satellite in place (whether that force derives from the stars' mass or from their rotation), there are equally many stars on the other side of the Earth, adding their pull to its tremendous gravitational force. The stars on the one side would seem to cancel out the stars on the other, leaving only the Earth's gravity to work on the satellite and leaving geocentrists with a difficult to explain manifestation of levitation.[11]

Here Keating fails to realize that since the satellite is closer by at least 22,236 miles to the stars right above it than the stars on the other side of the Earth. As such, there will be a greater gravitational pull on the satellite by the stars right above. Since the Newtonian equation $F = GMm/r^2$ means that the gravitational force is proportional to the distance, this means the extra 22,236 miles must be incorporated into the calculation. As such, the pull from one side will be greater than the other side.

Keating also made another claim on the blog of *Catholic World Report*. It was answered and Keating did not offer a rebuttal. Here is how the dialogue transpired:

> Second, to Keating, I hear that you are now saying that my answer to the Geosynchronous satellites can't be used because the geocentric version would require a "perpetual thrust." Here's the problem. So would your Geosynchronous satellite. Your satellite needs to keep up with an Earth rotating counter-clockwise at 1054 mph at the equator, hence, your satellite must travel 7000 mph to keep up with one spot over the Earth. How is it going to do so without a "perpetual thrust"?
>
> Now, if you want to argue that your satellite is moving counter-clockwise at 7000 mph because of inertia, well, the geocentric satellite can claim the same thing. In both models the satellite is given an initial counter-clockwise thrust of 7000 mph, and in both models it stays at that speed due to inertia. Since the "space" in both models is precisely the same, then neither model presents any friction against the satellite, and thus inertia will move each satellite just as if it is moving a planet around the sun.

[11] p. 105.

Martin Selbrede Answers Robert Carter on Geosynchronous Satellites

Recently, Robert Carter also claimed that geocentrism cannot explain the geosynchronous satellites. We wrote a paper showing that his reasoning was incorrect, both from a Machian/Einsteinian perspective, as well as a Newtonian perspective. Like Keating, Dr. Carter has the same problem of failing to apply the tenets of modern physics to the question of geocentrism. If he was forthright in applying those principles, he would see that ANY argument he raises against geocentrism is automatically falsified.

http://galileowaswrong.com/wp-content/uploads/2016/09/Carter-responds-Sungenis-responds.pdf

Carter: But think about this: a geostationary orbit can only be achieved above the earth's equator, and the equator is tilted in respect to the rotation of the universe. If it is the universe that is "pulling upward on the geosynchronous satellite", keeping it from falling back to earth, it cannot do so evenly throughout the year and thus the satellite could not sit still in reference to earth.

M. Selbrede: It seems that Carter has never examined a geocentric orrery in operation, or he would not have described the motion in the geocentric system so inaccurately. If you want to criticize a scientific position (which is always fair game to do) it is incumbent upon one to understand the model one is criticizing. To misfire at the outset is unfortunate. In point of fact, in geocentricity you have a WYSIWYG universe (What You See Is What You Get): the sun spiraling daily and making a north-south round trip journey throughout the year to the respective tropics of Cancer and Capricorn, passing through the equatorial plane during the two equinoxes. The "tilt" is an artifact of heliocentric thinking intruding into the geocentric picture, and depicts the situation incorrectly.

Of course, the spiraling (helical) motion of the sun is, indeed, fair game for attack . . . so long as you reject Einstein. Under Einsteinian relativity, the dynamics (not just the kinematics) must work out properly if the Earth is taken to be motionless and at rest. That means whatever spiraling the sun is doing must follow the laws of physics; or relativity is dead as a theory. Every critique Carter has raised against geocentricity must either be slain on the altar of relativity, or it would stand as an irrefutable proof against relativity. The law of excluded middle applies in this case. Is Carter attacking relativity theory? It isn't obvious this is the case, but in attacking geocentricity with these various "challenges" he necessarily is doing exactly that. Relativity teaches general covariance, and each challenge of Carter's attacks the validity of general covariance. If he wants to come clean and say this is his intention, then we can argue on that wise. Otherwise, his claims are internally incoherent.

So, what of the sun's "peculiar" motion and its alleged effect on the geostationary satellite (or what non-geocentrists prefer to call a geosynchronous satellite)? Let's understand the situation in terms of superimposed motions, of which there are three major elements: (1) a daily rotation of the cosmos around the earth, (2) a north-south annual motion of the sun superimposed on that daily rotation (the tropical motion creating the seasons on Earth), and (3) a closer-farther annual motion

of the sun (analogous to perihelion and aphelion in the heliocentric model in which the elliptical Keplerian motion is expressed). We will discuss the second motion as it is pertinent to the challenge, although some of our observations will be equally true (albeit along a different axis) for the third motion.

The solar motion between the tropics is a quasi-harmonic motion. The physics of such motion are well-understood: such motion varies (usually sinusoidally) as the sun moves to its farthest-north point within the diurnally-rotating cosmos, then back through the equilibrium point (at the equator) to the southern tropic. As there is no evident force to damp the oscillation, its amplitude remains constant. (As a comment, tidal forces acting on the sun could act to damp the oscillation, but if such exist their magnitude is essentially negligible).

More to the point, harmonic motion is distinguished by this key factor: there is a restorative force pulling the object in question back to the equilibrium point. The sign of the force is negative showing that the force vector *always points to the equatorial plane*. This force driving the harmonic motion doesn't merely act on the sun; rather, it acts on everything in its sphere of influence, *including the geostationary satellite*. The geostationary satellite, already stabilized on the equatorial plane, *stays on that plane* for the same reason the sun continues to return to cross that same plane every six months. The physical laws for the sun's annual motion *also proscribe the forces acting on the satellite*. A force powerful enough to continually yank the sun back to the equatorial plane is powerful enough to keep the satellite on that same plane. What orbital decay *does* exist would be the same for heliocentric or geocentric cosmologies.

Relativity theory mandates that this force be real when the Earth is taken to be motionless. In the heliocentric framework, the force is a consequence of the geometry and the purported axial tilt of the Earth. This is the way of general covariance: if a harmonic motion is observed in any given frame, the physics requires actual forces for it to be present, notwithstanding that in the "conventional" frame those forces may not exist. That alleged "non-existence" in relativity is purely an artifact of an arbitrary choice of reference frame *and nothing more* – the choice of frame causes the forces to vanish. General covariance is the price that physics pays to throw out geocentricity, *and general covariance by its very nature re-installs geocentricity as a legitimate albeit nonexclusive option*. The words of Penn Jillette (in a different context) seem to apply here to this result: "That is the nightmare!"

To argue that it's absurd to think that the sun moves up and down out of the equatorial plane as geocentricity demands is to call conventional astronomy absurd. Why? Because in conventional astronomy, the sun moves in and out of the Milky Way's galactic plane in a harmonic oscillation of 32 million years in alleged duration. Sauce for the heliocentric goose is sauce for the geocentric gander.

Of course, Carter didn't explicitly say that the *sun* is pulling unevenly on the satellite, he said the entire universe is pulling on it unevenly because (now putting on heliocentric glasses) the Earth is tilted with respect to the rotating universe. But in geocentricity, the universe is *not tilted* – it rotates on an axis going through the Earth's poles. There is only the superimposed north-south motion evidenced by the solar tropical motion, which is quasi-harmonic as asserted above. If the sun

partakes of the motion of the cosmos in making that north-south trip (most, but not all, geocentrists would hold to this approach) then the question becomes *what is the relative magnitude of this motion?* This longitudinal oscillation of the cylindrically-symmetric rotating cosmos is certainly an accelerated motion by definition, and although its average amplitude (being sinusoidal) is zero, perhaps its contribution to short term perturbation of the satellite's position should be examined to see if it is truly negligible or not.

The acceleration due to the annual harmonic tropical motion in question (superimposed over the daily rotational motion) is constant so we need not be concerned with time-dependent variations of the inertial frame dragging due to this longitudinal oscillation along the north-south axis. While the magnitude of the acceleration is but a tiny fraction of that due to the daily rotation, it is worth seeing that it has *no effect* on the satellite even if it were large. Why is that? Because such frame dragging still exhibits those three contributing components: centrifugal, Coriolis, and Eulerian forces. And of these, only the tiny constant centrifugal force will apply, because *the geostationary satellite is motionless in the Earth's coordinate frame*. "Like the magnetic Lorentz force ... the GM [gravitomagnetic] force of Eq. (37) vanishes for a particle at rest" (Reva Kay Williams, "The Gravitomagnetic Field and Penrose Processes," page 12 of preprint dated 24 Mar 2002 for *Phys. Rev. D*). That vector cross product with the velocity of the geostationary satellite reduces the force to zero. There *is no destabilizing force* from any such source as Carter identifies. The physics says No.

Carter is correct that there are big problems here, but those problems are not in the geocentric physics, they appear to be in Carter's understanding of physics. "For by wise counsel thou shalt make thy war" (Prov. 24:6), but we don't believe Dr. Carter (who is highly skilled in the life sciences) received wise counsel in preparing this challenge to geocentricity. The problem with many a quick-and-dirty polemic is the need to clean up the dirty parts later. We trust that Carter, as a Christian gentleman, will honor God by doing exactly that. We agree that these issues are worth debating, but surely they are worth debating well in front of so great a cloud of witnesses.

End

Robert Sungenis

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