Alec in Wonderland Meets the Queen of Planckdom

By Robert Sungenis

In his most recent paper, Mr. MacAndrew more or less admits that he cannot use Newtonian physics any longer to falsify geocentrism, and we put the final nail in the coffin to reinforce that fact. As such, MacAndrew can appeal to no other modern physical theory to deny geocentrism, for he has already admitted in previous papers that both Machian and Einsteinian physics support geocentrism. Even though previously it was probably painful for MacAndrew to attempt to use Newton's physics to falsify geocentrism (since it would mean that he was making Newton diametrically opposed to Mach and Einstein), it was, nevertheless, MacAndrew's last hope. That hope has now been taken off the table, as we shall see…

MacAndrew: Camille Carlisle is the Science Editor for Sky and Telescope, the leading US magazine for amateur astronomers. She is a Catholic and has recently published a scathing review of The Principle movie, "Protecting Faith from Pseudoscience: A Review of The Principle" on a Catholic blog here. The review points out both the scientific and the philosophical errors in the geocentrist position, and is well worth reading. Ms Carlisle makes similar scientific arguments to my articles here and here.

R. Sungenis: Ms. Carlisle blog article was thoroughly critiqued and you can view it here (http://galileowaswrong.com/response-to-sky-and-telescope-re-the-principle). Unfortunately for Ms. Carlisle, she forgot to add the basic physics of the Newtonian system she is using that requires a sun rotating around the mass-center of the universe to sustain a centrifugal force that keeps it away from the Earth.

MacAndrew: (The comment box on the blog is also entertaining: Rick DeLano rolled up and made the nonsensical assertion that Einstein, Mach, Thirring and Born would support the gravitational argument of the geocentrists, and two of the other commenters squashed him like a flea.)

R. Sungenis: The truth is, Mr. MacAndrew still hasn't come to grips with the fact that, by his own admission, both Mach and Einstein state that a universe

rotating around a fixed Earth is just as valid as a rotating Earth in a fixed universe. Let's look at them again in case Alec and his "commenters" missed them the first time:

1. **Mach stated**: "Obviously it matters little if we think of the Earth as turning about on its axis, or if we view it at rest while the fixed stars revolve around it. Geometrically these are exactly the same case of a relative rotation of the Earth and the fixed stars with respect to one another."[1]

   "All masses, all velocities, thus all forces are relative. There is no basis for us to decide between relative and absolute motion….If there are still modern authors who, through the Newtonian water bucket arguments, allow themselves to be misled into differentiating between relative and absolute motion, they fail to take into account that the world system has been given to us only once, but the Ptolemaic and Copernican views are only our interpretations, but both equally true."[2]

MacAndrew admitted Machian physics makes geocentrism viable, which is cited in my paper, *There Goes the Sun*, p. 3

> **MacAndrew:** A potentially successful way to arrive at a physical equivalence between an Earth-static geocentric frame and a rotating, orbiting Earth frame is by invoking Mach's Principle which states that inertia is determined by some influence of the cosmic matter and

[1] Ernst Mach, *Die Mechanik in Ihrer Entwicklung Historich-Kritisch Dargestellt*, Liepzig: Brokhaus, 1883. English title: *The Science of Mechanics: A Critical and Historical Account of its Development*, translated by T. J. Macormack, La Salle, Open Court Publishing, 1960, 6th edition, p. 201. The seventh edition of Mach's book was published in 1912. Although in this treatise Mach does not himself adopt geocentrism, he repeatedly challenges modern science with the fact that geocentrism is not only a viable alternative, but that it substantially answers the famous 1887 Michelson-Morley experiment.

[2] Ernst Mach, *Die Mechanik in Ihrer Entwicklung Historich-Kritisch Dargestellt*, Liepzig: Brokhaus, 1883, p. 222. The original German reads: "Alle Massen, alle Geschwindigkeiten, demnach alle Kräfte sind relativ. Es gibt keine Entscheidung über Relatives und Absolutes, welche wir treffen könnten, zu welcher wir gedrängt wären….Wenn noch immer moderne Autoren durch die Newtonschen, vom Wassergefäß hergenommenen Argumente sich verleiten lassen, zwischen relativer und absoluter Bewegung zu unterscheiden, so bedenken sie nicht, daß das Weltsystem uns nur einmal gegeben, die ptolemäische oder kopernikanische Auffassung aber unsere Interpretationen, aber beide gleich wirklich sind" (Translated by Mario Derksen). NB: Although Mach forbids Copernican science from making any distinctions, he cannot forbid the same to geocentric science, for it is upon divine revelation that the distinction is made, that is, the Earth is motionless and is our absolute rest frame.

energy. A consequence of Mach's Principle is that rotation is relative and not absolute. According to Mach, it is as valid to say that the universe rotates around the Earth once a day as it is to say that the Earth rotates once a day on its axis; they are equivalent and the choice is arbitrary.

Next, let's look at what Einstein said about the same issue:

Einstein said: "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."[3]

"We need not necessarily trace the existence of these centrifugal forces back to an absolute movement of K' [Earth]; we can instead just as well trace them back to the rotational movement of the distant ponderable masses [stars] in relation to K' whereby we treat K' as 'at rest.'… On the other hand, the following important argument speaks for the relativistic perspective. The centrifugal force that works on a body under given conditions is determined by precisely the same natural constants as the action of a gravitational field on the same body (*i.e.*, its mass), in such a way that we have no means to differentiate a 'centrifugal field' from a gravitational field.…This quite substantiates the view that we may regard the rotating system K' as at rest and the centrifugal field as a gravitational field.…The kinematic equivalence of two coordinate systems, namely, is not restricted to the case in which the two systems, K [the universe] and K' [the Earth] are in uniform relative translational motion. The equivalence exists just as well from the kinematic

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

> standpoint when for example the two systems rotate relative to one another."[4]

MacAndrew admitted the following about Einstein's theories, which you can find on page 34 of *There Goes the Sun*:

> **MacAndrew**: Surely, everyone has been taught that in GR all motions are relative and the descriptions, "Earth orbiting Sun" and "Sun orbiting Earth", are equivalent? It is true in GR that local experiments cannot distinguish between the cases, but we are also allowed to invoke non-local observations and causation to make reasonable inferences. Sungenis introduces the concept of purely relative rotation.
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> **MacAndrew**: In other words, Einstein's equations state that either the Earth can rotate in a non-rotating universe or the universe can rotate around a non-rotating Earth. The math AND the physics will allow such variation. The problem for General Relativity is that it can't tell us which one is correct.
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> **MacAndrew**: It is not true that this equivalence is implicit in the Einstein field equations of GR; **although we will see that it might be true in some of their solutions.**

The admission: "**although we will see that it might be true in some of their solutions**" means that the equivalence of an Earth rotating in a fixed universe and a universe rotating around a fixed Earth is, according to MacAndrew himself, allowable by Einstein's theory. MacAndrew further admits the same, in a round-about way, in the following statements from pages 36 and 38 of "There Goes the Sun":

[4] Einstein's October 1914 paper titled: "Die formale Grundlage der allgemeinen Relativitätstheorie," trans. by Carl Hoefer, in *Mach's Principle: From Newton's Bucket to Quantum Gravity*, eds. Julian Barbour and Herbert Pfister, pp. 69, 71.

> **MacAndrew:** In any case, it is clear that General Relativity satisfies the equivalence of inertial and gravitational mass, and that within GR, local experiments (which are confined to the local frame and exclude those that look beyond it to the rest of the universe) cannot distinguish between inertial (i.e. non-accelerating) frames in a zero gravitational field and frames in free fall accelerating in a gravitational field. Similarly, local experiments cannot distinguish between rotation in flat spacetime (i.e. in the absence of a gravitational field) and non-rotation in the Coriolis metric which is like a gravitational field that causes Coriolis and centrifugal-like forces in a non-rotating frame. The form of the physics is the same in all co-ordinate systems, so does this mean that Mach was right about the origin of inertia; and if so is that concept built into GR?
> To answer this question, the first step is to ask whether solutions to the Einstein field equations can result in Coriolis and centrifugal-like forces in a non-rotating frame. **They can. This was shown to be so by Hans Thirring, within two years of the publication of the field equations, in a paper in which he calculated the gravitational fields inside a massive rotating sphere and showed that Coriolis and centrifugal-like forces arise inside the sphere**27.
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> **MacAndrew**: So in a spatially closed universe, provided other conditions are met, perfect dragging can occur.

R. Sungenis: Of course, MacAndrew fails to admit that the precise information he cites above regarding Hans Thirring's discovery that Einstein's equations support geocentrism has been in my book, Galileo Was Wrong: The Church Was Right for the last ten years.

MacAndrew: True to type, Bob Sungenis can't bear to let any criticism go and has written a response to Ms Carlisle in his usual prolix style (he quotes the original piece in full, and makes up some sort of response for every single paragraph of it).

R. Sungenis: Of course, if I had not answered point by point, then MacAndrew would be the first to complain that I didn't answer all of Ms. Carlisle's points.

MacAndrew: His piece contains many of his usual fallacies and won't disappoint aficionados of his scientific blunders, but it also contains a new and farcical argument to entertain us. Mr Sungenis calculates the force that would be required to keep the Sun in a daily orbit around the Earth and finds that it is a million, million times more than the gravitational attraction between the Sun and the Earth (his calculation is badly wrong as we'll see below). In order to explain why the Sun doesn't fly off into interstellar space, he invokes an invented entity, the "Planck medium", which he claims "absorbs" the Sun's centrifugal force by some vague and unquantified mechanism. You can explain anything at all, to your own satisfaction, if you make it up as you go along. Let's look at this train wreck in more detail.

R. Sungenis: The answer to Ms. Carlisle had two phases. The first phase uses her own Newtonian physics and shows that the centrifugal force on the Sun would keep it away from the mass-center of the universe, where the Earth is located. Hence, Ms. Carlisle's objection was answered. The second phase reveals one of the components of the geocentric universe, which is the Planck medium, to deal with the centrifugal force.

MacAndrew: Sungenis writes:

> In Newtonian dynamics, since the Sun is revolving around the universe's center of mass (where Earth is positioned in the geocentric system), the Sun will have a centrifugal force acting upon it that keeps it away from the Earth. **The centrifugal force is calculated by the mass of the Sun multiplied by linear speed multiplied by the radius from the center, or Centrifugal Force = mlr** or Mw^2r (where w measures angular speed). The mass of the Sun is 1.98 x 10^30 kilograms. The linear speed is 30 kilometers/sec. The radius (which includes both the equatorial radius of the Sun and the Earth) is 1.5 x 10^8 kilometers. Hence, the centrifugal force on the Sun is 1.18 x 10^34 Newtons.

Sungenis blunders right from the outset. The bolded part of his statement above is completely wrong. The centrifugal force in the rotating frame

is $F_c=mv^2/r$, where m is the mass, v the tangential speed (or linear speed as Sungenis would have it), and r is the radius of the orbit. The expression mvr, or mlr as he states it, doesn't even give the right dimensions for force so it is obviously wrong[1]. Sungenis mangles not just freshman college physics but high school physics – pure ignorance. I assume Sungenis tried to calculate the force using the alternative expression $F_c=m\omega^2r$, as he gets the numeric part correct within rounding errors. But the exponent is wrong by a factor of a million. Yes, that's right – unbelievably, Sungenis, in a dismal display of incompetence, gets this trivial sum wrong by a factor of a million. Let's do the sum in tedious detail so we can be sure that he really is this wrong. $m = 1.98 \times 10^{30}$ kg (the mass of the Sun). $\omega = 1.99 \times 10^{-7}$ rad s^{-1} (in his cockamamie sum, Sungenis is attempting to calculate the putative *annual* orbit of the Sun on the ecliptic plane, as his reference to 30km/s as the tangential speed shows – that is the tangential speed of the annual orbit. He also claims that the Sun orbits the Earth *daily* on the equatorial plane – we'll come back to that later. In the annual case, ω is 2π rad/year, so $2\pi/(365.24x24x60x60)$ rad s^{-1}). $r = 1.496 \times 10^{11}$ m the mean distance from Sun to Earth, centre to centre. $v = 2.98 \times 10^4$ m s^{-1} ($v = 2\pi r/(365.24x24x60x60)$ = circumference of orbit/period in seconds). Now, whichever expression you use to do the sum, whether you use mv^2/r or $m\omega^2r$, you get $F_c = 1.174 \times 10^{28}$ N, a factor of a million less than Sungenis confidently but incorrectly states. (N stands for Newton, the unit of force, which is the force required to accelerate 1kg with an acceleration of 1m s^{-2}). He manages to calculate the gravitational force between Sun and Earth correctly within rounding errors ($F_g = Gm_em_s/r^2$), where G is the gravitational constant ($6.674 \times 10^{-11}m^3kg^{-1}s^{-2}$), m_e and m_s are the masses of Earth and Sun and r is as before. $F_g = 3.53 \times 10^{22}$N.

R. Sungenis: There are two ways to calculate the speed of the sun: (a) as independent of the rotating universe or (b) with the rotating universe. For this present demonstration I chose (a) since that would be comparable to the presumed speed of the Earth around the sun in the heliocentric system, which is 30km/sec. In that way we can compare apples to apples.

So that everyone is on the same page, let's use this website for calculations: http://www.calctool.org/CALC/phys/newtonian/centrifugal

Hence, if we plug in the numbers:

1.5 x 10e8 for the radius
30km/sec for the linear speed of the sun
1.98 x 10e30 kg for the mass of the sun

So the centrifugal force on the sun is 1.18 x 10e28

If one wants to use the speed of the rotating universe as it carries the sun with it, the sun would be traveling 2pi x r per day, or 5.84 x 10^8 miles per day or miles per 86,400 seconds. That comes to 6,759 miles per second or 10,877 km/sec.

1.5 x 10e8 for the radius
10,877 km/sec for the linear speed of the sun
1.98 x 10e30 for the mass of the sun

So the centrifugal force is 1.56 x 10e33

In either case, the Newtonian system gives a centrifugal force on the sun that is going to keep it away from the center, and thus Ms. Carlisle's objection is answered in full.

MacAndrew: Now even though Sungenis managed to get the centrifugal force wrong by a factor of a million, it is true that the centripetal force required to hold the Sun in annual orbit around the Earth is much greater than the gravitational force between Sun and Earth, in fact about 332,000 times greater. In other words, it makes no sense in Newtonian dynamical terms to say that the Sun revolves around the Earth once a year. (Sungenis also claims elsewhere that the Sun revolves around the Earth once per *day* on the Earth's equatorial plane instead of the Earth rotating on its axis once per day – in this case the centrifugal force would be 1.57 x 10^{33} N, about 45 *billion* times greater than the gravitational force between Sun and Earth.). The factor of 332,000 is not arbitrary, but is the ratio of the masses of the Sun and the Earth – if you swap the Earth for the Sun as the revolving body the forces are in dynamical balance as we'll see later. Of course this problem is worse for other stars which are further from the Earth than the Sun is. For example, as I point out here (on page 20), the centripetal force required to keep a solar mass star at z=0.1 in a

daily orbit round the Earth is 1.3 x 10^{47} N, a vast force for which there is no source.

R. Sungenis: MacAndrew and Carlisle never considered the centrifugal force on the sun as the force which compensates (or actually overpowers) the gravitational force of the sun on the Earth. As such, they both lost the debate and can never again use the sun's gravitation against the Earth as an argument against geocentrism.

Just so we are clear, below is Alec MacAndrew's previous argument against geocentrism, namely, that the sun's gravity would completely dominate the solar system and thus the Earth would have to revolve around the sun. This can be extracted from my rebuttal to MacAndrew titled "There Goes the Sun; A Rebuttal to Alec MacAndrew" at http://galileowaswrong.com/there-goes-the-sun-a-rebuttal-to-alec-macandrew. See pages 13 and 27.

> **MacAndrew:** As you can see, because of the inverse square relationship of gravitational field magnitude with distance, the Sun has by far the largest gravitational attraction at the Earth compared with all other bodies in the universe. Even the closest galaxy cluster, which consists of hundreds of galaxies (the Virgo cluster with the mass of a thousand trillion stars), has a gravitational field at the Earth of less than a billionth that of the Sun. The gravitational effects of extrasolar bodies are so low that it is quite acceptable to regard Sun-Earth as an isolated two-body system with small perturbations from the other solar planets. The gravitational influence of the universe at the Earth is completely dominated by the Sun.
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> **MacAndrew:** If the reader takes one thing away from this paper, it should be that the gravitational field of the Sun at the Earth is 200 times bigger than the next most influential object (the moon) and 31 million times bigger than the most influential extra-solar object (the entire Milky Way galaxy). We have seen that the Sun's gravity vastly dominates the Earth's motion and to that extent the Sun-Earth can be regarded as a two-body system (in fact because the Sun is so much

> more massive than the Earth, the calculation of the Earth's orbit can be reduced to the one-body problem as an excellent approximation).
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> **MacAndrew:** Well, I have demonstrated, with detailed quantified reasoning, that it is the case that we can regard the Sun-Earth system as a two-body system, because of the overwhelmingly dominant gravitational field of the Sun at the Earth, and therefore Sungenis should accept that the Earth orbits the Sun19.

R. Sungenis: So MacAndrew tries to make centrifugal force his ally by harping on how great the centrifugal force is on the sun. Previous to my introduction of the centrifugal force in the debate he was claiming that the sun would pull the Earth in. Now he is claiming that the centrifugal force pulls the sun out away from the Earth too much. So which is it, Alec?

MacAndrew: How does Sungenis explain the Sun's annual revolution around the Earth, which requires a centripetal force not twice, not ten times, not 100 times, but 332,000 times greater than gravity provides? The geocentrists have invented an entity, which they call the "Planck medium", and Sungenis claims that it "absorbs" the centrifugal force.

R. Sungenis: Not so fast. Above we noted that MacAndrew agrees that a Machian and Einstein universe allow the universe and the sun to rotate around the Earth on a daily basis. So how does MacAndrew explain the tremendous centrifugal forces that would be exhibited on the sun and stars in those Machian and Einsteinian cases? What centripetal forces does he have to counteract them? Answer: None. So MacAndrew is in the same can of worms.

That there are such tremendous centrifugal forces in the rotating Einstein universe is noted in Rosser's book on General Relativity. He states:

> 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]

The Planck Particle Factor

So what is left? The Newtonian system will need something to act as a centripetal force in order to compensate for the centrifugal force on the revolving sun. The Earth does not supply the centripetal force since its gravity compared to the sun is very weak. Whereas the Machian and Einsteinian systems allow the sun and stars to revolve around a fixed Earth, in the Newtonian system the bodies examined are limited to the sun and the Earth, and thus the Newtonian system cannot allow the sun to revolve around the Earth. So is there is a contradiction between the Newtonian system as opposed to Mach and Einstein. Is so, why?

The contradiction arises because the Newtonian system: (a) it cannot deal with more than a two bodies since Newton's force equation for gravity (F = Gm1m2/r^2) does not make room for more than two masses; and (b) Newton's Absolute Space (which he needed in order to say that a ball we twirl in circle and then let go could then travel in a straight line) could not make room for a space that had motion, such as a rotating space (as in geocentrism) or even an expanding space (as in the Big Bang). If the same ball is released in a space that moves, then we cannot say it travels in a straight line.

But if we move Newton's Absolute Space, which is precisely what Mach and Einstein did, then Newton can be made to work with Mach and Einstein. If, for example, we rotate Newton's Absolute Space (i.e., the universe), Newton's laws will create a center of mass for the universe. This means that the universe can rotate around a fixed Earth, but there will be centrifugal force inside a rotating universe. The question at issue is how the centrifugal force is distributed in a Newtonian system that allows the whole universe to rotate (as

[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.

opposed to celestial bodies revolving in an Absolute Space that does not move, i.e., does not rotate). The answer, as I stated before, will come from the constitution of the universe, but this will require a short history of ether, beginning with Einstein in 1905 to the present day.

Let us first realize, however, that if the universe rotates and creates a center of mass, this means that the edge of the universe must "communicate" force to the center of the universe instantaneously. This is historically known as the problem of "action-at-a-distance." How can force travel so fast? The geocentric understanding of the constitution of space has the answer to that problem, as we will see momentarily.

The "communication" problem was also evident for Mach and Einstein. Machian relativity allowed the universe to rotate around a fixed Earth, and Mach believed that the ether served as the mechanism for how gravity or inertial forces from the stars could travel instantaneously to the center of the universe, where Mach put the Earth. Mach, however, did not explain how the ether carried these forces.

Einstein faced and even greater problem since his Special Relativity theory limited the speed of light, gravity and inertial forces to 186,000 mps. Yet his General Relativity theory said that the universe could rotate around a fixed Earth, which would require instant force "communication" between the edge of the universe and its center. This is precisely why General Relativity says that light speed is NOT limited to 186,000 mps, and that any material object can travel at superluminal speeds, including gravity. Yes, the two theories contradict one another, at their cores.

The problem for Einstein, however, was that he did not have a mechanism for allowing instant "action-at-a-distance" between all parts of the universe. He had dispensed with ether as the medium when he invented Special Relativity and maintained that space was an empty vacuum of nothing.

Incidentally, previous to Einstein, Lorentz tried to answer the 1887 Michelson-Morley experiment by claiming that as the Earth revolved around the sun, the ether in its path caused Michelson's apparatus to shrink and give a false positive for a non-moving Earth. Einstein insisted on ridding physics of ether

because he did not agree with Lorentz that ether would compress matter. So Einstein still maintained Lorentz's hypothesis that matter shrinks when it moves, but he provided no physical mechanism for it. Hence, Special Relativity is a theory that says there is no ether in space, but Einstein never explained what space is, except to call it "space-time." Time was added to space because in addition to matter shrinking when it moved, Einstein said that time also had to shrink when the object moved. All of this was concocted to answer the Michelson-Morley experiment that showed the Earth wasn't moving. Einstein wanted to make it appear that the Earth was moving so he forced matter and time to shrink so that Michelson's results could be altered.

But whereas from the years 1905-1915 Einstein had rejected the notion of ether filling the constitution of space, it was in the year 1916 that he re-adopted ether as a constituent part of his theory of General Relativity, although with extensive modifications to Lorentzian ether. As his biographer Abraham Pais put it: "The aether of the general theory of relativity is a medium without mechanical and kinematic properties, but which codetermines mechanical and electromagnetic events."[6] In 1916 Einstein wrote:

> …in 1905 I was of the opinion that it was no longer allowed to speak about the ether in physics. This opinion, however, was too radical, as we will see later when we discuss the general theory of relativity. It does remain allowed, as always, to introduce a medium filling all space and to assume that the electromagnetic fields (and matter as well) are its states…once again "empty" space appears as endowed with physical properties, *i.e.*, no longer as physically empty, as seemed to be the case according to special relativity. One can thus say that the ether is resurrected in the general theory of relativity….Since in the new theory, metric facts can no longer be separated from "true" physical facts, the concepts of "space" and "ether" merge together.[7]

[6] *Subtle is the Lord*, Oxford, 1982, 2005, p. 313.

[7] Albert Einstein, "Grundgedanken und Methoden der Relativitätstheorie in ihrer Entwicklung dargestellt," *Morgan Manuscript*, EA 2070, as cited in Ludwik Kostro, *Einstein and the Ether*, Aperion, 2000, p. 2. For a good summation of Einstein's reasoning in regard to reviving the ether concept, see Galina Granek's "Einstein's Ether: Why Did Einstein Come Back to the Ether?" *Apeiron*, vol. 8, no. 3, July 2001; "Einstein's Ether: Rotational Motion of the Earth," *Apeiron*, vol. 8, no. 2, April 2001; Ludwik Kostro, "Einstein and the Ether," *Electronics and Wireless World*, 94:238-239 (1988). Kostro writes: "the notion of ether was not destroyed by Einstein, as the general public believes" (*ibid*., p. 239); "Lorentz wrote a letter to Einstein in which he maintained that the general theory of relativity admits of a stationary ether hypothesis. In reply, Einstein introduced his new non-stationary ether hypothesis" (*ibid*., p. 238).

> It would have been more correct if I had limited myself, in my earlier publications, to emphasizing only the non-existence of an ether velocity, instead of arguing the total non-existence of the ether, for I can see that with the word *ether* we say nothing else than that space has to be viewed as a carrier of physical qualities.[8]

Prior to this shift, Einstein had made the following statements, five years apart, the first from his famous 1905 paper:

> The introduction of a 'light ether' will prove to be superfluous, because the view here to be developed will introduce neither a 'space at absolute rest' provided with special properties, nor assign a velocity vector to a point of empty space in which electro-magnetic processes take place.[9]

The second, in 1910, stated: "The first step to be made…is to renounce the ether."[10] So there we have it. What Special Relativity taketh away with the left hand, General Relativity giveth back with the right hand. Few are aware of this dramatic shift in Einstein's thinking, and of those, many are embarrassed to admit that the ether concept had to be reintroduced and coincided with the very leg of the Relativity theory that had vociferously denied it. The reason? Prior to 1916, Einstein wanted to divest physics entirely of the notion of absolute rest. The concept of an immobile Earth or immobile ether was, for some odd reason, repugnant to him. Having already accepted Copernican cosmology, the ether was the last thing standing in his way. As he understood it, if ether existed, it necessitated that there be absolute space. If there is absolute space, then there is absolute rest. Obviously, Relativity cannot exist with anything being at absolute rest, for, by definition, the theory would be nullified.

[8] Albert Einstein, "Letter to H. A. Lorentz, November 15, 1919," EA 16, 494, as cited in Ludwik Kostro, *Einstein and the Ether*, *Aperion*, 2000, p. 2.
[9] "Zur Elektrodynamik bewegter Körper," *Annalen der Physik*, 4th series, 17, Sept. 26, 1905.
[10] "Le Principe de relativité et ses consequences dans la physique moderne," *Archives de sciences physiques et naturalles*, 29, pp. 18-19.

The task of putting the nails into ether's coffin was not so easy, however. Henri Poincaré left some unfinished business that Einstein still had to address. Poincaré continued to insist upon the existence of ether for three main reasons: (1) stellar aberration (which we covered previously in the study of the Arago and Airy experiments); (2) "action-at-a-distance" whereby gravity and electromagnetism could be transmitted over vast distances; (3) rotational motions (of which an example in Sagnac's 1913 experiment). Although Einstein felt that he had answered the phenomenon of stellar aberration (but in reality he had not), he did not have a quick answer for rotation and action-at-a-distance.

In addition, Dayton Miller was hot on Einstein's trail between 1921 and 1933. With Miller's new and improved interferometer experiments, Einstein could run but not hide from the mounting evidence for the existence of ether. Along these same lines, in 1923 Ernst Gehrcke published the article "The Contradictions between the Ether Theory and Relativity Theory and Experimental Tests"[11] in which he reexamined the Michelson-Morley, Michelson-Miller, and Georges Sagnac experiments, concluding that Relativity theory simply did not have a good explanation for the results.

In the late 1920s, Paul R. Heyl posed a different yet related question to Einstein:

> …Einstein pointed out that there might be no such thing as gravitational force any more than there is a centrifugal force; that both may be considered as manifestations of inertia aided in the case of gravitation by curved space acting much like a mechanical surface of constraint. For this reason it is sometimes said that the theory of relativity has done away with the ether. I hardly think that is a fair statement…[I]f relativity ignores the ether, does it not introduce what is to all intents and purposes its equivalent? The ether was supposed to be a medium filling all space that otherwise would be empty. Einstein supposes space itself to be enough of an entity to have a curvature, and to be "empty" only where and when it is flat. But if space can be bent and can straighten out again, why can it not repeat this process with

[11] German title: "Die Gegensätze zwischen der Äthertheorie und Relativitätstheorie und ihre experimentale Prüfung," *ZftP*, 4, 1923, Nr. 9, pp. 292-299, Kostro, p. 135.

> sufficient rapidity to be called a vibration? And what difference does it make whether it is space itself that vibrates, or something that fills space? Back in every one of our heads is the idea that there is something which philosophers call a "thing-in-itself" which is responsible for our sensations of light and electricity; and whether we spell it ETHER or SPACE, what does it matter?[12]

As 1993 Nobel Prize winner, **Robert Laughlin,** puts it:

> It is ironic that Einstein's most creative work, the general theory of relativity, should boil down to conceptualizing space as a medium when his original premise was that no such medium existed.… Einstein… utterly rejected the idea of ether and inferred from its nonexistence that the equations of electromagnetism had to be relative. But this same thought process led in the end to the very ether he had first rejected, albeit one with some special properties that ordinary elastic matter does not have. The word "ether" has extremely negative connotations in theoretical physics because of its past association with opposition to relativity. This is unfortunate because, stripped of these connotations, it rather nicely captures the way most physicists actually think about the vacuum.
>
> In the early days of relativity the conviction that light must be waves of something ran so strong that Einstein was widely dismissed. Even when Michelson and Morley demonstrated that the earth's orbital motion through the ether could not be detected, opponents argued that the earth must be dragging an envelope of ether along with it because relativity was lunacy and could not possibly be right.… Relativity actually says nothing about the existence or nonexistence of matter pervading the universe, only that such matter must have relativistic symmetry.

And he concludes with this important paragraph:

> It turns out that such matter exists. About the time relativity was becoming accepted, studies of radioactivity began showing that the

[12] Paul R. Heyl, "The History and Present Status of the Physicist's Concept of Light," in "Proceedings of the Michelson Meeting of the Optical Society of America," *Journal of the Optical Society of America*, vol. XVIII, March 1929, p. 191.

> empty vacuum of space had spectroscopic structure similar to that of ordinary quantum solids and fluids. Subsequent studies with large particle accelerators have now led us to understand that space is more like a piece of window glass than ideal Newtonian emptiness. It is filled with "stuff" that is normally transparent but can be made visible by hitting it sufficiently hard to knock out a part. The modern concept of the vacuum of space, confirmed every day by experiment, is a relativistic ether. But we do not call it this because it is taboo.[13]

Einstein was thus forced back to at least some concept of ether, but here is where he wanted it both ways. He needed ether to account for the physical effects of action-at-a-distance and rotational motion, but he did not want to give ether any physical attributes, for if he did, that would nullify Relativity theory. As he puts it:

> The special theory of relativity forbids us to assume the ether to consist of particles observable through time, but the hypothesis of ether is itself not in conflict with the special theory of relativity. Only we must be on our guard against ascribing a state of motion to the ether.[14]

So, according to Einstein's wishes, we can have the "concept" of ether but we cannot have "particles" or "motion" of ether. His followers were parroting the same reasoning. In 1923, Arthur Eddington had caught on to Einstein's rationale, stating:

> If a substantial aether analogous to a material ocean exists, it must rigidify, as it were, a definite space; and whether the observer or whether nature pays any attention to that space or not, a fundamental separation of space and time must be there. Some would cut the knot by denying the aether altogether. We do not consider that desirable, or,

[13] Robert B. Laughlin, *A Different Universe: Reinventing Physics from the Bottom Down*, 2005, pp. 120-121. The two chapters of Laughlin's book that deal with these issues are: "The Nuclear Family," (pp. 99-116 and "The Fabric of Space-Time" (pp. 117-126). Laughlin can speak so boldly about ether and not be afraid of suffering chastisement because, as one author notes: "…the impression of suggesting an ether theory is carefully avoided, because such can still be career suicide. Only physicists who were established beyond reproach could discuss ether-like aspects openly, like George Chapline, Gerd 't Hooft, Robert Laughlin, or Frank Wilczek, just to alphabetically list a few who did. Today, we finally witness the dams breaking and ever more people dare to 'come out.'" Sascha Vongehr, "Supporting Abstract Relational Space-Time as Fundamental without Doctrinism Against Emergence," Nanjing University, China, Dec. 2009, p. 2.

[14] May, 1920 Leyden address, para. 16.

> so far as we can see, possible; but we do deny that the aether need have such properties as to separate space and time in the way supposed.[15]

In this way, Einstein allows himself to maintain the key to his Relativity theory (the denial of absolute space and rest), yet have at least a conceptual basis for understanding action-at-a-distance and rotational motion. Although he says this "conceptual" ether has no "particles" or "motion," we are then told in the next paragraph that it, nevertheless, has at least some physical qualities. He writes:

> But on the other hand there is a weighty argument to be adduced in favor of the ether hypothesis. To deny the ether is ultimately to assume that empty space has no physical qualities whatsoever. The fundamental facts of mechanics do not harmonize with this view. For the mechanical behavior of a corporeal system hovering freely in empty space depends not only on relative position (distances) and relative velocities, but also on its state of rotation, which physically may be taken as a characteristic not appertaining to the system in itself. In order to be able to look upon the rotation of the system, at least formally, as something real, Newton objectivizes space. Since he classes his absolute space together with real things, for him rotation relative to an absolute space is also something real. Newton might no less well have called his absolute space "ether"; what is essential is merely that besides observable objects, another thing, which is not perceptible, must be looked upon as real, to enable acceleration or rotation to be looked upon as something real.[16]

Here Einstein is preparing us for his concept of ether by citing Newton's notion of space. Since Newton made no absolute claims to knowing the constitution of space or the cause of gravity, Einstein feels safe in appealing to Newton. Einstein needs to "objectivize" space in order to explain movement within it (*e.g.*, rotation and action-at-a-distance), but other than his metrical tensor

[15] Arthur Eddinton, *Space, Time and Gravitation*, p. 39.
[16] *Ibid*., para. 18.

fields developed from the geometry of Minkowski and Riemann, he does not reveal what "physical qualities" he will eventually attribute to space.

Ludwik Kostro has done the most work in retracing Einstein's steps toward reviving the ether. In fact, Kostro reveals that up to our day no one had made a thorough report of Einstein's concept of the ether, stating that his is "the first comprehensive history of Einstein's concept of the ether."[17] Kostro points out, however, like many other innovations of science attributed to Einstein, this, too, was the product of someone prior to Einstein that he had read but to whom he had not given any credit. The German physicist Paul Drude had written about the concept in 1900 in his work *Handbook of Optics*. Drude allows ether "…if one understands by ether not a substance, but only space endowed with certain physical characteristics."[18] Kostro comments:

> We know for sure…that Einstein read the…*Handbook of Optics*, because upon reading it he wrote a letter to the author in which he offered his comments on the book….Einstein must also have read Drude's *Physics of the Ether Based on Electro-magnetism*, which appeared in 1894…. Similarities between expressions, and even identical ways they were used, offer proof that Einstein studied these works thoroughly. In his subsequent works Einstein would define the ether as "physical space endowed with physical attributes."[19]

All in all, Einstein envisioned three different kinds of ether: one for the Special theory; one for the General theory; and one for his hoped-for Unified theory. The ether for the Special theory originated from Lorentz, but Einstein rejected it because Lorentz understood it as an immobile ether, identical to the concept held by the 1905 Nobel Prize winner Philipp Lenard,[20] and reminiscent of the "absolute space" of Isaac Newton. The ether of General Relativity only had to incorporate gravity, thus Einstein had to develop another type of ether

[17] Ludwik Kostro, *Einstein and the Ether*, 2000, p. 7. Kostro adds: "There do exist a number of articles outlining the history of this subject by the author of the present work [Kostro]. In works by other historians of physics which the author had been able to obtain, Einstein's ether and its features are given a mere mention. Many documents presented or quoted in this work have never been published. The documentation I have drawn upon here has been collected by the library of the Museum of Science and Technology in Munich (Deutsches Museum) and in the Bayerische Staatsbibliothek in Munich" (*ibid*).
[18] Kostro, *Einstein and the Ether*, p. 18.
[19] *Ibid*., pp. 19-20.
[20] Philipp Lenard, *Über Äther und Materie, Zweite, ausführlichere und mit Zusätzen versehene Auflage*, Heidelberg, C. Winters Universitätsbuchhandlung, 1911, cited in Kostro, p. 42.

in order to unify gravity with electromagnetism, which led to embellishing Riemann's geometry with what was known as "tele-parallelism" and six more tensor fields in addition to the ten already being used by General Relativity. Of course, this attempt brought Einstein to the end of his rope, and he began to see that the whole endeavor might be seriously flawed, as noted in his private letters to Maurice Solovine and others. Despite his valiant attempts, Einstein simply could not find singularity-free equations to his General or Unified Field theory.[21]

The details of Einstein's thought process are of interest here. In 1916, Einstein was distancing himself from Ernst Mach's philosophy, although he would keep Mach's concept of the "distant masses" (stars) as providing the inertial frame of the universe and the inertial force of local phenomena. (Mach maintained his belief in ether in order to have a medium to transport the force from the stars). By the time Einstein gave his University of Leyden address on May 5, 1920, he had been sufficiently influenced by Henrick Lorentz's ether-based electromagnetic and cosmological views, and thus he admitted publically for the first time that the concept of ether was vital to physics, and, in fact, physics could not exist without it. First, Einstein reviews the various ether theories of the past. In the first half of the nineteenth century, Einstein understands that in the era of Fizeau and Fresnel:

> …It appeared beyond question that light must be interpreted as a vibratory process in an elastic medium filling up universal space. It also seemed to be a necessary consequence of the fact that light is capable of polarization, that this medium, the ether, must be of the nature of a solid body, because transverse waves are not possible in a fluid, but only in a solid. Thus the physicists were bound to arrive at the theory of the "quasi-rigid" luminiferous ether, the parts of which can carry out no

[21] Kostro says that at one time Einstein arrived at a singularity-free theory by "removing the denominator from the equations." Quoting Einstein: "If one modifies the equations in an unessential manner so as to make them free from denominators, regular solutions can be obtained, provided one treats the physical space as consisting of two congruent sheets." Kostro also reveals that Einstein would eventually abandon this solution, however (*Einstein and the Ether*, pp. 138-140).

> movements relative to one another except the small movements of deformation which correspond to light-waves.[22]

As for Maxwell and Hertz, Einstein said:

> …the ether indeed still had properties which were purely mechanical, although of a much more complicated kind than the mechanical properties of tangible solid bodies. But neither Maxwell nor his followers succeeded in elaborating a mechanical model for the ether which might furnish a satisfactory mechanical interpretation of Maxwell's laws of the electro-magnetic field.…Thus the purely mechanical view of nature was gradually abandoned. But this change led to a fundamental dualism which in the long-run was insupportable.… This dualism still confronts us in unextenuated form in the theory of Hertz, where matter appears not only as the bearer of velocities, kinetic energy and mechanical pressures, but also as the bearer of electromagnetic fields.… The ether appears indistinguishable in its functions from ordinary matter. Within matter it takes part in the motion of matter and in empty space it has everywhere a velocity… [23]

This then leads to the theory of Lorentz. Einstein describes it as follows:

> Such was the state of things when H. A. Lorentz entered upon the scene.…He [took] from ether its mechanical, and from matter its electromagnetic, qualities. As in empty space, so too in the interior of material dies, the ether, and not matter viewed atomistically, was exclusively the seat of electro-magnetic field. According to Lorentz the elementary particles of matter alone are capable of carrying out movements; their electromagnetic activity is entirely confined to the carrying of electrical charges. Thus Lorentz succeeded in reducing all electromagnetic happenings to Maxwell's equations for free space. As to the mechanical nature of the Lorentzian ether, it may be said of it, in a somewhat playful spirit, that immobility is the only mechanical property of which it has not been deprived by H. A. Lorentz. It may be

[22] Einstein's Lecture at the University of Leyden, Germany, May 5, 1920.
[23] *Ibid*. See also Arthur Miller's *Albert Einstein's Special Theory of Relativity* for an in-depth explanation of Hertz's contribution to the electromagnetic/ether issue, pp. 11-14.

> added that the whole change in the conception of the ether which the special theory of relativity brought about, consisted in taking away from the ether its last mechanical quality, namely, its immobility.

Next Einstein explains by means of his famous K and K' models what led him, initially, to dispense with ether.

> The space-time and the kinematics of the special theory of relativity were modelled on the Maxwell-Lorentz theory of the electromagnetic field. This theory therefore satisfies the conditions of the special theory of relativity, but when viewed from the latter it acquires a novel aspect. For if K be a system of coordinates relative to which the Lorentzian ether is at rest, the Maxwell-Lorentz equations are valid primarily with reference to K. But by the special theory of relativity the same equations without any change of meaning also hold in relation to any new system of coordinates K' which is moving in uniform translation relative to K. Now comes the anxious question: Why must I in the theory distinguish the K system above all K' systems, which are physically equivalent to it in all respects, by assuming that the ether is at rest relative to the K system? For the theoretician such an asymmetry in the theoretical structure, with no corresponding asymmetry in the system of experience, is intolerable. If we assume the ether to be at rest relative to K, but in motion relative to K', the physical equivalence of K and K' seems to me from the logical standpoint, not indeed downright incorrect, but nevertheless unacceptable.

What Einstein is trying to say is that, by accepting Special Relativity as a fact (which he believes has been proven by the Michelson-Morley experiment), then it must also be accepted that the "space-time and the kinematics of the Special Theory of Relativity" must hold for all objects and locations, whether at rest or in motion. Hence, it would be incorrect to make a distinction between one object and another by saying that one object is *at rest in ether* and the other is *moving in ether*, since, if both objects experience the same "space-time" effects regardless of their relationship to the ether, then the ether had nothing to do with what they experienced. For Einstein, ether not only

becomes superfluous, it actually gets in the way of logic. Logic requires that if a substance such as ether exists, then it must produce different effects on an object at rest as opposed to an object in motion. Since there is no difference, in Einstein's logic one can then dispense with ether. Thus Einstein concludes:

> The next position which it was possible to take up in face of this state of things appeared to be the following. The ether does not exist at all. The electromagnetic fields are not states of a medium, and are not bound down to any bearer, but they are independent realities which are not reducible to anything else, exactly like the atoms of ponderable matter.

Now, let us recall from previous analysis what led Einstein to this kind of thinking. The 1887 Michelson-Morley experiment, including its Fizeau-Fresnel precursors and its post-1887 confirmations, led Einstein and the rest of the world to believe that ether had no effect on objects because, as the experiments apparently proved, a light beam traveling with the Earth's velocity of 30 km/sec against the ether experienced no reduction in its speed when compared to a light beam that was not traveling against the ether. Rather than entertain the idea that the Earth was immobile, Einstein had two other alternatives: (a) that ether traveled with the Earth in its revolution around the sun; or (b) that there is no ether, and thus light itself is an absolute. Thus, the theory of Special Relativity was born, for if there is no ether, and all the heavenly bodies are in motion, then there is no absolute state of rest and no central point in the universe. Every object can act as its own inertial point. Each object will be subject to the same laws, and we, the observers, can understand how one object relates to the next only by means of the equations of Relativity theory. Thus, if Special Relativity can explain the mathematical relationships of these various objects, then there is no need for an ether, or, for that matter, there is no need for any fixed absolute, including a fixed Earth. Relativity makes the need for all absolutes superfluous. Accordingly, the confusing array of length contractions, time dilations, mass increases and gravitational warping seem much better ways of explaining the universe to the sophisticates of modern science than the simplified notion of a fixed Earth in a revolving sphere of stars.

Philipp Lenard was one of Einstein's most vocal opponents at this time. In a 1917 speech titled "Relativity Principle, Ether, Gravitation" he remarked that Einstein merely renamed ether as "space," and concluded that General Relativity theory could not exist without ether.[24] Einstein responded with "Dialogue Concerning Accusations against Relativity Theory" in 1918.[25]

In it we find Einstein basing his ideas on the aforementioned misinterpretation of the Michelson-Morley experiment, saying such things as: "According to the special theory of relativity a privileged state of motion did not exist anymore; this meant the negation of ether in the sense of earlier theories," but he agreed with Lenard that the space of General Relativity had "physical properties." Ernst Gehrcke had already introduced a critique of Einstein with the article "On Critics and History of the New Theories of Gravitation" in 1916,[26] and Paul Weyland followed with a 1920 paper titled "Einstein's Theory of Relativity as Scientific Mass Suggestion," concluding that "Einstein eliminated the ether by decree, [but] he re-introduced it *via* a different concept with the same functions."[27]

After Einstein's Leyden address in 1920 came the 1924 article titled *Über den Äther*. Einstein was on a quest to eliminate Lorentz's immobile ether and replace it with a pliable ether. He needed ether, at least in some form, to answer Newton's biggest problem: "action-at-a-distance." As he says in *Über den Äether*: "We are going to call this physical reality, which enters into Newton's law of motion alongside the observable ponderable bodies, the 'ether of mechanics.'"[28] Einstein knew that there could be no such "action" unless there existed a continuous medium to carry it from one place to another. As he says in the same work: "But every contiguous action theory presumes continuous fields, and therefore also the existence of an 'ether.'"[29] Since Einstein was convinced he could not have any object or place in the

[24] "*Über Relativitätsprinzip, Äther, Gravitation,*" Leipzig, S. Hirzel, 1918, cited in Kostro.
[25] "Dialog über Einwande gegen die Relativitätstheorie," *Die Naturwissenschaften* 6, 1918, cited in Kostro.
[26] "Zur Kritik und Geschichte der neueren Gravitationstheorien," *AdP*, 50, 1916, pp. 119-124, cited in Kostro. Gehrcke had also proved that Einstein plagiarized some of his work, specifically the 1898 mathematical work of Paul Gerber concerning the perihelion of Mercury (Kostro, *Einstein and the Ether*, p. 79).
[27] "Einsteins Relativitätstheorie – eine wissenschaftliche Massensuggestion," *Tägliche Rundschau*, August 6, 1920, as cited in Kostro.
[28] *Über den Äether*, p. 85, as cited in Kostro, *Einstein and the Ether*, p. 103.
[29] *Über den Äether*, p. 93, as cited in Kostro, *Einstein and the Ether*, p. 106. Also appearing in and translated from *Schweizerische naturforschende Gesellschaft, Verhand-lungen*, 105, 1924, pp. 92-93, and also appearing in Einstein's book, *The World as I See It*, 1934, "Relativity and the Ether," 1920, pp. 121-137, cited from *The Einstein Myth*, Part 1, p. 100. Einstein would write many other papers on the ether, such as "The New Field Theory" in 1929; "The Problem of Space, Ether and Field as a Problem of Physics" in 1934.

universe serve as an immobile point, this medium had to move. In Einstein's theory, it would move because matter moved it, yet it would be continuous because matter permeates the universe. As he describes it:

> No space and no portion of space [can be conceived of] without gravitational potentials; for these give it its metrical properties without which it is not thinkable at all….According to the general theory of relativity, space without ether is unthinkable; for in such space, not only would there be no propagation of light, but also no possibility of existence for standards of space and time (measuring rods and clocks), nor therefore any space-time intervals in the physical sense.[30]

One can easily see the strain under which Einstein had put himself. He desperately wanted the ether because it would give him "standards of space and time," but he had not, and would never, as it develops, explain how he can possess such standards if both the matter and the ether it bends are constantly moving. Of course, we need only interject once again that, had Einstein properly interpreted the Michelson-Morley experiment, he would have had his "standard of space and time" in an immobile Earth.

Even among Einstein's supporters the understanding that space is filled with substance was never relinquished. Louis de Broglie (d. 1987), the Nobel laureate famous for his discovery of the electron's wave in the 1920s, wrote in 1971 that the concept of ether, or as he calls it "the hidden medium," needed to be revived. Critiquing the model of space proposed by Erwin Schrödinger in 1926, de Broglie longs for the days of fixed points reminiscent of Descartes' Cartesian axes and Newton's absolute space:

> Everything becomes clear if the idea that particles always have a position in space through time is brought back…. According to my current thinking, the particle is always located within a physical wave….The movement of the particle is assumed to be the superposition of a regular movement…and of a Brownian movement due to random energy exchanges which take place between the wave and a hidden medium, which acts as a subquantum thermostat. The point of prime importance in this model is that at each moment the

[30] *Äther und Relativitätstheorie*, Berlin, J. Springer, 1920, pp. 13-14, Kostro, *Einstein and the Ether*, pp. 97-98.

> particle occupies a well-defined position in space, and this re-establishes the clear meaning which the configuration space had in classical mechanics.[31]

Ludwik Kostro's book, *Einstein and the Ether*, has revealed the heretofore undisclosed history of ether science in the twentieth century. He states the following candid conclusion:

> Modern science has its roots in ancient Greek philosophy. This philosophy, as we know, used the word "ether" to designate the particular kind of matter that filled the universe. This term was used throughout the history of philosophy and science, and it was also current at the beginning of this century. A resumption of its use at the dawn of this new century is now a fact. Since, according to the General Theory of Relativity and other modern branches of physics, the space and time of the universe do not constitute a vacuum, but a structured material plenum characterized by different physical quantities, the historical and traditional word "ether" is the most appropriate to express these features of the universe.[32]

Galine Granek adds:

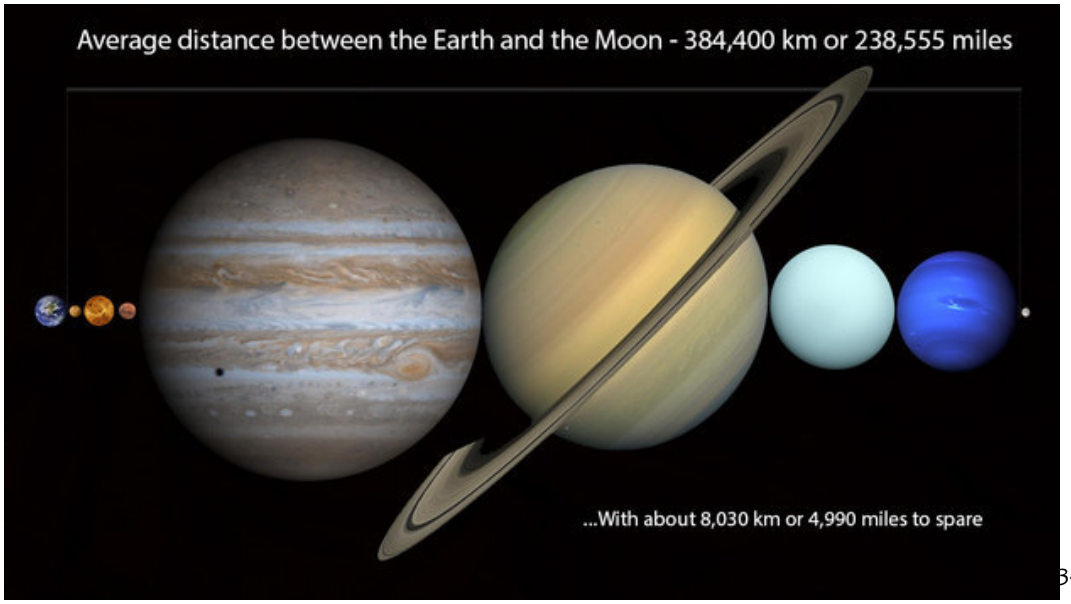
> Einstein's new kind of ether was the metrical tensor field. He thus started to adhere to this new ether. He named it "Mach's ether" or simply "ether," and supplied the same reasons that Poincaré had provided in his writings as to why we should adhere to the ether (we need the ether in order to remove absolute rotation and action-at-a-distance: see my papers "Poincaré's ether"). Einstein thus returned to

[31] Louis de Broglie, "Waves and Particles," *Physics Bulletin*, 22, February 1971, single page. In the same article he adds: "…whereas in my original concept I assumed that the coexistence of waves and particles, perceived by Einstein in 1905 in respect of light in his theory of light quanta, should be extended to all types of particle[s] in the form of the coexistence of a physical wave with a particle incorporated in it. Moreover, Schrödinger's ψ wave was soon to lose the nature of a physical wave on the day when Max Born put forward the hypothesis that it was a probability, and for that reason should be normalized, which is equivalent to assigning to it an arbitrary amplitude selected by the theorist. Thus, starting from a synthetic idea of the coexistence in physical space of waves and particles, a theory in which there was no longer any wave or particle was arrived at!….But as soon as Schrödinger's works were published I was struck by the paradox involved, as indeed I had already emphasized in an article which appeared in 1928 [Selected Papers on Wave Mechanics, London: Blackie, p. 130]. For since Schrödinger gave up the idea that particles existed in physical space, they no longer have well defined coordinates and it is difficult to imagine how the configuration space can be constructed with nonexistent coordinates….It may assist in clarifying this point to recall that in classical mechanics particles are treated as a first approximation as material points which have well defined coordinates in physical space at every moment….But this representation, clear and logical though it is, loses all its meaning in a theory in which particles have no spatial position as in current quantum mechanics" (*ibid*).

[32] Ludwik Kostro, *Einstein and the Ether*, 2000, pp. 186-187.

> the 19th century concept of the ether, but stripped of it its most important characteristic: a medium being in absolute rest. One could still pose the perplexing question: Was Einstein's ether endowed with any properties independent of the masses in it? For if it did possess such properties then there was actually no difference between Einstein and Poincaré's ether. Einstein did not give a definitive answer to the above question in his (1920) lecture.[33]

So, contrary to MacAndrew's accusation, geocentrism hasn't "invented" anything. Ether, whether Einstein's or one in the Planck dimensions, is granted by both General Relativity and Quantum Mechanics, respectively.



[34]

In fact, a quantum ether is a metaphysical necessity. Metaphysically, space cannot be "nothing" because nothing cannot exist. For example, we cannot say there is "nothing" between the Earth and the Moon. There must be something, otherwise the moon would coalesce with the Earth. The picture above shows that we could fit all of the planets between the Earth and the Moon. Hence, what occupied that space before we put the planets there?

Likewise, if we take the air out of a vacuum tube, we cannot say there is "nothing" in the tube, since "nothing" cannot exist. The vacuum of space in

[33] "Einstein's Ether: D. Rotational Motion of the Earth," Galina Granek, Department of Philosophy, Haifa University, Mount Carmel, Haifa 31905, Israel, *Apeiron*, Vol. 8, No. 2, April 2001, p. 64.
[34] http://www.buzzfeed.com/daves4/the-universe-is-scary

the tube must be holding something. The something that it holds must be a unit of mass or energy that is indivisible. This unit is named after Max Planck, and called a Planck particle, and it is common to all of Quantum Mechanics.

My addition to this state of affairs is that the Planck medium will sustain the centrifugal force of a rotating universe. Just as a spinning bowling ball will experience centrifugal force but not appreciably expand at its circumference, so the spinning Planck universe can do the same. If we put a marble inside a bowling ball about an inch from the center and then spin the bowling ball, that marble will rotate with the bowling ball and all the centrifugal force will be sustained by the bowling ball. Likewise, a spinning universe will sustain the centrifugal force of its spin and the celestial bodies in it will not be affected.

That space is solid may seem surprising to us, but it is not surprising to the science community. It is introduced well by popular physicist, Paul C. W. Davies:

> Is space just space? Or is it filled with some sort of mysterious, intangible substance. The ancient Greeks believed so, and so did scientists in the 19th century. Yet by the early part of the 20th century, the idea had been discredited and seemed to have gone for good [by Einstein's interpretation of the Michelson-Morley experiment]. Now, however, quantum physics is casting new light on this murky subject. Some of the ideas that fell from favor are creeping back into modern thought, giving rise to the notion of a quantum ether….
>
> If so, we'll have answered a question that has troubled philosophers and scientists for millennia. In the 5th century BC, Leucippus and Democritus concluded that the physical universe was made of tiny particles – atoms moving in a void. Impossible, countered the followers of Parmenides. A void implies nothingness, and if two atoms were separated by nothing, then they would not be separated at all, they would be touching. So space cannot exist unless it is filled with something, a substance they called the plenum.
>
> If the plenum exists, it must be quite unlike normal matter. For example, Isaac Newton's laws of motion state that a body moving

through empty space with no forces acting on it will go on moving in the same way. So the plenum cannot exert a frictional drag – indeed, if it did, the Earth would slow down in its orbit and spiral in towards the Sun.

Nevertheless, Newton himself was convinced that space was some kind of substance. He noted that any body rotating in a vacuum – a planet spinning in space, for example – experiences a centrifugal force. The Earth bulges slightly at the equator as a result. But truly empty space has no landmarks against which to gauge rotation. So, thought Newton, there must be something invisible lurking there to provide a frame of reference. This something, reacting back on the rotating body, creates the centrifugal force.

The 17th century German philosopher Gottfried Leibniz disagreed. He believed that all motion is relative, so rotation can only be gauged by reference to distant matter in the Universe. We know the Earth is spinning because we see the stars go round. Take away the rest of the Universe, Leibniz said, and there would be no way to tell if the Earth was rotating, and hence no centrifugal force.

The belief that space is filled with some strange, tenuous stuff was bolstered in the 19th century. Michael Faraday and James Clerk Maxwell considered electric and magnetic fields to be stresses in some invisible material medium, which became known as the luminiferous ether. Maxwell believed electromagnetic waves such as light to be vibrations in the ether. And the idea that we are surrounded and interpenetrated by a sort of ghostly jelly appealed to the spiritualists of the day, who concocted the notion that we each have an etheric body as well as a material one.

But when Albert Michelson and Edward Morley tried to measure how fast the Earth is moving through the ether, by comparing the speed of light signals going in different directions, the answer they got was zero.

R. Sungenis: Let me interject here to point out that Davies is also under the impression the Michelson found "null" results as is everyone else in the scientific community who believes the Earth revolves around the sun. Notice below that Davies says the answer to the "null" result was for Einstein to claim there was no ether at all, which was false, since all the experiments showed at least some ether, but nothing close for an Earth revolving around the sun at 66,000 mph.

> **Davies:** An explanation came from Albert Einstein: the ether simply doesn't exist, and Earth's motion can be considered only relative to other material bodies, not to space itself. In fact, no experiment can determine a body's speed through space, since uniform motion is purely relative, he said.
>
> Sounds OK so far, but there was one complication: acceleration. If you are in an aeroplane flying steadily, you can't tell that you're moving relative to the ground unless you look out of the window, just as Einstein asserted. You can pour a drink and sip it as comfortably as if you were at rest in your living room. But if the plane surges ahead or slows suddenly, you notice at once because your drink slops about. So although uniform motion is relative, acceleration appears to be absolute: you can detect it without reference to other bodies.
>
> Einstein wanted to explain this inertial effect – what we might commonly call g-forces – using the ideas of the Austrian philosopher Ernst Mach. Like Leibniz, Mach believed that all motion is relative, including acceleration. According to Mach, the slopping of your drink in the lurching aeroplane is attributable to the influence of all the matter in the Universe—an idea that became known as Mach's principle. Einstein warmed to the idea that the gravitational field of the rest of the Universe might explain centrifugal and other inertial forces resulting from acceleration.
>
> However, when in 1915 Einstein finished formulating his general theory of relativity–a theory of space, time and gravitation – he was

disappointed to find that it did not incorporate Mach's principle. Indeed, mathematician Kurt Gödel showed in 1948 that one solution to Einstein's equations describes a universe in a state of absolute rotation—something that is impossible if rotation can only be relative to distant matter. So if acceleration is not defined as relative to distant matter, what is it relative to? Some new version of the ether?

In 1976 I began investigating what quantum mechanics might have to say. According to quantum field theory, the vacuum has some strange properties. Heisenberg's uncertainty principle implies that even in empty space, subatomic particles such as electrons and photons are constantly popping into being from nowhere, then fading away again almost immediately. This means that the quantum vacuum is a seething frolic of evanescent "virtual particles."

Although these particles lack the permanence of normal matter, they can still have a physical influence. For example, a pair of mirrors arranged facing one another extremely close together will feel a tiny force of attraction, even in a perfect vacuum, because of the way the set-up affects the behaviour of the virtual photons. This has been confirmed in many experiments.

So clearly the quantum vacuum resembles the ether, in the sense that there's more there than just nothing. But what exactly is the new version of the ether like? You might think that a real particle such as an electron moving in this sea of virtual particles would have to batter its way through, losing energy and slowing down as it goes. Not so. Like the ether of old, the quantum vacuum exerts no frictional drag on a particle with constant velocity.

But it's a different story with acceleration. The quantum vacuum does affect accelerating particles. For example, an electron circling an atom

> is jostled by virtual photons from the vacuum, leading to a slight but measurable shift in its energy.[35]

The only difference between geocentrism's Planck dimensions and those of Davies or Krauss or any other quantum physicist today is that geocentrism's Planck particles don't pop in and out of existence. They are here to stay since they compose the very space that God created on the Second Day, the Firmament.

That the Genesis Firmament is the quantum medium is also approached, albeit indirectly, by one of the world's most respected physicists, John A. Wheeler, professor emeritus of Princeton University and co-author of the most comprehensive book written on gravitation to date. In an article he wrote with C. M. Patton titled: "Is Physics Legislated by Cosmology?" Wheeler, interestingly enough, begins with an offhand comment about the first two days of Genesis. He writes:

> No one sees any longer how to defend the view that 'geometry was created on Day One of creation, and quantized on Day Two. More reasonable today would appear the contrary view, that 'the advent of the quantum principle marked Day One, and out of the quantum principle geometry and particles were both somehow built on Day Two.[36]

In a simplified way we can summarize Wheeler's concern by noting that his remarks show that physics has wrestled with the proverbial problem of the chicken and the egg. Which came first, the chicken (geometry) or the egg (the composition of the universe that allows geometry and, even more basic, the concept of extension)? Technically speaking, an *ex nihilo* understanding of Day One and Day Two would have no such concern, since things are merely called into being by divine fiat and made to work with whatever material is present on the respective Days of creation.

Nevertheless, Wheeler's point about the "quantum principle" does not go unappreciated by an *ex nihiloist*, for the point of his remark is that the

[35] Paul Davies, "Liquid Space," *New Scientist*, Nov. 3, 2001.
[36] J. A. Wheeler and C. M. Patton, "Is Physics Legislated by Cosmology," in *The Encyclopedia of Ignorance*, 1977, p. 22.

"geometry" of the cosmos has a substratum which is defined by the principles of quantum mechanics, and which thus allows for the phenomena of extension and collapse. As Wheeler puts it:

> The black hole, as "experimental model" for gravitational collapse, brings us back full-circle to the paradox that continually confronts us, and all science, the paradox of big bang and gravitational collapse of the Universe itself. The existence of these two levels of collapse reminds us, however, that theory gives us also what is in effect a third level of collapse, small-scale quantum fluctuations in the geometry of space taking place and being undone, all the time and everywhere.[37]

We, of course, are only interested in Wheeler's "third level of collapse," since it relates directly to the constitution of the firmament of Day Two, or what Wheeler sees as the means by which the "…quantum principles of geometry and particles were…built." In this regard, Wheeler states:

> Among all the great developments in physics since World War II, there has been no more impressive advance in theory than the analysis of the fluctuations that take place all the time and everywhere in the electromagnetic field. There has been no more brilliant triumph of experimental physics than the precision measurement of the effect of these fluctuations on the energy levels of the hydrogen atom.…These developments tell us immediately that the electron in its travels in a hydrogenic atom is subject not only to the field Ze/r^2 of the nucleus, but also to a fluctuation field that has nothing directly to do with the atom, being a property of all space.[38]

In other words, the electron not only has to interact with the nucleus, but with the field of space between the nucleus and the electron, yet a field that "has nothing to do with the atom" itself, but is a property of the independent existence of something other than the atom. So, according to Wheeler, we have protons, neutrons, electrons and an undefined but experimentally proven "field" which constitutes the fabric "of all space." The only difference is that, whereas Wheeler sees "changes in connectivity with 'handles' and 'wormholes'

[37] J. A. Wheeler and C. M. Patton, "Is Physics Legislated by Cosmology," p. 24.
[38] *Ibid*., p. 24.

in the geometry all the time and everywhere forming and disappearing, forming and disappearing ('foam-like structure of space'),"[39] geocentrists hold that the "foam-like structure of space" is permanent and non-fluctuating. It doesn't "disappear" into "other universes" and come back a split second later. It is here to stay because it was made, *ex nihilo*, on Day Two, and which we call the Firmament.

Wheeler goes on to explain the dimensions and magnitude of this "field…of all space…is the Planck length,"[40] which is what I have been arguing as one of the basic constituents and dimensions of the firmament's granularity. Wheeler continues:

> One who had never heard of electricity, looking for evidence of this multiple connectivity of space, would *predict* electricity as [a] consequence of it. Thereupon *finding* electricity in nature, he would take this discovery as evidence that space really is multiply connected in the small. Nothing prevents our rising above the accidents of history to take the same position.[41]
>
> These fluctuation charges are not a property of elementary particles. The relevant scale of distances is twenty orders of magnitude less than nuclear dimensions. The charges are not quantized in magnitude. The charges occur everywhere, not only where there is a particle.[42]
>
> The view that large fluctuations go on at small distances puts physics in a new perspective. The density of mass-energy associated with a particle…is as unimportant compared to the calculated effective density of mass-energy of vacuum fluctuations down to the Planck scale of lengths…10^{94} g/cm^3…as the density of a cloud, ~ 10^{-6} g/cm3, is unimportant compared to the density of the sky, ~ 10^{-3} g/cm^3…the

[39] *Ibid*., p. 25.
[40] "In a region of observation of dimension L the calculated fluctuation field is of the order, $\Delta\varepsilon \sim (hc)^{1/2}/L^2$… The consideration of principle that give one in electrodynamics the fluctuation formula [$\Delta\varepsilon \sim (hc)^{1/2}/L^2$] tell one that in geometrodynamics, in a probe region of extension L, the quantum fluctuations in the normal metric coefficients –1, 1, 1, 1 are of the order, $\Delta g \sim L^*/L$. Here $L^* = (hG/c^3)^{1/2} = 1.6 \times 10^{-33}$ cm is the Planck length. These fluctuations are negligible at the scale of length, L, of atoms, nuclei, and elementary particles, as the wave-induced fluctuations in the level of the ocean appear negligible to an aviator flying 10 km above it. As he comes closer, or as L diminishes, the fluctuations become more impressive. Finally, when the region of analysis is of the order of the Planck length itself, the predicted fluctuations are of the order $\delta g \sim 1$."
[41] Concluding with: "Accordingly we are led to think of space as having a kind of fluctuating foam-like structure, with everywhere positive and negative charges of order $q \sim (hc)^{1/2} \sim 10e$ continually being created and annihilated."
[42] "Is Physics Legislated by Cosmology?" p. 26.

> proper starting point in dealing with physics…is the sky, not the cloud…no theory of particles that deals only with particles will ever explain particles.[43]

Using Wheeler's equation,[44] geocentrist Bouw writes:

> The *Planck density*, as this density is called, is today regarded as due to fluctuations in a vacuum caused by the uncertainty principle. Because of this, some have looked to this density as an explanation of the origin of the big-bang, assuming that the latter started at that density. But if the universe started at the Planck density, then it would also have to start at the Planck length and then the total mass of the universe would only be of the order of 10^{-5} grams. Furthermore, there is nothing vacuous about the firmament and so it is more logical to assume this to be a pervasive density which on sub-nuclear scales the universe can only suspect; but of whose existence it can never be certain. This, then is the density of the firmament.[45]

Obviously, if the firmament has such a tremendous density (10^{94} g/cm^3) one wonders how anything could move through it. A mere teaspoon full would weigh hundreds of millions of tons. As we noted earlier, however, science itself has found the answer since the discovery in 1923 of deBroglie waves. Material objects, from things as small as the electron to as large as stars, move in wave motion through the firmament.

Since the firmament is rotating, this will create a centrifugal force. Hence, to remain stable, the firmament will require an equal and opposite force to keep it from disrupting. If one of the fundamental substrates of the firmament is in the Planck dimensions, then a certain rotation period will be required to compensate for the inward pressure (gravity). The amount of centrifugal force created by the rotation will not equal the inward pressure; otherwise there would be no gravity. Rather, the rotation will be just enough to allow a residual inward pressure in order to give us the strength of gravity we see today. The rate of rotation required of the firmament to reach this equilibrium is

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[43] *Ibid*., p. 27. In his arrival at the density of the substratum of 10^{94} g/cm^3, Wheeler uses the equation $\rho \sim [(hc/L^*)/c^2]/L^{*3} \sim M^*/L^{*3} \equiv 2.2 \times 10^{-5}$ g/$(1.6 \times 10^{-33}$ cm$)^3 \sim 10^{94}$ g/cm^3.

[44] $\rho \sim [(hc/L^*)/c^2]/L^{*3} \sim M^*/L^{*3} \equiv 2.2 \times 10^{-5}$ g/$(1.6 \times 10^{-33}$ cm$)^3 \sim 10^{94}$ g/cm^3.

[45] *Bulletin of the Tychonian Society*, No 43, 1987, p. 17. In a related series of equations, Bouw finds that the energy flux of the firmament is 3×10^{125} ergs/cm^2/sec.

approximately 24 hours, which means it will turn 4.166×10^{-3} degrees per second, or 7.27×10^{-5} radians per second. Since the centrifugal and centripetal forces are balanced in favor of gravity in the rotating firmament, then the firmament's angular momentum should be proportional to the gravitational constant (G), the density (ρ) and the mass (M).

A similar discovery in physics may help us understand how the rotation of the universe helps keep it stable. In the book, *The Ether of Space*, after speaking about the tremendous elasticity and density of the ether as an "incompressible," "perfectly frictionless inviscid fluid," and "a perfect continuum, an absolute plenum,"[46] Sir Oliver Lodge states the following:

> But we must go on to ask, To what is this rigidity due? If the ether does not consist of parts, and if it is fluid, how can it possess the rigidity appropriate to a solid, so as to transmit transverse waves? To answer this we must fall back upon Lord Kelvin's kinetic theory of elasticity: that it must be due to rotational motion – intimate fine-grained motion throughout the whole ethereal region – motion not of the nature of locomotion, but circulation in closed curves, returning upon itself – vortex motion of a kind far more finely grained than any waves of light or any atomic or even electronic structure.[47]

Lodge, of course, did not believe that the universe rotated around the Earth. He made the same mistake that all other scientists made when interpreting the Michelson-Morley experiment. Several times in his book Lodge refers to the Earth moving "nineteen miles a second" around the sun as his basis for interpreting the famous interferometer experiment.[48] Thus, the "rotation" to which Lodge refers here is to the vortex motion of the ether itself, but according to Kelvin's kinetic theory, the required rotation could just as well be satisfied by a rotating universe.

Lodge makes further comments regarding ether, matter and rotation:

> The Essential distinction between matter and ether is that matter moves, in the sense that it has the property of locomotion and can

[46] Sir Oliver Lodge, *The Ether of Space*, 1909, pp. 47, 90, 95.
[47] *Ibid*., pp. 102-103.
[48] *Ibid*., pp. 55, 58, 61, 63, 66, 68.

> effect impact and bombardment; while ether is strained, and has the property of exerting stress and recoil. All potential energy exists in the ether. It may vibrate, and it may rotate, but as regards locomotion it is stationary – the most stationary body we know: absolutely stationary, so to speak; our standard of rest.[49]

Here, of course, we see that, identical to Lorentz and other physicists of this day, the ether was understood to be stationary while the Earth moved "nineteen miles per second" through it, which is why they were all so disconcerted when the Michelson-Morley experiment did not detect any such movement. Instead of having the Earth as their "standard of rest," they chose a stationary ether. Still, they possessed the scientific intuition that space contained a medium, and their quest was to understand the nature of that medium. They reasoned that it remained stable because of its rotation, which rotation allowed this "frictionless fluid" to also act as a solid. Lodge elaborates as follows:

> But now comes the question, How is it possible for matter to be composed of ether? How is it possible for a solid to be made out of fluid? A solid possesses the properties of rigidity, impenetrability, elasticity, and such like; how can these be imitated by a perfect fluid such as the ether must be?
>
> The answer is, They can be imitated by a fluid in motion; a statement which we make with confidence as the result of a great part of Lord Kelvin's work. It may be illustrated by a few experiments. A wheel of spokes, transparent or permeable when stationary, becomes opaque when revolving, so that a ball thrown against it does not go through, but rebounds. The motion only affects permeability to matter; transparency to light is unaffected. A silk cord hanging from a pulley becomes rigid and viscous when put into rapid motion….A flexible chain, set spinning, can stand up on end while the motion continues. A jet of water at sufficient speed can be struck with a hammer, and resists being cut with a sword. A spinning disk of paper becomes elastic like flexible metal, and can act like a circular saw.[50]

[49] *Ibid*., p. 118.
[50] *The Ether of Space*, pp. 118-119.

Of course, the remaining question for Lodge and the scientists of his day was how the ether could spin. As they understood it:

> If the ether can be set spinning, therefore, we may have some hope of making it imitate the properties of matter, or even of constructing matter by its aid, But *how* are we to spin the ether? Matter alone seems to have no grip on it. As already described, I have spun steel disks, a yard in diameter, 4000 times a minute, have sent light round and round between them, and tested carefully for the slightest effect on the ether. Not the slightest effect was perceptible. We cannot spin ether mechanically.[51]

We have already seen, however, that Lodge's experiments were sullied by his assumption that the Earth was moving at "nineteen miles per second" and thus his, and other experiments, would not be able to detect any significant effect on the ether. The point here is that Lodge and his colleagues recognized that the plenum of ether could perform as a rigid, solid mass if it were spun. In addition to the above, rotation is also involved in the relationship between electricity and magnetism, which will allow us to draw out further answers to the versatility of the geocentric universe. As Lodge explains the relationship:

> Rotation is supposed to exist whenever we put a charge into the neighborhood of a magnetic pole. Round the line joining the two, the ether is spinning like a top. I do not say it is spinning fast: that is a question of its density; it is, in fact, spinning with excessive slowness, but it is spinning with a definite moment of momentum. J. J. Thomson's theory makes its moment of momentum exactly equal to *em*, the product of charge and pole; the charge being measured electrostatically and the pole magnetically.
>
> How can this be shown experimentally? Suppose we had a spinning top enclosed in a case, so that the spin was unrecognizable by ordinary means – it could be detected by its gyrostatic behavior to force. If allowed to "precess" it will respond by moving perpendicularly to a deflecting force. So it is with the charge and the magnetic pole. Try to move the charge suddenly, and it immediately sets off at right angles. A

[51] *Ibid*., p. 120.

> moving charge is a current, and the pole and the current try to revolve round one another – a fact which may be regarded as exhibiting a true gyrostatic action due to the otherwise unrecognizable etherial spin. The Fact of such magnetic rotation was discovered by Faraday.[52]

This principle may explain why the Earth has a magnetic force pivoting off its poles and surrounding its entire circumference. Simply put, the rotation of the universe with its accompanying ether, which carries an electric field with its own impedance,[53] will create a magnetic force on the poles of a stationary Earth.

MacAndrew: Needless to say, he doesn't describe the physical properties of this medium which allow it to "absorb" the centrifugal forces. Does it do so gravitationally, by viscous drag, by electrostatics or magnetics? Who can say? How can it "absorb" these stupendous dynamic forces, and yet be completely undetectable? Only Bob knows.

R. Sungenis: I have answered MacAndrew's questions above. But now let's turn the tables and ask MacAndrew how an apple falls to the ground. Does MacAndrew know the answer to that question? No. The only thing he knows is that the apple falls, and he calls that process gravity. Gravity is a radial force (at least in Machian, Einsteinian and geocentric mechanics), that is, an object is drawn to the larger material object as if on a radius toward the centre of the larger material object. Likewise, centrifugal force is also a radial force, but it is away from the material object's center. Any object that spins is going to experience centrifugal force.

MacAndrew: Sungenis claims that the invented medium consists of Planck particles, so what are Planck particles? A Planck particle is a hypothetical entity, a black hole with its Schwarzschild radius equal to its Compton wavelength (link). (The Schwarzschild radius, r, of a black hole is the radius at which light cannot escape the black hole. For a black hole of mass m, $r = 2Gm/c^2$. The Compton wavelength of a particle, λ, is the wavelength of a photon which has the same energy as the rest mass of the particle, $\lambda = h/mc$where h is Planck's constant and c the speed of light. Setting $2Gm/c^2 = h/mc$ gives the mass and

[52] *The Ether of Space*, pp. 121-122.
[53] According to "Space Must Be Quantizied," *21st Century*, May-June, 1988, p. 26ff, the impedance of space is 376 ohms.

Schwarzschild radius of a Planck particle). The Planck particle mass would be 3.85 x 10^{-8} kg and its Schwarzschild radius would be 5.73 x 10^{-35} m.[2] Its uniform density would be 4.9 x 10^{94} kg/m^{-3} = 4.9 x 10^{91} g/cm^{-3} which Sungenis gets wrong by a factor of about 100 – does he ever get anything right? Such a density would make the mass in one cubic centimetre filled with Planck particles a stupendous factor of 10^{36} greater than the ordinary mass in the entire observable universe. But in any case, this is moot, because physicists don't think that such things as Planck particles actually exist in the outrageous bulk densities quoted by Sungenis.

R. Sungenis: As we saw above in the articles from numerous physicists, the Planck dimensions are believed to fill all of space in bulk density.

MacAndrew: Why? Because measurements of the CMB[3], as well as measurements based on supernovae[4] and Baryon Acoustic Oscillations[5] show that the geometry of the Universe is flat or close to flat and this means that the mean mass-energy density is close to the critical value of a little less than 10^{-26} kg/m^3 or about five hydrogen atoms per cubic metre (the critical value of mass-energy density in the Universe is that required to result in a flat geometry and Euclidean space).

R. Sungenis: No, that is not provable. Everything MacAndrew says above is based on the assumption that there was a Big Bang. But it is a theory, not fact. We cover the issues of the CMB, 1A supernovae and baryonic acoustic oscillations in Galileo Was Wrong, pages, 239 to 244. It further requires the addition of Inflation, Dark Matter and Dark Energy, in order to make a "flat" universe, which are also invented, not empirically verified. I have added Appendix 1 to explain the issues MacAndrew raises above.

MacAndrew: In order to answer the challenge that the Sun orbiting the Earth is dynamically absurd, Sungenis has to invoke an ad hoc explanation, using a medium for which there is not the slightest shred of evidence, and which, in spite of its supposed mind-boggling density, is completely undetectable, directly or indirectly.

R. Sungenis: We've already seen numerous physicists above that refute MacAndrew. Here are a few more:

Stephen Hawking supports Wheeler's theory, stating that, on extremely small scales in the Planck dimensions, space is alive with "turbid random activity and gargantuan masses," while "wormholes" provide passage to other universes.[54] Others, such as Ian Redmount and Wai-Mo Suen speak of "quantum space-time foam" or "Lorentizian space-time foam,"[55] as does S. J. Prokhovnik.[56] F. Selleri understands the CMB as the fundamental reference frame, pointing out that any object that travels through it is affected by radiation pressure.[57] Jean-Pierre Vigier refers to it as a "non-empty vacuum" and outlines the phenomenon of superluminal interactions in an "underlying deterministic substructure."[58] Vigier points to the experiments by Alain Aspect, which confirm the results.[59] Robert Moon, professor emeritus in physics at University of Chicago, adds:

> According to accepted theory, free space is a vacuum. If this is so, how can it exhibit impedance? But it does. The answer, of course, is that there is no such thing as a vacuum, and what we call free space has structure. The impedance equals 376+ ohms."[60]

Many theorists appeal to ultra small particles to explain the phenomenon of gravity, which has hitherto defied the efforts of modern science to uncover its physical mechanism. In trying to explain gravity as a process of interacting particles, the "empty space" of the cosmos is said to be filled with particles going by such names as "gravitons," "machions," "messenger particles," or "force-carrier particles." Included among these particles are electropon pairs, which are said to have a time-scale existence of 10^{-21} seconds. Another explanation, going by the name of String Theory, holds that, rather than space being filled with point particles, it consists of one-dimensional "strings" that are 10^{-33} cm in length. The particles we are detecting are merely oscillations of the strings. This theory requires the existence of 10 or more dimensions to

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[54] *Black Holes and Baby Universes and Other Essays*, Bantam, 1994; *A Briefer History of Time*, pp. 104-123.
[55] *Physical Review D*, 3rd series, vol. 47, No. 6, March 1993; I. Redmount and W.-M. Suen, "Is Quantum Spacetime Foam Unstable?" *Rapid Communication, Physical Review D*, 47, 2163 (1993); "De Broglie Waves on Dirac Ether," *Lettere Al Nuovo Cimento*, vol. 29, No. 14, Dec. 1980; W.-M. Suen, "Minkowski Spacetime is Unstable in Semi-Classical Gravity," *Physical Review Letters*, 62, 2217 (1989).
[56] S. J. Prokhovnik, "Light in Einstein's Universe," Dordrecht, Reidel, 1985; "A Cosmological Basis for Bell's View on Quantum and Relativistic Physics," in *Bell's Theorem and the Foundation of Modern Physics*, eds., A. Van der Merwe, F. Selleri, G. Tarozzi, New Jersey, World Scientific, 1990, pp. 508-514.
[57] F. Selleri, "Space-time Transformations in Ether Theories," *Z. Naturforsch*, 46a, 1990, pp. 419-425.
[58] J. P. Vigier, "Causal Superluminal Interpretation of the Einstein-Podolsky-Rosen Paradox," and "New non-zero photon mass interpretation of Sagnac effect as direct experimental justification of the Langevin paradox," *Physics Letters A*, 234, 1997, pp. 75-85; *Physics Letters A* 175, 1993, p. 269.
[59] *Physical Review Letters*, vol. 49, No. 2, July 12, 1982.
[60] "Space Must Be Quantizied," *21st Century*, May-June, 1988, p. 26ff.

make everything fit, which are given various exotic names such as "Calabi-Yau manifolds."[61]

Other discoveries have also added to the mystery. In 1948 Hendrik Casimir discovered that two mirrors facing each other in a perfect vacuum have a mysterious force acting upon them that draws them together, which is appropriately called "the Casimir effect."[62] This is a force that seems to appear out of nowhere, since in a vacuum there would be no obvious forces or material substances carrying them, yet a force it was. Current science tries to explain the appearance of this force as a "vacuum fluctuation" wherein the aforementioned "virtual particles" do their magic, but this is merely theoretical phraseology for something they really don't understand. One interesting theory held by the editor of the *Astrophysical Journal*, Bernard Haisch, is that the Casimir effect shows the existence of a "zero-point field" and is the scientific fulfillment of the opening verses of Genesis 1:3, "Let there be light."[63] Although Haisch's exuberance may be somewhat misplaced, it is obvious that he knows *something* is there, and it is far smaller than the dimensions we see

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[61] Brian Greene, *The Fabric of the Cosmos: Space, Time and the Texture of Reality*, New York: Alfred A. Knopf, 2004, p. 369.

[62] Hendrik B. G. Casimir, Proc. Kon. Ned. Akad. Wetensch. B51, 793, 1948; S. Lamoreaux, *Physical Review Letters*, 78, 5, 1996; M. Bordag, U. Mohideen and V. M. Mostepanenko, "New developments in the Casimir effect," *Phys. Rep.* 353 1, 2001; H. B. Chan, et al., "Nonlinear micromechanical Casimir oscillator," *Physical Review Letters* 87, 211801, 2001; F. Chen and U. Mohideen, "Demonstration of the lateral Casimir force," *Physical Review Letters* 88, 101801, 2002; C. Genet, A. Lambrecht and S. Reynaud, "Temperature dependence of the Casimir force between metallic mirrors," *Physical Review* A 62 012110, 2000; K. Lamoreaux, "Demonstration of the Casimir force in the 0.6 to 6 micrometer range," *Physical Review Letters* 78 5, 1997; K. A. Milton, *The Casimir Effect: Physical Manifestations of Zero-point Energy*, World Scientific, Singapore, 2001. The Casimir Effect also causes one to wonder whether the Gravitational constant *G* in Newton's force equation [$F = Gm_1m_2/r^2$] is, indeed, caused by gravity or some other force, since its value was determined in 1798 based on the attraction of metallic spheres in close proximity to one another. Stephen Mooney holds that the Cavendish Torsion Balance measures electrostatic attraction, not gravitational attraction. He points out that when Cavendish conducted the test, he found perplexing the fact that the attraction between the two spheres increased when he heated the larger of the two. Mooney believes the reason is that Cavendish was measuring the radiation density at the Earth's surface (which is not a constant value), not gravitational attraction (Stephen Mooney, "From the Cause of Gravity to the Revolution of Science," *Apeiron*, vol. 6, no. 1-2, pp. 138-141, 1999). Science is not agreed on the value of G in any case. Most disagree on its value after only three decimal places, and some disagree even after one decimal.

[63] Bernard Haisch, scientific editor of *The Astrophysical Journal* and editor-in-chief of the *Journal of Scientific Exploration*, has postulated that the Casimir Effect is due to the exclusion of the zero-point field from the gap between the plates, which was worthy enough to be published by *Physical Review*, (B. Haisch, A. Rueda, and H.E. Puthoff, Physical Review A, 49, 678, 1994. In an article in *Science and Spirit Magazine* titled "Brilliant Disguise: Light, Matter and the Zero-Point Field," Haisch coincides his findings with Genesis 1:3's "Let there be light." Haisch holds that the zero-point energy field results when, due to the Heisenberg Uncertainty Principle which says that there will be continual random movement in electromagnetic waves, if all the energy in those random movements are added up, it will produce the "background sea of light whose total energy is enormous: the zero-point field. The 'zero-point' refers to the fact that even though this energy is huge, it is the lowest possible energy state." Other articles include: "BEYOND $E=mc^2$: A First Glimpse of a Post-modern Physics in Which Mass, Inertia and Gravity Arise from Underlying Electromagnetic Processes," B. Haisch, A. Rueda and H. E. Puthoff, *The Sciences*, November/December, Vol. 34, No. 6, pp. 26-31, 1994; B. Haisch, A. Rueda and H. E. Putoff, "Inertia as a Zero Point Field Lorentz Force," *Physical Review* A, Vol. 49, No. 2, 1994; B Haisch and A. Rueda, "Electromagnetic Zero-Point Field as Active Energy Source in the Intergalactic Medium," presented at 35th Jet Propulsion Conference, June 1999. "Vacuum Zero-Point Field Pressure Instability in Astrophysical Plasmas and the Formation of Cosmic Voids," A. Rueda, B. Haisch and D. C. Cole, *Astrophysical Journal*, 445, 7, 1995; Puthoff, H.E., "Gravity as a Zero Point Fluctuation Force", *Physical Review* A, Vol. 39, No. 5, 1989; R. Matthews, "Inertia: Does Empty Space Put Up the Resistance?" *Science*, Vol. 263, 1994.

on the atomic level. Accordingly, other physicists recognize that it is high-time Einstein's theories about gravity be replaced.[64] All these discoveries spell a certain doom for the theories of Einstein because, try as they may, no one has been able to bridge the huge gap between Relativity and the Quantum world in which these particles are created and catalogued. In fact, Roger Penrose, who has coined the word "twistors" for his particles of choice, has stated that the concept of "space-time" may be eliminated from the basis of physical theory altogether.[65] Abhay Ashtekar holds that at the Planck scale the concept of space-time is replaced by a network of what he calls "loops and knots" of energy. This theory is being further developed by Carlo Rovelli and Lee Smolin.[66]

The seeming inevitable position to which science is being led is that there is a world of activity occurring at Planck dimensions that underlies everything that happens in the universe. Even staunch Relativists admit this eventuality. As Alan Kostelecký writes in *Scientific American*: "The observable effects of Planck-scale Relativity violations are likely to lie in the range of 10^{-34} to 10^{-17}."[67] Kostelecký more or less admits that, even though the ultimate theory of nature lies in these tiny dimensions, current science is at a loss to investigate them:

> Whatever the eventual form of the ultimate theory, quantum physics and gravity are expected to become inextricably intertwined at a fundamental length scale of about 10^{-35} meters, which is called the Planck length, after the 19th century German physicist Max Planck. The Planck length is far too small to be within the direct reach of either

[64] H. Yilmaz, "Towards a Field Theory of Gravitation," *Il Nuovo Cimento*, Vol. 107B, no. 8, 1991; I. Peterson, "A New Gravity? Challenging Einstein's General Theory of Relativity," *Science News*, Vol. 146, 1994; J. P. Siepmann, "The Laws of Space and Observation," *Journal of Theoretics*, Vol. 1, No. 1, 1999.

[65] Roger Penrose, *The Road to Reality: A Complete Guide to the Laws of the Universe*, New York, Alfred Knoph, 2005, pp. 968-1002.

[66] Lee Smolin, "Atoms of Space and Time," *Scientific American*, Sept. 2004; A. Ashtekar, V. Husain, J. Samuel, C. Rovelli, L. Smolin: "2+1 quantum gravity as a toy model for the 3+1 theory," *Classical and Quantum Gravity* 6, L185, 1989; C. Rovelli: "Loop space representation In: New perspectives in canonical gravity," A. Ashtekar Bibliopolis, Naples 1988; C. Rovelli and L. Smolin: "Knot theory and quantum gravity," *Physical Review Letters* 61, 1155, 1988; C. Rovelli, L. Smolin: "Loop space representation for quantum general relativity," *Nuclear Physics* B331, 80, 1990; A. Ashtekar, C. Rovelli, L. Smolin: "Gravitons and loops," *Physical Review* D44, 1740, 1991; A. Ashtekar, C. Rovelli: "Connections, loops and quantum general relativity," *Classical and Quantum Gravity* 9, 3, 1992; J. Iwasaki, C. Rovelli: "Gravitons from loops: non-perturbative loop-space quantum gravity contains the graviton-physics approximation," *Classical and Quantum Gravity* 11, 1653, 1994; H. Morales-Tecotl and C. Rovelli: "Loop space representation of quantum fermions and gravity," *Nuclear Physics* B 451, 325, 1995; C. Rovelli and L. Smolin: "Spin Networks and Quantum Gravity," *Physical Review* D 53, 5743, 1995; gr-qc/9505006. Lee Smolin argues that space is proportional to the area of its boundary in Planck units establishes a fundamental limitation on the nature of physical systems, called the "Bekenstein" bound. The power of this principle lies in its universality—any viable theory of quantum gravity must explain why it holds ("Three Roads to Quantum Gravity," Basic Books, 2001).

[67] Alan Kostelecký, "The Search for Relativity Violations, " *Scientific American*, September 2004, p. 96.

> conventional microscopes or less conventional ones such as high-energy particle colliders (which probe "merely" down to about 10^{-19} meter).[68]

The magazine itself adds:

> In quantum physics, short distance and short times correspond to high momenta and high energies. Thus, at sufficiently high energy – the so-called Planck energy – a particle should "see" the graininess of spacetime. That violates relativity, which depends on spacetime being smooth down to the tiniest size scales.[69]

It predicts the same doom, however, for Quantum Mechanics itself:

> Still, something is rotten in the state of quantumland, too. As Einstein was among the first to realize, quantum mechanics, too, is incomplete. It offers no reason for why individual physical events happen, provides no way to get at objects' intrinsic properties and has no compelling conceptual foundations.[70]

In the end, those who depend on "virtual" particles with word pictures such as "space-time foam" or "non-empty vacuum" have admitted, however, that the whole system of "virtual" particles is doomed from the start. Redmount and Suen have shown that if plancktons are left in the "pop in and pop out" category it creates numerous anomalies in the structure of the quantum field, including but not limited to "wormholes" on an intolerable scale.[71] This leads one to posit that the plancktons should be understood as real particles, the underlying substance of the Genesis firmament itself. We will cover this possibility momentarily.

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[68] *Ibid*.
[69] Graham P. Collins, staff writer, *Scientific American*, Sept. 2004, p. 99. NB: We are not here supporting the concept of "space-time," but merely using the same terminology of modern science as they discover the contradictions and anomalies in their own theories.
[70] George Musser, "Was Einstein Right," *Scientific American*, Sept. 2004, p. 89.
[71] I. Redmount and W.-M. Suen, "Is Quantum Spacetime Foam Unstable?" *Rapid Communication, Physical Review D*, 47, 2163, 1993.

MacAndrew: He proposes no quantified mechanism by which this medium "absorbs" these vast centrifugal forces while allowing planets and satellites to move freely through it.

R. Sungenis: I have given the explanation above. We know that both gravity and centrifugal force occur and affect material bodies. Since Planck particles are material bodies, they will be affected by centrifugal force, unless Mr. MacAndrew can show us an exception to what centrifugal force will affect.

MacAndrew: No-one else performing real, complicated celestial mechanics calculations (like NASA or ESA for example!) has to invoke this fantasy. This made-up medium, this fairy dust has no physical interaction other than magically doing just what he needs it to do while remaining completely undetectable whenever he doesn't need it – way to go, Bob.

R. Sungenis: Apparently, MacAndrew is not up to speed on the literature regarding the Planck medium that I cited above. As for who is inventing a "fantasy," the Dark Matter and Dark Energy of Alec in Wonderland's Big Bang theory wins the prize.

MacAndrew: Now let's consider that when geocentrists like Sungenis talk about the "Planck medium", which is a term used almost exclusively by geocentrists, they are probably referring to the hypothesised vacuum energy or zero point energy of the vacuum that arises from a naïve interpretation of Quantum Field Theory[6]. A naïve calculation results in an *infinite* energy density for the vacuum, and a slightly less naïve calculation yields a finite but stupendously large value. Since the energy of the vacuum is *measured* to be actually rather small (see above – 10^{-26} kg/m^3 is the upper limit of the density of the vacuum) it is clear that there must be a problem in the renormalisation step of the QFT calculation at these scales. QFT does not include gravity which is expected to unify with electromagnetism and the strong and weak nuclear forces at these scales. Most physicists agree that in the absence of a theory of Quantum Gravity, QFT on its own is unable to model the density of the vacuum which remains undetermined in QFT[7]. And in any case, it is empirically clear that the vacuum doesn't have the viscous or drag properties that Sungenis wants it to have. Even if the zero point energy is what he means when he

speaks of the "Planck medium", he has imbued it with properties that it doesn't have, even as a highly hypothetical entity in QFT.

R. Sungenis: If and when MacAndrew can show us that gravity and centrifugal force cannot come from or affect a Planck medium, all bets are off.

MacAndrew: There are two ironies which illustrate Sungenis's contempt for consistency and coherence. First of all, he rather hypocritically invokes Planck particles – which are black holes by definition – *even though he regularly derides the existence of black holes, insisting that they're completely unevidenced.*

R. Sungenis: So MacAndrew wants us to believe he is being consistent when he keeps the blackholes of General Relativity but denies them for the Planck dimensions.

MacAndrew: Secondly, he often criticises cosmologists' hypotheses of dark matter and dark energy, claiming that they are poorly evidenced ad hoc solutions to the problem of missing mass in galaxies and the accelerating expansion of the Universe. But here he is, proposing a solution to the dynamical problem of a revolving Sun, where he has to explain the problem that the gravitational force is a whopping 332,000 times too small to maintain the Sun in a an annual geocentric orbit, by invoking an entirely arbitrary, undetectable, unquantifiable and, frankly, magical idea. That's ironic, because although the composition of dark matter is unknown, its presence can be and has been detected and quantified throughout the Universe by its gravitational interaction with other matter and with radiation.

R. Sungenis: That is pure bull. It only shows how MacAndrew and his colleagues twist the evidence to make it appear as if it points to Dark Matter.

MacAndrew: It is an entirely reasonable hypothesis that is consistent with other things that we know about the Universe – whereas Sungenis's Planck medium not only lacks evidence but is *incompatible* with observations.

R. Sungenis: Again, MacAndrew's view is against all the physicists I quote above, from Einstein who took back the ether to Quantum Mechanics which

insists on a Planck level medium. As for "incompatible with observations," MacAndrew hasn't proven one.

MacAndrew: And while Sungenis hoots at the dark energy hypothesis of the Standard Cosmological Model, he wants us to accept his undetectable hypothetical entity which is *120 orders of magnitude* denser than dark energy[8]. Moreover this is invoked by Sungenis to explain two phenomena, the Earth's rotation and its revolution round the Sun, which already have good Newtonian explanations, gravity and the conservation of angular momentum, whichi date back over three hundred years. It's an unnecessary and ridiculous solution looking for a non-existent problem.

R. Sungenis: When MacAndrew can show us that there is absolutely "nothing" between the Earth and the Moon he has something to talk about. Good luck trying to cross that metaphysical bridge.

MacAndrew: So here's the kicker – the thing that Sungenis fails to bring out in his buffoonery: we have already seen that **the gravitational attraction between the Sun and Earth is 3.53 x 10^{22} N** (given by $F_g = Gm_em_s/r^2$). So let's calculate the centrifugal force if the Earth is revolving round the Sun once a year. We have seen that $F_c=m\omega^2r$ and in this case: m = 5.97 x 10^{24} kg, ω = 1.99 x 10^{-7} rad/s, r = 1.496 x 10^{11} m. **So the centrifugal force of the Earth's annual revolution is (5.97 x 10^{24}) x (1.99 x 10^{-7})^2 x (1.5 x 10^{11}) = 3.54 x 10^{22} N**. Therefore, the gravitational attraction between the Sun and Earth is equal to the centrifugal force of the Earth's annual revolution. Is this an amazing coincidence? Of course it's not. It's the simple consequence of Earth's orbit around the Sun – the force of the Sun's gravitational attraction is exactly equal to the centripetal force required for the Earth's annual orbit at its distance of ~150 million kilometres from the sun – no magical media to "absorb" the centrifugal force is required, just straightforward orbital mechanics based on standard Newtonian physics, such as can be applied to all the planets, including the Earth. That's physics, not geocentric wishful thinking. Since the same condition equating the gravitational force for each planet and the centripetal force required at that planet's orbit holds in the case of every planet, including the Earth, it beats me why anyone would think that the Earth is a special case not orbiting the Sun. In carrying out these calculations (very badly), Sungenis has been hoist with his own petard – it has blown up in his face.

R. Sungenis: We'll see who has been "hoist." Newtonian physics doesn't know what the mass of the sun really is. Nobody has ever put the sun on a scale. Newtonian physicists merely calculate what the Sun's mass MUST be to fulfill a Newtonian equation that has the Earth revolving around the sun. Here is a page from NASA showing how the mass of the sun is calculated: (http://imagine.gsfc.nasa.gov/YBA/cyg-X1-mass/mass-of-sun.html). So it is not the "hand in glove" fit that MacAndrew is touting, but a mere working backwards from a presumption that the Earth is traveling around the sun.

Moreover, neither MacAndrew nor anyone else can tell us 'how and why' the centripetal force is in the Newtonian system, since they don't know what causes gravity.

Newtonian physics also doesn't really have a centrifugal force to speak of since it is a fictitious force due to the fact that it can only incorporate two bodies and ignores the rest of the universe.

Conversely, our geocentric model explains the 'how and why' of gravity, centrifugal force, and centripetal force, since we show that there is a medium constituting space that produces all three.

Moreover, we don't have an "action-at-a-distance" problem, since gravity and inertial forces can travel very fast in a Planck medium. Because of its extreme density, it reacts instantly to any changes within it, in about 10^{-78} seconds.

Another calculation is the speed of sound as a function of tension (T), otherwise known as "transverse waves," which is how light beams travel through space. The equation for a transverse wave is: $v_t = \sqrt{T/\mu}$ where μ is the mass per unit length. In the Planck dimensions, the mass of the firmament is 2.2×10^{-5} grams over a length of 1.6×10^{-33} centimeters, yielding a value for μ at 1.89×10^{56} gm/cm. Since the tension is the gravitational attraction between Planck particles, the force is: $T = G\mu^2 = 1.27 \times 10^{49}$. Substituting these values in the original formula [$v_t = \sqrt{T/\mu}v_t$] yields $v_t = 3.04 \times 10^{10}$ cm/sec, within the margin of error for the terrestrial speed of light.

In a geocentric universe, however, light is not limited to 186,000 mps since that is only the terrestrial speed of light near the Earth. When the T (tension) in the

Firmament is increased the further the location is from Earth, the faster will be the speed of light, which also solves the starlight problem of Genesis 1:14-17.

A second calculation of speed can be based on temperature. In Planck dimensions, the firmament has a temperature of 1.42×10^{32} Kelvin. The quantum speed, v_q, is related to Boltzmann's constant, k, while the particle mass, m, in the equation: $v_q = \sqrt{(3kTmx^{-1}}$ yields a value for v_q as 5.17×10^{10} cm/sec.

The third calculation is the most significant since it measures the speed of the pressure wave (compressional or longitudinal) through the Firmament. This calculation depends on the compressibility of the universe in the Firmament. The speed of the pressure wave, v_b, is derived by its relation to the density, ρ, in the equation: $v_b = \sqrt{(B_m/\rho)}$. A bulk modulus relates pressure to volume by the formula $B_m = (P - P_o)\, V_o/V_o - V$, where P and V are the compressed pressure and volume and P_o and V_o are the original values. Assuming a difference in compression between space and the firmament, $P_o = 0$ while $P = 10^{49}$ (the pressure between two Planck particles. $V_o = 10^{85}$ cm^3, the volume of the universe. The final volume is 10^{-39} cm^3. The density is the critical density of the universe set at 10^{-29} gm/cm^3. Applying these estimates in the formula: $v_b = \sqrt{(B_m/\rho)}$, then $v_b = 3 \times 10^{39}$ cm/sec as the speed of the compression waves. At this rapid speed the compression wave crosses the universe in 10^{-11} seconds, virtually instantaneously. Depending on adjustments to the above figures, the upper limit for the speed of the compression wave is the Planck time of 10^{-44} seconds as opposed to 10^{-11} seconds.[72]

We can also say the following about the Firmament's relation to the Earth. Because the firmament is some 10^{123} times as massive as the universe, the universe follows the Firmament-induced Coriolis and Centrifugal forces' dictates.

Since the earth is located at the gravitational center of the Firmament and on its axis of rotation, it will not feel the gravitational wave.

[72] C. L. Andrews writes: "For longitudinal waves in a liquid $v = \sqrt{B/\rho}$ where B is the bulk modulus of elasticity and ρ is the mass per volume or 'volume density'…For transverse waves in a solid $v = \sqrt{n/\rho}$ where n is the shear modulus of elasticity and ρ the density. By definition of a solid, only solid media may transmit transverse waves. Thus the historical 'ether' is a solid which, if it has a shear modulus of elasticity no less than steel, must have a density less less than that of our best vacuum in order to transmit transverse waves with the speed of light" (*Optics of the Electromagnetic Spectrum*, 1960, p. 53).

There is one other phenomenon predicted by this model. If the earth is at the gravitational center of the Firmament, earth's gravitational field, as opposed to any other body's gravitational field, coincides with the Firmament's. As such, any force applied to either move the earth out of its central position or to change the length of the day, will be opposed by the Firmament.

We can also explain why there is an Axis of Evil. It is a consequence of the yearly Coriolis force exerted by the effective daily rotation of the Firmament. The entire universe will follow the solar motion as long as the center of gravity of the earth exactly coincides with the center of gravity of the Firmament.

As we can see, the geocentric model explains all it needs to explain, and it provides what is missing in Newtonian, Machian and Einsteinian physics, and also relates intrinsically to Quantum Mechanics.

Robert Sungenis
November 20, 2014

Notes for MacAndrew's paper

[Notes for pedants: I use some approximations in the various calculations above. In no case does the approximation affect what I am saying in any significant way. Examples of approximations include rounding figures to a few significant places, assuming that the Earth's orbit is circular rather than elliptical (it's nearly circular), and referring to the Earth's orbit around the centre of the Sun rather than round the Sun-Earth centre of mass (since the Sun is about 332,000 times more massive than the Earth this approximation has little effect).]

[1] The dimensions of *mvr* are kg m^2 s^{-1}. But the dimensions of force are kg m s^{-2}. Getting the dimensions of an expression wrong or entirely ignoring dimensional analysis is characteristic of a pseudoscientist.

[2] See http://en.wikipedia.org/wiki/Planck_particle . Some people use the reduced Compton wavelength which is defined by the reduced Planck constant ħ = h/2π in deriving the mass and dimensions of a Planck particle:http://math.ucr.edu/home/baez/planck/node2.html

[3] For popular web-pages that explain the geometry of the Universe and what we can conclude from WMAP data, see http://map.gsfc.nasa.gov/universe/uni_matter.html andhttp://map.gsfc.nasa.gov/universe/uni_shape.html . For examples of the numerous technical papers which report the flatness of the Universe, see Komatsu et al, *Five-Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Cosmological Interpretation,* arXiv:0803.0547v2 and Larson et al, *Seven-Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Power Spectra and WMAP-Derived Parameters*, arXiv:1001.4635v2

[4] Sullivan et al, *SNLS3: Constraints on Dark Energy Combining the Supernova Legacy Survey Three Year Data with Other Probes*, arXiv:1104.1444v2

[5] Percival et al, *Baryon Acoustic Oscillations in the Sloan Digital Sky Survey Data Release 7 Galaxy Sample*, arXiv:0907.1660v3

[6] Sungenis and Bennett, *Galileo Was Wrong*, 10th Edition. Chapter 6

[7] For a formal treatment, see a QFT textbook, for example: Michio Kaku, *Quantum Field Theory; A Modern Introduction*, Oxford University Press, ISBN-0-19-509158-2, particularly pages 67-68, 87, 196 et seq. Unfortunately, a grounding in tensors, spinors and group theory (particularly Lie algebras) is needed to follow the formal physics. Alternatively John Baez's popular page sets out the discussion in layman's termshttp://math.ucr.edu/home/baez/vacuum.html and Sean Carroll's pedagogical paper can be followed by someone with some grounding in university level maths for physicists:http://relativity.livingreviews.org/Articles/lrr-2001-1/index.html

[8] As energy and mass are equivalent we can refer to the density of the vacuum either as an energy density (joules m^{-3}) or a mass density (kg m^{-3}). The

upper limit of the observed vacuum density is about 10^{-26} kgm^{-3} which is 10^{-9} joules m^{-3}. Sungenis's medium is $4.9X10^{94}$ kg m^{-3} or 4.4×10^{111} joules m^{-3}

Appendix 1 for R. Sungenis

When Newton discovered gravity, one of his first problems was having to deal with Copernicus' limited universe. Newton realized that the very gravity he discovered would eventually pull the stars into one massive ball. In order to compensate for this problem, Newton opted for an infinite universe. As time went by, science realized there were too many problems with an infinite universe, so Einstein tried to compensate for gravity by introducing an opposing force, which he called the "cosmological constant." As Misner, et al, describe it:

> In 1915, when Einstein developed his general relativity theory, the permanence of the universe was a fixed item of belief in Western philosophy. "The heavens endure from everlasting to everlasting." Thus, it disturbed Einstein greatly to discover that his geometrodynamic law **G** = 8π**T** predicts a *non*permanent universe; a dynamic universe; a universe that originated in a "big-bang" explosion, or will be destroyed eventually by contraction to infinite density, or both. Faced with this contradiction between his theory and the firm philosophical belief of the day, Einstein weakened; he modified his theory.[73]

His new theory would reverse the effects of gravity and keep the universe from falling in on itself. The universe would remain static, not expanding or contracting. It would also follow Mach's principle, wherein space was defined by the matter within it. But Wilhelm de Sitter didn't follow Mach's rules and created a variation for Einstein's cosmological constant. De Sitter ignored all the matter of the universe and only concentrated on its quantum energy, an energy that would be enough to propel the expansion of the universe. So the choice was between Einstein's static but matter-filled universe and de Sitter's expanding but matter-deficient universe. Next, Alexander Friedmann then

[73] Misner, Thorne and Wheeler, *Gravitation*, pp. 409-410.

fiddled with Einstein's math and eliminated the cosmological constant and produced an expanding universe still under the constraints of General Relativity.[74] But this required that he make the equations produce a universe whose matter was spread out evenly and was the same everywhere (*i.e.*, isotropic and homogeneous), otherwise known as the "cosmological principle." This made Arthur Eddington backtrack to point out that, even with the cosmological constant, an Einstein-type universe was not really static or balanced. Since gravity and Einstein's cosmological constant (Λ) had to be balanced so perfectly (*e.g.*, like balancing a pencil on its point), even minute fluctuations would produce a runaway expansion or an unstoppable contraction. The best Friedmann could do was propose a universe with enough matter (what he called "the critical density") that would allow the universe to expand for eternity but at an ever decreasing rate, even though this solution itself was counterintuitive. As NASA puts it:

> Einstein first proposed the cosmological constant…as a mathematical fix to the theory of general relativity. In its simplest form, general relativity predicted that the universe must either expand or contract. Einstein thought the universe was static, so he added this new term [(Λ) lambda] to stop the expansion. Friedmann, a Russian mathematician, realized that this was an unstable fix, like balancing a pencil on its point, and proposed an expanding universe model, now called the Big Bang theory.[75]

In retrospect, when Hubble relieved some of the problem by interpreting the redshift of galaxies as a sign that the universe was expanding, still, in order to have the matter move yet remain homogeneous (as required by Friedmann's equation), the value of its rate of expansion (H); as well as the value of its density (Ω); and the energy to propel the expansion (Λ), had to fulfill the Goldilocks rule – it had to be just right or there would be no universe. Various scientists have spent their entire careers trying to figure out the perfect combination to these three numbers, but to no avail. Again, it is like trying to

[74] For a good analysis of Friedmann's five equations, see http://nicadd.niu.edu /~bterzic/PHYS652/Lecture_05.pdf
[75] "Dark Energy: A Cosmological Constant?" http://map.gsfc.nasa.gov/universe/ uni_matter.html

balance a pencil on its point. This is what happens when the universe is made to start from a big bang instead of creative fiat – the math never produces what we actually see. Postulating a big bang is easy. Making it work with all the other laws of science is impossible.[76]

Another problem arose at the tail end of the twentieth century. Observations of class 1*a* supernovae, which are used as measuring devices for time and distance in Big Bang cosmology, revealed that the universe wasn't slowing down in its expansion but was speeding up.[77] This meant that there was no possibility this new acceleration (H_2) could be accounted for by the present amount of energy and baryonic matter ($\Lambda + \Omega$) in the Big Bang universe.

A related problem arose when the 2001 Wilkinson Microwave Anisotropy Probe (WMAP) apparently found that the geometry of the universe is "flat,"[78] which Big Bang advocates prefer because it is the only one which will allow the negative energy of gravity to balance out the positive energy of matter so that the net energy is zero.[79] Big Bang advocates want a zero energy sum because

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[76] One of those "laws of science" cropped up in what was known as the "horizon problem." If the speed of light is limited (and thus the spread of information from one end of the Big Bang to the other is also limited), how could the right hand of the explosion know what the left hand was doing? This problem was solved by the imposition of yet another fudge factor – the inflation theory. Designed by Alan Guth of MIT, it postulates that the Big Bang exploded 10^{50} times faster than previously thought, which then allowed the information to travel 10^{50} times faster.

[77] The 1*a* Supernovae explosions were dimmer than expected, which, based on redshift values, translated into them being farther away from Earth than what astronomers previously believed. Since their light has taken longer to reach Earth, Big Bang cosmologists assume the universe must have taken longer to grow to its current size. Consequently, the expansion rate must have been slower in the past than previously thought. Hence, the supernovae are dim enough that the expansion must have accelerated to have caught up with its current expansion rate. Yet the universe's matter should have slowed the expansion. So what is making it speed up? If the cosmological principle is accepted such that the acceleration occurs evenly and smoothly for the entire universe, it forces the introduction of "dark energy" to sustain the acceleration. See "Observational Evidence from Supernovae for an Accelerating Universe and a Cosmological Constant," Adam G. Riess, et al, 1998. The abstract concludes: "A Universe closed by ordinary matter (*i.e.*, $\Omega_M = 1$) is formally ruled out at the 7σ to 8σ confidence level for the two different fitting methods." (http://arxiv.org/pdf/astro-ph/9805201v1.pdf). See also "Surveying Spacetime with Supernovae," Craig J. Hogan, *et al*., *Scientific American*, January 1999. See also Marie-Noëlle Célérier who concludes: "The interpretation of recently published data from high redshift SNIa surveys…It has been shown that a straight reading of these data does not exclude the possibility of ruling out the Cosmological Principle" ("Do we really see a Cosmological Constant in the Supernovae data?" *Aston. & Astro*. Feb. 2008, p. 9.

[78] A "flat" universe is a Euclidean 3-dimensional universe as opposed to a Reimann curved universe. Taken as a whole, the universe is Euclidean. In a "flat" universe, if one were to inscribe a giant triangle in a circle in outer space, the value would be π (3.14). Another way to describe it is to say that light travels in straight lines in a flat universe. In Big Bang cosmology, the "flatness" of the universe is determined by its energy density (Ω). If Ω is > 1 or < 1, then the universe is curved or non-Euclidean and the above triangle would be > or < π, and light would travel a curved directions. Big Bang cosmologists prefer a "flat" universe so that it can expand forever (as opposed to curving back in on itself). It is believed that the distribution of the cosmic microwave radiation (CMB) found by the 2001 WMAP showed a density fitting a "flat" universe.

[79] Krauss claims that WMAP determined the universe is "flat" by the following reasoning: The energy at the very beginning of the Big Bang was not zero, so one needs to arrive at zero sometime in the aftermath of the Big Bang. This was accomplished by

they believe it will answer the haunting question concerning the origins of the Big Bang, with the answer being "it came from nothing." As Lawrence Krauss puts it: "The laws of physics allow the universe to begin from nothing. You don't need a deity. You have nothing, zero total energy, and quantum fluctuations can produce a universe."[80] In the same video, the crass Krauss also says:

> You are all stardust. You couldn't be here today if stars hadn't exploded… because the elements… carbon, nitrogen, oxygen, iron, all the things that matter for evolution weren't created at the beginning of time, they were created in the nuclear furnaces of stars, and the only way they could get into your body is if the stars were kind enough to explode. *So forget Jesus. The stars died so you could be here today*.

To arrive at zero energy to counterbalance the negative energy of gravity, our universe has only 4% of the needed matter. Additionally, if they were going to use Friedmann's equations, then a "flat" universe requires that the "critical density" must be equal to the average density. But even adding in 23% Dark Matter and 4% normal matter, this left 73% positive energy still required to

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finding a measurement in space that appeared to be zero. A triangle is drawn in space as the measuring device and applied as follows: if the universe is 13.78 billion years old, one should be able to see the beginning of the Big Bang (looking backwards into time, as it were). But one cannot see all the way back to the Big Bang because there is an opaque wall in the way. This wall is due to the fact that the temperature at the Big Bang was hot enough (3000K) to break apart hydrogen atoms to produce protons and electrons, which is a 'charged plasma' that is opaque to radiation. One cannot see past this part of the universe since it is opaque. But light bounces off the surface of the opaque wall and is radiated back to Earth (See Figure 2). This light is the CMB at 2.73K (instead of the original 3000K), so the protons have captured the electrons and made space transparent instead of opaque, and thus one can see this part of space from Earth. Moreover, the radiation should be coming to Earth from all directions since the wall surrounds earth like a sphere. Then, if one takes 1 arc second on the wall of the CMB (where it is opaque), it represents 100,000 light years in distance. Since Einstein said no information can be transferred faster than light, this means that anything that happened on one side of the CMB could not affect anything on the other side. Thus, big lumps of matter (bigger than 100,000 light years across) could not collapse because gravity, which Einstein limited to the speed of light, could not go across them. Lumps that collapsed had to be 100,000 light years or less in size. Since 100,000 light years equals one arc second for the base of the triangle; and the distance to the "opaque wall" provides the two other sides of the isosceles triangle (and since light rays travel in straight lines in the "transparent" part, then the sides of the triangle are straight), Viola! the needed "triangle" is produced to "measure" the energy. In an Open universe the light rays will diverge as one looks back into time, so the distance across the "lump" (the "ruler") will look smaller, perhaps half an arc second. In a Closed universe the light rays look bigger as one looks back into time so the distance across the lump would be bigger than 1 arc second. The lumps are measured to see if they are a half, one, or 1.5 arc seconds. Boomerang and WMAP took a picture of the opaque wall and found the separation of the lumps was about 1 arc second, which matches a "flat" universe. Using a computer generated lump-picture in which the lump is less than 1 arc second produces a "Closed" universe. If the lumps are larger than one, they get an "Open" universe. (See Figure 1). As Krauss puts it: "the universe is flat, it has zero total energy, and it could have come from nothing."

[80] http://www.youtube.com/watch?v=7ImvlS8PLIo

counterbalance gravity. Yet another problem was the time needed for the formation of stars and galaxies. Under present calculations it appeared that the age of the universe was younger than the age of its oldest stars! NASA describes the dilemma and the proposed solution:

> Many cosmologists advocate reviving [Einstein's] cosmological constant term on theoretical grounds, as a way to explain the rate of expansion of the universe.…The main attraction of the cosmological constant term is that it significantly improves the agreement between theory and observation.…For example, if the cosmological constant today comprises most of the energy density of the universe, then the extrapolated age of the universe is much larger than it would be without such a term, which helps avoid the dilemma that the extrapolated age of the universe is younger than some of the oldest stare we observe![81]

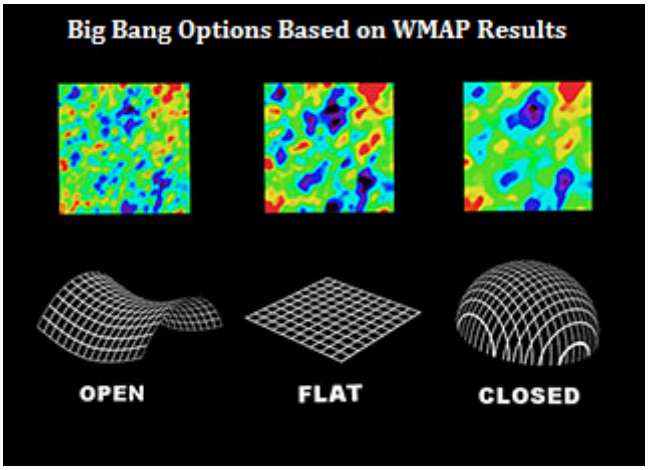

Figure 1: Moderate distribution of CMB (as opposed to confined or sparse) is said to produce a "flat" universe

[81] "Dark Energy: A Cosmological Constant?" http://map.gsfc.nasa.gov/universe /uni_matter.html

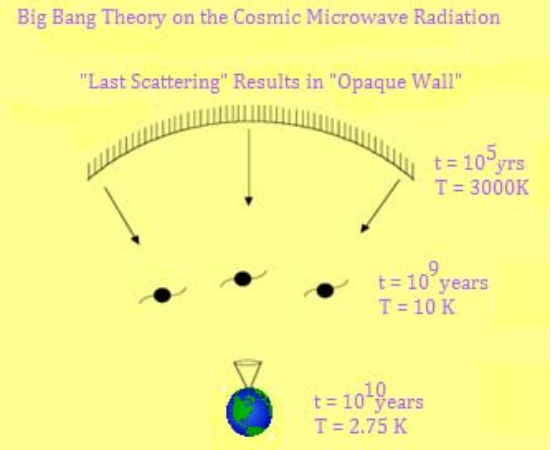

Figure 2: Light is said to reflect off of the "Opaque Wall"

So what is a Big Bang cosmologist to do? If he has no energy source for the accelerating universe and is missing more than two-thirds of the needed "critical density" for a flat universe, then he would have to abandon the Big Bang theory and perhaps start reading Genesis 1 with a little more open-mindedness. But he will have none of that. So he does the same thing with this problem that he did with the spiral galaxies that were spinning too erratically to fit Newton's and Einstein's laws of motion – he simply invents the energy he needs. This time it is called Dark Energy, but he can't see, hear, feel, taste or smell it. How much does he need? According to the equations, about 73% of the universe must be composed of Dark Energy to make the Big Bang conform to 1*a* supernovae requirements. This invention then allows the universe to be 13.7 billion years old (so that it is older than the stars) and give enough energy to reach the needed "critical density."

The proponents of this convenient manipulation of data seem oblivious to their ploys. But George Ellis is not ashamed to admit that the whole thing is based on wishing or presuming that the Copernican Principle is true:

> Additionally, we must take seriously the idea that the acceleration apparently indicated by supernova data could be due to large scale inhomogeneity with no dark energy. Observational tests of the latter

> possibility are as important as pursuing the dark energy (exotic physics) option in a homogeneous universe. Theoretical prejudices as to the universe's geometry, and our place in it, must bow to such observational tests. Precisely because of the foundational nature of the Copernican Principle for standard cosmology, we need to fully check this foundation. And one must emphasize here that standard CMB anisotropy studies do not prove the Copernican principle: they assume it at the start.…The further issue that arises is that while some form of averaging process is in principle what one should do to arrive at the large scale geometry of the universe on the basis of observations, in practice what is normally done is the inverse. One assumes a priori a FLRW model as a background model, and then uses some form of observationally-based fitting process to determine its basic parameters.[82]

Michio Kaku is a perfect example of cosmology not heeding Ellis' warning:

> No one at the present time has any understanding of where this 'energy of nothing' comes from.…If we take the latest theory of subatomic particles and try to compute the value of this dark energy, we find a number that is off by 10^{120}.[83]

As Kaku's admits that modern theory is "off by 10^{120}" he is referring to the discovery by Russian physicist Yakov Zel'dovich, and later established in quantum electrodynamics (QED) or quantum field theory (QFT), that empty space has an energy of 10^{120} more than the Dark Energy needed to propel the proposed "accelerating expansion of the universe."[84] The 10^{120} excess energy is the only source available but it cannot be cut up into slices. It is all or nothing.

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[82] "Inhomogeneity effects in Cosmology," George F. R. Ellis, March 14, 2011, University of Cape Town, pp. 19, 5; http://arxiv.org/pdf/1103.2335.pdf).

[83] *Parallel Worlds*, p. 12.

[84] The actual number is 1.38×10^{123}. But this is only after any energy greater than the Planck scale is excluded. According to Sean Carroll at California Technical Institute: "You can add up all the effects of these virtual particles….and you get infinity….So we cut things off by saying we will exclude contributions of virtual particles whose energy is larger than the Planck scale…which we have no right to think we understand what's going on…Then you get a finite answer for the vacuum, and answer that is bigger than what you observer by a factor of 10 to the 120^{th} power." (https://www.youtube.com/watch?v= SwyTaSt0XxE &feature =watch-vrec). This is one of the reasons Carroll runs the website titled: "The Preposterous Universe" at http://preposterousuniverse.com.

This is precisely why Big Bang advocates invented "Dark Energy" – a hoped for source of energy that is more than the miniscule energy created by baryonic matter but less than the 10^{120} excess energy given by quantum theory.

Here is an even bigger problem. Since Big Bang cosmologists believe space contains 10^{120} more energy than what we have detected; and since Einstein's General Theory of Relativity requires that all forms of energy (even the 10^{120}) function as a source of gravity; and since Einstein's equations require that the "curvature" of the universe depends on its energy content, then, since the energy content is 10^{120} more than what Einstein proposed, the whole universe should presently be curled up into a space smaller than the dot on this i. Obviously it isn't. As we can see, the Big Bang universe simply does not work under present empirical evidence.

Noted physicist Paul Steinhardt of Princeton has gone on record against the present Big Bang theory. He opts for what can best be called the Big Brane theory. In a recent lecture, Steinhardt says the following of the Big Bang:

> So, the first point I want to make about the Big Bang model is that the Big Bang model of 2011…that model I just described, definitely fails….We have to fix the Big Bang model, we have to add things to it to make it work.[85]

[85] http://www.youtube.com/watch?v=IcxptIJS7kQ.