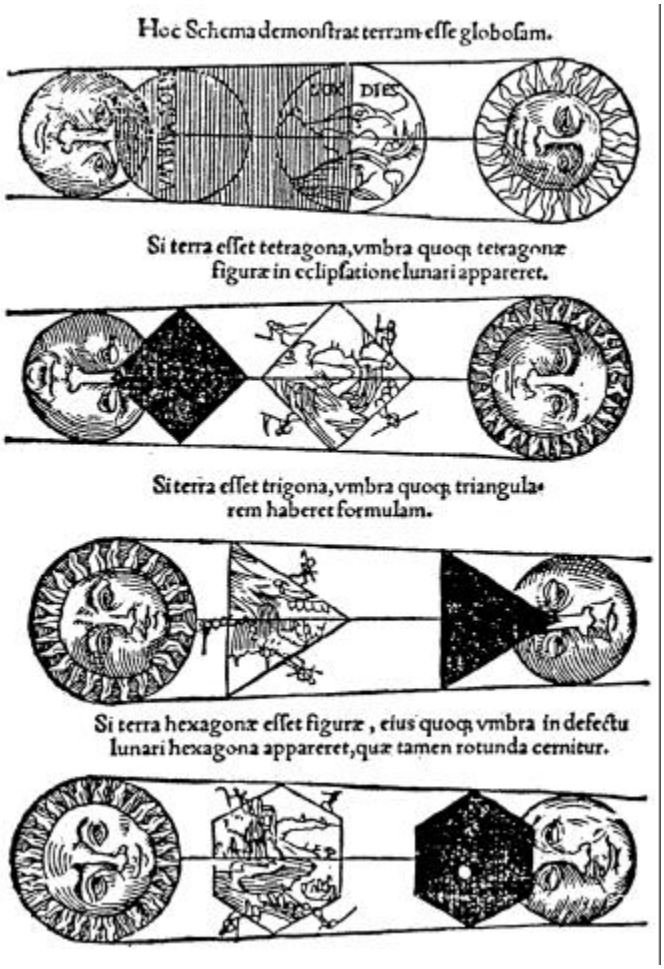
VOLUME 12 NUMBER 99

THE

BIBLICAL ASTRONOMER

Winter 2002



(Publications list continued from the back cover.)

The Earth: Our Home by Philip Stott. The wise men, philosophers, and scientists of the world have repeatedly changed their minds about such things as space and our position in it. This book provides and historical look at the topic of geocentricity and offers evidence for it. 32 pp. $3.50

Vital Questions by Philip Stott. Tackles just how flimsy the evidence is for such well-established ideas as the Big Bang, Relativity, and evolution. 124 pp. $13

Evidence for the Flood by Philip Stott. VHS video $20
Problems in Astronomy by Philip Stott. VHS video $20
Where in the Universe Are We? by Philip Stott. VHS video $20
Any three videos for $50

Geocentricity: the Scriptural Cosmology narrated by Dr. Bouw explains the seasons, retrograde motion and other phenomena using the Norwalt Tychonic Orrery. (See editorial) $20

Subscriptions to the *Biblical Astronomer* are $15 per year ($20 outside the USA). Membership is $20 per year, ($25 outside the USA) and members are allowed a 15% discount on all materials published by the Biblical Astronomer. Offerings to make possible additional publishing and research projects are gratefully accepted. Foreign orders please send either cash or cheques drawn on a United States bank. Credit cards accepted, though payment can only be made on the Internet through PayPal using the E-mail address below.

Editor: Gerardus D. Bouw, Ph.D.
4527 Wetzel Avenue
Cleveland, Ohio 44109
U.S.A.

E-mail address: gbouw@bw.edu
http://www.geocentricity.com
FAX: (440) 826-6973, please mark it *attn: Dr. Bouw*

Cover: Proof from lunar eclipses that the earth is a sphere. Recorde, in his *Castle of Knowledge* shows how different shapes for the earth would cast differently-shaped shadows on the moon during an eclipse of the moon.

THE
BIBLICAL ASTRONOMER

Volume 12, Number 99
WINTER 2002

TABLE OF CONTENTS

EDITORIAL

Erratum

In the previous issue on page 128, fourth line down, 1985 should be 1983. This error was saved in copying from the original quote in which it appears. The same mistake occurs in footnote 4, end of the first paragraph where the date Sept. 15, 1985 should be corrected to Sept. 1, 1983. The article that Smith was referencing was published the 15th. Furthermore, the flight number was not 800, an obvious confusion with the flight shot down by a missile (more than 600 eyewitnesses of whom over 200 signed affidavits) off the coast of Long Island, New York. The correct flight number of the Korean airliner was 007.

When I uncovered the above errors, I did a little checking and found that most likely, the airliner landed in Soviet territory at Sakhalin Island, after being hit by the missile. U.S. Representative Larry McDonald (D-GA) was on board the flight. A member of the John Birch Society and rising star among American conservatives, it would have been in the best interest of both American parties to have him silenced. His office received several phone calls from Korean Air Lines and the Federal Aviation Association that the plane had landed safely at Sakhalin Island. The reference to the ER-135 electronic warfare planes appears to be correct as reported in the previous issue.

Video tape news

The Astronomer has acquired the ability to provide video tapes in the world's most common formats. No longer will tapes be only available in American NTSC television format. We can now offer VHS tapes in PAL (European) and SECAM (Far Eastern) formats.

Also, we forgot to mention that the new tape, "Geocentricity: the Scriptural Cosmology" is a prototype video that we hope to remake within the next year or two. At that time, purchasers of the current video will be able to buy the new release for little more than shipping. The money raised from sales of the present video will go toward production of a new version. What we are presently interested in are comments and suggestions from purchasers of the present tape.

Internet news

For some years now the Biblical Astronomer has been on the Internet, specifically the World Wide Web, at the URL http://www.biblicalastronomer.org. Over the eight months, our hosting service has become less responsive to out needs. We asked that the domain be transferred to a new host but all such requests have been ignored. Finally, we

cancelled our account with Stratos, but they are not responsible for hosting but rent the service themselves. As a result, the site is still up.

About a month ago, in early December, the web host was hacked and the biblicalastronomer.org disappeared from the Web for a short time. When it came back on line, pages were missing so that not all links worked. Worse, my FTP access to the site was gone. In the meantime, the site was restored from an old backup that the host had, but I still have no FTP access. That means I can make no changes or corrections to the site.

Fortunately, there is a backup plan. About six months ago we obtained the domain name geocentricity.com, which we have for ten years. The biblicalastronomer.org domain name is due to expire in April, and that will force the closure of the web site when it won't be renewed. Once it's shut down, we may buy it again from Network Solutions. So, for World Wide Web access to the Biblical Astronomer, please point your browsers to

http://www.geocentricity.com/

There is one additional feature that will be available on the new web site and that is that we will be able to conduct credit card sales over the web. Currently we are using the services of PayPal, but one need not be a member of PayPal to buy from our site. The geocentricity store will have a shopping cart link to PayPal and any credit card information will go through PayPal's secure server. This was not something we could do with biblicalastronomer.org. To buy there, one had to go to PayPal with the Astronomer's email address.

In the next issue

As a result of the research that went into the Morning Stars article of issue number 97, and a speaking engagement in Amarillo, Texas early November, some work was done in the Gospel in the Stars view of the origin of the constellations. Lord willing, in the next issue we shall start a series, beginning with the constellations associated with the dragon, and reviewing the validity of that theory. The constellations hold some real surprises for the church in the world today.

EARTHQUAKES, SNOWFALLS, AND GEOCENTRICITY

Gerardus D. Bouw, Ph.D.

For as the heavens are higher than the earth, so are my ways higher than your ways, and my thoughts than your thoughts.

— Isaiah 55:9

Introduction

A number of critics of geocentricity, and some others with genuine concern, have raised the question of how sudden changes in the length of the day can come about. Today's heliocentric explanation is that events such as an earthquake, large snowfall, or anything else which may redistribute the mass of the earth, changes the angular velocity (speed of rotation) of the earth. Hence, the uplift of a mountain or even the raising of a shovel-full of earth increase the length of the day and shifts the earth's axis of rotation. Likewise, lowering the mountains would decrease the length of the day. In this article, we examine the connection among changes in the length of day and earth movements from a geocentric perspective.

For those readers mystified by equations, the following can be read without having to understand the equations. The key terms are usually explained in a high school physics course, but they are also explained in every-day terms when first introduced. The explanation is usually in parentheses, if short, or in a footnote if longer.

The physics[1]

The underlying principle of physics that is invoked to explain changes in the length of day based on shifting mass is called the *conservation of angular momentum*.[2] Basically, the angular momentum, $\boldsymbol{L}$, can be stated as the cross-

[1] Hanson, J. N. and G. D. Bouw, 1987. "Earthquakes and Geocentricity," *Bulletin of the Tychonian Society*, no. 42, pp. 16-20, (January).

[2] Momentum is the property that a constantly moving body will stay in constant motion. A car traveling at forty miles per hour will have twice the momentum of one moving at twenty miles per hour, although it has four times the (kinetic) energy. Starting a vehicle or stopping it involves adding to or absorbing energy from the vehicle. Turning a corner at constant speed, involves a change in momentum only, not a change in energy. Angular momentum is the momentum of spinning bodies and the conservation of angular momentum says that the momentum will stay the

product of an object's moment of inertia,[3] $\boldsymbol{I}$, and its angular velocity, $\boldsymbol{\omega}$ (its rotational speed in, say, degrees per second).[4] I.e.:

$$\boldsymbol{L} = \boldsymbol{I} \times \boldsymbol{\omega}.$$

For a coordinate system fixed on the center of mass of a body,[5] the moment of inertia, $\boldsymbol{I}$, is a property measuring the resistance to changes in rotation and which depends on the object's density distribution, $\mathrm{D}(\boldsymbol{r})$, (where $\boldsymbol{r}$ is the distance from the center of mass) and a characteristic area (r^2) over the volume V of the body, i.e.:

$$\boldsymbol{I} = \int \mathrm{D}(\boldsymbol{r})\, r^2 \, \mathrm{d}V$$

Conservation of angular momentum simply means that if the moment of inertia is changed (e.g., by a redistribution of matter,) that then the angular velocity, $\boldsymbol{\omega}$, must also change so as to keep the angular momentum, $\boldsymbol{L}$, constant. We see this principle in examples around us every day. For instance, a figure skater starts to twirl. As she pulls her arms and legs in closer to her body, she spins faster and faster. Upon moving them out again her angular velocity decreases and she is seen to rotate more slowly.

Now those who ask the question of how geocentricity deals with such an effect may have oversimplified the matter. We could turn the question around and ask the same of the heliocentrist. The usual first attempt at an *heliocentric* explanation would go as follows.

Let $\boldsymbol{I}_0$ be the moment of inertia of the body (we shall use the earth as an example) without the "movable" mass such as a mountain or a shovel full of dirt. Our "movable" object has a mass, m, and is rigidly lifted (i.e., not thrown) up a distance, h. Furthermore, let ω_0 be the original angular velocity of the earth and ω be the new angular velocity after the mass has been hoisted above the earth. Let R be the radius of the earth; then the conservation of momentum dictates that:

---

same unless an outside force adds or removes spin energy (for instance, your hand slapping a spinning globe to make it spin faster).

[3] The moment of inertia of a body is a measure of its resistance to changes in its rotation rate.

[4] Bold variable names denote vectors; regular italic variable names denote magnitudes. A vector has both a magnitude (value) and an associated direction. For example, with a tug of war, one pulls with a certain strength (magnitude) in a specific direction.

[5] The center of mass of a body is the point (usually inside a body) where, if you tied a rope there, the body would balance no matter which way it was hung, whether left side up, front side up, upside down, etc.

$$(I_0 + m(h + R)^2)\,\omega = (I_0 + m(0 + R)^2)\,\omega_0 \qquad (1)$$

so that

$$\omega = \omega_0[(I_0 + mR^2)/(I_0 + m(h + R)^2)]. \qquad (2)$$

Now we must also consider the conservation of energy. That is, the amount of energy in the two cases must remain the same. Since the kinetic energy (energy of motion), T relates to the angular momentum, L, as:

$$T = \boldsymbol{\omega} \bullet \boldsymbol{L}/2 = \tfrac{1}{2}\boldsymbol{\omega} \bullet (\boldsymbol{I} \times \boldsymbol{\omega})$$

(where $\boldsymbol{L}$ is the angular momentum) or

$$T = \tfrac{1}{2} I\,\omega^2.$$

Then, from (1) above,

$$\tfrac{1}{2}\,(I_0 + m(h + R)^2)\omega^2 = \tfrac{1}{2}\,(I_0 + m(0 + R)^2)\,\omega_0^2$$

which means that:

$$\omega^2 = \omega_0^2\,[(I_0 + mR^2) / (I_0 + m(h + R)^2)]. \qquad (3)$$

Dividing the energy conservation case (3) by the momentum conservation case (2) yields:

$$\omega = \omega_0. \qquad (4)$$

This equation means that for *both* the laws of conservation of angular momentum *and* of conservation of energy to hold, the distribution of mass can have no effect on the angular velocity (the rate of spin). In other words, when our skater pulls in her arms, her spin rate should stay constant; she shouldn't speed up! If her rotational speed does increase–and it most certainly *does*–then one of the two laws is violated. In math and physics, such a result typically means that $\omega=\omega_0=0$ if the other changes such as the uplift are real.

One is tempted to say, "See, the earth does not rotate, its angular velocity is zero," but that is not necessarily what is indicated by this result. Remember

the skater's angular velocity *does* change. What it does show is that, in the heliocentric frame, not all is as simple as is commonly assumed. The questioner is mistaken who thinks that changes in the earth's angular velocity in response to earthquakes and such prove heliocentrism or acentrism. He assumes these are readily accounted for by the conservation of angular momentum, and so concludes that only the heliocentric view leads to a simple solution (or to any solution at all). Evidently, none of those who pose the problem to geocentrists has ever attempted a solution in either model, let alone both models, so their challenge holds no weight.

Actually, the question stems from two factors. The first is a grossly over-simplified view of geocentricity, and the second is an equally grossly inflated view of heliocentrism. The latter is evidenced because of the mistaken belief that heliocentrism is the only geometry (and that is all it is, geometry) capable of modeling "reality." In this case, one of the two conservation laws is violated. It has to be the law of conservation of angular momentum since it is violated in certain particle interactions, too. The former error, the oversimplified view of geocentricity, is reflected in the questioner assumption that Biblical geocentricity requires an absolutely immobile earth. We'll deal with these in turn.

On ignoring the presence of the universe

The problem with the modern heliocentric physics is that in most of its derivations, it assumes that the effect of the universe cancels out equally in all directions. When applied to forces, for example, this leads to inertial terms like the "fictitious" forces (such as centrifugal and Coriolis effects), and force terms[6] each with separate, *independent* derivations (such as Newton's $\boldsymbol{F}=m\boldsymbol{a}$ and the Euler force term[7]). To remove a lot of confusion about the derivations and nature of such terms, one needs to consider the effects induced by the presence of the universe. In other words, one must consider an alternate geometry.

Of all the various geometries dealing with the earth as the center of a rotating universe, the best and most comprehensive so far was published in a 1977 paper by Barbour and Bertotti.[8] The authors assume that the universe can be characterized by a particular energy equation called a *Lagrangian* (a

[6] A term is a part of an equation separated from another part by either a plus sign or a minus sign. E.g., t_1, t_2, and $2t_3^2$ are terms in the following equation: $S=t_1 + t_2 - 2t_3^2$.

[7] The force that explains how the torque (twisting force) on the wheel can make a vehicle go in a straight line.

[8] Barbour, J. B. and B. Bertotti, 1977. "Gravity and Inertia in a Machian Framework," *Il Nuovo Cimento*, **38**(1):1-27.

simplifying assumption, taking advantage of the conservation of energy law; widely used in mechanics) and that the Lagrangian, L, is of the form:

$$L = T - \Lambda(\boldsymbol{r}, \boldsymbol{v}),$$

where $\Lambda(\boldsymbol{r},\boldsymbol{v})$ is the potential energy term – the sum of the contributions by all the particles in the universe to the potential energy of a body.[9] T is the kinetic energy, $\boldsymbol{r}$ is the distance between contributing body and our test body, and $\boldsymbol{v}$ is their relative velocity. Solving the Lagrangian yields the usual ("heliocentric") force law, including the so-called inertial terms. That is,

$$\boldsymbol{F} = m\boldsymbol{a} + \text{"inertial terms"}$$

where $\boldsymbol{a}$ is acceleration. More completely,

$$\boldsymbol{F} = m\boldsymbol{a} \; - \; m\boldsymbol{\omega} \times (\boldsymbol{\omega} \times \boldsymbol{r}) \; - \; 2m\boldsymbol{\omega} \times \boldsymbol{v} \; + \; m\boldsymbol{r} \times \mathrm{d}\boldsymbol{\omega}/\mathrm{d}t. \qquad (5)$$

The first term is Newton's definition of a force, the second is the centrifugal, the third is the Coriolis, and the fourth is the Euler force (due to changes in rotation speed). The point is that Barbour and Bertotti derived these terms from what could be interpreted as a geocentric perspective (a.k.a. Machian[10]). Hence, the heliocentric or acentric geometry is not necessary, and is certainly not unique, in being able to "solve" the equations of motion for the sun, moons, planets and stars. Indeed, in the geocentric derivation, the centrifugal and Coriolis terms are not fictitious but are real, gravitational forces, imposed by the total of the gravitational fields of all the other objects in the universe.

What we showed in this section is that by disregarding the universe, heliocentrism is forced to separately derive each term of equation (5) while the terms all have the same source (gravity) in the geocentric (Machian) derivation.

Overestimating the acentrism of modern physics

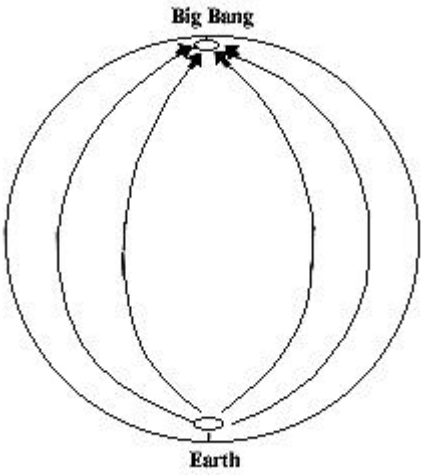
Now it may be argued that the angular velocity $\boldsymbol{\omega}$ in equation (5) is a constant of integration and may thus have an arbitrary value. This is what gives

[9] Potential energy is energy a body has which can be converted to work. Thus, a mug on a table has potential energy relative to the floor. Shove the mug off the table and that energy is imparted to the mug and dissipated to the floor as heat, and the air as sound, when the mug hits the floor. Some of the energy will also be absorbed by the mug as heat and shock (sound), the latter possibly shattering the mug.

[10] For our foreign readers, a.k.a. stands for "also known as."

the modern acentric view its clout, for one could just as well take Mars as the center of the universe, or the Pole Star, or any atom in space, for that matter. However, this view is indistinguishable from assuming that the universe is infinite, when it is not. One definition of an infinite universe is that it is a space whose boundary is nowhere and whose center is everywhere. Now this is exactly the property that modern science claims for its acentric universe. Cosmologists claim that the universe is unbounded and that every point behaves as if it is at the center of the universe. This is the very *definition* of today's "acentric" physics, which was founded on heliocentrism. Acentric physics is what happens when the heliocentric physics of Copernicus, Galileo, and Kepler meets the "totally unacceptable" geocentric reality of Airy's failure, the Michelson-Morley experiment, and the Sagnac experiment. So, though all evidence shows the universe is finite, modern physics makes it look like it is infinite to avoid the geocentric conclusion.

Insofar as post-nineteenth century physics is concerned, then, every point in the universe looks like it is at the very center of the universe. When astronomers see a distant object, they think of it in terms of being far away in time as well as distance. The edge of space is the end of every line of sight and that theoretically is the "zero event," the Big Bang. You'll note that whatever direction we look in, the line of sight purports to end at a single *point* in the "history" of the universe.



Thus, Ellis has postulated that the earth is located at the "anticenter" of the universe, at the point farthest away from the point of origin of the Big Bang.[11] Ellis's view, pictured at left, is that the Big Bang, the "center" of the universe is located at one pole of a four-dimensional sphere whereas the earth is located at the opposite pole. The lines in the figure at left are the lines of sight mentioned in the previous paragraph. Unless hitting an object such as a star the line of sight ends at the point from which the Big Bang supposedly originated.

[11] Ellis, G. F. R., 1979. "The Homogeneity of the Universe." The paper was an essay entered in a contest sponsored by the Gravity Research Foundation and won first prize.

The universe is observationally[12] as well as Scripturally finite.[13] If the universe is finite, then by all appearances it is geocentric. To deny the appearances and to deny the earth its position, every place in the universe must be made to look like the center, that is, to insist that the universe is infinite, or, as in Ellis's case, two opposite points of the universe look central and each have special properties, the "center" having the property of "origin" and the anticenter having the property of "life." For most "cosmologists," however, the "out" is the obfuscating claim that the Big Bang is not an explosion *into space* but an explosion *of space* itself. That seems one way out of the paradox.

Yet that is not a way out of the paradox. The Big Bang allegedly started from a volume of 10^{-40} cubic centimeters[14] of the firmament (variously called by physicists "Planck space," "the vacuum state," and several other terms), a volume about 3.14×10^{-13} cm in diameter. The problem of getting such a huge (no, I'm not being facetious) volume of the firmament to explode in unison is extreme. Each particle of the firmament is 1.62×10^{-33} cm in size, and these are packed solidly.[15] The gravitational attraction or tension between each pair is 1.3×10^{49} dynes which is roughly 10^{46} times the earth's gravitational pull, an unimaginably immense force. Each particle itself is like a tiny little black hole. Somehow, a spherical group of 10^{59} of these little black-hole type particles, packed together with a density of 4.22×10^{93}, spontaneously dissociated themselves from the bonds of the surrounding firmament to become white holes. The 3.14×10^{-13} cm in diameter hole they came from is filled in within 2×10^{-23} seconds, possibly much, much less, at which time the size of the universe has only increased by half the initial size of the breakaway radius.[16] By some stupendous miracle, the implosion of the firmament does not reabsorb the expanding universe and suck it out of existence. Thus the space into which the universe expands is not space itself, but is the space of the firmament, which firmament will dictate the laws of physics to the universe throughout its history. Or consider it this way. The figure on page 10 shows three-dimensional space as a surface in four-dimensional space. The reader will note that any such closed surface will have an inside and an outside. So the claim that the Big Bang is not an explosion into space but an explosion of space itself is seen to be a fabulous myth.

---

[12] Bouw, G. D., 1991. "Olbers' Paradox: Why is the Night Sky Dark?" *Biblical Astronomer*, **1**(56):11.

[13] Isaiah 13:5; Matthew 24:31; etc.

[14] There are 2.54 centimeters to the inch and 16.4 cubic centimeters in a cubic inch, so this becomes 10^{-41} cubic inch. For the former, one could just as well read "inches" for "centimeters."

[15] I.e., having a volume of 10^{-99} cm^3 or 10^{-100} cubic inch.

[16] See appendix for a technical derivation.

Underestimating geocentricity

We now consider the question asked by those who have too simplistic a view of geocentricity, namely, how can earthquakes change the length of the day in geocentricity?

Let it first be noted that the Bible does allow the earth some motions. Earthquakes are allowed, for instance. Motions in earth's foundations are allowed. The earth will pass away at its end, and motions pertaining to that event are quite explicit as reported in Isaiah 24:18-20.[17] Psalm 104:5 is conditional when it states that God is he:

> Who laid the foundations of the earth that it *should* not be removed for ever (emphasis added).

There are only two motions that are not allowed the earth in Scripture. The first of these is rotation with a period of one day (Joshua 10:13, Ecclesiastes 1:5, etc.) The second is revolution with a period of one year. This latter is rather more subtle in the Bible. In part, it rests on whether or not the sun is to rule the night in addition to the day by having the night in orbit (as the shadow of the earth) about it. If the night orbits the sun, then Genesis 1:16 is contradicted.[18] Job 26:7[19] is another proof text for a non-orbiting earth. There are also indirect references such as Psalm 19:1-6, etc. But Biblical geocentricity does not require an absolutely immobile earth. The earth may well be gravitationally pushed or pulled or shaken by the sun, moon, planets and universe, much as in the heliocentric model. It may even react to torques imposed on it by the cosmos very slowly and so experience changes in rotation relative to the starry firmament; but it cannot, Scripturally, have a rotation period of 24 hours or a revolutionary period of one year. The factors involved in the lengthening of the day, leading to the occasional "leap second" inserted between years, amounts to

---

[17] Isaiah 24:18-20 – [18] And it shall come to pass, *that* he who fleeth from the noise of the fear shall fall into the pit; and he that cometh up out of the midst of the pit shall be taken in the snare: for the windows from on high are open, and the foundations of the earth do shake. [19] The earth is utterly broken down, the earth is clean dissolved, the earth is moved exceedingly. [20] The earth shall reel to and fro like a drunkard, and shall be removed like a cottage; and the transgression thereof shall be heavy upon it; and it shall fall, and not rise again.

[18] Bouw, G., 1992. *Geocentricity*, (Cleveland, Ohio: Association for Biblical Astronomy), pp. 134-136. See back cover of this issue for availability.

[19] Job 26:7 "He stretcheth out the north over the empty place, *and* hangeth the earth upon nothing." Some maintain that the final clause of this verse refers to *gravity*, but then gravity would be "nothing." This verse can only be true if the earth is at the dynamic center of the universe.

roughly one rotation in 100,000 years. That is not a whole lot given the age of the earth is 6,000 years.

So it is that earthquakes could cause the drag which the rotating universe has on the surface of the earth to be slightly asymmetric and so induce a slow spin on the earth, or even accelerate or slow the spin rate. Such asymmetry could be exacerbated by uplifts and landfalls, or even snowfall. These phenomena would convert comparatively slight amounts of the universe's potential energy into kinetic energy of the earth via the conservation of energy law, a law that is at least as valid in geocentricity as in heliocentrism.

All that is not to say that the earth *must* exhibit such second-order motions. In fact, Job 26:7 might dictate the contrary. Scientifically speaking, the universe itself will fight any attempt to change the position or even the rotation rate (which geocentrically is zero).[20] This point, combined with the Barbour and Bertotti geocentric model mentioned earlier, means that the universe itself could be exhibiting the changes in period and in position about the earth.

The role of the firmament

The Barbour and Bertotti approach will work as long as the earth is precisely at the dynamic center of the universe. Why it works is not directly obvious to most scientists. The main objection is based on the speed of gravity. It is generally assumed that gravity travels at the speed of light, but this has yet to be demonstrated. Indeed, observations suggest that the speed of gravity is a great many times the speed of light. The concept of the firmament helps in that understanding.

The creation of the firmament is recounted in Genesis 1:6-8. Apparently, it is derived from the light that God created on the first day (see some of the properties derived in the appendix). The name aptly describes the medium, which is detected at the frontiers of quantum mechanics and particle physics.[21] That firmament has a "natural" frequency of about 1.87×10^{43} Hz (cycles per second), yielding a characteristic time of 5.39×10^{-44} second. Consequently, one could envision the following scenario: Say that God wishes to cause an

[20] Misner, Wheeler & Thorne, 1973. *Gravitation*, pp. 1119-1120.

[21] Prof. Robert A. Herrmann of the Mathematics Department at the U.S. Naval Academy says of the firmament: "Relative to the methods of theoretical cosmology, quantum logic and the concept of *indirect* verification, a "vacuum" as represented by a "dense" field of ultimate sub-particles exists in physical reality due to its predictions of natural-system behavior. Further, such a field is as "firm" as anything that can ever be measured by any natural means since it is not affected by any natural process. The field can only be influenced by pure ultra-natural processes." (Quoted from *The Biblical Astronomer*, **6**(77):8, 1997.)

earthquake in San Francisco. All that he would have to do is to distress the firmament in just the right spot (flaw?). The resulting change in the angular velocity of the firmament would propagate to the earth in about 10^{-44} second and the earthquake would commence. As the firmament would "resonate" with the "tap," it would take time for the material superimposed on the firmament to come into equilibrium. That time is characteristic of the scale and density of the material. In fact, that time would be characterized by the speed of compressional, also called longitudinal, "sound" waves through the firmament (see appendix). Though theoretically possible, this explanation is left wanting.

The advanced potential

A second possibility is a variant of the first and one that is more realistic. With it, the changes in the length of day are caused by an *advanced potential*. The advanced potential model of geocentricity was first introduced back in 1898 by the German physicist Paul Gerber.[22] In an advanced potential, the issue is one of causality. Is it the strain and stress in the rocks of the earth that cause an earthquake (heliocentric view), or is it that the strains and stresses are imposed by the universe (geocentric view)? Such a view is consistent with the curse imposed on the ground in Genesis 3:17,[23] but is not required by Scripture.

Part and parcel of causality is the issue of *first cause* – that is, what is the true cause of the earthquakes? It should be remembered, that wave equations (equation of state or Schröedinger equation) for these kinds of problems–and earthquakes do involve waves–have no solution unless a wave comes in from "infinity" before the event (such as a quake) and then radiates from the source after "focussing" or undergoing a state transformation at the source or event. This mumbo jumbo is best illustrated by a radio wave emanating from an antenna. The usual equation of state of a radio wave of amplitude (strength or loudness) A and frequency ω in time t is,

$$A(t) \sin \omega t, \qquad t \geq 0.$$

But that is only half of the solution to the problem. It starts at an arbitrary time marked as $t = 0$. The real solution is

---

[22] Gerber, P., 1898. *Zeitschrift für mathematik physik*, **43**:93. An English translation of the paper was done by the Tychonian Society and appears in *The Geocentric Papers* p. 61. (See back cover of this issue for ordering information.)

[23] And unto Adam he said, Because thou hast hearkened unto the voice of thy wife, and hast eaten of the tree, of which I commanded thee, saying, Thou shalt not eat of it: cursed *is* the ground for thy sake; in sorrow shalt thou eat *of* it all the days of thy life.

$$A(t) \sin \omega t, \quad -\infty \leq t \leq +\infty$$

which is demanded by the constraints placed on such equations of state by boundary conditions and continuity. The real solution says that a wave comes in from infinity, hits the antenna at time $t = 0$ and then radiates outward for $t > 0$. In other words: is the action of transmitting the radio wave done by forces originating in the antenna, or is it done by a wave arriving from outer space and coinciding with the radio signal-generating forces on earth? The latter gives a continuous solution (one with no sudden starts and stops) while the former has a definite, sudden beginning.

So far we have seen that the heliocentric solution to the question of why the length of the day seems to change with earthquakes, snowfall, etc. is not as simple as its proponents might wish it to be. The geocentric solution can take at least two forms: the first was exemplified in the two cases above that attribute the cause of the earthquake or heavy snowfall to forces arriving from outside or, at least from the boundary, of the universe. The second alternative is that the generalized force equation, when derived from a geocentric perspective, exhibits the usual Newtonian force definition, including the so-called inertial terms – the Eulerian, Coriolis, and centrifugal. The former is incorporated in Gerber's paper while the latter is considered in the paper by Barbour and Bertotti. We now consider the strangest view of all, that of the ultra light universe.

The ultra light universe

In the seminal paper on the firmament,[24] it was noted that quantum behavior appeared to dominate on the small scale of the universe, such as at atomic and nuclear scales, and again when considering the universe as a whole. It was noted that at atomic scales the more massive a particle, the smaller it is. In our everyday world, and even insofar as stars and galaxies are concerned, the more massive the object, the bigger it is. Thus, on the atomic scale, an electron with a mass of only 9.1×10^{-28} gm has a size of roughly 10^{-9} cm while a proton with a mass of 1.7×10^{-24} gm, some 1800 times more massive than the electron, has a size of 10^{-13} cm, some 10,000 times smaller than the electron.

If the quantum law holds for the universe as a whole, we can imagine the universe to be a standing wave of wavelength (diameter) $l = 4\times10^{28}$ cm (36 billion light years). Using Compton's formula

[24] Bouw, G.D., 1987. *Bulletin of the Tychonian Society*, no. 43, p. 11.

$$l = h/(mc)$$

where l is the wavelength, h is Planck's constant, m is the effective mass of the particle, and c is the speed of light, we derive the effective mass of the universe as 5.5×10^{-66} gm., much, much lighter than any known particle, photon or neutrino. That mass is only perceived at the edge of the universe. Any place else, even at the dynamic center which is, of course, the position of the earth, perceived the mass of the universe to be 5.68×10^{56} gm.

If any earthquake, or flood, or snowfall tries to change the rotational rate of the cosmos about the earth, the impulse to twist the earth will be communicated almost instantly through the firmament. Although well inside the universe, the fundamental particles that constitute it are only marginally aware at best of the existence of the firmament, at the edge of the firmament, its presence is felt by the matter making up the universe. This presence causes interference or friction in particles moving through the firmament. So when the impulse reaches the edge of the universe, it is the ultra-light universe to which it is imparted instead of the earth. Since it is a reflection, the universe picks up the new rotation rate *in the opposite direction* of the impulse originating from the earth. Thus, if a shift in the crust of the earth were to try to make the earth rotate faster to the west, that is slowing the day, the universe instead receives the new rotation rate in an easterly direction, again slowing the day. So the twist is communicated to the ultra-light universe instead of the earth. In essence, the twist is imparted to the ultra-light universe by virtue of the instant communication through the firmament of the gravitational impulse.

In support of this radical view, we submit the work of Dr. Thomas van Flandern[25] who has dramatically demonstrated that the speed of gravity must be *at least* twenty billion times the speed of light. The universe reacts at the speed of gravity, the signal that it has already happened travels only at the speed of light.

Conclusion

Those who doubt that geocentricity can explain the apparent change in the length of a day due to tidal friction by the moon, heavy snows, earthquakes and the like, have too high a view of heliocentrism and too low a view of geocentricity. It was shown in this article that the heliocentric solution violates the conservation of momentum law.

---

[25] Panorama, 2000. "The speed of gravity," *Biblical Astronomer*, **10**(94):39.

Three models are presented that could account for the change in rotation rate from a geocentric perspective. The change in the length of the day and direction of the poles could be a sudden actual change in the rotation rate of the universe which is communicated as an impact such as an earthquake to the crust of the earth. The fault in the universe could build up, stressing the rock, until released, causing the earthquake. The advanced potential model is such a model. In that case, non-stress events such as heavy snowfall or water amassing behind a dam actually does cause the earth to twist or turn, but such rates are very slow compared to a day.

An alternative model is based on the firmament which sees the universe as an ultra-light particle and transfers the new angular velocity to the universe through its gravitational field. This model can account for changes in the length of a day resulting from earthquakes as well as snowfalls, floods, etc. In any case, it is an error for anyone to think that such changes in the length of a day can only be accounted for by the heliocentric model.

Appendix

We report here on recent work in determining the properties of the firmament. This work has to do with the characteristic speeds through the firmament. The speed of "sound," that is, a disturbance through the firmament can be determined analogous to that for normal matter. Here we implicitly assume that such analogy is valid, and we argue that it is because the formulae are "ideal," assuming infinite-like properties for the medium.

The first method we looked at was the speed of sound as a function of the tension (T). These are transverse waves, that is, waves like light waves and the waves one can make with a rope. The formula for the speed of the transverse wave, v_t is:

$$v_t = \sqrt{(T/m)}$$

where m is the mass per unit length. For the firmament, the mass is 2.2×10^{-5} gram over a length of 1.6×10^{-33} cm giving $m = 1.89\times10^{56}$ gm/cm. Taking the tension to be the gravitational attraction between neighboring Planck particles, the gravitational force becomes:

$$T = Gm^2 = 1.27\times10^{49}$$

which means that

$$v_t = \sqrt{(T/m)}.$$

Substituting in the values for T and m gives

$$v_t = 3.04\times10^{10} \text{ cm/sec}$$

which is, within error, the speed of light. *We thus find that the transverse-wave speed of a disturbance in the firmament is the observed speed of light.*

Another formula for the "speed of sound" through a medium is that for a gas given the pressure P and the density r. For the speed of sound through air the formula is:

$$v_a = \sqrt{(1.4P/r)}$$

which, using the tension derived above for the pressure and the density of the firmament gives an incredibly slow speed of 1.7×10^{-23} cm/sec. At that speed, it would take more than a year to traverse the original 3.14×10^{-13} cm breakaway volume which allegedly spawned the Big bang.

A third speed can be derived from the temperature of a medium. The firmament has a temperature of 1.42×10^{32} Kelvin.[26] The formula gives the quantum speed v_q is related to Boltzmann's constant, k, and the particle mass, m, and is derived from equating the kinetic energy of a particle to its thermal energy as:

$$v_q = \sqrt{(3kTm^{-1})}.$$

It gives a value for v_q of 5.17×10^{10} cm/sec. This is roughly twice the speed of light and may well be equal to the speed of light given that the coefficient of 3 assumes three degrees of freedom for the particle. If there's only one, then the speed becomes 2.98×10^{10} cm/sec which is the speed of light.

The fourth speed is the most interesting because it measures the speed of a pressure wave (compressional or longitudinal) through the firmament. To derive it we need to be able to measure the compressibility of the universe in the firmament. What is needed is a property called the "bulk modulus" (B_m) of the firmament. The speed (v_b) can then be derived by relating it to the density $\tilde{n}$ by the relationship:

---

[26] At these immense values, one can just as well read Fahrenheit for Kelvin.

$$v_b = \sqrt{(B_m/r)}. \qquad (6)$$

The bulk modulus relates pressure and volume via the expression:

$$B_m = \frac{(P - P_0)\ V_0}{V_0 - V}.$$

Here P and V are the compressed pressure and volume while P_0 and V_0 are the original pressure and volume respectively.

Let us assume that the firmament is uncompressible, but for the moment let's allow that a difference exists between the uncompressed volume we call space and the firmament. Essentially, we look at the problem of compressing the universe to the density of the firmament. In that case, P_0 is zero, there being very little pressure in the vacuum of space, and P is of the order of at least 10^{49}, the pressure between two adjacent grains of the firmament. The initial volume, V_0, is the volume of the universe which is roughly 10^{85} cm^3. The final volume is the volume of the starting ball of firmament constituting the Big Bang, that is, of the order of 10^{-39} cm^3. The starting density we assume to be the critical density of the universe which is of the order of 10^{-29} gm/cm^3. We are now able to arrive at a crude estimate of the rate at which a compression wave, such as sound of gravity, can travel through the heaven we call outer space.

When the numbers are used in equation (6), we find that the speed of compressional waves is roughly 3×10^{39} cm/sec. At that speed, the signal crosses the universe in roughly 10^{-11} sec or one-hundred billionth of a second. The actual speed is likely much higher since the pressure inside the compressed ball is likely to be greater then the pressure between two Planck particles in contact with one another. After all, we did ignore the contributions of the two neighboring particles beyond the ones touching. We can come up with an upper limit by assuming that the maximum pressure is 10^{49} times the number of particles in the primordial fireball, that is, 10^{59}. This gives a speed of roughly 10^{68} cm/sec, crossing the universe in about 10^{-40} second. It may well be that it will take a Planck time (10^{-44} sec) if all the numbers were better known, but that is just a conjecture for now. In an earlier analysis based on stellar structure, a speed of sound through the firmament was estimated to be 10^{107} cm/sec.

Geocentrism and Creation: a reply

Gerardus D. Bouw, Ph.D.

The following is a letter to the editor of Answers in Genesis's publication, *Creation Ex Nihilo Technical Journal*. In August of 2001 the Journal published and article by Danny Faulkner attacking Scriptural geocentricity. The letter is under consideration for publishing once it is shortened to fewer than 2,000 words. A shortened version has been submitted, omitting some of the long quote by Augustus de Morgan and some of the less cogent arguments. Responses have been sent in by other geocentrists and these may also be published here. A full response will be sent to members of the Biblical Astronomer under separate cover when available. The illustrated article will be printed as the *Biblical Astronomer Technical Paper no. 2*, and titled "Heliocentrism: A Fable for Educated Man" (The first technical paper, "The Gravitational Analog of a Rolling Ball on an Elastic Membrane" by Prof. James Hanson was published in 1996.) Non-members may purchase the full paper (currently over 12 pages) for $5 postpaid in North America and $7 elsewhere.

Danny Faulkner's "Geocentrism and Creation" was first published in the *Creation Ex Nihilo Technical Journal* (CENTJ)[1] and was subsequently posted on the Answers in Genesis (AIG) web site.[2] The article purportedly counters my book, *Geocentricity*.[3] Although the article is lengthy, it is shallow and often misrepresents geocentricity, geocentrists, the history of the Copernican Revolution, its evidences, and the authority of Scripture. It fails to deal with any of the hard issues, *viz*. the stance of the Scripture and that of modern science on the matter and the scientific arguments pro and con. Rather than deal with the hard issues, Faulkner prefers to launch into *ad hominem* arguments, lifting quotes out of context, and misrepresenting the modern geocentric case.[4] There

---

[1] Faulkner, D., 2001. "Geocentrism and Creation," Creation *Ex Nihilo Technical Journal*, **15**(2):110-121, p. 110.

[2] http://www.answersingenesis.org/home/area/magazines/tj/docs/tj_v15n2_geocentrism_creation.asp

[3] Bouw, G. D., 1992. *Geocentricity*, (Assoc. for Biblical Astronomy: 4527 Wetzel Ave., Cleveland, OH 44109).

[4] For instance, Faulkner chides Bouw's "use of the word 'nebulae' to describe external galaxies, a term that has been out of favour for decades." His footnote, no. 49 refers to its usage in a quote

are three areas to the geocentric arguments, namely, historical, scriptural, and scientific. All three received a short shrift in Faulkner's article.

Historical Arguments

From the historic position, Faulkner seems ignorant of the true nature of Copernicus's model. It was not centered on the sun but on the center of the earth's orbit, which made it more complicated for earth-based calculations than was the original Ptolemaic model.[5] Insofar as the arguments, both physical and spiritual of Copernicus, Kepler, Brahe, and Galileo are concerned, these are documented in *Geocentricity* so need not be refuted here. By criticizing *geocentrism*, born of the notion of the crystalline spheres and simplified in the Ptolemaic mode, and by dismissing without definition *geocentricity*, Faulkner sets up a straw man, easily demolished. In *Geocentricity*, the same model that Faulkner demolishes is also demolished.

How does geocentrism differ from *geocentricity*? In geocentricity, the earth is static, but not necessarily at the center if the universe. The earth is deemed immobile as seen from outside the universe, that is, as seen from the third heaven, the location of the throne of God. (Note: a footstool is not a footstool if it is moving – Isaiah 66:1.) Geocentric models (listed later) are more comprehensive insofar as they take the gravitational field of the distant stars into consideration at all times. Thus, the so-called fictitious forces, namely the Coriolis and centrifugal come out as real gravitational forces. The standard acentric model isolates them from the gravitational field of the stars, that is, from the inertial field. Thus the model has the characteristics of the geocentric model (suffix "-ity") without requiring the earth to be dead center of the universe, just the dynamic center. Geocentrism, by contrast, divides the universe into separate components (suffix "-ism").

In the book, *heliocentrism* is used instead of *acentrism* because the modern acentric model divides the universe into unrelated parts ("-isms"); but also because it was founded on sun worship.[6] By using the term, I remind the reader of its origin. But historical arguments really don't deal with the key issue,

---

drawn from a 1932 paper by Kennedy and Thorndike. Also, the 1928 OED is the source of Bouw's contention regarding stablish, etc.

[5] For a readily available treatise of the Copernican model's technical details compared with the Ptolemaic, the interested reader is referred to J. L. E. Dryer, 1906. *History of the Planetary Systems from Thales to Kepler*, (Cambridge Univ. Press). Dover reprinted it in 1953 and it is available under the title of *A History of Astronomy from Thales to Kepler*, ISBN 0-486-60079-3.

[6] Fully documented by Bouw in ref. 3, ch. 17 from Copernicus's own words. Also see E. A. Burtt, *The Metaphysical Foundations of Modern Physical Science* (rev. ed.; New York, 1932), esp. pp. 44-49 for Kepler's role.

namely, with respect to what is the earth moving? For me, the only reason I'm a geocentrist is because the Scripture demands it. It is secondary that science happens to support that position.

Scriptural Arguments

It was Augustus de Morgan who 130 years ago summed up the Scriptural argument with these words:

> The question of the earth's motion was the single point in which orthodoxy came into real contact with science. Many students of physics were suspected of magic, many of atheism: but, stupid as the mistake may have been, it was *bona fide* the magic or the atheism, not the physics, which was assailed. In the astronomical case it was the very doctrine, as doctrine, independently of consequences, which was the *corpus delicti*: and this because it contradicted the Bible. And so it did; for the stability of the earth is as clearly assumed from one end of the Old Testament to the other as the solidity of iron. Those who take the Bible to be *totidem verbis* dictated by the God of Truth can refuse to believe it; and they make strange reasons. They undertake, *a priori*, to settle Divine intentions. The Holy Spirit did not *mean* to teach natural philosophy: this they know beforehand; or else they infer it from finding out that the earth does move, and the Bible says it does not. Of course, ignorance apart, every word is truth, or the writer did not mean truth. But this puts the whole book on its trial: for we can never find out what the writer meant, unless we otherwise find out what is true. Those who like may, of course, declare for an inspiration over which they are to be viceroys; but common sense will either accept the verbal meaning or deny verbal inspiration.[7]

Faulkner spends all his efforts on peripheral scriptures, which are admitted to be such in *Geocentricity*. The harder scriptures include Genesis 1, what did the earth orbit the first three days of creation before the sun was created? Should a footstool not be stationary with respect to a throne (Isaiah 61:1)? Does it seem likely that the New Jerusalem descends to an orbiting, rotating planet (Rev. 21:2)? Does it seem reasonable that Jacob's ladder (Gen. 28:12 which is a type of the Lord Jesus Christ as per John 1:51) and Christ's ascension (Luke 24:51–note Acts 1:1-2–and Acts 1:9) would be dizzying through space at 30 km/sec while rotating at some 1300 kilometers per hour?

---

[7] De Morgan, Augustus, 1872. *A Budget of Paradoxes*, 2nd edition edited by D. E. Smith, 1915, (Chicago & London: The Open Court Publishing Co.), **1**:36.

Then there are the hardest scriptures. If Genesis 1:1, "In the beginning God created the heaven and the earth" is a clear statement of creationism, then isn't Ecclesiastes 1:5, "The sun also ariseth, and the sun goeth down, and hasteth to his place where he arose" an equally clear statement of the immobility of the earth? Or what of Joshua 10:13?

> And the sun stood still, and the moon stayed, until the people had avenged themselves upon their enemies. *Is* not this written in the book of Jasher? So the sun stood still in the midst of heaven, and hasted not to go down about a whole day.

It is the sun that is said to stand still. God could have said "And the earth stopped turning so that the sun appeared to stand still," but he didn't. If it was inconvenient for God to tell the truth so that he promoted the commonly accepted story, although he knew it not to be true, how can God say that he is the God of Truth and the Spirit of truth (who inspired the scriptures)? Indeed, isn't God's creative power such that his very speaking "the sun stood still" would instantly have transformed the acentric cosmos unto geocentric? For centuries, Bible scholars have argued that God cannot lie because if he ever did, then the "lie" would immediately come to pass and it would instantly no longer be a lie. This they believe because God spoke the universe into being when it was not. So, to be consistent, shouldn't those that reject the geocentric model also reject the creationist model? Why not?

Or what of Malachi 4:2?

> But unto you that fear my name shall the Sun of righteousness arise with healing in his wings; and ye shall go forth, and grow up as calves of the stall.

Here the Sun, as a type of Jesus (also see Psalm 19:1-6), is said to arise. It is clear that this refers to the resurrection. How, then, can a believer in the resurrection of the Lord Jesus Christ insist that the word "arise" is literal truth when referring to the resurrection here, yet at the same time insist that it is not literally true when applied to the Sun here, in this same verse? And if the heliocentric model is true, then no one before Copernicus could possibly have guessed the "heliocentric truth," and we are left to ponder what else will science may reveal that is currently misunderstood by Bible believers: evolution? Is it any wonder that de Morgan wrote what he did?

Scientific Arguments

Though the authority of Scripture should be paramount, for most it is the authority of science that supersedes Scripture. So it behooves us to look at the scientific arguments.

Faulkner barely touches on the scientific issues although those take up a third of Bouw's *Geocentricity*. Most of those he does touch are rather historic than scientific. For example, to Faulkner the phases of Venus disprove geocentricity once and for all. Apparently, he does not understand the modified Tychonic model.

When it comes to modern science, introductory astronomy texts will present the modern acentric model as a proven fact, just as they do evolution, but a more advanced text will admit that no proof exists and that the geocentric model is just as viable as the Copernican.[8] Indeed, it is dangerous to rely on elementary textbooks of which Kuhn has said that it is in the best interest of science that these should sometimes lie.[9] The evidence for geocentricity is one such case.[8] Science is properly concerned only with relative motion (Leibniz, Berkeley, Mach, Einstein's general relativity) and so geocentricity is not really a scientific matter but is rather philosophical or, as noted above, theological. As P. F. Browne noted in 1977, the heliocentric model can only be proven if one assumes that the universe is "the smallest isolated system."[10] That makes the issue a theological one. It is the third heaven that determines which is the true case, and the third heaven is where the throne of God is located. Hence, the argument is purely theological.

Appendix

For those interested in pursuing the physical arguments, the following papers, which appeared in refereed, respectable physics journals presented a model geocentric in a mathematically tractable way. Several of these models yielded the same equations of motion, i.e. the same inertial system, as the common heliocentric model.

---

[8] *Ibid.*, p. 154. Also, Hoyle, Sir F., 1975. *Astronomy and Cosmology: A Modern Course*, (San Francisco: W. H. Freeman & Co.), p. 416 where he writes: "We know that the difference between a heliocentric theory and a geocentric theory is one of relative motion only, and that such a difference has no physical significance."

[9] "In the case of textbooks, at least, there are even good reasons why…they should be systematically misleading," Kuhn, T.S., 1962. *The Structure of Scientific Revolutions*, 2nd ed., 1970, vol. 2, no. 2 of Foundations of the Unity of Science series, p. 137.

[10] Browne, P. F., 1977. *Jrnl. of Phys. A: Math & Gen.*, **10**:727.

Gerber, Paul, 1898. *Zeitschrift für mathematik physik*, **43**:93.
Thirring, Hans, 1918. *Physikalische Zeitschrift*, **19**:23.
Lense, J., and H. Thirring, 1918. *Ibid*., p. 156.
Møller, C., 1952. *The Theory of Relativity*, (Oxford: Clarendon Press), pp. 318-321.
Birkhoff, G. D., 1944. *Boletin de la Sociedad Mathematica Mexicana*, **1**:1.
Brown, G. B., 1955. *Proc. Of the Phys. Soc*., *B*, **68**: 672.
Moon, P. and D. E. Spenser, 1959. *Philos. Of Science*, **26**:125.
Nightingale, J. D., 1977. *Am. Jrn. of Phys*., **45**:376.
Rosser, W., 1964. *An Introduction to the Theory of Relativity*, (London: Butterworths), p. 460.
Barbour, J. B. and B. Bertotti, 1977. *Il Nuovo Cimento*, **38B**(1):1.
Browne, P. F., 1977. *Jrnl. of Phys. A: Math & Gen.*, **10**:727.
Mach, E., 1883. *Die Mechanik in Ihrer entwicklung Historisch-Kritisch Dargestellt*, (Prague).
Gödel, K., 1952. *Proc. Of the International Congrs. of Math.*, **1**:175.
Eby, P., 1977. *General Relativity & Gravitation*, **29**(5):621.

Real thinkers are not fooled by evolution

This evolutionist doctrine is itself one of the strangest phenomena of humanity … a system destitute of any shadow of proof, and supported merely by vague analogies and figures of speech. Let the reader take up either of Darwin's great books, or Spencer's *Biology*, and merely ask himself as he reads each paragraph, "What is assumed here and what is proved?" and he will find the whole fabric melt away like a vision…. We thus see that evolution as an hypothesis has no basis in experience or scientific fact, and that its imagined series of transmutations has breaks which cannot be filled.

Sir John William Dawson,
Pres. of McGill University and the
British Assoc. for the Advancement of Science

PANORAMA

Confirmation of the big bang isn't

On April 29 at a meeting of the American Physical Society in Washington, D.C., researchers heralded new support for the big bang. The big bang is the fabled event zero, where the universe popped into existence from nothing. At least, that was the initial model. When it was noted that without God such a theory violated the first law of thermodynamics,[1] cosmogonists looked to the firmament[2] for the source of the mass and energy. Even at that, originally theorists thought that the universe started at 10^{-44} inch (or cm) in diameter. This, however, would have given the universe a mass of roughly one millionth of an ounce (or about one hundred-thousandths gm), way short of the estimated 10^{54-56}. Now the theorists start the universe off at about 10^{-13} inch (or cm) in size.

The new evidence is heralded with these words:

> Astronomers now report the results of two experiments that tuned in the Big Bang's relic vibrations. They say that this newly detected primordial fanfare proclaims as never before that all the structures in the universe – from stars to galaxies to huge galaxy clusters – had their origins in random, unimaginably tiny fluctuations in density during the earliest moments of the universe. Then, according to theorists, a brief but powerful period of hyper expansion, called inflation, stretched these subatomic fluctuations to cosmic scales.[3]

The two experiments observed the microwave background radiation (formerly the 3K black body radiation) over the South Pole. One was BOOMERANG (Balloon Observations of Millimeter Extragalactic Radiation and Geophysics)[4] and the other was DASI (Degree Angular Scale Interferometer), a ground-based apparatus. The observations reputedly observed the conditions of the universe when it was "only about 300,000 years old." Before that time, theory has it, the universe was so hot that atomic nuclei (mostly hydrogen and helium) and electrons could not bind into atoms. Now the

---

[1] The first law of thermodynamics says that matter and energy can neither be created nor destroyed by natural processes, they can only be exchanged one for the other.

[2] The firmament is variously called the "vacuum state," "Planck particles," "maximons," "virtual particles," "vacuum energy," etc.

[3] Cowen, R., 2001. "Sounds of the universe confirm Big Bang," *Science News*, **159**:261.

[4] See "The flat cosmos," *Biblical Astronomer*, **10**(92):35, Spring, 2000.

temperature dropped low enough that they could, and in so doing, the universe became transparent to light and other electromagnetic waves. Gravity could no longer contain the radiation, which up to that time had fought one another causing a sloshing in the matter making up the universe. Now the radiation was free and it held the imprint of that sloshing. As it emanated from the primordial soup, it provided a freeze frame of what the universe looked like at the time. It is the "freeze frame" that the two devices examined.

What the researchers hoped to find was the imprint of the largest pressure regions possible at the time when the radiation decoupled from mass. Smaller scale fluctuations or regions are also expected. Both experiments measured the temperature differences between points in the sky at different distances one from the other. They reported that the temperature differences reached a maximum at a separation of roughly one degree (two apparent lunar diameters) from one another.

One of the byproducts of the experiment is that 95.5% of the material in the universe is made up of matter of an unknown type. This is determined from the ratio of the second peak to the first in the above figure. The density of baryons (regular matter) can only account for about 4.5% of all matter. The rest is presumed to exist in the form of dark, invisible matter. The baryon result agrees with that computed from the amount of deuterium in the universe. What this means is that on a cosmic distance scale, 95.5% of the apparent mass of the universe is missing or "invisible." In some clusters of galaxies it's as high as 99%. For the Milky Way, it is about 20%. The missing mass could simply be nothing more than that the firmament is manifesting its presence on the universe and its objects in a way that is dependent on the size of the object. Such effects are most pronounced on large objects such as the universe as a whole, and very small objects such a nuclear and subnuclear particles.

Does the new data prove the big bang? On the contrary! The result confirms another, rival, theory of creation, not the big bang. It confirms the inflationary model, a rival theory to the big bang. But by transferring the big bang title to the inflationary model, theorists can claim "they knew it all along." It looks like the death of king Big Bang is imminent.

And what's so special about the inflationary model in which the universe expands at many times the speed of light for some (brief) time? Well, it falls in line with the Holy Bible's description of how God stretched out the heavens at the time of their creation (Isaiah 42:5[5]).

[5] [The LORD]…created the heavens, and stretched them out….

Pluto, king of the Kuiper belt?

The debate about whether or not Pluto is a planet has heated up considerably over the past couple of years. Allied with that is a question of what constitutes a planet.

First, Pluto's orbit is inclined 17 degrees to the plane of the ecliptic, the Zodiac, along which the sun moves yearly. Second, Pluto does not appear to belong to either of the two groups in which astronomers classify planets. It isn't a rocky planet like Mercury, Venus, and Mars (they include the earth in that group); nor is it a "gas giant" such as Jupiter, Saturn, Uranus, and Neptune. Pluto is presumed to be icy, more like a comet. Even the fact that Pluto has a satellite about half its diameter weighs against it because no other planet is that closely matched to one of its satellites. Of course, it has also been argued in the past that the earth's moon should not be classified as a moon, either, but as a planet. Mercury's status as planet has even been questioned on the grounds that some of Jupiter's satellites are larger than it.

Increasingly, however, opinion seems to be shifting among astronomers that Pluto should be reclassified as a Kuiper belt object–the largest Kuiper belt object. The Kuiper belt is a group of what seem to be icy objects located beyond Neptune's orbit. The first Kuiper belt object was discovered in 1992 and they number 377 at present. Four of them are called "Plutinos" because, like Pluto, they orbit the sun twice every time Neptune goes around the sun three times.

Now one of the objections against Pluto's change of status has fallen. The argument that no other Kuiper object is double has fallen with the discovery that object $1998W_{31}$ has a companion about 40,000 kilometers (24,000 miles) distant from it.

Then in the May 24 *Nature*, another objection fell. This time the issue is the size of Pluto, which appears to be much larger than other Kuiper objects. Called Varuna, the object's diameter is about 900 km (540 miles), about 40% the diameter of Pluto and about ¾ the size of Pluto's moon, Charon. The issue raises the prospect that objects larger than Pluto may yet be found further out in the Kuiper belt.

The stealth catastrophe[6]

Recently, as geologists reckon time–only 800,000 years ago–Australia, Southeast Asia, and the eastern Indian Ocean were bombarded by untold

[6] Quoted from *Science Frontiers*, no. 136, Jul-Aug 2001, p. 3. Published by the Sourcebook Project, Box 107, Glen Arm, MD 21057, U.S.A.

numbers of small, oddly shaped stones called "tektites." New finds of tektites have expanded the strewn field of these Australasian tektites to include part of China. It now appears that about 30% of the earth's area was subjected to this stony bombardment. It is inescapable that the Australasian-tektite fall was a major event in the earth's history. But where are other signs of this great catastrophe?

The present consensus holds that the Australasian tektites originated when a large celestial body slammed into our planet somewhere in Southeast Asia. The energy of the impact splashed droplets of molten rock into the atmosphere, where they were shaped aerodynamically and then fell as tektites. The extent of the immense Australasian-tektite strewn field implies a hard-to-miss crater about [60 miles] 100 kilometers in diameter. Yet, despite the geological recentness of the event and despite much geological surveying, no convincing crater has been discovered. So, we have abundant evidence of a terrestrial event encompassing much of the planet but no "smoking crater"!

The mystery deepens when one realizes that whatever cataclysm sent the Australian tektites aloft may have been comparable in magnitude to the impact that extinguished the dinosaurs (and other fauna) some 65 million years ago. This much older event has its crater buried below the Yucatan and is further marked by widespread biological extinctions. In contrast, the Australasian-tektite event is not only minus an obvious crater but seems to have had scant effect on the earth's cargo of sensitive life forms. It was a strangely "gentle" event despite the rocky deluge of tektites. What really happened?[7]

William Corliss then adds a comment to the above quote:

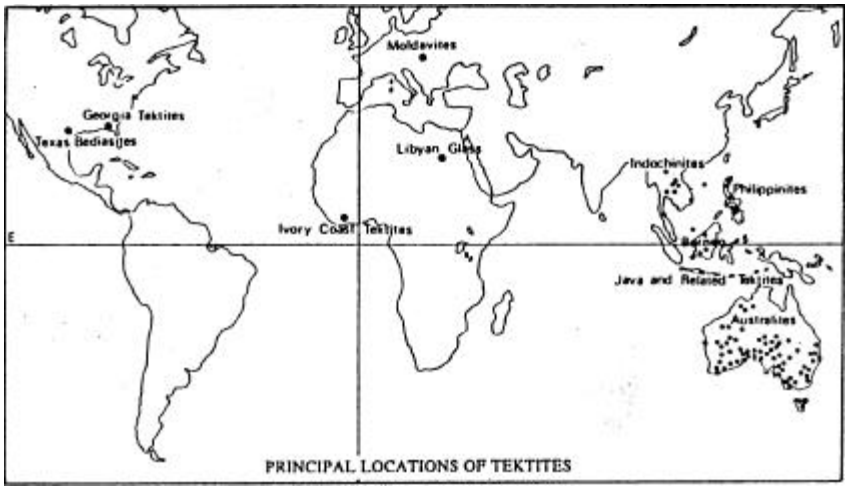
> Comment. Was the Australasian-tektite event an encounter with mirror matter, perhaps like Tunguska might have been?
>
> We would be derelict not to mention here the claim by J. A. O'Keefe and others that the rain of Australasian tektites originated in an impact event that occurred not on earth but rather on the moon. A lunar impact would obviously not require a terrestrial crater, and earthly biota would be spared. The debate over the possible lunar origin of this tektite fall has been particularly bitter. Those interested should refer to: O'Keefe, Hohn A.; "The Coming Revolution in Planetology," *Eos*, **66**:89, 1985.

[7] Corliss ends the quote here and the cites two references: Paine, Michael, Feb. 2001. "Source of the Australasian Tektites," *Meteorite*, p. 24; and Louis Varricchio, May 2001. "Tektite Origins," *Meteorite*, p. 4.

Now for some comments by your editor. As I write this, I am looking at a tektite from Indochina: Thailand, to be precise. It is rounded on one side, flat on the other. It is pitted with holes, most smaller than 3/16th inch in diameter. The rock looks like dirty, flawed obsidian; obsidian that has been roughened by sand blasting. Indeed, a corner that had broken off is shiny and smooth just like obsidian.

Because I saw a map of where tektites are found on earth before anyone told me that they were from the moon, I've always had doubts about their lunar origin. Almost every tektite known comes from an area of recent (post-Flood) volcanic activity. But there is also a smaller field in Texas, not all that far from the volcanism of New Mexico. The only reason why modern scientists might object to a terrestrial origin is chemical composition: perhaps the chemical elements in a tektite are not standard for the lava beds found deposited on the surface of the earth.

It is clear that tektites did fly through the ear, and it certainly looks as if they started out their flight in a molten state. The chances of such small objects (mine is about 1¼ inch or three cm, by 7/8 inch or 2.2 cm, by 5/8 inch or 1.6



cm) staying molten during a flight from the moon, a flight that probably took hours, if not a couple of days, seems remote.

Usually it is the presence of the element Iridium that is thought to be characteristic of extraterrestrial origin of a rock. This presents an interesting enigma to science, though not recognized, leastwise, not verbalized. If little meteors and big asteroids, presumably all evolving from the same primordial dust cloud, have Iridium, where is the earth's Iridium? Should the earth not

have the same fraction of Iridium as the other solar system objects formed from the same cloud? Of course, it may be as I suspect, that Iridium is terrestrial, but not found near the surface, in the crust of the earth. It may surface with extremely deep, tremendously violent eruptions. I'd recommend looking for Iridium in the dust of recently exploded volcanoes such as Mt. St. Helen and Krakatoa, but I fear those may not have originated deep enough.[8]

Is the speed of light constant?

Dr. Tom van Flandern, astrophysical gadfly, makes the following observation on the speed of light and global positioning satellites. These satellites are orbiting atomic clocks which are corrected to compensate for relativistic effects prior to launch. One of the side effects is that the clocks allow for the one-way speed of light measurement.

> Our goal here is not to set the most stringent limit on possible variations in the speed of light, but rather to determine what the maximum possible variation might be that can remain consistent with the data. The GPS operates by sending atomic clock signals from orbital altitudes to the ground. This takes a mere 0.08 seconds from our human perspective, but a very long (although equivalent) 80,000,000 ns from the perspective of an atomic clock. Because of this precision, the system has shown that the speed of radio signals (identical to the "speed of light") is the same from all satellites to all ground stations at all times of day and in all directions within ±12 meters per second (m/s). The same numerical value for the speed of light works equally well at any season of the year.[9]

In subsequent discussion, van Flandern notes that although this is consistent with Einstein's theory of Special Relativity (SR, 1905), it is also consistent with Lorentzian Relativity (LR, 1904). The latter assumes an aether, a preferred reference frame, and a universal time, factors done away with by Einstein's SR.

The Sagnac experiment, and the Ives-Stilwell experiment of 1941 (in which it was shown that ions radiate at frequencies dependent on their motion) were all publicized at the time as inconsistent with SR. "...[M]ost of the experiments contain some aspect that makes their interpretation simpler in a preferred frame, consistent with LR." In LR, the preferred frame is not universal, but rather coincides with the local gravity field.

---

[8] For another view, see Unruh, J. T., 1992. "Tektites: stones of space," *Biblical Astronomer*, **2**(60):5.
[9] Van Flandern, T., 2000. http://www.metaresearch.org/mrb/gps-relativity.htm.

The 1982 Hafele and Keating showed that atomic clocks flown around the earth in opposite directions, when compared with a third which stayed fixed, "showed slowing that depended on their absolute speed through space–the vector sum of the Earth's rotation and airplane speeds–rather than on the relative velocities of the clocks. But he quickly accepted that astronomers always use the Earth's frame for local phenomena, to get results that agreed with the predictions of relativity."

Although any experimental result can be explained by SR, there are some that are better explained by LR. Among these are aberration, Fresnel drag, Airy's failure, double star aberration, the lack of aberration of the moon beyond what is expected from its orbital speed, and the Sagnac experiment as well as Hafele-Keating.

The upshot is that such a local frame is implicitly geocentric. The earth's gravity field sets the frame of reference. Likewise, the sun's field controls incoming light. It would be interesting to see what aberration is experienced at the Lagrangian point occupied by the SOHO satellite.

Extracting energy from a black hole[10]

Scientists for the first time have seen energy being extracted from a black hole. Like an electric dynamo, this black hole spins and pumps energy out through cable-like magnetic field lines into the chaotic gas whipping around it, making the gas – already infernally hot from the sheer force of crushing gravity – even hotter. Joern Wilms of Tuebingen University, Germany, and an international team of astronomers observed the novel "power tapping" with the European Space Agency's X-ray Multi-Mirror Mission (XMM-Newton) satellite by watching a supermassive black hole in the core of galaxy named MCG-6-30-15. The observation also may explain the origin of particle jets in quasars.

"Never before have we seen energy extracted from a black hole," said co-author Christopher Reynolds of the University of Maryland, College Park. "We always see energy going in, not out." The gravity in this region appears to be so intense that it twists around the black hole, dragging magnetic field lines along with it. As the field tightens about the black hole, it slows its spin. The resulting friction heats the region to even higher temperatures.

The observed X-ray glow of iron gas travels about half the speed of light very close to the black hole in MCG-6-30-15's event horizon, the theoretical border of a black hole. XMM-Newton captured the spectrum, or chemical fingerprint, of this gas. The iron spectrum from MCG-6-30-15 has extremely

[10] Beasley, D. and Bill Steigerwald, 2001. "New energy source 'wrings' power from black hole spin," NASA Press release 01-200, Oct. 22.

broad lines, indicating that gravity tugs at the waves of light, literally stretching the light. MCG 6-30-15's iron line is so broad that the bulk of the light must emanate from very close to the black hole, where the force of gravity is the greatest, but the total energy output is too much to be due to gravity and the free fall of matter alone. Some additional power source must boost the luminosity to the observed intensity. The most likely source is the rotational energy of the black hole itself.

The Blandford-Znajek theory holds that energy flows to particle jets emanating perpendicularly from the accretion disk (the disk formed around the black hole's equator) in quasars. MCG 6-30-15 is not a quasar, but the theory can still apply because it predicts that the magnetic field might also link to the disk.

Atom experiment brings teleportation a step closer?

Physicists at the University of Aarhus in Denmark have made two samples of trillions of atoms interact at a distance in an experiment purported to bring both teleportation and rapid quantum computing closer to reality. Eugene Polzik and his colleagues reported in the science journal *Nature* on 26 September on an experiment involving quantum entanglement – a concept of entwining two or more particles without physical contact.

Entangled states are needed for quantum computing and teleportation. Scientists have entangled states of a few atoms in earlier experiments, but Polzik and his team have done it with very large numbers and using laser light. "It is the first result where two macroscopic material objects have been entangled," said Polzik. The entanglement is at a distance which signifies that two distant sites can share entangled objects. This is required for quantum communication, including quantum teleportation.

In 1998, the first teleportation experiment was done when scientists at the California Institute of Technology teleported a beam of light across a laboratory bench. But his is the first time two different atomic samples have been entangled in this way – using light – even though the samples are separated by some distance.

And that is the official story of the experiment, but don't volunteer for the first "flight." The atoms at the destination are not identical with those of the source, and there is no true teleportation. If anything, this is more likely to become a three-dimensional copier than a teleporter. A quantum computer is much easier to make than a teleporter.

Fast-spinning star's bulge is observed[11]

For the first time ever, a star spinning so fast its mid-section is stretched out has been directly measured by an ultra-high-resolution NASA telescope system on Palomar Mountain in Southern California. The star, Altair which is the brightest star in the constellation of Aquila (the eagle) and also serves as the southernmost star of the Summer Triangle, bulges about 14%. In other words, its diameter at the equator is 14% larger than the polar diameter.

"Measuring the shape of this star...was as difficult as standing in Los Angeles, looking at a hen's egg in New York, and trying to prove that it's oval-shaped and not circular," said Dr. Charles Beichman, chief scientist for astronomy and physics at NASA's Jet Propulsion Laboratory, Pasadena, California. Astronomers used the Palomar Testbed Interferometer, which links multiple telescopes to give an effective telescope size of 100 yards (100 meters), to measure the star's radius at different angles on the sky. They found that the size of the star varied with changing angles, the first tip-off that Altair is not perfectly round.

To verify that it was the star and not the interferometer that was oblate, the astronomers also measured the size of another star, Vega, at the same time. That star is the westernmost of the Summer Triangle and its shape didn't change with angle.

Previous studies of Altair raised the prospect that the star might have midriff bulge, but never before had the shape been measured directly. Earlier measurements of the star's spectrum, or light-wave pattern, had hinted that Altair was rotating very fast. Altair rotates at least once every 10.4 hours, and the new Palomar observations reveal the diameter at its equator is at least 14 percent greater than at its poles. For comparison, the sun rotates once every 30 days and its equatorial diameter is only 0.001 percent greater than its polar diameter. Altair's equator rotates at a speed of 470,000 miles per hour (200 km/sec).

New quantum gyro to measure changes in the day[12]

This news item relates to the "Earthquakes, snowfalls, and geocentricity" article appearing on page 5 of this issue. A discovery that may someday help measure the change induced in the universe's rotation rate due to clouds and earthquakes has come from an experiment which made friction-free helium whistle. By manipulating ultra-cold liquid helium-3 in a hollow, doughnut-

[11] Based on an article that appeared in the October 1, 2001 issue of the *Astrophysical Journal.*
[12] From a July 5, 2001 NASA Press Release 2001-140.

shaped container, a team led by Richard Packard and Séamus Davis at the University of California at Berkeley produced a whistling sound that got louder or quieter depending on its orientation relative to the north pole and the universe's rotation rate. In principle, small changes in the daily rotation rate will vary the loudness of the whistle. Clouds, the motions of earth's crust, ocean currents, and snow falls can make any given day slightly longer or shorter. These new findings might provide an unusual new way to measure such changes.

"Current [diurnal] rotation measurement techniques are not sensitive enough to detect rotational changes caused by earthquakes, even those as large as magnitude 8," said Richard Gross, a geoscientist at JPL. "If we had more sensitive techniques, like those being developed by Dr. Packard, then we could measure the effects on [the length of the day]. That would help us better understand earth's structure."

The team cooled the doughnut-shaped vessel filled with liquid helium-3 to a temperature nearly 1 million times colder than room temperature. At this ultra-cold temperature, the liquid is a superfluid. A superfluid is a state of matter that has no friction, so the liquid can flow continuously inside the vessel. The liquid in the doughnut acts like a single, super-giant atom that does not follow everyday behavior, but follows the rules of quantum mechanics.

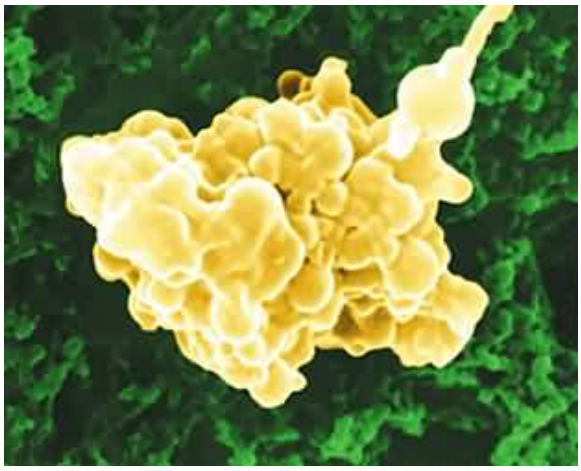
The original version of this experiment demonstrated a phenomenon called the Josephson effect. As the researchers tried to push the fluid through holes, each $1/500^{th}$ the thickness of a human hair, it jiggled to and fro. The vibration frequency increased as they pushed harder on the fluid. They used the world's most sensitive microphone and ordinary headphones to hear the vibrations–an oscillating, whistling sound.

In this latest experiment, the team put two thin membranes, each with an array of more than 4,000 tiny holes, at opposite sides of the doughnut to divide the fluid. When the researchers tried to push the fluid through the holes with electrostatic pressure, it did not flow in the direction they were pushing. Instead, it flowed in a strange, oscillating pattern, which produced a whistle. In flowing through the doughnut-shaped vessel, the whistle got louder or softer, depending on the vessel's orientation with respect to Earth's rotation axis.

The phenomenon demonstrates quantum interference in the superfluid. By linking two superfluid quantum systems using a doughnut shape, the Sagnac effect due to the relative rotation of cosmos about the earth affects both systems so they interfere with each other. The two systems thus behave as one whose properties are influenced by rotation of the universe about the earth.

Bacterial rain from space

Clusters of living microbes have been found on the edge of the earth's atmosphere in what is claimed to be the first proof that life exists beyond this planet. The extraterrestrial bugs, stuck together in clumps, resemble bacteria found on earth, but scientists said the height at which they were found, and their distribution, suggests that rather than being swept up in air currents they fell from space. This led the researchers to estimate that the earth is bombarded by about of a third of a ton of the space bugs every day.



Professor Chandra Wickramasinghe, of Cardiff University, a leading member of the scientific team, said: "There is now unambiguous evidence for the presence of clumps of living cells in air samples from as high as 41 kilometers, well above the local tropopause, above which no air from lower down would normally be transported." The team used high altitude balloons launched from a research facility in Hyderabad, India, earlier this year, to collect the air samples. Sophisticated sampling devices were employed which kept the air in highly sterile conditions to avoid any chance of contamination. A fluorescent dye which is only taken up by the membranes of living cells was used to detect the presence of the organisms. Electron microscope images revealed coral-like clumps of material measuring between five and 15 microns across.

The scientists, whose findings were presented at a meeting of the International Society for Optical Engineering in San Diego, California, claim that the way their distribution varied with height indicated "strongly" that the bugs were falling from space. However, last night a leading British space expert was skeptical about the claims. "The more I hear about this, the less I want to hear," said the scientist, who asked not to be named. "Professor Wickramasinghe has made other statements about life coming to earth, and

about the links with BSE, foot-and-mouth and so on. Of course, it would be a major discovery if someone was able to discover life beyond earth, but it requires really painstaking research."

However, Prof Wickramasinghe explained why he was convinced the bugs came from space, not earth. "I think they are extraterrestrial for a couple of reasons," he said. "The chances of getting anything terrestrial at a height of 41 kilometers is remote. It could possibly happen as a result of violent eruptions, or debris from space missions, but we have detected between one and 10 clumps of these bacteria per liter of ambient air. That's a huge amount. The height profile is also significant. You would expect a much greater density near the surface than further up for something terrestrial, but this isn't what we found. When you calculate the expected distribution of particles falling from space it fits in exactly with our results."

The scientists are now trying to grow the bugs at Cardiff University's Center for Astrobiology and examine their DNA. However, attempts have so far failed, something the scientists claim is in itself evidence they were not earthly contaminants. The £1 million center was set up last November and aims to be a world center for the study of extraterrestrial organisms and bio-molecules. A member of the Cardiff team was also remaining cautious yesterday about the findings. Professor David Lloyd, who led the analysis of the samples, said: "What we found look like normal bacteria. They are the right size and have a cell wall, and it's not unusual to find bacteria in clumps like this. It may be they are just common ordinary terrestrial bacteria, but we don't know how they could have got up to these heights. On the other hand, many developments have happened recently, which make the idea of extraterrestrial organisms believable. We now know of extremely robust and resilient bacteria that can survive temperatures as high as 130C and as low as minus 50C."

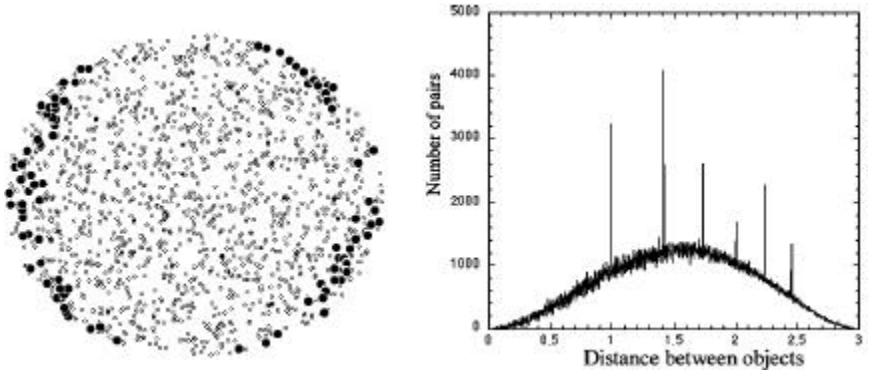
Wickramasinghe has argued for more than 20 years that comets and space dust probably brought the seeds of life to Earth. He and the late cosmologist Sir Fred Hoyle first put forward the so-called Panspermia Theory, which suggests life, or the building blocks of life, can be carried to planets by comets or drifting interstellar dust particles.

In 1996, NASA scientists caused a sensation by claiming to have found evidence of fossilized bacteria in a lump of Martian rock that had landed on Earth. However, many experts have since disputed the claims made about the meteorite, which is imagined to have been blasted off the surface of Mars by a comet or asteroid 16 million years ago.

A small spherical universe after all?

A fairly new field of astronomy called *cosmic topology* has gained an increased interest, as evidenced by the special session "Geometry and Topology of the Universe" organized by the American Mathematical Society during its 2001 meeting held last October in Williamstown, Mass. Three French cosmologists were invited to present to an audience of mathematicians, physicists and astronomers the statistical method they recently devised for detecting space topology: *cosmic crystallography*.

Cosmic crystallography looks at the 3-dimensional observed distribution of high redshift sources (e.g. galaxy clusters, quasars) in order to discover repeating patterns in their distribution, much like the repeating patterns of atoms



observed in crystals. They showed that "pair separation histograms" (a chart of columns) are in most cases able to detect a multi-connected topology of space, in the form of spikes clearly standing out above the noise distribution as expected in the simply-connected case. The researchers have particularly studied small universe models, which explain the billions of visible galaxies as repeating images of a smaller number of actual galaxies.

This is illustrated in the above figure at left. Here the large black spots on the outskirts of the circle represent 100 original sources. The smaller spots scattered throughout the area of the circle represent 1939 "topological images" of the original 100. The sky map simulates in hypertorus flat space a fundamental polyhedron, which is a cube, with a length equal to 60% the horizon size (circumference). The Pair Separation Histogram (above right) exhibits spikes which stand out at values and with amplitudes depending on the topological properties of space.

Until recently, the search for the shape of space had focused on big bang models with flat or negatively curved spatial sections. In other words, if the density of the universe is less than the critical density (of the order of 10^{-29} gm/cm^3, or that fraction of the density of water), then the possibility of the universe being small exists. Also crucial to this theory is that the expansion of the universe must be accelerating. Recently a combination of astronomical (type I supernovae) and cosmological (temperature anisotropies of the cosmic background radiation) observations hint that the expansions of the universe is accelerating, and constrains the value of space curvature (effective density) in a range that *marginally* favors a positively curved (i.e. spherical) model. Consequently, spherical spaceforms (geometries in which the universe is viewed as a sphere) have come back to the forefront of cosmology.

In their latest work, to be published in *Classical and Quantum Gravity*, the authors, Jean-Pierre Luminet, Roland Lehoucq, Jean-Philippe Uzan, Evelise Gausmann, and Jeffrey Weeks fill a gap in the cosmic topology literature by investigating the full properties of spherical universes. The simplest case is the celebrated hypersphere, which is finite yet with no boundary (i.e., a finite-infinite universe mentioned in the article on page 5 of this issue).

Theoretically, there are an infinite number of spherical spaceforms, including lens spaces and Poincaré space. The Poincaré space is represented by a dodecahedron whose opposite faces are pairwise identified, and has volume 120 times smaller than the hypersphere. If cosmic space has such a shape, an extraordinary "spherical lens" is generated, with images of cosmic sources repeating according to the Poincaré space's 120-fold "crystal structure." The authors give the construction and complete classification of all 3-dimensional spherical spaces, and discuss which topologies are likely to be detectable by crystallographic methods. They predict the shape of the pair separation histogram and they check their prediction by computer simulations.

Experimental projects related to cosmic crystallographic methods and to the detection of correlated pairs of circles in the cosmic background radiation are currently underway. Presently, the data are not good enough to provide firm conclusions about the topology of the Universe. Fortunately breakthroughs are expected in the coming decade: high redshift surveys of galaxies will be completed, and high angular resolution maps of the cosmic background radiation's temperature will be provided by the MAP and Planck Surveyor satellite missions. The new data will provide clues to the shape of the Universe we live in, a question that puzzles not only cosmologists, but also philosophers and artists.

By how much does this make the universe smaller? Take the example of the 100 unique sources that each appeared 19.39 times. In that case, the area

covered by the original sources is one nineteenth of the total area of the circle. The resulting diameter is 23% of the original diameter if two-dimensional and 37% of the original diameter if three-dimensional. In other words, even if the volume of the universe were only 1/120th (Poincaré space) of the current estimate, the diameter of the universe would still be over four billion light years, (20% of the current estimate).

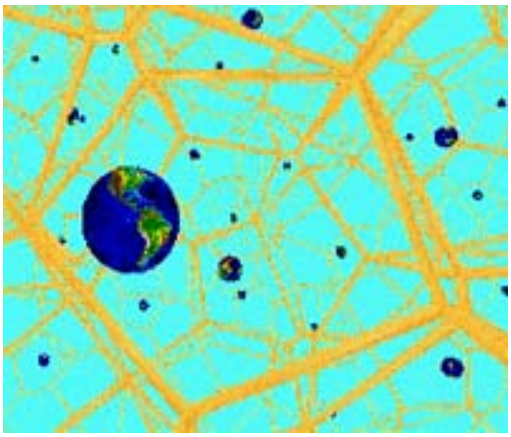


Figure at left: In a multi-connected Universe, the physical space is identified to a fundamental polyhedron, the duplicate images of which form the observable universe. Representing the structure of apparent space is equivalent to representing its "crystalline" structure, each cell of which is a duplicate of the fundamental polyhedron. In this depiction of a closed hyperbolic Weeks space, viewed from inside, we see the illusion of a cellular space, tiled by polyhedra distorted with optical illusions (here only one celestial object, the earth, is depicted). © Jeffrey Weeks.

More anomalous spacecraft behavior

For years, we've been reporting on the apparent acceleration of the Pioneer space craft, now billions of miles from us, as they fly out into interstellar space. Now, rumor has it, preliminary evidence from four earth flybys appear to also show some anomalous behavior. No further word yet on the latest apparitions.

Feynman on the small universe

In his *Lectures in Physics*, Richard Feynman,[13] wrote: "...we can still make the instruments detect the signals from Mariner II and find out about galaxies a billion miles away, and so on." Galaxies only a billion miles away, just a bit further out than Saturn. Who would ever suspect that Feynman was a closet small-universe proponent? ; -)

[13] Feynman, R., 1964. *Lectures in Physics*, (California Institute of Technology, Addison-Wesley Publishing Co.), Volume 2, Page 20-10, end of 3rd complete paragraph, last sentence. The quote was contributed by Martin Selbrede.

CREDO

The Biblical Astronomer was founded in 1971 as the Tychonian Society. It is based on the premise that the only absolutely trustworthy information about the origin and purpose of all that exists and happens is given by God, our Creator and Redeemer, in his infallible, preserved word, the Holy Bible commonly called the King James Bible. All scientific endeavor which does not accept this revelation from on high without any reservations, literary, philosophical or whatever, we reject as already condemned in its unfounded first assumptions.

We believe that the creation was completed in six twenty-four hour days and that the world is not older than about six thousand years. We maintain that the Bible teaches us of an earth that neither rotates daily nor revolves yearly about the sun; that it is at rest with respect to the throne of him who called it into existence; and that hence it is absolutely at rest in the universe.

We affirm that no man is righteous and so all are in need of salvation, which is the free gift of God, given by the grace of God, and not to be obtained through any merit or works of our own. We affirm that salvation is available only through faith in the shed blood and finished work of our risen LORD and saviour, Jesus Christ.

Lastly, the reason why we deem a return to a geocentric astronomy a first apologetic necessity is that its rejection at the beginning of our Modern Age constitutes one very important, if not the most important, cause of the historical development of Bible criticism, now resulting in an increasingly anti-Christian world in which atheistic existentialism preaches a life that is really meaningless.

If you agree with the above, please consider becoming a member. Membership dues are $25 per year. Members receive a 15% discount on all items offered for sale by the *Biblical Astronomer*.

To the law and to the testimony: if they speak not according to this word, it is because there is no light in them.

– Isaiah 8:20

TITLES AVAILABLE FROM THE B.A.

Orders can be honored only if accompanied by payment in United States currency either by cheque drawn on a U.S. bank or cash. US orders add 15% postage. Orders outside North America please add $5 per item, $2 per audio tape (sorry, the US Postal Service quadrupled postage this year). **Videotape prices are for VHS. For PAL or SECAM add $10.**

BOOKS AND TAPES

The Book of Bible Problems. The most difficult "contradictions" in the Bible are answered without compromise. "A classic," writes Gail Riplinger. 266 pages, indexed. $12

Geocentricity. The best, most comprehensive book on the topic of geocentricity. 400 pages, 45 figures, scripture and general indexes. In Europe, Geocentricity may be purchased for £12.50 (postpaid in the U.K., postage by quotation otherwise) from Brian V. Lamb, Quarryside, Castletown, Caithness, Scotland KW14 8SS. $15

The Geocentric Papers, A compendium of papers, most of which appeared in the *Bulletin of the Tychonian Society*. A technical supplement to *Geocentricity*, including articles on geocentricity, creationism, and the Bible itself. (120 pages, 8.5x11 gluebound.) $15

New-Age Bible Versions, by Gail Riplinger. The critics love to attack the author, but they never, ever address the **real** issue, *viz*. the occult influence in the modern versions. A real eye-opener. 600^{+} pages. $15

Geocentricity Videotape. Martin Selbrede gives a first rate presentation of geocentricity. Good quality tape. $20

A Creationist Scenario for the Creation. Dr. Bouw presents a scientific approach to the creation act demonstrating that it is possible to derive a biblical scientific model of creation. $20

Thinking Psych-Economically Interviews. Economist Dr. Arthur Sharron interviews Dr. Bouw on the scientific inerrancy of scripture and the decline of Biblical authority. $20

(Continued on the inside front cover.)