THE VELIKOVSKIAN

THE ELECTRO-GRAVITIC THEORY

OF

CELESTIAL MOTION & COSMOLOGY

Appendix by George Talbott

Special Edition

THE VELIKOVSKIAN

A Journal of Myth, History and Science

Quota pars operis tanti nobis committitur?

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By Charles Ginenthal

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1999

THE ELECTRO-GRAVITIC THEORY OF CELESTIAL MOTION

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MAGNETISM THE COUNTERFORCE

"I must admit, however, that in searching for the causes of the great upheavals of the past and in considering their effects, I became skeptical of the great theories concerning the celestial motions that were formulated when the historical facts described here were not known to science. The subject deserves to be discussed in detail and quantitatively. All that I would venture to say at this time and in this place is the following: The accepted celestial mechanics, notwithstanding the many calculations that have been carried out to many decimal places, or verified by celestial motions, stands only *if* the Sun, the source of light, warmth, and other radiation produced by fusion and fission of atoms, *is as a whole an electrically neutral body*, and also if the planets, in their usual orbits, are neutral bodies.

"Fundamental principles in celestial mechanics, including the law of gravitation, must come into question if the Sun possesses a charge sufficient to influence the planets in their orbits or comets in theirs. In the Newtonian celestial mechanics, based on the theory of gravitation, electricity and magnetism play no role.

Immanuel Velikovsky
Worlds in Collision
(New York, 1950), page 387

"Descartes had described real motions in our atmosphere, and had argued that the planets are carried around by material vortices. At the end of Book II [of *Principia*] Newton produced a powerful argument based on his studies of fluid media, which he regarded as a conclusive refutation of the existence of these vortices. Newton considered this refutation to be one of the great triumphs of the *Principia*. Indeed, he went further and argued that the persistence of the orbits of the planets proved that they moved in a near vacuum."[1]

The theory presented here grew directly out of the concepts offered by Immanuel Velikovsky which reinstates Descarte's vortices. It is posited that there is a counter force to

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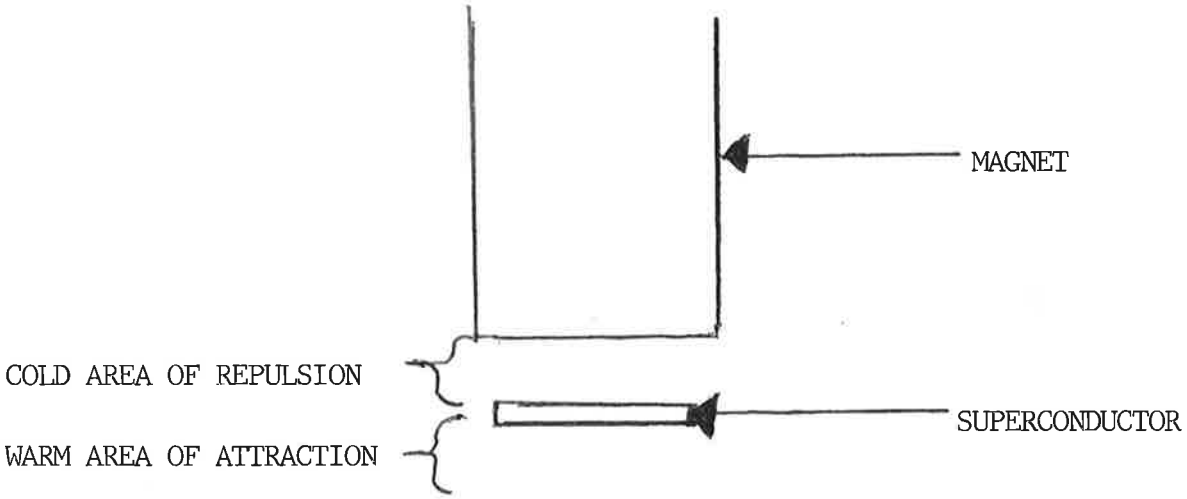
[1]John Roche, "Newton's Principia," *Let Newton Be!*, (Oxford, Eng., 1989), pp. 56-57.

gravity which exerts its force on all electrically charged bodies in space by influencing their magnetic fields. When I read Velikovsky I asked myself this question: If gravity is a force of attraction between bodies, what was electromagnetism? The obvious answer was that electromagnetism was a force of repulsion between charged celestial bodies. However, the fundamental calculations related to magnetism indicate that, as a force, it dissipates so rapidly that it could never influence the motion of a celestial body. Furthermore, magnetism generates both attractive as well as repulsive forces, and thus appears not to be only a repelling agent, as the theory requires.

Nevertheless, I learned that, based on the theory of electricity, an electrically charged rotating body was an antenna that emitted two magnetic fields that do not dissipate as do simple iron magnets. An emitting antenna transmits a radial field and a tangential field which weaken to zero over five rotations of the rotating body.[2] Based on this law, the Sun emits a magnetic field that transverses the solar system in only the first one percent of one wave. The radial magnetic field falls from a relative intensity of infinity at the center of the Sun to 4,000 over one percent of a wave length, and the same is found for the tangential field. Hence, it appears that magnetic forces are not inconsequential in celestial mechanics.

With respect to the attractive and repelling forces of magnets, I also learned that superconducting bodies which emit magnetic fields generate only repelling ones. In *The New York Times*, for September 20, 1988, page C1, an article showed that cryogenically cold, superconducting bodies repel. Two superconducting materials were actually suspended below a magnet in air! The article stated, "As long as the chip stays cold enough, it will stay suspended." See figure 1

Figure 1



[2]*Reference Data for Radio Engineers*, 6th Ed., (Indianapolis, Ind., 1975), Ch. 27, pp 1-3.

The questions that suggest themselves are:

Do magnetic fields, when they meet in the super-cold environment of space, also repel each other?

Is space a kind of superconducting medium?

Although the answers to these questions is not known, I am working upon the assumption that at least the first question is answered in the affirmative. Hence, the counter force theory has a basis in known and established physical forces; if rotating celestial bodies are charged, their radial and tangential magnetic fields extend far into space, and if in the super-cold environment of space these fields repel one another, then there is a repulsion between their fields which is allied to the bodies interacting.

If this theory is valid, then the orbital and rotational motions of celestial bodies should exhibit systematic and symmetric behavior. Upon investigation of the motions of celestial bodies, this is what I believe I have found. What follows is my research into the above questions.

ROTATION BY ELECTROMAGNETISM

Andre Danjon,[3] Gribbin and Plagemann[4] reported that large solar flares ejected toward the Earth slowed our planet's rotation temporarily. Juergens explained that this additional charge acted as a breaking mechanism by changing the Earth's polar moment of inertia.[5] But to reaccelerate the Earth's rotation back to its former velocity also requires a force to do this. I suggest that force is magnetism.

When the weaker planetary magnetic field encounters the immensely stronger solar field the solar field repels the weaker field, but most strongly on one side of the planet, where the two fields oppose each other. The planet with its field embedded within it adjusts to the superior solar field repulsion by rotating. The same applies to stars in the galaxy and galaxies in general.

Since space is frictionless, the constant force of the solar field on the planetary field would continue to accelerate it *ad infinitum*. But this does not occur. The reason is that the solar field transmits an electrical charge which Juergens showed was a brake on the planet's rotation. This breaking charge decreases with distance. The final rotational velocity of a planet or star is determined by the electromagnetic field strength's of the bodies. The following assumption are all one needs to predict rotational mechanics.

1. The strength of a celestial body's magnetospheres varies with the radial and tangential field strength over radial distance.
2. The greater the relative charge of a celestial body to another the higher the current from that body to the other.

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[3]Andre Danjon, *Compes rendu des Sceances de l'Academie des Sciences*, Vol. 250, (1960), p. 1399.

[4]John Gribbin, *New Scientist*, (May 1975), p. 339.

[5]Ralph Juergens, "On Convection of Electric Charge by the Rotating Earth," *KRONOS*, Vol. II, No. 3, (1977), pp. 12-30.

3. A celestial body of oppositely aligned field to another rotates in the same direction; a celestial body whose field is aligned to another rotates in the opposite direction.
4. Of two intrinsically charged bodies the one with the lower charge will rotate.
5. It is easier to rotate a small mass than a large one. Of two equally charged bodies at equal distance from their primary, the one of smaller mass will rotate more rapidly than the larger mass.
6. The angle of alignment of the magnetic and rotational poles will also determine the rate of rotation (see discussion of Uranus).

A deduction from the postulates: If one of two charged bodies of equal mass rotates at an angular velocity v at a distance r from the other, at the distance $R > r$ it will rotate $V > v$.

Mercury's electromagnetic field is about 0.01 that of Earth. With its small charge and mass but with its very close proximity to the Sun it receives a very great breaking charge. Thus it rotates quite slowly—about 59 days.

Venus' poles, I assume, are reversed to that of Earth but aligned with that of the Sun. Hence, following postulate 3 Venus' rotation is retrograde. With a minute electromagnetic field to that of Earth and close proximity to the Sun, Venus receives an immense braking charge which causes it to rotate in 243 days.

Earth's electromagnetic field is 100 times greater than that of Mercury. At 1 AU distance from the Sun, the solar braking charge is much smaller than on Mercury or Venus. The Earth rotates in 24 hours.

The Moon's rotation is difficult to analyze because of the great tidal braking action on it of the Earth. Great gravitational tidal forces can and do overcome magnetic interaction.

Mars' electromagnetic field is 1/800 that of Earth and possesses 1/10 Earth's mass. At 1.52 AU distance from the Sun the solar braking charge has so diminished that Mars rotates in about 24.6 hours.

Jupiter's electromagnetic fields vary in strength from 3 to 14 gauss.[6] Its field is also quadra-polar and octa-polar.[7] I assume Jupiter's strongest polar alignments are the same as those of the Earth. However, Jupiter is 318 times more massive than Earth and, at 5.2 AU distance from the Sun, the solar braking charge on Jupiter is the smallest yet encountered. Hence Jupiter possesses the greatest rotational velocity of the planets—about 9.8 hours.

Saturn's electromagnetic field is 0.7 that of Earth. At nearly twice Jupiter's distance from the Sun (9.5 AU)and 95 times more massive as earth, it rotates in about 10.2 hours.

Uranus is lying on its side and thus its rotational pole is tilted 97.9 degrees. However, its magnetic poles are at great distance from that of its rotational poles. The very same condition also pertains to Neptune. Both planets are of much less mass and at much greater distance from the Sun than Saturn; hence, they should rotate more rapidly than Saturn with magnetic fields assumed to be about the same strength as that larger planet. This appears to be a contradiction to the theory, but it is not.

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[6]McGraw-Hill, *Encyclopedia of Science and Technology*, Vol. 7, (New York, 1982), p. 456.

[7]*Ibid.*

Evidence of this phenomenon is clearly observed in the rotation of magnetic stars called Ap stars. Ap stars are A type stars, but unlike the common A stars, the Aps have their magnetic poles aligned like those of Uranus and Neptune, except that the tilt of these poles is greater than these planets. On the basis of Electro-Gravitic Theory, all Ap stars should be slow rotators, as compared with normal A stars, whose magnetic poles nearly coincide with their rotational poles. This is precisely what is observed. Jean Louis Tassoul, in his book, *Theory of Rotating Stars*, (Princeton 1978), p. 334, states: "On the evidence before us, it thus appears that Ap stars are intrinsically slow rotators." Thus, Uranus and Neptune rotate more slowly than Saturn because of the alignment of their magnetic axes.

Pluto possesses the largest satellite compared to its mass; Charon is about 0.33 Pluto's mass, and quite close to the planet—17,000 km. The tidal braking action by this nearby satellite is quite large and its rotational period of 6.4 days hardly reflects its much more rapid rotation if it had no moon.

THE STARS

Stars are classified according to their luminosity and surface temperature. Going from the brightest, hottest stars, to the lease bright, coolest, they are classified as O, B, A, F, G, K, and M. I assume that the phenomenon responsible for the production of heat and light is also responsible for electromagnetism in stars. Thus, O stars have stronger magnetic fields and charges than A stars and so on down the main sequences, as O to M stars are termed. Based on this analysis, the rotational velocity of stars should be greatest at the top of the sequence (the O stars) and decrease as we descend the entire main sequence. This is exactly what has been found. "In single stars, especially those of early spectral type [such as O, B, and A] rotation is rapid. The velocity of rotation drops rapidly down the main sequence and usually is too small to be detected in single stars of types later than G."[8] Giant old, red stars are bright because they have expanded to great volume. However, their actual brightness in terms of intensity is really extremely small compared to giant O type stars. Old, red giants, therefore, have very tiny magnetic fields and thus, based on the theory, rotate, if at all, only very slowly.

White dwarf stars, according to Angel and Landstreet, possess magnetic fields "of the order of $10^7 > G$" or 10 million gauss,[9] far greater than normal main sequence stars. They should rotate at great velocity and they do. White dwarfs rotate in periods of between 0.3 seconds (based on broadening of the absorption lines by doppler effect) upwards to a half hour.

Pulsars rotate even more rapidly than white dwarf stars. They are known to have rotational periods from 33 milliseconds to 3.75 seconds[10]. "Their very nearly constant

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[8] *McGraw-Hill Encyclopedia of Science and Technology, op. cit.*, Vol. 13, p. 48.

[9] J. R. P. Angel, D. Landstreet, *White Dwarfs, International Astronomical Union Symposium, No. 42,* W. J. Luyten, ed., (New York, 1971), p. 79.

[10] *McGraw-Hill Encycl., op. cit.*, Vol. 11, p. 98.

pulsation period suggests they possess an extremely precise timing mechanism."[11] Hence, their magnetic field strengths must be the greatest yet discussed. "The distance measurement and the observed radio flux densities at Earth show that the total radio emissions from the pulsars is of the order of the luminosity of the Sun . . . from 10^6-10^{10} the surface brightness of the Sun at all wavelengths."[12] Their magnetic fields are on the order of 10^{12} gauss[13] and thus they produce immense rotational velocity. The stellar magnetic fields are interacting with the galaxies magnetic field.

GALAXIES

Various forms of galaxies exist: our Milky Way is but one form; the galactic spiral which rotates in about 225 million years. There are billions of galaxies and they also rotate. The galactic electromagnetic fields are interacting with the magnetic field of the Universe. Based on the earlier postulates and evidence, the brightest galaxies should rotate more rapidly than galaxies that are less luminous. This, too, is exactly the case.

Quasars are among the brightest galactic like structures to be seen. They have diameters of less than one light day or the size of the solar system. They contain energy that is so great that they have internal velocities of hundreds of thousands of kilometers per second.[14] Larger but less luminous objects that have quasar-like characteristics, the radiogalaxies, called N galaxies are found to be surrounded by a faint distribution of stars.[15] They contain so much energy at the center, the nucleus, that the energy there surpasses that of the rest of the galaxy combined,[16] and they rotate slower than pulsars. Larger but less energetic than N galaxies are Seyfert galaxies, named after Carl Seyfert, who discovered them in the 1940s. They pump out a hundred times as much energy in the infrared as they do in the visible light.[17] These galaxies are rotating so rapidly that they are hurling outward from their centers clouds of gas each as massive as ten million suns at speeds of nearly 400 miles per second. The energy required to accomplish this feat is equal to the energy generated by millions of supernovae.[18]

Spiral galaxies rotate far more slowly than these highly energetic galaxies and exhibit no such immense sources of energy.

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[11] *Ibid.*

[12] *Ibid.*

[13] *Ibid.*

[14] *McGraw-Hill Encyclopedia, op. cit.*, Vol. 2, p. 196.

[15] *Ibid.*

[16] *McGraw-Hill Encyclopedia, op. cit.*, Vol. 6, p. 12.

[17] Nigel Calder, *Violent Universe*, (New York, 1970), p. 107.

[18] Timothy Ferris, *Galaxies*, (Ontario, Can.: Sierra Club Books, no date), p. 112.

Elliptical galaxies, made up of mostly old, red, giant stars, like the old, red giants, are bright because their constituent stars have expanded outward into a great volume in space. Although these galaxies are bright because of their volume and makeup of old, red giants, their brightness in terms of intensity is really smaller compared to quasars. Elliptical galaxies, thus, possess very tiny magnetic fields, and again, based on the theory, rotate, if at all, only very slowly. The same applies to globular clusters of old, red giants which contain up to a million of these stars with few if any main sequence type stars. They also exhibit practically no rotation.

In review, we find the planets that revolve around the Sun rotate in accordance with the postulates outlined earlier. The celestial bodies that revolve around the center of the galaxy, *i.e.*, all the classes of stars on the main sequence show that the greater the strengths of their electromagnetic fields the more rapidly they rotate: white dwarf stars with even stronger magnetic fields rotate faster than bright main sequence stars. Pulsars with the strongest magnetic fields rotate even more rapidly than white dwarf stars. Among the galaxies the evidence is the same. The brightest galaxies rotate more rapidly than those less bright and less energetic. Seyfert galaxies rotate faster than spiral galaxies and N galaxies more than Seyferts, and quasars spin faster than N galaxies. In a remarkable manner, it can be observed that the greater the electromagnetic field of a celestial body the greater its rotational velocity.

REVOLUTION

A body in orbit around another in which both masses possess electromagnetic fields is subject to two forces—gravity or attraction and magnetism or repulsion. Magnetism's force like that of gravity—is strongest between the two bodies when they are closest to one another while it is weakest between the masses when they are most distant from each other. Therefore, when the orbiting body comes closest to its primary, it feels not only a stronger repulsion on its own field away from that primary, but because the magnetic field of the primary is rotating with it, the orbiting body receives an additional acceleration forward along its orbit.

Gravity assists this phenomenon because, at closest distance between the two bodies, the orbital velocity is greatest.

These two magnetic accelerations—one away from the primary and the other forward along the orbit—cause the orbiting mass to have a greater pericenter distance from the center of the primary than if only gravity were operating. An orbiting body without an magnetic field experiences no such repelling accelerations. If the orbiting body is in a retrograde orbit and has a magnetic field, it will experience a resistance throughout its orbit and must spiral inward towards its primary.

On the other hand, at the greatest distance an orbiting mass is from its primary, the weakest the repulsion away and along its orbit is. At this region of the orbit, gravity pulls the body back toward its primary along its orbit. The two counter forces are always in operation but each becomes more significant for the orbiting body at either nearest approach, say to the Sun—perihelion—or greatest distance—aphelion. The smaller the magnetic field of an orbiting body is the smaller is the final range of distance between greatest and least distance from its primary. An orbiting body with a tiny magnetic field ultimately will achieve a highly circular orbit. However, this phenomenon is also related to the mass of the orbiting body. Small

massive bodies even with small magnetic fields are easier to accelerate than larger, massive bodies. Very small charged bodies, say, in the solar system, should have highly elliptical orbits.

Based on these parameters, two bodies in the solar system have tiny magnetic fields and highly circular orbits. They are Venus and Neptune. It is well-known that Venus' magnetic field is tiny, while Neptune's field is still not fully understood. In a paper published in *Science*, Norman F. Ness admits that Voyager 2 encountered "spurious noise" and that the model of Neptune's magnetic field "is valid [only] between 4 and 115 Rn [radii of Neptune]. The observed field departs progressively inside and outside this range."[19] If we accept, as do the scientists, that the magnetosphere boundary is at 26.5 radii from Neptune, then the model proposed that Neptune has a fairly substantial field is valid for only 34 percent of the model for Neptune's magnetic field of "0.133 gauss"[20] cannot be correct. In a paper in this journal, Vol. I, No. 2, pages 80 through 100, I was able to show that seventeen electromagnetic phenomena are either present or strong in Uranus' magnetic field, but are absent or very weak in Neptune's magnetic field. All of this, I suggest, indicates Neptune has a tiny magnetic field. Thus, Venus and Neptune, with tiny magnetic fields, possess extremely circular orbits.

As for Mercury, Mars and Pluto (the smallest planets), they all follow fairly elliptical orbits. All the other planets have orbits with eccentricities between those of Venus and Neptune's highly circular ones, and Mercury, Mars and Pluto's fairly elliptical ones.

In fact, the satellite systems of Uranus and Neptune offer an interesting test of this counter force model. Uranus rotates in the retrograde direction causing its field to rotate with it. All of its satellites, caught in the whirlpool effect of that field, also rotate in the retrograde direction. Neptune rotates in the prograde direction, but its inner large satellite, Triton, revolves retrograde on a highly circular orbit, but always outside its magnetic field boundary. Nereid, the distant outer satellite, orbits Neptune in a highly elliptical, prograde orbit. Because Neptune has a tiny magnetic field, as does Triton, Triton's orbit is highly circular. Nereid, on the other hand, is an extremely small body and may well have been captured in its present orbit. If it is not charged, its orbit will only respond to gravity. If it is charged, its orbit, like that of Pluto, may respond to both forces to give it its highly elliptical orbit, which responds to Neptune's prograde rotation.

Electro-Gravitic Theory also explains why in celestial systems, most of the angular momentum is found in the bodies revolving about the primary. In the solar system, the planets possess the greater angular momentum but the Sun's electromagnetic energy is greater to that of the planets. If this theory is correct, the law that explains this phenomenon states: *The electromagnetic energy and angular momentum of the bodies in a celestial system will never exceed the electromagnetic energy and angular momentum of the primary.*

THE CAUSES OF ELECTROMAGNETISM IN CELESTIAL BODIES

The mass and electromagnetic field strengths of celestial bodies follow a clear pattern which is seen in the period of their rotational velocity. The bodies that revolve about the Sun

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[19]Norman F. Ness, *et al., Science*, (December 15, 1989), pp. 1473-1474.

[20]*Ibid.*

involve two classes of planets—the terrestrial and gas giants. The Earth, the most massive of the terrestrial planets, with the largest electromagnetic field, possesses the shortest period of rotation. Jupiter, the most massive of the gas giants, also possesses the largest electromagnetic field and shortest rotational period. The most massive, brightest, hottest stars that evolve about the center of the galaxy show the same phenomenon. White dwarf stars with huge electromagnetic fields rotate even more rapidly than the brightest main sequence stars. Pulsars with immense electromagnetic fields rotate at fantastic velocities. An explanation for this pattern of mass, electromagnetic energy and rotational velocity is the following: *The production of electromagnetic energy from within celestial bodies is due to the amount of collapsed matter in each body and the degree of collapse of the matter.*

Compressed matter in the core of celestial bodies arranges itself into a lattice structure to offset the enormous pressure above. As the matter collapses further, it produces a piezoelectric, piezo-magnetic effect, best termed "piezo-electromagnetism." Gravitation, which is responsible for internal pressure in celestial bodies, is therefore the source of the production of electromagnetism in celestial bodies.

The surprising conclusion is that the stars are not radiating by fission and fusion of atomic nuclei, but by electromagnetic radiation. This accounts for the lack of solar neutrinos that fission and fusion in the Sun should produce but cannot be observed in test apparatus for over twenty-five years.

STELLAR AND GALACTIC CLUSTERS

Since stellar and galactic masses and electromagnetic fields in action are far greater than planets, these greater magnitudes will produce more pronounced and, therefore, more definitive behavior patterns on a larger and grander scale. In this respect, only one rule applies: *stars and galaxies will only attract to form associations or clusters if their gravitational attraction to each other is greater than their electromagnetic repulsion from another.*

Young O and B type stars have very great masses, but rotate rapidly. From a purely gravitational point of view, large masses should attract each other and tend to form clusters. But since their rotations are rapid, they possess strong repelling magnetic fields which suggest they should not form large clusters. This is, in fact, the case. "It has been computed that the stars in an O association are moving [away from each other] so fast that in 100 million years they will be so dispersed that the association will no longer be apparent."[21] Furthermore, George O. Abell states, "There is no generally accepted hypothesis why the O and B stars should move rapidly away from the other stars of their parent cluster."[22] The gravitational mass of dust that created the cluster should be the same mass that holds it together. Apparently the repulsion between and among the constituents in the cluster helps it to disperse.

Ancient old, red stars vary in mass, but all possess little or no rotation. They are small masses compared to O or B stars. With such small masses, they should attract each other only

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[21]Franklin M. Bramley, *Black Holes, White Dwarfs and Superstars*, (New York, 1976), p. 38.

[22]George O. Abell, *Realm of the Universe*, 3 ed., (Los Angeles, 1979), p. 316.

weakly and tend not to form clusters. But since they lack much rotation, they have very weak repulsive magnetic fields and should cluster in the greatest numbers based on Electro-Gravitic Theory. That is exactly what they do. "The most spectacular clusters are the globular clusters which often have 100,000 stars."[23]

Galaxies with the greatest preponderance of ancient and very old stars should comprise the great galactic association. Elliptical galaxies are composed of mostly population II stars like those found in globular clusters and these galaxies do cluster together. "The regular [galaxy] clusters are very rich and show marked spherical symmetry and high central concentration [just like globular clusters]. They contain few if any spiral galaxies but rather have a membership dominated by the ellipticals."[24] At the center of these galactic clusters a "cD galaxy. A supergiant elliptical galaxy [is] frequently found in the center of clusters of galaxies."[25]

THE PERIHELION ADVANCE OF MERCURY

Mercury, as it orbits the Sun like all the planets, has its closest point perihelion constantly rotating to a new advanced position. However, Mercury's "perihelion advance" moves it a larger distance for each orbit than can be accounted for by gravitational equations. Albert Einstein presented his theory of General Relativity and explained this disparity of Mercury's orbit claiming that space around the Sun was curved. Hence, Mercury would orbit the Sun in curved space and also in time and appear at a farther perihelion point. This conclusion, I suggest, is incorrect. Since Mercury is a small mass with a magnetic field strength 0.01 to that of Earth, it can be moved farther by the strong solar magnetic field than if it were a much larger mass. The Sun's magnetic field moves away from it at about a 45 degree angle and not only repels Mercury, but at perihelion accelerates it slightly forward along its orbit creating this advance. The more distant planets also feel this forward push, but it is weakened with distance so this effect will diminish and this smaller advance is just what is observed for the more distant planets.

BINARY STARS

At least half the nearby stars belong to binaries whose members are separated by distances comparable to the diameter of the solar system. Based on observation, it seems that double star systems are more common than single star systems. How do such systems form?

> "We might imagine that double stars form because of encounters between single stars, but closer examination shows that a triple (star) encounter is needed. The energy in a

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[23]George Gibilisse, *Black Holes, Quasars, and Other Mysteries of the Universe,* (Blue Ridge Summit, 1984), p. 73.

[24]Abell, *Realm of the Universe, op. cit.,* p. 309.

[25]*Ibid.*, Appendix 2, A-8.

> binary is negative; the initial energy of the partners in a stellar encounter is positive. A third participant is needed to carry off the excess energy. Triple star encounters are exceedingly rare, however, under present conditions. They could not begin to account for the prevalence of binaries."[26]

As two stars approach each other, gravity will cause them to accelerate more and more rapidly. Thus, when nearest to one another, they are travelling so rapidly that they will accelerate beyond each other's gravitational grasp. A third star is needed to slow their velocities as they approach each other to allow capture. Hence, it is believed that binary stars cannot form by a capture process. However, if Electro-Gravitic Theory is correct, the stars' repelling magnetic fields will tend to slow them as they approach each other and permit capture to occur.

THE NATURE OF BINARY STARS

Binary stars will form partners if their attracting and repelling fields allow them to do so. Sir Arthur Eddington, in the early part of this century, discovered a systematic relationship between binary stars' absolute magnitudes or intrinsic luminosities (their total radiation) and their masses in these systems.

> "The difference in brightness is directly related to the differences of mass of the two stars involved. The relation between the mass of a star and its intrinsic luminosity . . . became of special significance through Eddington's research. The relation is such that if two stars differ by a certain amount of absolute magnitude, the ratio of their masses will have the same value regardless of whether the two stars are relatively bright or relatively faint. Only for the very luminous stars [old, red giants] will this mass proportion be somewhat different.[27]

Thus, if one star in a binary system is three times a certain number of magnitudes brighter than its companion, then one of the stars will be three times more massive than its partner. This relationship is in full accord with Electro-Gravitic Theory in that the brightness of a star is a fairly good indicator of its repelling magnetic field. This observed systematic relationship should not exist if gravity were the only force responsible for the production and maintenance of binary systems. The absolute magnitudes of stars should have nothing to do with binary systems because gravitational theory would allow any two stars regardless of their luminosities and masses to become partners.

Furthermore, there is another systematic difference observed in binary stars—their orbits—which indicates that gravity is not the only force governing their behavior. Binary stars of equal mass and absolute magnitude follow highly circular orbits while stars of greatly unequal mass have more highly elliptical ones. Based on strict gravitational theory, stars of equal mass

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[26]David Layzer, *Constructing the Universe*, (New York, 1984), pp. 276-277.

[27]Gerard Kuiper, "Double Stars," *The Evolution of Stars,* T. Page, L. W. Page eds., (New York, 1968), p. 165.

and absolute magnitude can pursue either highly circular or highly elliptical orbits. All that is required by gravitational theory is that both stars are always equidistant from the barycenter, or center of their masses. Such a binary system can have either a highly circular or elliptical orbit. Nevertheless, Cecilia Payne-Gaposchkin claims "Identical twins [double stars] span the entire main sequence . . . almost all have perfectly circular orbits."[28] On the other hand, after discussing double stars of different masses and absolute magnitudes, Gaposchkin claims, "But there is one trend shown by these 'visual double stars,' that cannot be fortuitous: most of them travel in elongated orbits rather than circles; and the longer the period, the more elongated the orbit."[29] Again, such partners with different masses and absolute magnitudes can follow either highly circular or highly elliptical orbits based on gravitational theory, but they follow more highly elliptical orbits than stars with equal masses and luminosities.

In addition, stars with relatively strong magnetic fields, as opposed to those with weak fields, should also affect binarity. This, too, is well observed. Pulsars with the strongest electromagnetic fields are rarely found with a companion. White dwarf stars with the next greatest field strengths to pulsars "are single stars, or have only distant binary companions."[30] Ap stars with very great magnetic fields are also very rarely found in binary systems.[31] And Ap stars rarely form close spectroscopic doubles. However, K and M spectral type stars, called U Geminorum type, that rotate slowly, indicating they have weak magnetic fields, nearly always are found in binary systems.[32] Also, old, red super giant stars, with large masses and small electromagnetic fields, should most frequently form binaries with the greatest variety of stars. "The unions between giant stars show ever greater variety [of partners],"[33]

The smallest stars with relatively average electromagnetic fields should be easily repelled by other stars and tend to form few binary systems, and this behavior should become more pronounced the smaller the star. This is exactly what is found. "In those star systems of less 'mass,' the percentage of single stars rises dramatically. For the range of 0.5 to 0.25 sun [masses], eighty-five percent of the stars appear single (while) 0.1 stars [1/10 the mass of the Sun] seem always single."[34] Lastly, large stars should tend to form binaries with greater distance between the partners. And this, too, is observed. [Dr. Earl Milton pointed this out to me at the 1984 CSIS symposium at Haliburton, Canada.]

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[28]Cecilia Payne-Gaposchkin, *Stars in the Making*, soft cover ed., (New York, 1952), pp. 63-64.

[29]*Ibid.*, p. 58.

[30]*Sky & Telescope*, (October 1968), p. 349.

[31]*The Facts on File Dictionary of Astronomy* (Revised Edition), Valerie Illingworth, ed., (New York, 1985), pp. 21-22.

[32]Iosif S. Shklovskii, *Stars, Their Birth, Life and Death*, (San Francisco, 1980), p. 64.

[33]Payne-Gaposchkin, *Stars in the Making, op. cit.*, p. 66.

[34]Earl Milton, Alfred de Grazia, *Solaria Binaria*, (Princeton, N.J., 1984), pp. 229-230.

A small number of stars form triples as compared to double stars, with two of the companions relatively close to one another, as opposed to the third star, which is much farther from its siblings. Based on gravitational theory, this behavior is not required. The stars could all be relatively equidistant to each other, but this is not the case. Why? Based on Electro-Gravitic Theory, the two closer stars' magnetic fields combine, and the distant triplet, which is later captured, feels these fields as one stronger field, as if it encountered one star and cannot orbit close, as its companions do.

Magnetic stars give an even stronger indication of how magnetism affects binarity. Dr. James Warwick calculated the influence of two magnetic stars, each of 10,000 gauss separated by three solar radii, and aligned with their dipole moments directly toward each other to maximize their magnetic interaction. His calculation indicated that the magnetic interaction between these stars was about a billion times smaller than gravity—far too small to influence the orbits of these bodies.[35]

This calculation, however, does not explain the actual behavior of these stars, as observed in space. Magnetic, nondegenerate stars, on the main sequence, fall into two classes: Ap stars, with strong magnetic fields,[36] and Am stars, with much weaker fields. The magnetic axes of these stars are at great angles to the rotational axes, so that the magnetic poles are observed to be close to the rotational equator.[37] When stars form close binaries, tidal forces drive them to align so that their rotational axes move toward parallelism allowing the magnetic poles to face each other as Warwick calculated. Yet, over time, the magnetic axes migrate to align more closely with the rotational axes.[38] Thus, the magnetic axes of the stars with the strongest magnetic field lie close to the rotational equator, and for another star to be a partner of such an Ap star, it must overcome the magnetic field of that Ap star.

Both Ap and Am stars form binary systems, but there is a significant difference that appears to deny Dr. Warwick's calculation that magnetism is inconsequential in these systems. Spectroscopic binary systems are double stars that orbit so close to one another that they can only be observed by spectroscopic analysis. All main sequence stars form spectroscopic binaries and, based on Warwick's analysis, there is absolutely no reason for the highly magnetic Ap stars not to form spectroscopic binary systems. Based on Electro-Gravitic Theory, because their repelling magnetic fields are large, few binary systems, and extremely few spectroscopic binary systems, should form. We are specifically told that "Ap stars are generally slow rotators, but differ [from Am stars] in being *single*, rather than *spectroscopic, binaries.*"[39] The exact opposite is the case with very low magnetic Am stars. Interestingly, we are informed that they

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[35]C. Leroy Ellenberger, "Still Facing Many Problems," (Part II), *KRONOS*, Vol. X, No. 3, (1985), pp. 10-11.

[36]Jean-Louis Tassoul, *Theory of Rotating Stars,* (Princeton, N.J., 1978), p. 430.

[37]*Ibid.*, pp. 431-432.

[38]P. North, "The evolution of some characteristics of Ap stars," *Astronomy and Astrophysics,* Vol. 148, (1985), p. 165.

[39]*Fact on the File Dictionary, op. cit.*, p. 22.

are "almost all short-period spectroscopic binaries."[40] There "seems to be a severe shortage of such [spectroscopic] binaries among Ap stars.[41]

The only principle which coherently explains the fact that Ap stars with strong magnetic fields, are largely single and not spectroscopic binaries, is an electromagnetic repulsion that is too powerful to overcome by gravity at close distance. The only principle which coherently explains the fact that the Am stars with weak magnetic fields are almost all spectroscopic binaries, is a magnetic repulsion that is weak and is, thus, overcome by gravity at close distance. There is no other force known to account for the differences in the nature of the two type of magnetic stars in binary systems.

Warwick's calculations in this respect ignore the clearly observed facts that disprove his analysis. A theoretical calculation is of no value unless it is backed up by observation. Wallace and Karen Tucker allude to such thinking as "flipping the usual procedure of the scientific method on its head. Instead of using observations to support a theory, they are using theory to say what the observations must be."[42] In fact, M. Floquet has already come to the conclusion, "The magnetic fields seem to play and important role in the relation between binarity and the Ap phenomenon."[43] For a fuller discussion of this matter, see my paper "Pendulums and Sunspots," *AEON,* Vol. II, No. 2, (1990).

THE STRUCTURES CREATED BY ELECTROMAGNETISM

I maintain that a spherical volume containing many celestial bodies is one dominated by gravity. For example, globular clusters and elliptical galaxies made up of old, red stars which exhibit little or no rotation tend to form highly global structures. I further maintain that the celestial structures formed by electromagnetism tend to be linear. A bar magnet under a sheet of paper sprinkled with iron filings produces the common structure of a magnetic field, in which the filings align themselves along their long axes with the magnetic field. Increasing the strength of the magnet does not change the shape, only extends it a greater distance from the bar.

One of the problems in astronomy is to account for the presence of galactic magnetic fields.

> "One of the most baffling of all astronomical phenomena is the magnetic field known to exist in our galaxy. In order to generate coherent fields of this magnitude by any reasonably conventional means, a time of around 10^{26} years would be needed . . . yet the age of the whole universe as we know it is only 10^{10} years. Clearly, come drastically powerful generating mechanism must have been at work when these fields formed, and opinion amongst astronomers generally favors the idea that the galactic magnetic field, like

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[40] *Ibid.,* p. 11.

[41] *Magnetic and Related Stars,* R. C. Cameron, ed., (Baltimore, 1967), p. 536.

[42] W. and K. Tucker, *The Dark Matter*, (New York, 1988) pp. 162-163.

[43] M. Floquet, "Les Étoiles Ap Binaries," *Astronomy and Astrophysics Abstracts,* Vol. 30, Part I, (1983), p. 439.

the galaxy itself, was created when the universe began and must, therefore, remain largely inexplicable."[44]

If, as I assume, a black hole at the center of the galaxy generates this magnetic field, then evidence will indicate it is more powerful toward the galactic center then elsewhere. A radio survey of this region showed a very large scale field lying 40 parsecs from the galactic center, which revealed that it is made up of long arcs of material.

> "The arc actually consists of thin parallel filaments. Furthermore, at the northern end of the arc the filaments merge with a second, less regular, set of filaments that curve back down into Sagittarius A West, the radio source that marks the center of the galaxy. More recent work suggests that the arc may be part of a still larger structure. The filaments mean that the arc is almost certainly shaped by the magnetic field."[45]
>
> "The polarization measurements also give an estimate of the magnetic field 10^4 gauss, which is very large relative to the overall magnetic field of the galaxy."[46]

The arms of spiral galaxies are also arranged into long curved linear structures. Based on this theory, they should be highly magnetic compared to the rest of the galaxy outside of them. It is noted that "20 years ago the trend [among astronomers] was to consider as the most likely hypothesis that galactic spiral structure [of the galactic arms] is caused and maintained by large-scale magnetic fields, which were supposed to align the gas in the spiral pattern.[47] The popular theory—developed by P. O. Lindblad, is based on density waves that generate spiral arm structures. However, "There is as yet no complete theory to explain how the spiral potential (density wave) fields occur in the first place."[48] J. H. Piddington has suggested that hydromagnetic elements generate the spiral arms of galaxies. His theory predicts the spiral feature a distance from the central disc of the galaxy, which has been found by R. D. Davies and Verschuur.[49]

If this is indeed the case, then gases and stars born in these gases which contain large magnetic fields, would tend to align themselves with these fields. S. Strom reports:

> "To our great surprise, when we started to look at a large number of outflows (gas and disks of young stars), we noticed a tendency for them to be aligned with clearly defined large-scale structures in the parent cloud. Further measurements of the polarization of light

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[44]"Did the Galaxy's Rotation Wind Up Its Magnetic Field?" *New Scientist,* Vol. 42, (1969), p. 567.

[45]Mitchell M. Waldrop, "New Mysteries at the Galactic Center," *Science,* Vol. 230, (1985), p. 652.

[46]D. E. Thomsen, "Galactic Dynamo-ism, a Radiation Belt," *Science News,* Vol. 126, (1984), P. 20.

[47]Bart J. Bok, Pricilla F. Bok, *The Milky Way,* 5th ed., (Cambridge, Mass., 1981), p. 304.

[48]*Ibid.*, p. 306.

[49]*Ibid.*, p. 307

> from stars behind the clouds show that the structures were related to magnetic fields. In about 80 percent of the cases, the ejected gas was flowing in a direction within 20 degrees of the magnetic field lines. That indicates that the stars' rotational poles [and, presumably, magnetic poles] are aligned along the magnetic lines of force."[50]

Not only do stars and gas in strong magnetic fields align themselves with the field, but even elliptical galaxies in clusters show a strong tendency for their elliptical axes to align themselves parallel with that of the major axis of the cluster.[51] This strongly suggests that the cluster, as a whole, as well as its component galaxies, are aligning themselves with the electromagnetic field of the Universe. This phenomenon can be more succinctly observed in the "frequent association of strings of galaxies aligned with radio-emitting elliptical E galaxies. These lines are collinear with the lines of elongation of the radio components."[52]

Although gravity has been considered the one and only major force governing celestial behavior, I suggest that this evidence of large-scale structures in spiral arms of galaxies and alignments of elliptical galaxies and strings of galaxies indicate electromagnetism is a primary contributor, as well.

SYSTEMATIC MOTION AND SYMMETRICAL STRUCTURE IN SPIRAL GALAXIES

Both the motions and locations of stars in spiral galaxies, I believe, exhibit systematic motions and star locations within these galaxies as evidence of the correctness of the principles of Electro-Gravitic Theory.

Spiral galaxies contain several types of stars; the stars are born along a central line running along the spiral arms, and then move out of these open clusters—their nurseries. The least massive stars appear to be pushed out of these clusters earliest; the larger ones later. T. Tauri stars "are probably very young stars of low mass."[53] Since stars are born in clouds of dust and gas, these should be pushed to the edges in large numbers, which is just what is found. T. Tauri variable stars are found especially at the edges of dark nebulae."[54]

Based on this theory, then, the velocity of stars in spiral galaxies like our own will be determined by their mass to magnetism ratio and should exhibit a systematic variation in velocity. The largest stars are the O and B types. They have masses of about 20 or so times that of the Sun. Although they also possess relatively strong magnetic fields, as shown by their very rapid rotation, their masses in the galaxy are at such distances from the center, such that gravity tends to outweigh electromagnetism. But, as we descend the main sequence of stars, the

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[50]Jeff Hecht, "Young Stars Line Up in Magnetic Fields," *New Scientist*, (June 26, 1985), p. 36.

[51]Mart T. Adam, *et al.*, "Linear Clusters of Galaxies," *Astrophysics Journal,* Vol. 238 (1980), p. 445.

[52]William R. Corliss, *Stars, Galaxies, Cosmos*, (Glen Arm, Md., 1987), p. 178.

[53]Bok and Bok, *op. cit.*, p. 127.

[54]*Ibid.*

masses become ever smaller compared to the magnetic fields. Since smaller bodies are easier to push than larger ones, the velocity of the stars should increase as we move from class to class.

Furthermore, a large stellar magnetic field of the O and B type stars must push its way through the vortex of the galactic magnetic field. Like boats in a stream, smaller boats will move with and through the current faster than larger ones. Therefore, the sizes of the stars' magnetic fields influence the velocity of them around the galaxy. This relationship of type of star to orbital velocity has long been known.

> "As long ago as 1910, Campbell at the Lick Observatory suggested that the derived value of the solar velocity varies with spectral class. He found the B stars have a rather small solar velocity and that its value increases as we proceed from spectral class A through F to G and K, but that it becomes somewhat more like B average for the bright M stars. Later work has shown that there is marked dependence on the value for the solar velocity on the intrinsic luminosities of the stars, with M dwarfs, for example, giving a much higher velocity than the M giants."[55]

Furthermore, the shape of the orbits ought also to be reflected in terms of spectral class based on the theory. "The stars of the galaxy are continually being reshuffled, for as small a difference as 1 kilometer per second will serve, in the course of one million years . . . to separate two stars by 1 parsec (3.26 light years)."[56] In a relatively short time, the stars should change their newborn velocities and orbits to ones that reflect their mass to magnetism ratio. From this I conclude that the largest, most massive stars with greatest mass to magnetism ratio should pursue the highly circular orbits, while the smaller stars with smaller mass to magnetism ratios should pursue orbits that are more and more elliptical, like the smallest planets.

> "The sun and the majority of Population I stars [Main Sequence type stars] have motions . . . [that show] all their orbits differ only slightly from the pure circular orbits . . . [some of these stars—notably] the O and B stars, the cepheids, certain open clusters follow most nearly the circular orbits of pure galactic rotation.
>
> "The [older] R. R. Lyrae and other fast-moving stars [such as K.M.S.] are presumably following elongated orbits shaped somewhat like ellipses."[57]

Thus, the orbits and velocities of stars also follow the principles of Electro-Gravitic Theory. Finally, let us turn the locations of the various classes of stars in the galaxy. Based on this analysis of how stars form clusters, we should find that after the stars are born in the center of the spiral arms of the galaxy, they should tend to move into regions that become more and more spherical in shape as they age and have lost more of their mass and electromagnetic

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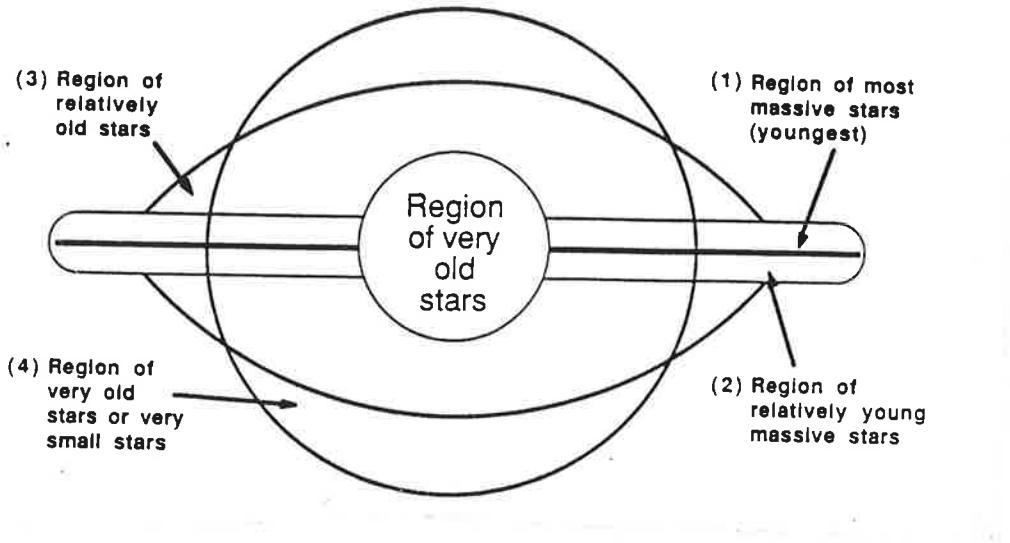
[55] *Ibid.*, p. 159.

[56] *Ibid.*, p. 314.

[57] *Ibid.*, pp. 166-167.

energy. Their location in the galaxy should clearly reflect this. The following diagram (Figure 2) comes from a book on general astronomy.[58]

Figure 2



As illustrated, the youngest, most massive stars born in the spiral arms form a linear structure across the galaxy. They do not form spherical structure to the greatest degree. Those stars that are somewhat older with somewhat smaller masses and electromagnetic repulsive fields are found in the spiral arms, but begin to form a shape that is only slightly less linear; that is, these older stars form a broader line. Within the extremely oblate spheroid above and below the disk (shaped like an American football) are found the older R. R. Lyrae stars and other older stars. Finally, the old, red stars form two spheroids, one at the center of the galaxy—the nucleus—and at the region of the orbits of the globular cluster.[59] See the table below which describes this evidence.

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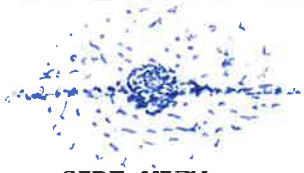
[58]Stuart J. Inglis, *Planets, Stars and Galaxies*, (New York, 1976), p. 296.

[59]Bok & Bok, *op. cit.*, pp. 108-110.

TABLE OF OPEN AND GLOBULAR CLUSTERS OF SPIRAL AND ELLIPTICAL GALAXIES AND CLUSTERS OF GALAXIES

Open Cluster	Globular Cluster	Spiral Galaxy	Clusters of Galaxies & Elliptical Galaxy
Member stars rotate. They are young stars.	Member stars do not rotate. They are old, red stars.	Member stars rotate. They are young stars.	Member stars do not rotate. They are old, red stars.
The entire structure rotates.	The entire structure does not rotate.	The entire structure rotates.	The entire structure does not rotate.
Contains many binary stars.	Contains no binary stars.	Contains many binary stars.	Contains no binary stars.
Shape is oblate.	Shape is spherical.	Shape: disk with young stars is oblate. Halo with old, red stars is spherical. Nucleus with old, red stars is spherical.	Young elliptical galaxies have oblate shape. Old elliptical galaxies have a spherical shape. Galaxy clusters have spherical shape.
Members' orbits around the galaxy are highly circular.	Members' orbits around the galaxy are highly elliptical.	Disk members have highly circular orbits. Halo members have highly elliptical orbits.	All old, red star members have elliptical or chaotic orbits.
Does not form large groups. The members disperse	Does form large groups. The members stay together	Does not form large groups.	Does form large groups. The members stay together.
*Components below are not drawn to scale. 		 SIDE VIEW  VIEW FROM ABOVE	 CLUSTER OF ELLIPTICAL GALAXIES  YOUNG ELLIPTICAL GALAXY OLD ELLIPTICAL GALAXY

I contend that this systematic and symmetric behavior of stars (in terms of their velocities, the shapes of their orbits and the symmetrical nature of their locations in the galaxy) all point

unmistakably to an electromagnetic repulsive force that governs the heavens as significantly as does gravity.

Electro-Gravitic Theory also explains why stars in spiral galaxies do not follow Keplarian motions.[60] It explains this phenomenon without the recourse of postulating dark matter. The theory is further supported by the behavior of globular clusters. Globular clusters, based strictly on gravitational theory, should lose their component stars. As stars near one another, one would gather sufficient velocity so that it escapes the cluster altogether. Over long periods of time, the cluster should shrink in volume and lose its component stars. However, this does not occur. The argument has been raised, "that some mechanism halts the collapse and even causes the core to re-expand to normal."[61] For a further discussion of this, see Charles Ginenthal, "Proof of a Celestial Counterforce to Gravity," *The Velikovskian*, Vol. I, No. 3 (1993), pp. 32-36.

CONCLUSION TO MOTION THEORY

For the model I have proposed, I am deeply indebted to Immanuel Velikovsky who was, for me, a beacon in the night like the stars were to the ancient navigators. I am also indebted to Ralph E. Juergens, whose "Convection of Charge on the Rotating Earth," in *KRONOS,* Vol. II, No. 3, pp. 12-30, placed undeniable evidence before us as to the connection of electromagnetism with the rotation of celestial bodies, an idea incorporated into this theory.

Surprisingly, in researching the history of astronomy over the past few years, I discovered that this theory synthesizes several early models of celestial motion. Newton was correct with respect to gravity, but he did not consider that another force might be acting against gravity. Kepler concluded that there was a pushing and a pulling force between the Sun and the planets, but he believed the force was strictly magnetic. Thus, like Newton, he held to a single force rather than to a bi-force concept. Rene Descartes was correct when he attributed the motions of celestial bodies to celestial "whirlpools," but he did not conceive that these whirlpools emanate from electromagnetic bodies and that they are pushing outward rather than pulling inward. Velikovsky was surprisingly correct when he maintained that electromagnetic repulsion exists between comets and the Sun, between celestial bodies at close range and even at distant range, between magnetic stars and, in general, between charged celestial bodies in space. The magnetotails of the planets, pushed away from the direction of the Sun, was the clue that led me to believe that a electromagnetic repulsion must play a role in the motion of celestial bodies.

Lastly, before moving on to the cosmological implications of this theory, what has not yet been discussed will be presented. Should this theory, upon testing, be found basically sound, there is a clear implication. The implication is that travel in space generated by electromagnetism will be highly feasible. Thus, the journey to the stars that light our night may be accomplished with the electromagnetic energy they so freely radiate.

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[60]Charles Ginenthal, "Dark Matter," *The Velikovskian,* Vol. I, No. 2, (1993), pp. 18-37.

[61]Ivan King, "Globular Clusters," *Scientific American,* Vol. 252, (June 1985), p. 88.

THE ELECTRO-GRAVITIC THEORY OF COSMOLOGY

THE ORIGIN AND EVOLUTION OF GALAXIES

The following theory of cosmology was written long ago and was withheld from publication in order to have the original theory of celestial motion tested in space, so that the foundation of the theory's mechanism could be validated. Since that test appears to have little chance of ever being run, the cosmological theory derived from the motion theory will now be presented with updated material. The original papers on the theory of celestial motion were presented in two journals, *AEON* and *The Velikovskian*.[62]

The present theory is derived directly from the motion theory and will be presented in three parts. Part One: The Origin and Evolution of Galaxies; Part Two: The Origin and Evolution of Stars; Part Three: The Origin and Evolution of Solar Systems.

The papers do not attempt to analyze all the inherent problems with the Big Bang Theory, the formation and evolution of galaxies, nor problems in stellar evolution and solar system formation, although it will touch on these at times. Much has been written on these problems, of which astronomers,astrophysicists, and planetary scientists are fully cognizant. The approach I follow is that of the fissioning theory concept. Rather than taking as the starting point that masses of dust and gas condense to form celestial bodies, it is presented that celestial bodies are born from larger, denser bodies that spin to instability and break up or throw off smaller masses that then evolve. If others have suggested similar concepts for star or galaxy formation, I have found nothing or little to this effect and thus, offer the following as an explanation of galaxies, stars, and solar systems.

One further point: this theory does not attempt to explain the origin of matter. Such questions, I believe, for the present, are best left to the theologians. It is taken as a given that gravity and electromagnetism are concurrent counter forces which operate in the universe (of which I believe we exist in but one of many) and generate the celestial bodies by their

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[62]Charles Ginenthal, "The Electro-Gravitic Theory of Celestial Motion," *AEON,* Vol. I, No. 1, (1988), pp. 63-87; Charles Ginenthal, "Stars, Galaxies and Electro-Gravitic Theory," *AEON,* Vol. I, No. 2, (1988), pp. 69-86; Charles Ginenthal, "The Solar System and Electro-Gravitic Theory," *AEON,* Vol. I, No. 3, (1988), pp. 5-13; Charles Ginenthal, "Dark Matter," *The Velikovskian*, Vol. I, No. 2, (1993), pp. 18-37; Charles Ginenthal, "Is Space a Superconducting Medium?" *The Velikovskian*, Vol. I, No. 2, pp. 101-102; Charles Ginenthal, "Proof of a Celestial Counterforce to Gravity," *The Velikovskian*, Vol. I, No. 3, (1993), pp. 32-36; George Talbott, Charles Ginenthal, "Measurements of the Electromagnetic Properties of Space," *The Velikovskian*, Vol. I, No. 3, (1993), pp. 37-55.

interactions. I further concur with Halton Arp that the redshifts are not all derived by an expanding universe. Rather, I suggest light traveling through space which is riven with gravitational and electromagnetic fields, must lose energy as it does so. Therefore, the greater the distance light travels, the greater gravitational and, perhaps, electromagnetic interference it will encounter, causing it to lose energy in quantum leaps. This finding has been identified and broadly discussed[63] in the scientific literature: redshifts are indications of distance, not of an expanding universe.

THE ORIGIN AND EVOLUTION OF GALAXIES

According to the predominant cosmological theory—The Big Bang—the universe was born when a singularity, or black hole that contained all the material matter of the universe, exploded. However, the cause of the explosion is unexplained, and the theory is contrary to fundamental scientific understanding and accepted laws of science. Robert Jastrow, the founder and director of NASA's Goddard Institute for Space Studies, presents this view:

> "The Universe and everything that has happened since the beginning of time are a grand effect without a known cause. An effect without a cause? That is not the world of science; it is a world of witchcraft and wild events and the whims of demons, a medieval world that science has tried to banish."[64]

Jastrow, while pondering this enigma, adds,

> "This bizarre conclusion rests on the equivalence of mass and energy which is one of the most basic and well established laws of physics. The door to the past is closed; the beginning of the world is the product of some prior event that we cannot discover. We only know it happened."[65]

Allan Sandage, one of the giants of modern cosmology, also admits the metaphysical nature of the origin of the universe from a black hole.

> "If there was a creation event, it had to have had a cause. . . . As astronomers you can't say anything except that here is a miracle, what seems almost supernatural, an event which has come across the horizon into science, through the big bang."[66]

Sir Fred Hoyle considers this aspect of the Big Bang theory "metaphysical"and, therefore, suggests the theory cannot be of any value to science.

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[63]William R. Corliss, "*Stars, Galaxies, Cosmos*, (Glen Arm, Md., 1987), pp. 195-200.

[64]Robert Jastrow, "The Riddle of Creation," *Until the Sun Dies*, (New York, 1977), p. 21.

[65]*Ibid.*

[66]Timothy Ferris, *Coming of Age in the Milky Way*, (New York, 1988), p. 351.

> "Big-bang cosmology is a form of religious fundamentalism, . . . It is in the nature of fundamentalism that it should contain a powerful streak of irrationality and that it should not relate, in a verifiable, practical way, to the everyday world. . . . Big-bang cosmology refers to an epoch that cannot be reached by any form of astronomy, and, in more than three decades, it has not produced a single successful prediction.[67]

Cause and effect is one of the most basic and well-established, rational concepts of science, and a causeless effect implies that a logical force exists that played a major role in such events that science has not considered. In following the work of Immanuel Velikovsky, I maintain that electromagnetism is a force in celestial motion, and by positing this mechanism, Velikovsky may have opened the door to the creation of galaxies from a universal singularity. This in no way is meant to suggest *creation ex nilo*, that is, matter out of nothing. It does suggest that the matter already existed, but condensed at an infinitely small point. I further submit that there are untold universes similar to our own that exist beyond our present ability to detect, and which may even interact with each other. Therefore, this theory does not explain the origin of matter; even in a singularity; it exists and is there.

The question is: How does one get one of these universal singularities to throw off masses the size of galaxies?

When an object in space rotates, its mass is moved outward from the center by centrifugal force. In a stable rotating body, this outward force is counterbalanced by a greater inward pull of gravity or centripetal force. But, if the object rotates more and more rapidly, it must ultimately reach a point at which the outward force overcomes gravity, and at that point, the body becomes unstable and throws off elements of itself. In "The Electro-Gravitic Theory of Celestial Motion,"I stated the larger the magnetic field of a celestial body, the faster it must spin. I also claimed that the production of electromagnetism within a celestial body is dependent upon the amount of collapsed matter in it and the degree of collapse of that matter.[68]

Therefore, if a black hole contained all the matter in the universe collapsed to the greatest degree, it would produce a universal magnetic field of such strength that it would extend outside the black hole beyond the Schwartzschield radius and reach outward to immense distance. This field would meet and interact with the universal magnetic fields of other universal black holes. In such a case, the interactions would cause these to rotate ever more rapidly. At the immense distances, these bodies are from each other, they will be able to rotate to what might be considered infinite velocity. Since it is accepted that not even light can escape a black hole, the question arises: Can a singularity rotate more rapidly than the speed of light? I maintain that the limits and constraints thought to exist on the velocity of ordinary matter do not apply to black holes. I contend that singularity masses can violate this limit. That is, a singularity can rotate to instability.

At superluminary velocity (beyond the speed of light) at some point the universal singularity will become unstable. This raises a further question: Did that universal body completely disintegrate as the Big Bang theory suggests, or did it eject outward one or numerous

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[67]Sir Fred Hoyle in Michael Hawkins, *Hunting Down the Universe*, (Reading, Mass., 1997), p. 13.

[68]Charles Ginenthal, "The Electro-Gravitic Theory of Celestial Motion," *op. cit.*, p. 79.

smaller pieces of itself? I reject the Big Bang conclusion that that body completely disintegrated, and conclude from the evidence available that, at instability, this universal body ejected myriad pieces of itself—other smaller singularities—and that these, at various distances from the parent body, also rotated to instability and, in so doing, evolved into galaxies. The evidence for this conclusion is as follows:

The Big Bang cosmological model suggests that when that universal body disintegrated, it released protomatter, which was incredibly hot, and expelled outward at superinflationary velocity. Thereafter, as the protomatter cooled, it coalesced into ordinary matter, mostly hydrogen and helium, which gradually condensed and, because of mutual gravitational attraction among the particles, gave rise to the galaxies. The theory being presented suggests just the opposite occurred.

The possibility that such a process occurred is discussed by the English astronomer, Bernard Lovell.

> "This assumption is based on the estimate that the expanding primeval gas *could* only condense into galaxies in a rather limited time span when the density of the universe was about ten thousand times its present value. This would mean that the galaxies formed only a few hundred million years after the expansion began. It must be remarked that this is a purely theoretical estimate and that the observational evidence on this matter is effectively zero. In fact, observations of the most dense objects in the universe (the quasars) casts some doubt on the belief that galaxies condensed in the early stages of expansion."[69]

Heat causes materials to expand outward away from the center of a mass and, thus, is a great impediment to the process of condensation of matter from hot, gaseous clouds into galaxies. As matter expands, the density of any wave energy, be it gravitational, or electromagnetic, falls away more rapidly than the density of matter. Conversely, by retrocalculation of wave-energy effects left over from the Big Bang, which are insignificant today, would have overwhelmed the gaseous material when the universe was young. That is the reason it is understood the ordinary heat-radiation pressure, which is negligible today, would have blown apart any incipient condensations like galaxies in the distant past.[70]

Therefore, galaxies had to condense at a later period when the heat-radiation pressure was smaller in magnitude. But this delay poses another obstacle to galaxy formation. The gaseous matter out of which the galaxies condensed had to have expanded more greatly and become less dense so that contraction could not have gotten sufficiently underway to permit galaxies to form.

The very expansion of the universe poses still an additional obstacle to the process of galaxy formation. Given the present comparative observations of the velocities of quasars and galaxies in the early universe, based on their redshifts, indicates quasars accelerated in the distant past at velocities greater than the speed of light. Nevertheless, if we reduce this velocity to just below the speed of light—12 to 15 billion years ago—then the gases out of which the

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[69]Bernard Lovell, *Emerging Cosmology*, (New York, 1981), p. 179.

[70]James S. Trefil, *The Moment of Creation*, (New York, 1983), p. 41.

galaxies condensed also had to travel at nearly the speed of light[71] and at these velocities could not have gravitationally condensed to form dense clouds of matter capable of forming galaxies.[72] Yet, quasars are observed at this very early period and they are extraordinarily massive objects. The rudimentary physics forbids the formation of ultra massive objects at the earliest stages of expansion, but quasars *are* ultra dense, ultra massive bodies that exist in contradiction to the proposed model.

Michael Disney, in 1984, made this comment: ". . . in 1944 a Russian called Lefschetz proved mathematically that galaxies cannot condense out of an expanding universe. No one since has found a convincing way around Lefschetz."[73] In order to overcome these difficulties, it is proposed that the gas out of which the galaxies formed accelerated in such a manner to cause "small disturbances, amounting to only 10^5 [100,000] solar masses (which) as shown by detailed calculation, can condense out of the gas, along with disturbances of greater mass."[74] If there were slight disturbances which created centers of inhomogeneities of mass in the expanding gas cloud, then it is suggested, that from these, galaxies could indeed condense. "However, there's one real weakness . . . [with this proposal] . . . Even though disturbances can be unstable, they grow slowly, so slowly that the galaxies we see could hardly have formed by now."[75]

On the basis of physical laws governing gaseous cloud density, the galaxies would not have formed because heat-radiation pressure would not allow this possibility. Retrocalculation of the velocity of expansion encounters the same difficulty. The time required for galaxies to form, even with disturbances in the expanding clouds, is too great. No one has effectively answered Lefschetz' calculations and observational evidence to support this condensation process is effectively zero. Because the observations themselves contradict the entire hypothesis, it is extremely difficult to accept the conclusion that galaxies were formed out of condensing clouds of gas.

Martin Ryle states:

> "What we now need is an understanding of the physical mechanisms involved in the formation of a galaxy from primeval gas, and its subsequent evolution from this earliest stage to that involving the sudden enormous energy production in radio galaxies."[76]

Lurie H. John states:

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[71]Fred Hoyle, *The Intelligent Universe*, (New York, 1984), p. 184.

[72]*Ibid.*

[73]Michael Disney, *The Hidden Universe*, (New York, 1984), p. 66.

[74]Michael Zeilik, *Astronomy the Evolving Universe,* 4th ed., (New York, 1985), p. 437.

[75]*Ibid.*

[76]Martin Ryle, in *Cosmology Now*, (New York, 1976), p. 42.

> "The encyclopedias and popular astronomical books are full of plausible tales of condensation from vortices, turbulent gas clouds and the like, but the sad truth is that we do not know how galaxies came into being." [And] "Now some writers have discussed the possibility that some irregularity of density was present in the universe from the outset and that this led ultimately to the occurrence of galaxies. This idea has not achieved any success since it assumes practically all that is to be inferred."[77]

Geoffrey Burbidge states:

> "Finally, we come to the vexed question of the origin of galaxies. As the big bang bandwagon has gained momentum, an increasing number of investigations have been carried out in which attempts are made to explain the condensation of dense objects from an initial cloud of matter and radiation which is expanding. It has been known for many years that this is very difficult to understand, and the investigations have now reached the point where it is generally accepted the existence of dense objects [such as galaxies, stars, etc.] cannot be understood unless very large density fluctuations in a highly turbulent medium, or otherwise, are invoked in the first place. There is again no physical understanding of the situation; it is a condition which is put in, in a hypothetical state, to explain a major, property of the universe. Thus, these theories amount to nothing more than the statement protogalaxies have a cosmological origin, and their origin cannot be understood . . . "[78]

James Pebbles states: "None of the standard models for formation of galaxies and clusters of galaxies fits very well with all of the data . . . we're getting a little desperate." He introduces this statement with "Maybe something crazy is needed."[79]

W. H. McCrea admits, "We do not yet know how to tackle the problem."[80] John B. Irwin writes:

> "The Milky Way system, like other galaxies, is thought to have originated from a condensation or collapse of the intergalactic medium, which event resulted in a system of stars. The reason for the collapse is not known, and the details of the process are uncertain.[81]

James S. Trefil presents this provocative statement:

> "Since the simple solutions [for the formation of galaxies] do not seem to work, there are only two ways out. Either the universe was created with matter already clumped

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[77] *Ibid.*, p. 85.

[78] G. Burbidge, "Was There Really A Big Bang?" *Nature*, Vol. 233, (1971), pp. 36-40.

[79] John Boslough, *Masters of Time*, (Reading, Mass., 1992), p. 112.

[80] W. H. McCrea, *Astronomy Now, op. cit.*, p. 94.

[81] John B. Irwin, *Sky & Telescope*, (November 1973), p. 287.

> together into aggregations that would eventually form galaxies, or there was some yet unknown process that would form such aggregations. The first option is a direct violation of our rules and will, therefore, be avoided as long as possible."[82]

Electro-Gravitic Theory deals with this question from the viewpoint Trefil suggests should be avoided. Let us, then, compare the observations related to the condensation theory and the theory presented here. The more distant a celestial body is from an observer, the longer it takes light to travel to him or her. The objects observed most distant from the modern observer were, of course, the first ones to form in the early universe. If the condensation theory for galaxy formation from gaseous clouds is correct, the most distant objects that would be seen are enormous, glowing clouds of hot gas. Somewhat closer to us in time and space, these clouds would be observed growing brighter, smaller, and rotating more and more rapidly. This condensation process would gradually continue until galaxies are observed within these dissipating gas clouds. If, on the other hand, Electro-Gravitic Theory is correct and galaxies are formed from disrupted singularities, the most distant observable bodies should be very small in volume, yet contain immense mass. They should be the myriad singularities cast off by the universal body that had rotated to instability and are observed to be violently throwing off mass and increasing in volume.

The oldest accepted, observed structures presently are the quasars. They are not immense clouds of gas, but are considered, instead, to be only about the size of our solar system in order to emit the incredible amount of energy they produce. These bodies must also contain incredible amounts of mass, with luminosities greater than a trillion suns.[83]

One quasar on the assumption it is shaped like a ball—Quasar Q1442+101,

> ". . . must shine with power on the order of 100 trillion, trillion, trillion (10^{38}) kilowatts. This is about 10,000 times the entire radiated power of the Milky Way galaxy.
>
> "A startling feature of the quasars and other exotic sources is that their intensity often fluctuates in short intervals, sometimes days. This means their energy source is confined to small regions, at most, a few light days in diameter (the solar system is about 11 light hours across).
>
> "What chiefly puzzles astronomers is how such prodigious amounts of power can be generated in such confined regions. For all the energy they release, such thermonuclear fusion processes as those [postulated] in the sun and stars have an efficiency of only one percent. [There are several explanations given, but the author admits] . . . .
>
> ". . . the energy source of the exotic objects remains one of the biggest unknowns in astronomy today. . . . "[84]

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[82]Trefil, *The Moment of Creation, op. cit.*, p. 43.

[83]*Britannica Book of the Year 1979*, (London, Eng., 1979), p. 204.

[84]Anonymous, "The Extragalactic Ferment," *Mosaic,* Vol. 9, (May/June 1978), pp. 18-27.

Alan P. Lightman suggests "that the prodigious power of quasars can be explained only by new laws of physics."[85]

Quasars must possess sufficient mass to form trillions of stars. Hence, at the center of quasars, it is believed there must reside immense singularities.

The myriad singularities that were ejected from the universal body could never have escaped that more massive singularity if they were, in terms of mass, small objects. In order to escape the universal body, an object must also be a singularity. If the ejected body contained very little mass, I contend that the atomic forces in such a mass would be able to express themselves and cause the mass to expand. If an escaping mass from a singularity has even a tiny diameter, it would be subject to tidal forces. As Asimov explains:

> "There is another gravitational effect that we can neglect on Earth's surface, but that becomes of overwhelming importance in the neighborhood of a neutron [star or singularity]. This is the *tidal effect*.
>
> "The strength of the gravitational attraction between two particular objects of given mass depends on the distance between their centers. For instance, when you are standing on Earth's surface, the strength of Earth's gravitational pull on you depends on your distance from Earth's center.
>
> "Not all of you, however, is at the same distance from Earth's center. Your feet are nearly two meters [6 feet] closer to the Earth's center than your head is. That means that your feet are more strongly attracted to the Earth than your head is because gravitation increases as distance decreases. The difference in the gravitational attraction between two ends of an object is the tidal effect.
>
> "Under ordinary circumstances, tidal effects aren't great."[86]

However, the more massive a body is the more powerful its tidal effects on nearby, smaller masses. For example, the Moon creates a tidal effect on the oceans of the Earth. If the Moon were much closer to the Earth, the ocean tides would be much larger. Conversely, the Earth produces a tidal effect on the Moon thereby generating a tiny bulge which faces the Earth. If the Moon were much closer to the Earth, that bulge would increase in size. The greater the mass and density of a body, and the smaller its volume will permit it to generate more and more powerful tidal forces on nearby bodies.

Although the Sun is about 335,500 times more massive than Earth, because its diameter is farther from its center than Earth, its tidal effect is only about a quarter that of the Moon.[87]

> "But suppose the Sun were to contract without losing any mass. Any object on its surface would be closer and closer to its center and the tidal effect on it would increase rapidly.

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[85]Alan P. Lightman, "Cosmic Powerhouse: Quasars and Black Holes," *Revealing the Universe,* James Cornell, Alan P. Lightman, eds., (Cambridge, Mass., 1982), p. 137.

[86]Isaac Asimov, *The collapsing Universe*, Pocket Book ed., (New York, 1978), pp. 167-168.

[87]*Ibid.*, pp. 174-175.

> "[The dwarf star] Sirius B, has a mass equal to the Sun but has a diameter only 1/30 that of the Sun. . . .[Since the tidal effect varies as the inverse cube of the distance]. The tidal effect on the surface of Sirius B would be 30 x 30 x 30, or 27,000 times that on the surface of the Sun. . . ."[88]

Related to this tidal effect is the Roche limit. French mathematician Edouard A. Roche showed that a body held together by its gravitational field will break apart if it is liquid at 2.44 times the radius of a planet and somewhat closer if held together as a solid by ordinary electromagnetic forces, as is rock.[89] Asimov goes on to show:

> ". . . that any large, object trapped too close to a white dwarf will be broken up much more finely than it will be if it is trapped too close to the Sun or Earth. It also means that small objects that could resist the tidal effects of the Sun or Earth at their Roche limits and that would remain whole may, nevertheless, break up under the influence of a white dwarf [star]."[90]

Therefore, a neutron star only about 14 kilometers or 8.75 miles in diameter would have a tidal effect on its surface a million billion times that of the Sun.[91] Thus, a singularity would produce tidal effects many trillions of times greater, or even more, than that of a neutron star, and any mass near it would explode into atomic or even subatomic particles. Therefore, the only bodies that can escape a black hole are other singularities with immense masses and infinitely small diameters.

In addition, if light traveling at 186,000 miles per second cannot escape the gravitational pull of a singularity, an object would have to travel at superluminal velocity or beyond the speed of light in order to escape the singularity's gravitational pull. If the theory I propose is correct, not only should the most distant objects observed be of immense mass, they should also be exploding outward and emitting materials at velocities greater than the speed of light. In this respect, we are told:

> "Several quasars have been observed with very long baseline interferometry. . . . In several cases (less than a dozen), *small discrete sources* in the quasars have been found that change position from one observation to the next. *The motions are generally radially outward from the center of the quasar image.* The velocities have been measured for the moving sources and if the redshifts of the quasars are cosmological . . . some of the velocities of the moving sources are in the range of five to ten times the speed of light."[92] (Emphasis added)

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[88] *Ibid.*, p. 175.

[89] *Ibid.*, p. 173.

[90] *Ibid.*, pp. 175-176.

[91] *Ibid.*

[92] G. O. Abell, *Realm of the Universe*, (Los Angeles, 1979), p. 429.

> "Quasar 3C 345 seems to be expanding faster than light. That is, two components of radio noise in the object are separating at an angular velocity which appears to be 14 times the speed of light."[93]

The above authors, however, contend that such apparent velocity may be an illusion caused by the geometry of the sources with respect to the Earth. But for this to be valid, the source must be moving toward the Earth at nearly the speed of light and their light shifts should be toward the blue end of the spectrum.

Halton Arp explains the dilemma:

> "The necessary rationalization finally adopted [to explain away faster than light motions] was that a relativistic jet (ejection of material at nearly the speed of light) was directed almost exactly at the observer and this then gave the illusion of faster-than-light expansion. The trouble was that (even accepting the implausible idea of ejection of massive particles at so close to the speed of light) the alignment had to be so exact that there was only one chance in a thousand of that happening accidentally. But there were not thousands or even hundreds of objects like [it]. . . in the sky . . . . Since the outer parts of the object would look roughly the same from any direction, it was exceedingly unlikely that the single object like this would have an unresolved [visual] inner jet accidentally pointing directly at us."[94]

When these superluminary velocities were first discovered, Gerrit Verschuur tells us, "This discovery caused a furor." With respect to the geometrical explanations to explain them, he remarks that "none of these answers is fully satisfactory."[95] The question that is somehow never asked is, If quasars are, indeed, black holes, how is it possible for them to expel any matter whatsoever, especially since astronomers and astrophysicists profess that only gravitational forces affect celestial motion? Quasars are a fundamental contradiction to that expectation. According to Nigel Calder:

> "Talking to his colleagues at the Royal Astronomical Society in London about the difficulties of explaining sources of energy like quasars, radio galaxies and Seyfert galaxies, [Sir Fred] Hoyle declared, 'The behavior of the sources cannot, in any case, be explained in terms of conventional physical theory. According to conventional theory, large masses in small volumes plunge into singularities. . . . I would expect the sources to fade away . . . in a time scale of the order of a year. Instead, we observe outbursts in a time scale of the order of a year. The observed properties are *exactly the opposite* of what is expected according to conventional theory."[96] (Emphasis added)

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[93]*New Scientist*, (March 13, 1983), p. 25.

[94]Halton Arp, *Quasars, Redshifts and Controversies*, (Berkeley, Calif., 1987), pp. 126-127.

[95]Gerrit Verschuur, *Starscapes*, (Boston, 1973), p. 181.

[96]Nigel Calder, *Violent Universe*, (New York, 1970), pp. 149-150.

What Hoyle claims is that what are considered the most distant objects—the quasars—are more massive and distant and, therefore older, than radio galaxies which are more massive, distant, and older than Seyfert galaxies, and all three should collapse inward. What has been proposed to explain this contradiction to gravitational theory is to claim that Seyfert galaxies, the least massive, and least distant objects, are actually more distant than radio galaxies and pulsars. Therefore, Seyfert galaxies collapse to become radio galaxies, which further collapse to become quasars. The problem with this analysis is that to do so the redshifts must be reversed and Seyfert galaxies should be the most distant or most redshifted than the radio galaxies, which should be less so than the Seyfert galaxies. This is precisely the opposite of what is observed with respect to the redshifts and still does not explain why quasars do not collapse into black holes in a year or so. All theories of quasars founder on the fact of their great massiveness, which supports this theory.

Martin Rees offers that the "'best buy' theory of quasars . . . is that they consist of black holes with a mass about 10^8 [800 million] times the mass of the sun in the center of giant galaxies, with fuel being supplied by the captive of gas—or even entire stars—from their surroundings."[97] But if this theory were correct, we should also have seen these galaxies form from earlier glowing gas clouds prior to the creation of quasars. What astronomers have done is skip an entire step in their theory. First they assume massive galaxies form which then evolve into quasars, but they have observed no such process occurring earlier.

In any case, Electro-Gravitic Theory is supported, not contradicted, by the observations, and it does explain how quasars arise. It also explains how galaxies arise and evolve from quasars. Sir Martin Ryle, of the Mullard Radio Astronomical Observatory at Cambridge University, England, states that

> "'. . . it is very difficult to draw a sharp dividing line between quasars and radio galaxies. Some objects that look like quasars, by radio [wave analysis] prove to be visible galaxies; others that look like radio galaxies, by radio turn out to be quasi-stellar [quasars] in the optical telescopes. It also stands to reason that what we now see as widely-spread clouds in a radio galaxy must have been much closer together [suggesting ongoing expansion] at the early stages of explosion. Conversely, the immense release of energy in a quasar suggests that it may eventually expand to make something like a radio galaxy. Moreover, although the quasars, by their extreme compactness, are the more astonishing objects, the release of energy represented by a radio galaxy is quite comparable with that of a quasar.' All these arguments Ryle deploys to say that quasars and radio galaxies are simply the same kind of explosive object at different ages."[98]

I am in agreement with Ryle's explanation of quasars, the more energetic bodies evolving into radio galaxies, than the less energetic bodies. I will analyze Seyfert galaxies in the unit of this paper, "Special Galaxies." *Figure 1* describes this expansion process of quasars to radio galaxies.

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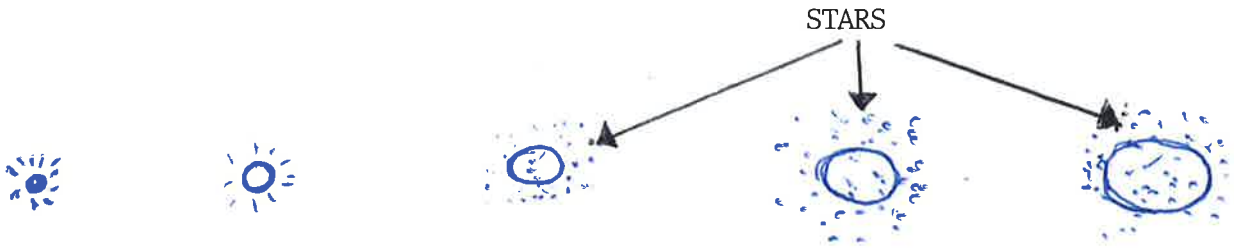
[97]William D. Metz, "Violently Active Galaxies: The Search for the Energy Machine," *Science*, Vol. 201, (1978), p. 700.

[98]Calder, *Violent Universe, op. cit.*, pp. 96-97.

Figure 1



Quasar	Very Young Radio Galaxy	Young Radio Galaxy	Mature Radio Galaxy	Old Radio Galaxy

Figure 1 describes, in part, the birth and infant stage of galactic evolution. In dealing with the entire process of galactic evolution, Disney states,

> "The conformity between a galaxy's outward appearance and its internal composition is both striking and puzzling. Ellipticals never contain much gas, but why not? One feels that there are underlying physical relations between the three sorts of galaxy [irregular spirals and ellipticals], but what are they? could it be that they represent succeeding ages of a single developing population, the irregulars being young, the spirals older, and the ellipticals oldest of all? Apparently not, for ancient stars are seen in all three types. Is there a single, underlying property, the amount of rotational, angular momentum, for instance, which controls both outward appearance and inward constitution? None has been found so far."[99]

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[99]Disney, *The Hidden Universe, op. cit.*, pp. 65-66.

Astronomers are stymied about this seemingly evident evolution of galaxies because the conventional theory which explains the birth, evolution and death of stars indicates that the three types of galaxies all contain ancient stars and must, therefore, all have similar ages. But what if the conventional model of stellar evolution is invalid? I maintain that it is, and will offer another model to explain stellar evolution in the following unit. In so doing, Electro-Gravitic Theory can explain galactic evolution as a single, continuous process from birth through youth, middle age, old age, and death. I propose that there is a main sequence of galactic development based on the following seven parameters of galaxies.

1. Electromagnetic energy measured in all frequencies.
2. Galactic rotational velocity (angular momentum).
3. The organization of stars in the galaxy.
4. The amount of gas and dust in the galaxy.
5. The expansion and contraction of the entire galactic system.
6. The increase and decrease of the diameter of the galactic nucleus.
7. The general color of the galaxy as evidence of the number of young to old stars it contains.

Employing these parameters as modes of analysis the entire sequence of galactic evolution seems to be derived. However, I wish to present a very general overview of the physics involved before we begin this descriptive, analytical journey. It is proposed that there are two concurrent counter forces that dominate the lives of galaxies, namely, gravity, the attractive force and electromagnetism, the repelling force. Both forces are immense in magnitude at the very beginning—the birth and infant stage of galactic life. During the early youthful period of galactic evolution, electromagnetic repulsion between the central black hole and the earliest pre-stellar bodies predominates and causes the entire galactic system to expand. In the period of maturity, both forces are diminished but electromagnetism more so and gravity expresses itself in the system ever more dominantly causing the galaxy to slowly contract. Ultimately, in galactic old age, gravity predominates and brings about the galaxy's death with an inexorable contraction to final collapse into a singularity, and the process may then repeat itself especially in clusters of elliptical galaxies.

The Youthful Stage of Galactic Evolution

As pointed out earlier, galaxies evolve from quasars which expand over time through stages wherein they evolve to old radio galaxies. It is from these old radio galaxies that I maintain that spiral galaxies evolve. What must necessarily be explained is the growth and evolution of the galactic arms that define spiral galaxies from these older radio galaxies. What must be explained is:

1. How the arms of spiral galaxies form.
2. Why the arms persist for eons.
3. How the arms evolve after they form.

The contemporary model for the formation of galactic arms was pioneered by Bertil Lindblad, of the Yerkes Observatory, and is called "the density wave model" for spiral structure. It assumes that a density wave (similar to a sound wave) produces areas of low compression and high compression around the galactic disk. In the areas of high compression, dust collected to form great interstellar galactic dust and gas clouds which formed into the shape of galactic arms. Since these clouds contained immense amounts of this material, only in these regions could stars condense, giving rise to the structure of galactic arms, with extremely young stars in them.

This model, however, suffers from many serious defects. It offers no explanation for the origin of these density waves. It does not explain how once the wave action begins that it maintains itself, because a density wave, traversing an interstellar medium, must lose energy and should dissipate in about a billion years. The model does not explain why two arms are formed as opposed to three or more. Two arms do explain their observed spiral galaxy structures. Finally, it fails to explain why spiral zero galaxies, elliptical galaxies, and irregular galaxies, do not generate the same density waves as do spiral galaxies, and do not have arm structures. This hypothesis is based on a force without an origin or cause, and the observations of certain galaxies indicate that, since they lack arms, they must also lack density waves. But why some galactic systems generate density waves while others do not is, again, unexplained. I reject the density wave model and hold, instead, that galactic arms are formed from the immense forces of gravity and electromagnetism that originate in quasars.

Heretofore, in discussing the disruption of the universal singularity, I did not explain the nature whereby the instability of a black hole liberates its mass. The presentation that is now offered is speculation of how I assume the process probably operates.

A singularity has its mass so greatly compressed that the subatomic particles themselves must arrange themselves under the pressure generated into the most perfect lattice structure produced in nature. The ejection of even a minute mass from such a body would cause the minute volume to instantly reconform its lattice arrangement to preserve its structure. As such a body rotates to instability, it first beings to eject minute particles from its surface. These minute particles are ejected at beyond the speed of light and are instantaneously converted to plasma by the tidal forces emanating from the black hole. It is these particles or larger masses that produce much of the enormous dust clouds which can be observed in quasars. but with expulsion of ever larger and larger masses that are converted to dust and gas, the internal lattice structure of the singularity constantly becomes less and less stable. The moment eventually occurs when the internal instability becomes so disturbed that the lattice structure cannot reconstruct itself as rapidly as material is expelled. At that point, the black hole must eject matter. The singularity, because of its lattice, is bipolar and it is at the poles that matter, in the form of singularities, is ejected. The generation of one opening in the black hole generates instability across the singularity to the opposite side. It is through these two windows, so to say, out of which the singularity disgorges some of its mass gradually, over eons, as black holes. The masses ejected may sometimes collide and merge into a larger black hole, but if the masses are significantly small, they expand and can be torn apart by each other's tidal energy.

Although there are no observations inside a black hole to verify this speculative analysis, there are observations of quasars, themselves, that support this conjectural process. In my

analysis of quasars and radio galaxies, I omitted discussion on the jets and lobes emanating from them, and are well observed arrangements associated with such bodies.

Great lobes and jets are well observed on opposite sides of quasars and radio galaxies.

> "The resulting maps of radio galaxies showed some well-known features, notably the great lobes of radio emissions, that lay on either side of the visible galaxy. But high precision mapping also showed 'hot spots' in these lobes and in the central galaxy itself. Sometimes it was plain that a single galaxy had exploded on several occasions.
>
> ". . . roughly equal lobes of radio emissions extended in opposite directions from the visible galaxy which plainly generated them. As millions of years passed, the lobes shifted further and further apart."[100]

Lightman said that an

> ". . . important clue to understanding quasars is the strong symmetry exhibited by the ejected matter.
>
> "Quasars seem to single out a particular direction in space and to remember this direction for most or all of their active lifetimes. Tananbaum has shown radio images on radio-wave-emitting blobs of matter extending in a line."[101]

Remnants of these lobes are also observed in the Milky Way.

> "New radio observations of our galaxy's troubled center strongly support ideas that the activity there is fueled by a massive black hole. Writing in *Nature,* (Vol. 322, p. 522), N. E. Kassim, T. N. LaRosa, and William C. Erickson, of the Astronomy Program at the University of Maryland, report the discovery of two 'lobes' of radio emissions straddling the galactic center itself. This kind of structure is widely observed in radio galaxies and in some quasars, whose central violence is believed to be powered by huge black holes."[102]

Furthermore, we are also informed that at the center of the Milky Way,

> ". . . gas in the spiral pattern appears to be flowing outward from the central source at the rate of about one solar mass per 1,000 years and at velocities in excess of 350 kilometers [220 miles] per second, said [R. L.] Brown. On one arm of the spiral, gas is approaching the Earth, and on the other arm it is receding. This makes sense, he said, if the source is emitting a pair of opposing jets that wobbles with a precision period of about 2,300 years."[103]

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[100]Nigel Calder, *The Key to the Universe* (New York, 1977), p. 150.

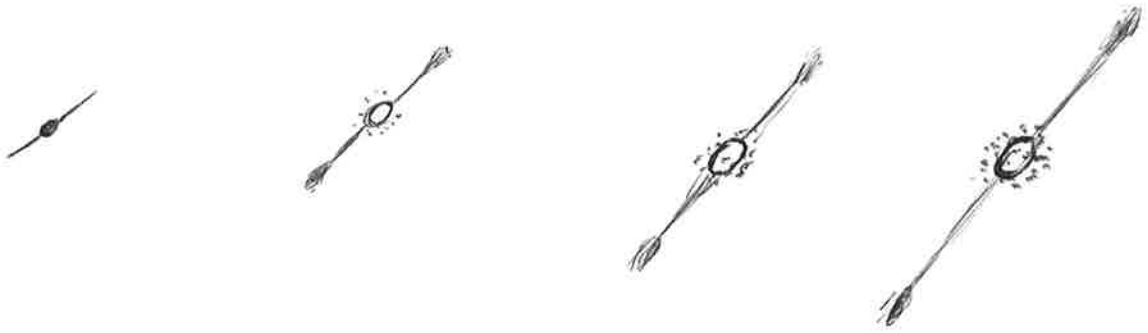
[101]Lightman, *Revealing the Universe, op. cit.,* p. 136.

[102]Heather Couper, "Black Hole at the Center of the Milky Way," *New Scientist*, (August 21, 1986), p. 21.

[103]Mitchell M. Waldrop, "A Hole in the Milky Way," *Science*, Vol. 216, (1982), p. 838.

Figure 2 describes the process of early galactic arm formation in quasar and radio galaxies.

Figure 2



Quasar with lobes	Young radio galaxy with lobes	Mature radio galaxy with lobes	Old radio galaxy with lobes

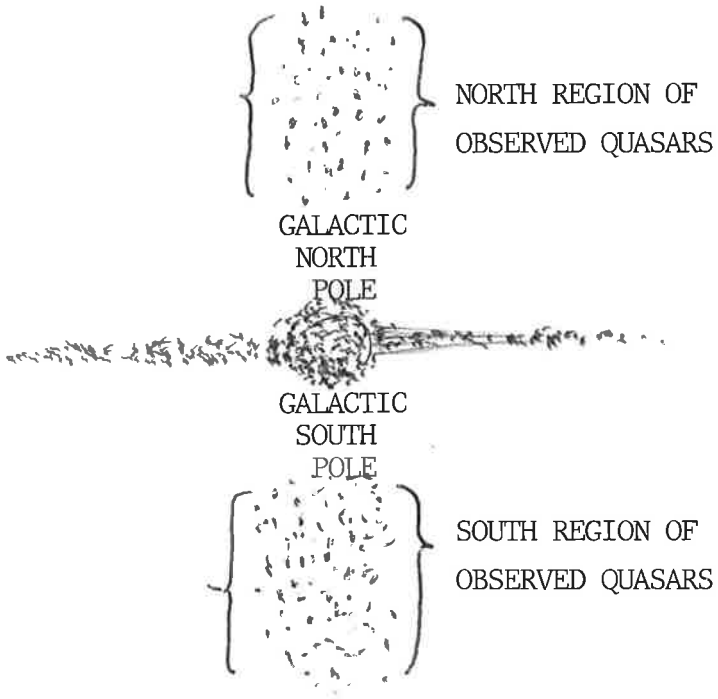
The process by which this occurs may also allow the massive central black hole to repair both openings. Since it has lost some of its mass, based on this theory, its electromagnetic field is reduced and its rotation slows so that it temporarily becomes stable once more. Nevertheless, once stabilized the singularity begins to rotate more rapidly because it is still accelerating away from the universal black hole. Therefore, though it is less massive, it periodically spins again and again to instability, each time disgorging some of its mass from the polar windows as myriad smaller singularities. With each disruption of the smaller and smaller central body mass in the form of black holes is ejected, however, the violence of these events is less so than the earlier stages. This disgorgement of smaller singularities from itself goes on for eons.

The lobes of the quasars evolving to radio galaxies spraying their immense electromagnetic jets of radiation and ejecting black holes will, over time, give rise to the two arms of the spiral galaxies. This visible light from the center of the lobes implies that objects inside them exist which radiate light. Therefore, if this theory is correct, and a universal black hole is ejecting other black holes that form galaxies, these quasars and radio galaxies, like the arms of a spiral galaxy, should form a curved linear arm structure running through the universe. The observations of these bodies should exhibit a curved linear structure related to the position of the Milky Way. This, in fact, seems to be the case:

> "Most of the quasars have been found at high galactic latitude. That is, if you were to draw a map of the Milky Way, most quasars would appear close to the galactic north and

south poles. Comparatively few have been found closer to the galactic equator than 40°."[104]

Figure 3



Some astronomers dispute this distribution because of the dust at the galactic equator which obscures observations along that line of sight. "But despite these limitations in observational capacity, most astronomers now agree that quasars seem to 'prefer' high galactic latitudes; they are actually grouped near the Milky Way's north and south poles."[105] "Some astronomers feel that this distribution is an important clue to the nature of the quasars."[106]

This author is in agreement with these astronomers and holds that the linear distribution of these bodies is caused by the universal singularity disgorging black holes with the mass of galaxies from its own north and south poles that become quasars, as do these quasars, which expel black holes from their north and south poles that give rise to the stars of the stellar arms of spiral galaxies. This distribution of quasars indicates that the universe is similar in structure to a spiral galaxy, but with the difference that the galaxies are acting as do the stars in a universal macrogalaxy.

Based on this analysis, the galaxies, en mass, should also be orbiting around the universal black hole. This mass motion has been discovered, but has been attributed to a giant mass—the great attractor—in the region of space, to which all these galaxies are streaming. James Gleick reports,

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[104]Ben Bova, *In Quest of Quasars*, (London, Eng., 1969), p. 150.

[105]*Ibid.*, p. 151.

[106]*Ibid.*

> "This galaxy and its thousands of neighbors in a gigantic portion of the universe appear to be streaming across space at speeds of more than 100 miles per second, a group of astronomers has found. . . . The strong implication is that these galaxies, in a region hundreds of millions of light years across must be pulled by the gravitational force of some huge . . . mass. . . ."[107]

Furthermore, if the galaxies are in orbit around a universal galactic singularity, then they should also be rotating in the universal electromagnetic field predominantly in the same direction as do stars in the galaxy. Again, there seems to be evidence for this general prograde rotation.

> ". . . The British astronomer P. Birch reported finding evidence that indicated that the universe was rotating.
>
> "Though far from conclusive, the rotation thesis was advanced after a study of 94 distant galaxies by radio telescope which showed that shape of galaxies appeared to depend on their position in the universe. Looking out from Earth, the galaxies in one part of the sky are bent in an S shape. Arms of galaxies in the other part of the sky bend in the opposite direction and form a Z shape."[108]

Vera Rubin, of the Carnegie Institute, in Washington, D. C., presented this same conclusion as that presented in John Boslough's *Masters of Time*, pages 12-17. The antagonism from within the astrophysics community was so ferocious "A few senior colleagues advised her to desist if she knew what was good for her career. Discouraged, Rubin quit."[109] The theory presented here suggests Rubin is correct.

Getting back to quasars, evolving to radio galaxies and thence to spiral galaxies, the super hot gas and dust ejected in the jets can only expand radially outward for a few thousand light years before the gravitational pull of the central singularity causes this expansion to halt and the material orbits the central body. Such particles lack strong electromagnetic fields to act as a repelling mechanism. Therefore, the giant nucleus of these old radio galaxies, as is observed, is made up primarily of gas and dust and a few million stars. However, in the lobes nearest to the nucleus, stars will begin to form in the incipient arms of the galaxy. As the lobes expand outward from the nucleus, stars will form farther and farther from the nucleus. The myriad smaller black holes that were ejected as they accelerated farther from the nucleus must, according to theory, rotate to instability, giving off immense quantities of gas and dust. Hence, new stars form in the dust and gas clouds, forming a long bar on either side of the galaxy. As this process operates, both gas and some old stars migrate toward the nucleus attracted by the immense mass residing there.

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[107]James Gleick, "Galaxies Reported Moving at Great Speed," *The New York Times*, (December 2, 1986), p. C1.

[108]*The Science Almanac*, Bryan Bunch ed., (New York, 1984), p. 85.

[109]John Boslough, *Masters of Time*, (Reading, Mass., 1992), p. 17.

If one were to ask which galactic structure conforms with this analysis, what one discovers is that what is being described is the evolution of "Spiral Barred" or SB galaxies. See Figure 4. SB stands for "spiral barred."

The data related to this material I derived from Timothy Ferris' book, *Galaxies* (New York, 1982), Michael Disney's *The Hidden Universe* (New York, 1982), pages 62-66, and several general college texts on astronomy.

Figure 4

Old Radio Galaxy	SBo Galaxy	SBa Galaxy	SBb Galaxy	SBc Galaxy	SBd Galaxy

It can be seen that old radio galaxies evolve into spiral barred zero galaxies and thence to SBa to SBb and SBc, culminating in SBd galaxies. The general color of these galaxies is quite blue, indicating that they are producing great numbers of hot, young stars and ever greater amounts of gas and dust. The rotational velocity of the system continuously slows because the stars that form the system act gravitationally like the arms of a skater moving outward and the highly magnetic field in the expanding arms must push through the magnetic field of the universe.

This discussion will not be complete without an analysis presented to explain how gravitational and electromagnetic forces produce this spiral barred configuration. The myriad singularities expelled from opposite poles of the central galactic black hole were accelerated at beyond the speed of light would not be subject to the gravitational pull of the central singularity. Each ejected black hole would also possess, like the central body, an enormous amount of electromagnetic energy. At greater and greater distance from the parent black hole, they, too, would rotate at ever greater velocity and, like the parent body, would become unstable. Some would eject even smaller bodies with large amounts of gas and dust. It is from this process stars are born. Newborn stars born out of material traveling away from the galactic nucleus would continue to accelerate away from the galactic center if they were also ejected outward. However, over time, the gravitational pull of all the stars, gas, and dust toward the center of the galaxy will slow the outward migration of the most distant stars, and they would fall behind the arms on both sides of the galaxy to create the bend observed at the extreme outward ends of

some of the arms of spiral barred galaxies. As new black holes are ejected into the arms and spin to instability, they maintain the arm structure and the gas and dust, stars and black holes act gravitationally to maintain the arms over great periods of time. Although new stars will grow old and migrate out of the arms, as discussed earlier, there is always a constant resupply of material ejected from the central black hole to take their places.

What must also be explained is that the arms of spiral galaxies are magnetic in nature and that this magnetism, to a large extent, determines how straight the arms will be. I maintain that the magnetic windows of the poles of the central galactic black hole reach immense distances into space as with quasars. Based on this theory, I claimed cosmic magnetic fields are generated by immense masses creating lattices of subatomic particles or of atoms. The greater the mass the greater the compression and the greater the magnetic field. Therefore, the immense mass of a spiral galaxy's central black hole allows it to extend its magnetic field fairly straight out into space. But the black hole is, over time, expelling mass and, thus, its magnetic field is attenuated because its lattice is not as greatly compressed. The magnetic field, therefore, becomes weaker and cannot maintain a fairly straight bar as it loses mass, because it is encountering the greater universal magnetic field through which it must travel, and it bends. Because this process continues for eons, the arms of the galaxy must inevitably bend further around the central galactic singularity. The black holes ejected from that central body, like electrons traveling down a wire, follow the magnetic field through the galactic arms even when those arms bend around the galactic nucleus.

As I also pointed out earlier, stars generally align their rotation axes in a gas cloud aligned with the cloud's magnetic field. The stars' rotational axes are generally aligned with their magnetic axes and, thus, we can see that galactic magnetism in the arms does orient the highly magnetic objects found in it. In essence, the mass of the central black hole determines the strength, length, and curvature of the arms of spiral galaxies.

What has been described is that during the youthful stage of galactic evolution, the central singularity is shedding its mass periodically so that from an extremely straight set of galactic arms observed in spiral barred O galaxies, the arms extend farther and farther into space and curve more and more as the central black hole releases mass to generate stars in these arms. In review, the seven parameters of galactic evolution fully conforms with the observations of spiral barred galaxies.

1. Electromagnetism in all frequencies is reduced from SBo to SBd galaxies causing
2. The rotation of the galaxy to slow as it evolves from SBo to SBd.
3. Gas and dust accumulation increases from SBo to SBd from the continuous disruption of singularities in the arms.
4. The bar arrangement of the newborn stars with gas and dust in the arms increases from SBo through SBd.
5. The galactic nucleus surrounding the central singularity decreases in diameter from SBo to SBd because the mass of the central black hole reabsorbs this material.
6. The galaxy expands from SBo to SBd.

7. The stars observed in the arms are overwhelmingly large blue to blue-white young O and B super hot giants which gives the galaxy a blue to blue-white appearance.

THE MATURE STAGE OF GALACTIC EVOLUTION

The processes discussed above for the bending of the arms of spiral barred galaxies continues and the arms will bend and curve around the central galactic nucleus more and more. In so doing, the arms are collapsing inward as they form long curved arcs that wrap themselves ever more tightly around the galactic center.

Stellar production, nevertheless, continues throughout this stage; hence, the bar structure near the nucleus may still be observed in some galaxies, in others it is obscured by the nucleus. However, over time, star formation is reduced because the central black hole is being depleted of its mass and ejects fewer and fewer black holes into the arms of the galaxy. As fewer stars are being created, less gas and dust are produced and the system begins a process of removal of gas and dust by a purely gravitational mechanism. As the stellar arms of the galaxy with the central black hole precess and revolve about the nucleus, they begin sweeping the galactic plane in which gas and dust have been produced and accumulated. The billions of stars and their companions draw this dust matter into themselves by the well-known Poynting-Robertson effect. Any dust that has somehow escaped into the halo of the galaxy is removed by halo stars via the same process. Traversing this space repeatedly, the stars in their billions continue this cleansing and nearly complete this dust removal process toward the end of the cycle.

A further action involves the increase of mostly old red stars in the galactic nucleus which causes it to expand. As we saw with spiral barred galaxies, the central galactic body eventually absorbed most of the gas, dust, and stars that formed the early large nucleus of old radio galaxies. During the mature cycle, this process of gathering more and more old red stars continues. The question that poses itself is: if the spiral barred, central black hole was able to absorb the stars in its nucleus with other material, why doesn't this continue during the later stages? The reason for this is that the central black hole has lost so much of its mass by ejection of small black holes to immense distance that its ability to continue to absorb stars as effectively is so greatly diminished that, rather than removing this matter more rapidly than it accumulates, the old red stars accumulate at and around the nucleus more rapidly than it can reabsorb them. A smaller mass will attract less matter than a larger mass.

The galactic rotational velocity will also continue to dwindle because the reduction of electromagnetic repulsive force is also dwindling in the central black hole, which generates less electromagnetic repulsive force in the galactic arms. The galactic rotation is also governed by gravity because the arms containing an immense amount of mass in the form of stars, gas, and dust, are themselves collapsing inward toward the nucleus. Hence, two processes govern this stage of galactic rotation; gravitational, inward pull of the arms, like the inward motion of a skater's arms, causes the galaxy's rotational velocity to increase. On the other hand, immensely reduced electromagnetic repulsion in the central black hole with its arms, as they interact with the universe's electromagnetic field, will have just the opposite effect. To restate the axioms of the motion theory, the smaller the electromagnetic energy of a body, the slower it will rotate. While the galaxy, overall, has much the same mass, its magnetic field is immensely attenuated.

Thus, the galaxy continues to rotate more and more slowly, but because of the infalling mass of stars, this slowing occurs at a somewhat different rate.

Lastly, the general color of the galaxy becomes less blue because there are more and more older stars in the maturing system. Toward the end of the cycle, the vast majority of the stars are old red giants. Because the arms have folded all around and inward during this cycle, there is a general contraction of the system. Again, one may ask: Which galactic system corresponds to this analysis in terms of the seven parameters discussed? This modality is clearly observed in spiral galaxies. See Figure 5. S stands for "spiral."

Figure 5

Sd Galaxy | Sc Galaxy | Sb Galaxy | So Galaxy

1. Electromagnetism, as measured in all frequencies, shows a reduction from Sd to So galaxies.
2. Galactic rotational velocity slows very gradually from Sd to So galaxies.
3. Gas and dust matter is reduced from Sd to So galaxies.
4. Internal arrangement of the stars will be discussed below.
5. The nucleus diameter increases from Sd to So.
6. The arms of the galaxy contract from Sd to So.
7. The general color of the galaxy is less and less blue becoming, over time, more white and yellow in aspect and arriving at nearly all red as we go from Sd to So.

OLD AGE AND DEATH IN GALACTIC EVOLUTION

The spiral zero galaxy in Figure 5 is a flat disk shaped body like a pancake with a great bulge at its center. Its stars are nearly all becoming quite old and have emitted most of their electromagnetic energy. Production of new stars has practically ceased and with this decrease of electromagnetic energy these aged stars behave more and more as gravitational bodies and less and less as electromagnetic ones. Such stars will be most significantly influenced by the

mass distribution within the galaxy. The central nuclear bulge of stars will continue to attract ever greater numbers of stars around itself gradually giving rise to a more and more ball-like shape. These stars, at greater distance from the central nucleus, will be most affected by the gravitational pull of clusters of stars nearest to hem. They will move like bees in all directions ultimately forming a massive ball-shaped galaxy of giant, old red stars.

Nevertheless, even these myriad ancient stars are electromagnetic bodies and though gathered into giant galactic clusters at the beginning of the cycle, they rarely collide. As Timothy Ferris tells us:

> "Unlike the stars of a spiral galaxy which follow orbits that lie along the plane of the disk, like runners rounding the track the stars of elliptical galaxies pursue orbits that are inclined at a great diversity of angles. Their orbits resemble the flights of hunting sea birds some diving and then swooping upward while others circle variously amid them."[110]

It is clear that such stellar motions, over time, will tend to distribute stars in such systems into a giant spherical arrangement.

The dust and gas in these systems will have been swept nearly clean giving rise to, "The pristine clarity of space between their stars [which] is sullied by only the scarcest traces of interstellar material."[111]

Since the stars have lost most of their electromagnetic energy, the rotational velocity of the system will be extremely small. "A few elliptical galaxies are thought to be rotating as a whole; others display no evidence of rotation."[112] The star population, with time, becomes "predominantly old. They glow a dull orange of antique lamps and that, in a sense, is what they are."[113] We are further told that,

> ". . . ellipticals are far more varied in terms of mass. Dwarf ellipticals, with only a few million stars and a diameter of but a few thousand light years, are common, while at the other end of the scale, supergiant ellipticals have been found with populations estimated at ten thousand billion stars."[114]

Many of these tiny elliptical galaxies may be escaped globular clusters as explained by Earl R. Milton:

> "In addition, eleven globular clusters within galactic space seem to be part of the local cluster. The intergalactic 'tramps' [that orbit the Milky Way] may be globular star clusters

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[110]Timothy Ferris, *Galaxies*, (New York, 1982), p. 106.

[111]*Ibid.*, p. 105.

[112]*Ibid.*, p. 106.

[113]*Ibid.*, p. 107.

[114]*Ibid.*, p. 106.

> which have escaped from orbit about member galaxies, but whose motion keeps them within the cluster. These 'tramp' clusters are abnormally large, resembling elliptical galaxies."[115]

Ferris further explains:

> "The largest globular clusters have millions of stars, at least in the case of those that lie well away from their parent galaxy. It is difficult to decide just where to draw the line distinguishing a large globular cluster from a dwarf galaxy."[116]

I suggest that these "tramp" clusters have escaped from their parent galaxies and represent the smallest dwarf elliptical galaxies observed.

Another reason old galaxies may vary somewhat in size is that the central singularity, which is too small in mass to spin to instability, as related to the electromagnetic field of the universe, is reabsorbing stars near it. The ancient stars end their existence as they approach the central galactic black hole and are tidally annihilated as their last shred of mass is pulled apart and devoured by it. The birth of galaxies, as heretofore described, is a violently catastrophic event as is, no less, the death of galaxies.

As old age galactic systems ebb to their end, the orbits of the stars in these galaxies more and more often gradually change causing the stars to intersect each other's path and collide or have their orbits disrupted by near collisions. These occur at random, and often involve multiple collisions. We are told "The most violent of the violent galaxies are the giant ellipticals."[117] This violence occurs not only because the stars collide in each elliptical galaxy, but also because ancient elliptical galaxies collide to form great clusters and the galaxies, themselves, are involved in the same collision process where many stars collide. Again, we are told, "In fact, galaxy collisions occur fairly often, especially in rich clusters."[118] In fact, the largest elliptical galaxies, called cD galaxies, found at the center of such a cluster, have cannibalized the surrounding elliptical galaxies and possess "multiple nuclei near their centers."[119]

On the other hand, spiral galaxies contain stars that are much more massive than those in elliptical galaxies, but these have strong electromagnetic repulsive fields and tend to approach one another to form binary galaxies and not close clusters. In these cases, they rarely fully collide with each other; only their outer halos meet. However, should two or more large elliptical galaxies converge to form a cD galaxy and their central black holes merge, then the

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[115]Earl R. Milton, *Cosmic Spark*, (a Workbook) (Lethbridge, Can., 1985), "Local Group of Galaxies," no page number.

[116]Ferris, *op. cit.,* p. 50.

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

[118]G. B. Field, E. J. Chaisson, *The Invisible Universe Probing the Frontiers of Astrophysics*, (Boston, 1985), p. 83.

[119]Zeilik, *op. cit.,* pp. 395-397.

process of spinning to instability may recommence and the ejection of smaller black holes will begin again. The newly formed, more massive, galactic singularity that is created will begin to rotate more rapidly and must, again, repeat the process. The newly ejected black holes, moving away from the center of the galaxy through the densely spaced ancient stars, also create enormous violence, such as that observed, say, in galaxy M87. Thus, the evolution of elliptical galaxies through old age is represented by Figure 6. E stands for "Elliptical."

Figure 6

E7 Galaxy	E5 Galaxy	E3 Galaxy	Eo Galaxy	Large E Dwarf Galaxy	Small E Dwarf Galaxy

The seven parameters show

1. Electromagnetism as measured in all frequencies is reduced from E7 to Eo and further in small E dwarf galaxies.
2. Rotational velocity is halted from E7 to Eo.
3. Gas and dust matter is reduced from E7 to Eo.
4. The internal arrangement of stars in these galaxies gives rise to a sphere that, over time, diminishes in volume.
5. The nuclear diameter decreases by stellar incorporation into the central black hole and thus:
   a. The galaxy contracts from E7 to Eo;
   b. The color of the galaxy as expressed by its old red stars stays red.

SEYFERT GALAXIES

Seyfert galaxies appear to be "volcanos[s] of activity [with] clouds of gas each as massive as ten million suns. . . . The energy required to produce this maelstrom is equal to that

generated by millions of supernovae."[120] "The so-called *Seyfert galaxies* contain considerable loose gas highly excited and moving with velocities of 4,500 km/sec."[121] These are extremely young galaxies with behavior similar to that of quasars, but of far smaller energy. Yet Seyfert galaxies seem to be observed at distances far smaller or nearer to us than that of quasars. These phenomena require explanation in terms of Electro-Gravitic Theory.

Like quasars, Seyfert galaxies originate as singularities ejected from the universal black hole, but with far less mass than those singularities that formed the quasars. They contain perhaps 65 to 75 percent of the mass of the Milky Way galaxy, or perhaps even much less. Such a black hole would possess a smaller electromagnetic field and, therefore, could not rotate to instability as rapidly or as near to the universal singularity as would the more massive quasars. Therefore, instead of becoming unstable 12 to 15 billion years ago, they would do so billions of years later at greater distance from the universal body.

However, because of their smaller mass, they would be disrupted with less force than quasars. Furthermore, since their mass is still fairly large, the period of time in which they are unstable would also take a long time, as is the same with quasars. Since the galactic singularity of the Seyfert system is smaller than a quasar, any arms that form from such a galactic black hole would tend to bend around the galaxy at far shorter distances than those of early spiral barred galaxies. Seyfert galaxies are merely smaller galaxies that formed from large quasars that became unstable at a later time.

IRREGULAR GALAXIES

Irregular galaxies have even smaller central singularities than the Seyferts. Their origin I also attribute to that of the universal black hole. I suggest that these galaxies were ejected from universal singularities also at instability, and are of far less mass than small spiral galactic sized black holes. At a distance well beyond the distance where the spiral barred system becomes unstable, they ultimately began to rotate to instability. Because they have so much less mass than even a Seyfert galaxy, they became unstable, but not with anything like the violence of the Seyfert system. This is clearly observed in M82. Allan R. Sandage of Mt. Palomar Observatory in California, and C. R. Lynds of the National Radio Observatory in West Virginia, working together on M82, an irregular galaxy about ten million light years away, found filaments of hydrogen gas shooting out of the galaxy at speeds of up to 1,000 km/sec.[122]

Since these galaxies are so small in terms of the mass contained in their central black hole, the violent period of their instability is relatively short before they reach a more quiescent state. And since they spun to instability later in their galactic history, so to say, their stars would be extremely young. The smaller central black holes of irregular galaxies must exert on their constituent stars a weaker gravitational and electromagnetic force on their young stellar populations. Like the newborn stars in a spiral galaxy's open cluster, which repel each other

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[120]Ferris, *op. cit.,* pp. 120-121.

[121]Ben Bova, *In Quest of Quasars*, (London, Eng., 1969), p. 122.

[122]*Ibid.*, pp. 123-124.

by their electromagnetic fields, newborn stars in irregular clusters will follow the same process. Over a relatively short period of time, the repulsion of the stars causing them to escape the cluster in all directions forms the irregular pattern so well observed in the nearby Magellanic irregular galaxies.

BUBBLES

One final note related to the evolution of galaxies. The distribution of superclusters of galaxies indicates they are located on the surface of bubble-like forms which are somewhat like Swiss cheese with the galaxies on the edges of the holes in the cheese. No theory explains this anomalous condition. As reported in *Mercury*,

> "In maps of the locations of galaxies on the sky, the superclusters appear to form chains which, in turn, link themselves into nets, which surround the cell-like voids. Thus, the maps give the impression that large-scale structure of the universe is cellular, with the superclusters forming the walls of the cell."[123]

This finding was corroborated by further research.[124] Why would galaxies tend to cluster strongly on the outside of great bubble voids in space?

If galaxies were born, like stars are born, in galactic clusters at the centers of these bubbles, they would migrate, like newborn stars, out of the center, because of their electromagnetic repulsion, and tend to gather in groups at the edges of the bubbles. That is, as they migrate outward, they would age and lose most of their electromagnetic properties. We described this process in the Electro-Gravitic motion unit, which discussed clustering. Old stars, as well as old galaxies, tend to cluster, as opposed to new stars and new galaxies. Once they arrive at the edges of the bubbles, which reside next to one another, the galaxies cluster and stay together. This suggests quasars are born in clusters. T. Shanks, *et al.,* states,

> "Faint stars of ultraviolet excess [quasars] are often found to be quasi-stellar objects [QSOs]. We have formed a complete sample of such stars at the South Galactic Pole using machine measurements of U. K. Schmidt's photographs. Statistical analysis of the stars' [quasars] distribution shows evidence both that they are clustered amongst themselves and they are anti-clustered with respect to faint galaxies."[125]

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[123]"Superclusters of Galaxies," *Mercury*, Vol. 8, (Nov/Dec 1979), p. 142.

[124]Mitchell M. Waldrop, "Bubbles upon the River of Time,"*Science,* Vol. 215, (1982), p. 1082; "Honeycomb Universe Must Be Closed," *New Scientist*, Vol. 98, (1983), p. 540; Joseph Silk, *et al.*, "The Large-Scale Structure of the Universe," *Scientific American*, Vol. 249, (October 1983), p. 72; Jeff Hecht, "Is the Universe Made of Froth?" *New Scientist*, (February 13, 1986), p. 25.

[125]T. Shanks, *et al.,* "Clustering of Quasars," *Royal Astronomical Society Monthly Notices*, Vol., 203, (1983), p. 181.

If, as is proposed here, quasars evolve into galaxies and move outward from their points of birth, then they should early on be found in clusters and later be clustered as faint galaxies in clusters on the walls of bubbles. This evidence regarding clusters has also been confirmed.[126]

However, many of these quasars on their outward journey often fission off parts of themselves. Halton Arp, who has been maliciously attacked for many years, has proposed just this concept. In study after study, he showed one quasar aligned with others and connected to one another by a bridge of gas an dust[127] He has suggested that these violent galaxies throw off other galaxies with discrepant redshifts. He argues that light leaving a highly massive object will be redshifted more by heavier quasars than less massive ones. Nigel Calder describes the situation thus:

> "More significantly, part of the redshift in quasar light could be due, not to great speed of recession, but to the effects of strong gravity—with the light losing energy in climbing away from an extremely massive body, and so shifting toward the red. . . . Leading optical astronomers find . . . such ideas horripilant, as they cast doubt on the classical interpretation of the redshift, as a measure of both velocity and distance, in an expanding universe. 'If that went,' Jesse Greenstein says 'it would be worse than the fall of the Roman Empire.'"[128]

I agree, in part, with Arp's analysis, which indicates that quasars are not always as distant as imagined. That clearly implies that galactic birth from quasars was not only an event that occurred once in the great distant past, but is also going on continuously; that galaxies, like stars, are being created, evolving and dying throughout the history of the cosmos.

CONCLUSION OF GALACTIC EVOLUTION

The principle that is derived from these descriptions of the evolution of the galaxies is that the smaller the black hole, the less violent must be its disruption, and the shorter its period of extreme violence. The most massive black holes that give rise to the spiral galaxies—the quasars—exhibit the most violent disruption and the longest period of explosiveness. Seyfert galaxies display less violence over a shorter period, while irregular galaxies, such as M82, when observed at instability, are found to exhibit far less violence over a much shorter period.

This is shown by the quasars which exhibit material moving outward at nearly the speed of light or even greater velocity. Seyfert galaxies, at instability, exhibit material moving outward at 4,500 km/sec, while an irregular galaxy—M82—has material expanding outward at

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[126]John N. Bacall, *et al.*, "Multiple Quasars for Multiple Images," *Nature,* Vol. 326, (1986), p. 185; Margaret E. Burbidge, *et al.*, "A 'Cluster' of Quasi-Stellar Objects Near M82," *Astrophysical Journal,* Vol. 242, (1980), p. L55; Morely B. Bell, "Clusters of Quasi-Stellar Objects," *Nature,* Vol. 224, (1969), p. 229.

[127]Halton Arp, *Quasars, Redshifts and Controversies, op. cit.*, (especially Chapter 9: "Ejection From Galaxies," pp. 133-163).

[128]Nigel Calder, *Violent Universe*, (New York, 1969), p. 98.

1,000 km/sec. It is readily seen that the explosion of each is less forceful going from quasars to Seyferts to irregular galaxies. The process is explained by the force required to disrupt the various magnitudes of mass. Since a more massive singularity contains greater mass in a greater state of compression, it requires greater rotational velocity to achieve instability. At instability, the greater internal forces let loose by the disruption operate more strongly and subside more slowly.

The process described is one of entropy. We begin with immense masses that produce immense electromagnetic fields. Over the eons, these masses are reduced, which reduce the electromagnetism in the system; the rotational velocity goes from high velocity to low; the electromagnetic emission also goes from high to low energy. I wish the reader to keep this concept in mind as we now come to the Electro-Gravitic Theory of stellar evolution.

THE ORIGIN AND EVOLUTION OF STARS

Some individuals may assume that stellar evolution is so well understood and appears to explain quite well the history of stars that we do not need a new model of this process. In spite of this belief, I. S. Shklovskii has characterized the understanding of stellar formation with the remark that the "star formation problem" is still in the "realm of pure speculation."[129] Simon Milton calls the star formation process "almost a total mystery."[130] Regarding the formation of stars, Sir John Maddox, Editor Emeritus at *Nature*, says, ". . . it is remarkable that their formation should be so much in doubt. . . there is every reason to regard the understanding of star formation as a challenge for the years ahead."[131] Compared to the present theory of stellar formation and evolution, Electro-Gravitic Theory explains the evidence far more comprehensively. But unlike the present theory, it does not conflict with the observations. The theory presented is in harmony with itself and, more importantly, with the observations. This evidence will be fully amplified in what follows. Far too many of the observations simply are opposed to, or are in contradiction with, the presently held, long established theory.

One major problem is the missing Population III stars, as reported in *Sky & Telescope*:

> "Down the years, astronomers have been able to divide almost all stars into two groups: Population-I, made up of young stars enriched by the products of their ancestors; and Population-II, the relatively older ancestors containing more hydrogen and fewer heavier elements. Population-I, according to present thinking, was formed out of the 'ashes' of Population-II stars.
>
> "What is missing in this picture are Population-III stars—stars almost devoid of elements heavier than hydrogen and helium, and formed while the Big Bang was still echoing throughout the cosmos. Current astrophysical theory requires 'ashes' from Population-III to create Population-II.
>
> "Do astronomers find any primordial Population-III stars, still kicking around? Hardly a handful; not nearly enough to satisfy the prevailing model of stellar evolution."[132]

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[129]I. S. Shklovskii, *Stars, Their Birth and Death* (San Francisco, 1978), p. 66.

[130]Simon Milton, *Exploring the Galaxies*, (New York, 1976), p. 89.

[131]Sir John Maddox, *What Remains to be Discovered,* (New York, 1998), p. 49.

[132]"Where is Population-III? *Sky & Telescope*, Vol. 64, (1982), p. 19.

This is explained by the fact that the smaller the star, the more slowly it burns its atomic fuel, in terms of conventional theory. There are many small stars seen in the Milky Way galaxy that should not have burned out their fuel and should be composed only of hydrogen and helium, but these are not seen in the numbers expected.

Various theories have been put forth to explain the dearth of Population-III stars, but Stephen P. Maren admits, ". . . [N]o matter how hard astronomers have looked, very few Population-III stars seem to be left anywhere—not even way out in the universe. . . . A vital 'transition form' is missing in astronomy's fossil record."[133] This is a shaky start for an established theory. However, if stars are born by a different process, then this anomaly may be resolved.

Electro-Gravitic Theory does not hold that stars that contain numerous heavier elements, other than hydrogen or helium, obtained these heavier elements by capturing them from the debris of other stars that exploded. The theory suggests that these various elements were born with the star. Therefore, stars will contain varied combinations of elements. They will exhibit predominantly hydrogen and helium atmospheres with a broad spectrum of other elements. And this is well observed in stars. Thus, at the start of this analysis, the contradictions to established theory begin.

At the outset, I propose to show that stellar and pre-stellar objects rotate in conformity with Electro-Gravitic Theory to establish the link that stellar evolution proceeds along an Electro-Gravitic main sequence. The theory claims that the more massive the star or protostar, the more rapidly it must rotate. Then, as stars radiate their electromagnetic energy into space, their rotation slows until, in extremely ancient stars, there is little or no rotation. Bright young stars with large electromagnetic fields rotate quite rapidly. According to Electro-Gravitic Theory, the younger or more massive a star, the greater its electromagnetic field and the greater its rotational velocity.

This phenomenon can readily be seen with T. Tauri stars, which are among the youngest of stars. It is estimated that they may rotate "fifty or more times faster than the sun."[134] "Stars that have masses, say, ten times that of the Sun, rotate some 200 kilometers [120 miles] a second."[135] Furthermore, "Astronomers have found that the youngest, hottest stars all are spinning quite fast; spin rates of up to 500 km/sec are not uncommon."[136] Our Sun, rotating at about 500 km/sec, would complete one rotation rapidly; its rotation period is, however, almost 26 days.

By retrocalculation, prior to becoming a main sequence star, protostars would possess even greater mass, electromagnetic field strengths and, therefore, even greater rotational velocity than very young stars. Although proto-stars are not observed greatly, they have, nevertheless, been detected by radio telescopes. According to Field and Chaisson:

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[133]Stephen P. Maren, "Stellar Old-Timers," *Natural History*, Vol. 96, (February 1987), p. 80.

[134]F. M. Bramley, *Black Holes, White Dwarfs and Superstars*, (New York, 1976), p. 34.

[135]*Ibid.*

[136]Bova, *op. cit.*, p. 161.

> "Strong [electromagnetic] winds are also associated with objects called protostars. . . . Recent radio and infrared observation of H_2 and CO_2 molecules in the Orion Nebula [where new stars are forming] have revealed clouds of gas extending outward at velocities approaching 100 kilometers per second. Furthermore, high resolution, very-long-baseline interformeter observations have described knots of H_2O maser emission near the star-forming regions in Orion thus linking the strong winds to the protostars themselves."[137]

Based on this theory, the radiation of these protostars should be far stronger than that of luminous ones. In this respect, we are told, "Several possible protostars have been seen in the infrared wave lengths. One of the first to be discovered is in the constellation Cygnus. At a wavelength of 2 microns, the Cygnus IR [infrared] source is emitting as much energy as the brightest visible star in the sky."[138] If we include emissions at all the other wave lengths, this protostar may have emissions that are far greater than even the brightest stars. Based on Electro-Gravitic Theory, such protostars should necessarily rotate even more rapidly than the brightest stars on the main sequence.

By retrocalculation prior to becoming a protostar, the body from which it evolved should possess even greater rotational velocity. The only celestial star-like objects that conform with this analysis are collapsed bodies called white dwarf stars that would be among the slowest rotators in this class. Further, white dwarf stars possess magnetic fields measured in the millions of gauss and rotational rates measured in seconds. A white dwarf star about the size of the Earth can rotate in about one second, or at a velocity of 25,000 miles per second. The "Typical rotation [of white dwarfs are] of an hour or so,"[139] or about 25,000 miles per hour. These are the slower rotating objects compared to those that rotate in seconds.

However, it is presently held, based on conventional theory, that white dwarf stars are burned out, collapsed dead stars, and are always less massive than O, B, or A type stars, with masses of about 1.4 times the mass of the Sun. This is an assumption based on unproven, theoretical conclusions derived from the thermonuclear star model. This I reject, and claim further research will show white dwarf stars can be more massive than calculations from the present model indicate. On this matter of white dwarf star mass, I. M. Levitt states:

> "The masses of white dwarfs are not too well determined. They are only determined definitively when the white dwarf is a member of a binary system, as in the case of Sirius. But there are quite a few that are members of binary systems. The results of these few indicate that the masses are, in the three best observed cases, less than the mass of the Sun with an error in this determination of less than 10 percent. Theoretical considerations indicate that the limiting mass for completely degenerating non-rotating stars is approximately 1.2 times the mass of the Sun. However, if the star is rotating, and in all

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[137]Field, Chaisson, *op. cit.*, p. 49.

[138]Bova, *The New Astronomies*, (New York, 1972), p. 100.

[139]*Sky & Telescope*, (October 1968), p. 349.

probability it is, then masses up to *several times the mass of the sun appear possible.*"[140] (Emphasis added)

In essence, the white dwarf stars that are not in binary systems and are rotating can have masses several times that of the Sun. The more rapidly the white dwarf rotates, the stronger its centrifugal force outward and the more mass it can sustain. Those rotating in a second or less, based on this analysis, can have masses greater than the most massive stars. But just how reliable are the masses of even these binary white dwarfs? W. J. Luyten states:

"The first two white dwarfs discovered, Sirius B and O_2 Eridani B were both components of binaries, and their masses were known beforehand. Since that time, Procyon, also with a known mass has been identified as a *probable* white dwarf. However, the companion to Sirius has often been suspected of being a close double and *its mass rather larger than expected while the companion to Procyon is so faint and so close to its primary that it is virtually impossible to obtain reliable values for its apparent magnitude, color and spectrum.* This leaves O_2 B as the only white dwarf for which the mass, luminosity, color, and spectrum, hence also the surface temperature are known with reasonable accuracy—*surely not an auspicious base on which to erect a whole theory of white dwarfs.*"[141] (Emphasis added)

Luyten goes on to say that the "three best cases" that is, those discussed above, Sirius B, O_2 Eridani B and Procyon B, are very far from conclusive in telling us their masses, etc. Then Luyten adds,

"Theory demands a close relationship between the mass, radius and spectral red shift of a white dwarf, but it now appears that this relation is not quite as simple as we used to believe. Moreover, real red shifts cannot be determined for single white dwarfs (except again statistically, and this would involve some assumptions as to the kinematics involved) while, in addition, many of the most interesting white dwarfs have almost featureless spectra in which red shifts cannot be reliably determined."[142]

In essence, since one cannot, with anything resembling accuracy, determine the distance of a white dwarf via its redshift, one cannot tell much about it, including its mass. The most direct contradiction to the theory of stellar evolution of old red giant stars shedding mass to become white dwarf stars was exposed by Dewey B. Larson, who explains:

"Even in the light of conventional theory, the hypothesis that the [old red giant] stars 'move rapidly to the left of the HR [Hertzsprung-Russell] diagram [from the red giant region] and then downward,' meanwhile shedding mass, is untenable. MOVEMENT TO

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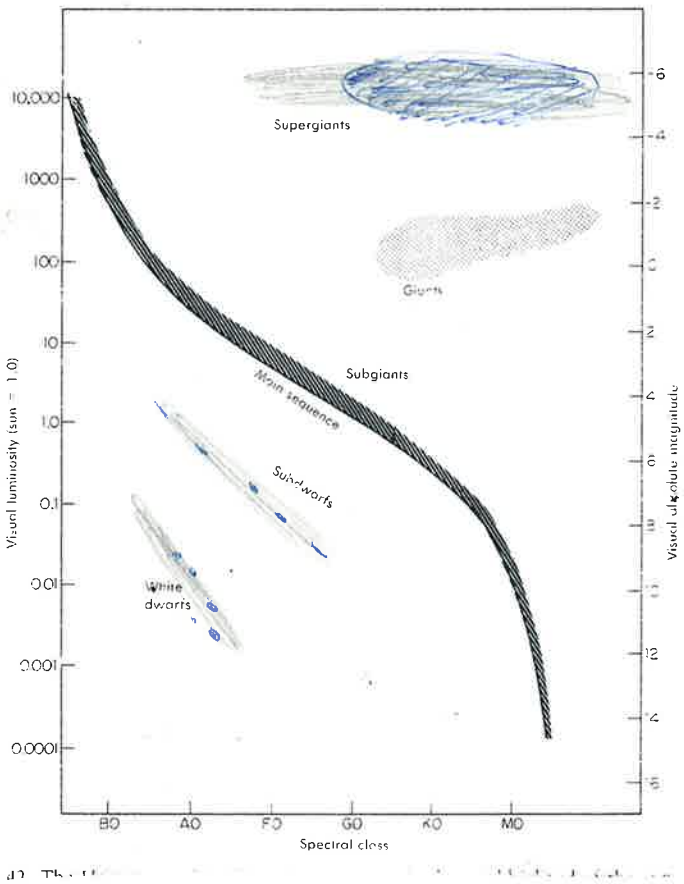
[140]I. M. Levitt, *Beyond the Known Universe*, (New York, 1974), pp. 51-52.

[141]W. J. Luyten, *White Dwarfs,* W. J. Luyten, ed., (International Astronomical Union Symposium, No. 42), (Holland, 1971), p. 5.

[142]*Ibid.*, p. 6.

THE LEFT FROM THE RED GIANT REGION INVOLVES AN *INCREASE* IN THE MASS OF A CLASS 1 STAR, AND EITHER AN INCREASE OR A CONSTANT MASS OF ONE OF THE LATER CLASSES. The stars in the upper left of the diagram are most massive of all the known stars. The mass loss assumed to be taking place during this hypothetical leftward [sic] movement is incompatible with the observed mass relationship. Nor is there any explanation as to *how* this assumed loss of mass could take place. Shklovskii, for instance, concedes that 'we simply do not understand exactly how material is ejected from the envelopes of such [red giant] stars.'"[143] (Capitalization added) See Figure 7.

Figure 7



THE HERTZSPRUNG-RUSSELL DIAGRAM

Here is the problem presented by Larson. In order for a star to move to the left on the Hertzsprung-Russell diagram, *it must gain mass*. However, the conventional theory of stellar evolution claims that old red stars (seen in the upper right of the diagram) explode and much of their mass that does not escape the star's gravitational hold implodes and forms a white dwarf star. However, all the evidence we have of white dwarfs in terms of their absolute magnitude (their brightness of a star seen at a particular distance from the Earth), their surface temperature,

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[143]Dewey B. Larson, *The Universe of Motion*, (Portland, Ore., 1984), p. 81.

their spectral class, and their luminosity relative to the sun, indicates they have greater mass than the red giants from which they supposedly evolved. Corliss writes, "The red giant-white dwarf transition is critical in the theory of stellar evolution. To find . . . [such] serious objections is unsettling."[144]

In essence, the evidence indicates white dwarf stars contain more mass than the stars from which they evolved, which is impossible. But, based on Electro-Gravitic Theory, white dwarf stars are the precursors of newborn stars and, thus, their placement on the Hertzsprung-Russell diagram is in full conformity with theory.

However, even white dwarfs cannot account for the giant O, B, and A type stars on the Hertzsprung-Russell diagram, because these stars are located even further to the left of these bodies. Therefore, what is required to generate these larger or more massive stars is a body that would be even farther to the left of O type stars. In order to accommodate these pre proto-stellar bodies, the diagram would have to be extended to the left for bodies of much greater mass. The only bodies, I suggest, that conform to this position are the pulsars which are also known as neutron stars. So little regarding single pulsars is known that their mass cannot actually be determined. George Greenstein frankly admits:

> "In some ways it was an unsatisfactory discovery. For after all, what direct evidence have we found for the existence of neutron stars? The entire story is based upon a rapid train of radio pulsations whose rate is gradually diminishing. It is a long way from this to the actual observation of a tiny ball [a few miles or so in diameter] of neutronic matter lost in the vastness of space. It has been a purely negative argument that we have recounted. People [scientists] drew up a list of possible candidates and eliminated all but one."[145]

Without clear observational data of the object, its mass cannot be determined. However, on the basis of its magnetic field which measures on the "order 10^{12} gauss,[146] the amount of mass necessary to generate such a field must exceed that of the most massive stars known. Their rotations reflect these immense magnetic fields. Pulsar 4C2153 is accepted to rotate at "642 times per second"[147] This pulsar is rotating so rapidly that ". . . its rate of rotation is too great for it to be simply the remains of a supernova."[148]

> "This so-called millisecond pulsar must be rotating so rapidly that it is on the verge of flying apart. . . . The pulsar did not appear to lie within an observable remnant of a

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[144]William R. Corliss, *Stars, Galaxies, Cosmos*, (Glen Arm, Md., 1987), p. 56.

[145]George Greenstein, "Neutron Stars and the discovery of Pulsars," *Mercury*, Vol. 14, (1985), p. 66.

[146]*McGraw-Hill Encyclopedia of Science and Technology,* Vol. 11 (New York, 1982), p. 98.

[147]*Britannica Book of the Year 1983* (London, 1983), p. 194.

[148]Bunch, *op. cit.,* p. 94.

> supernova, the presumed origin of pulsars. Thus, it is fairly old, although the fast pulsation would be a sign of rather young age."[149]

On the basis of conventional models, pulsars are born from ancient stars that have collapsed and left a radially expanding sphere of gas. I dispute this model.

The astronomers, in order to have pulsar 4C 2153 conform with the conventional model, say that it "has been spun up, that is, the neutron star has drawn in huge amounts of matter from a companion star[150] which caused it to spin more rapidly than the theory will allow. The explanation, unfortunately, ignores the explosive force of such a supernova event. Had the star that supposedly became 4C 2153 exploded, its companion star would have been destroyed or blown away from the pulsar. To get around this difficulty, it is argued that "While a standard supernova explosion would blow away the companion, some types of explosions would blow the companion slowly enough for the pulsar to form first."[151] But even if the companion star is blown away slowly, the pulsar that supposedly formed from a massive star must still implode away from its companion and at the same time push its companion some distance from it. By losing most of its mass (as the conventional theory demands), its gravitation force must also be greatly reduced.[152]

With less gravitational mass, and being farther from its companion, the pulsar would not be in a condition to gravitationally remove mass from a binary star. The mass removal from its companion would have occurred when it was still a main sequence star, larger in mass and closer to its companion. Even this is disputable.

In fact, pulsars are never observed with a luminous main sequence star companion. They are believed to be in orbit around other pulsars or planets or white dwarf stars that cannot be observed. Speaking of pulsars in binary systems, Valerie Illingworth claims:

> "A pulsar that is in orbit about another star, and is detected by its intrinsic emission of radiation (usually radio waves) rather than by radiation resulting from mass transfer. . . . The orbital motion is inferred from apparent changes in the pulse period as the pulsar orbits its companion; in the four binary pulsars known to date (1984), the companion star has not been detected directly, but is believed to be a neutron star or a white dwarf."[153]

This is in full agreement with Electro-Gravitic Theory which claims that stellar type high magnetic bodies will only have companions with masses that are immense. Although it is taken from such binaries (based on strictly gravitational theory) that these binary pulsars have masses

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[149]*Britannica Book of the Year 1983, op. cit.,* p. 194.

[150]Bunch, *op. cit.,* p. 95.

[151]G. Abell, *op. cit.,* p. 392.

[152]Nigel Calder, *op. cit.,* p. 63.

[153]*The Fact on the File Dictionary of Astronomy* (Revised), Valerie Illingworth, ed., (New York, 1985), p. 41.

of over 1.4 times that of the Sun, we still must face an absolute contradiction to the theory of pulsar origins that demolishes its validity.

> "Two midget stars, orbiting around one another at a dizzying 450,000 m.p.h. have astronomers scrambling to their radio telescopes and computers in an attempt to answer some baffling questions. According to current theory, two stars as close together as this pair should not exist."[154]

The reason for this is made explicit. One of the members of this binary system is a pulsar, at one solar diameter apart from its partner.

> "Whatever the companion's nature, there is an unexplainable aspect to both of these strange cosmic twins. . . . [P]ulsars . . . and white dwarfs are all cadavers of dead stars of huge dimensions. How did these two stars get so close together if they each had come from stars larger than the sun? How did one survive the supernova explosion required to create the other?"[155]

In fact, binary system 401820-30, which contains a pulsar, is in orbit about a companion with a radius that is one seventh the diameter of the Sun. The other is believed to be a white dwarf star that cannot be seen.[156] In this case, both stars exploded. Why, then, are they so close to one another? This contradiction is simply too great to give credence to the conventional theory of stellar evolution.

Finally, one asks, Would not by retrocalculation the prior body that evolved into a pulsar possess even greater mass, electromagnetic energy, and rotational velocity than a pulsar? The only bodies capable of greater rotational velocity—even above the speed of light—able to maintain their physical integrity at these rotational velocities are black holes.

The conclusion that I draw, based on Electro-Gravitic principles, is that stellar formation is not a condensation collapse process from clouds of dust, and gas, as conventional theory posits, but one of mass reduction by electromagnetic energy emission, then particle emission and physical expansion of black holes. These spin to instability creating novas, supernovas, and give rise to pulsars, white dwarf stars, which give rise to the stars. I maintain that the evolution of stars is diametrically the opposite process presented in all textbooks and scientific papers. I maintain that the great, luminous supernovae and novae observed in the galaxies, accompanied by the emergence of pulsars and white dwarf stars, is not the death throes of ancient stars, but is, in reality, the conversion of black holes to pulsars, or white dwarf stars, thence to protostars, and then to young stars. It is not star death. It is glorious star birth, just like the birth of the galaxies.

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[154]"Scientists Baffled by Strange Double Star," *Astronomy,* Vol. 2, (December 1974), p. 59.

[155]"One Little, Two Little . . . Binary Pulsars," *Science News*, Vol. 121, (1982), p. 307.

[156]D. E. Thomasen, "A Dizzying Orbit for a Binary Star," *Science News*, Vol. 130, (1986), p. 231; A. R. King, M. G. Watson, "The Shortest Period Binary Star?" *Nature*, Vol. 323, (1986), p. 105.

SUPERNOVAE

It may be stated that supernovae are understood and we have an excellent example of a star exploding which was well observed in the Greater Magellanic Cloud, a satellite galaxy of the Milky Way. In order to have a nova or supernova, based on conventional theory, the proper sized star at the proper age of its evolution is needed. While the public and the press were greatly impressed by the event of 1987, the findings do not fit the theory, but have dismayed the theorists. According to Mitchell M. Waldrop:

> "(1) No one can determine which star, if any, blew up. The 12th magnitude star Sanduleak -69 202 was first fingered for it is located in the proper spot. But it is still there, apparently unchanged, as is a fainter companion. The problem is that if [supernova] 1987A really originated with an even fainter star, such a star would not have enough mass to go supernova according to theory."[157]

Thereafter, Waldrop stated:

> "In the above item, we reported some of the anomalies surrounding supernova 1987A, the first nearly supernova since 1604 A.D. . . . . The prime suspect was the star Sanduleak -69 202. But then it was claimed that old -69 202 was still alive and well. This presented a quandary because no other star in the area was large enough to go supernova. But now, it seems there was a mistake, and it was Sanduleak -69 202 all along that detonated."[158]

At this news, the astronomers felt that their theory was saved and could return to their work assured of their understandings of supernovae.

The problem endemic to the Sanduleak -69 202 supernova is that it was a young star with plenty of hydrogen fuel to generate energy. Based on conventional theory, a supernova arises from a cool, red supergiant star. This was pointed out by Paul A. LaViolette.

> ". . . in 1997 when astronomers finally did observe a supernova relatively close by, in the Magellanic Cloud, they found a flaw in their collapsed theory. The progenitor star was not a cool red supergiant, as expected, but a hot blue supergiant, called Sanduleak -69 202. Since energy production was at a peak in this star, the expected collapse should never have occurred."[159]

On May 23, 1987, Malcolm W. Browne, in an article titled "Stellar Explosion Reported to Spawn Mysterious Twin," in *The New York Times* reported,

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[157]Mitchell M. Waldrop, "The Supernova 1987A shows a mind of its own—and a Burst of Neutrinos," *Science,* Vol. 235, (1987), p. 1322.

[158]Mitchell M. Waldrop, "Supernova 1987A; Notes From All Over," *Science,* Vol. 263, (1987), p. 522.

[159]Paul A. LaViolette, *Beyond the Big Bang,* (Rochester, Vt., 1995), p. 306.

> "According to Dr. Robert W. Noyes of Harvard-Smithsonian (Center for Astrophysics), the observations gathered by an extraordinarily sensitive camera show that the bright exploding star, or supernova, is actually two points of light, very close together, one about 10 times brighter than its companion. Since neither was present before the explosion, astronomers assume they both arose from the same blast, but how this could happen is a mystery. . . .
>
> "The supernova and its apparent companion lie in the Greater Magellanic Cloud, a satellite galaxy of our Milky Way, at a distance of about 150,000 light years from Earth. The instrument used by the Harvard-Smithsonian group measured the distance between the two supernova elements as about one-twentieth of an arc second. This is about the separation a human eye would see between the headlights of a car some 5,000 miles away.
>
> "Dr. Noyes said this distance was equivalent to an actual distance between the two bright objects of only about 3,000 Astronomical Units, where one Astronomical Unit is the distance from the Sun to the Earth, about 93,000,000 miles. This is a tiny distance in astronomical terms, but if both objects stemmed from the same explosion, Dr. Noyes said, they must have been moving apart at more than half the speed of light—an immense and surprising speed."

Supernovae are not known to be capable of generating enough power to throw off large elements of a star at a speed greater than half the speed of light. Several other problems related to this supernova were reported by Roger A. Chevalier.[160]

But what was most important in his findings is that the central body lying amid the debris of the 1987A supernova was a "central compact object."

As Corliss comments on this finding, "Prevailing supernova paradigms cannot account for this high density remnant."[161] Electro-Gravitic Theory requires that the object left from a black hole spinning to instability is a high density body or newborn star which is just what has been confirmed by this data.

But, returning to Electro-Gravitic Theory, I claimed the black holes that gave birth to supernovae were traveling at or near the speed of light. The separation of the elements of 1987A seem to indicate this; *viz.*, that the supernova fissioned a piece of itself.

A further nail was driven into the entire concept of conventional supernova theory when Ken Crosswell explained:

> "What happens when two white dwarf stars in close orbit finally fall into one another? Theory says you get a colossal explosion called a Type-I supernova. But this hypothesis is in trouble because a recent survey of white dwarfs revealed absolutely no double white dwarfs in a sample of 25 from the Milky Way. Even if a few pairs are eventually found, they do not appear to be numerous enough to account for the rate at which supernovas are observed."[162]

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[160]Roger A. Chevalier, "Supernova 1987A at Five Years of Age," *Nature,* Vol. 355, (1992), p. 691.

[161]Corliss, *Science Frontiers*, (Glen Arm, Md., 1994), p. 85.

[162]Ken Crosswell, "Supernova Theory Exploded by Solitary White Dwarfs," *New Scientist,* (March 23, 1991), p. 23.

The theory states that binary white dwarf stars fall into one another which also generate supernovae. If this were the case, then binary white dwarf stars would be common enough to explain this aspect of the theory. Again, this is not the case. While supernova theory is contradicted by these fundamental problems, Electro-Gravitic Theory exhibits no such weakness.

ELECTRO-GRAVITIC STAR BIRTH

How, then, do black holes become pulsars or white dwarf stars? In order to explain this, I will have recourse to assuming hypothetical masses of these black holes. It should be understood at the outset that the numbers employed in the following analysis are for illustrative purposes only and are not in any way to be construed as the proper values of the masses to be discussed. The only position being advanced is that the more massive the black hole, the more violent will be its behavior at instability; and the longer its period of instability, its nova or supernova.

The first hypothetical singularity ejected by our spiral galactic black hole is of one million solar masses. Such a massive body must posses a commensurably large electromagnetic field and will rotate to instability relatively near the central galactic singularity. Because of their large masses, these bodies will eject much of their masses as quasars. The orientations of their poles will be at various angels at the central black hole and, therefore, they will eject their various masses in all directions around the galactic nucleus to evolve into stars at later periods. These black holes that generate their stars the earliest will create young stars in and around the galactic center. In addition to attracting ancient red stars toward the central black hole with its immense mass, it also generates young stars, as well.

One question related to star birth is: Why is it that luminous stars of millions, thousands, or even hundreds of solar masses, are never observed in our galaxy or any other spiral type galaxies? "Stars, it seems, are never more than 20 times the diameter of the sun."[163] The most massive star yet observed in the Milky Way is *Alpha Herculis*. "The faintest component of Plaskett's Star discovered by J. S. Plaskett from the Dominion Astrophysical Observatory, Victoria, British Columbia, Canada *c.* 1920 . . . [has] a mass 55 times that of the sun."[164] Also, why is it that spiral type galaxies of millions, thousands, or even hundreds of masses larger than the Milky Way are also never observed? The most massive galaxy yet observed was ". . . found to be 41C 31:04 (a binary system) with a mass 45 times that of the Milky Way."[165]

The limits of the stellar and galactic masses are clearly derived from Electro-Gravitic Theory: huge sizes of black holes with greater masses than these, with commensurably larger electromagnetic fields, must rotate to instability and shed their masses until their rotations are slowed sufficiently to either stop ejecting mass, or ejecting mass at a slower rate. Electro-Gravitic Theory forbids the existence of greatly more massive galaxies than the Milky Way, or

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[163]G. S. Hawkings, *Mindsteps to the Cosmos*, (New York, 1983), p. 224.

[164]*Guinness Book of World Records 1977*, (New York, 1977) p. 159.

[165]*Ibid.*, p. 162.

of stars in spiral type galaxies consisting of hundreds of solar masses. However, the established theories of galactic formation in no manner whatsoever forbid clouds of gas that condense to form galaxies millions, thousands, or hundreds of masses greater than the Milky Way, nor stars millions, thousands, nor hundreds of masses greater than the Sun. Since gravitational collapse of dust clouds would have created at least several such galaxies in the visible universe or several such stars in these galaxies, where are they? One cannot have a theory that generates all sizes of galaxies and stars only producing galaxies and stars of a limited mass. I am sure ingenious theories have been promulgated to do just this, but these were only created as *post hoc* explanations to make the observation fit the paradigm.

In fact, directly the opposite seems to be the case. As P. E. Seiden states, especially with respect to galaxies:

> "The standard Big Bang model does not give rise to lumpiness. That model assumes the universe started out as a globally smooth, homogeneous, expanding gas. If you apply the laws of physics to this model, you get a universe that is uniform, a cosmic vastness of evenly distributed atoms with no organization of any kind. 'No galaxies, no stars, no planets, no nothin'.' Needless to say, the night sky, dazzling in its lumps, clumps, and clusters, says otherwise.
>
> "How, then, did the lumps get there? No one can say—at least not yet, and perhaps not ever. The prerequisite for a cosmos with clusters of concentrated matter is inhomogeneity—some irregularity, some departure from uniformity, some wrinkle in the smoothness of space time—around which matter, forged in the primordial furnace, could accrete.
>
> "For now, some cosmologists all but ignore this most vexatious conundrum. They opt, instead, to take the inhomogeneity as given, as if some matrix of organization, some preexistent framework for clumping somehow leaked out of the primeval inferno into a newly evolving universe with lumpiness in place, [based on nothing known to exist or tested in any way] the laws of physics seem to work fine in explaining the evolution of the cosmos we've come to know."[166]

We outlined this earlier regarding the birth of galaxies. On the other hand, Electro-Gravitic Theory predicts the universe must be lumpy because it starts out in just that way. Gerrit Verschuur tells us, with respect to dust clouds in the Milky Way and the ability of these to collapse into stars,

> "Basically there does not appear to be enough matter in any of the hydrogen clouds in the Milky Way that would allow them to contract and be stable. Apparently our attempt to explain the first stages in star evolution have failed."[167]

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[166]Ben Patrusky, "Why Is the Cosmos Lumpy?" *Science 81*, Vol. 2, (June 1981), p. 96.

[167]Gerrit Verschuur, *Starscapes*, (Boston, 1973), p. 102.

Furthermore, there is the problem of the rotation of these various main sequences and condensed stars. Otto Struve, in *Sky & Telescope* for December 1960 and January 1961 outlined the problem thus:

> "Rotation is an important factor in the problem of star formation. A principle difficulty has been to explain how a vast, diffuse cloud of gas and dust can ever contract into a star that has as little angular momentum as the 10^{53} units characteristic of a very rapidly spinning A- or B-type star."[168]

Various authorities have presented several ad hoc theories to get away from the problem that a massive cloud condensing inward to create a rotating star requires that the star rotate immensely faster than those actually observed.[169] Ultimately, Struve was forced to admit.

> "One great unresolved difficulty is that the number of slowly rotating O, B, and A stars is greater than follows from . . . theory. In other words, there are many more of these stars with small *observed* rotational velocities than we should expect. . . . Their existence does not seem to be explained by [E.] Schatzman's present hypothesis or, for that matter, by any other hypothesis advanced to date."[170]

While Struve wrote this in the 1960s, in 1977 it was also admitted,

> "The simplest calculations for star formation suggest that all stars should be spinning very, very fast as a result of their enormous contraction from cloud to star, but they do not do so. Why not? The answer is far from known at present."[171]

In essence, the slow rotational velocities of stars do not correlate with the theory of their formation, and the clouds from which they are assumed to condense, which are much too tenuous to accomplish this collapse. Unfortunately for conventional theory, the very same problem exists for the pulsars or neutron stars, and the white dwarfs, as well.[172] For both classes of stars—young, massive, main sequence stars, pulsars, and white dwarfs, this is a basic problem for conventional theory, while it is well in accord with Electro-Gravitic Theory.

Therefore, the evidence suggests that stars do not condense out of dust clouds any more than it suggests galaxies condense from such nebular material. On both the galactic and stellar

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[168]Otto Struve, "Some Problems of Stellar Rotation," *The Evolution of Stars*, T. Page, L. Page, eds., (New York, 1968), pp. 184-185.

[169]*Ibid.*, pp. 185-189.

[170]*Ibid.*, p. 189.

[171]Verschuur, *Starscapes, op. cit.,* p. 105.

[172]K. Brecher, C. Chanmugam, "Why Do Collapsed Stars Rotate So Slowly?" *Astrophysical Journal,* Vol. 221, (1978), p. 969.

level, the condensation model is without support. But let us return to the masses of black holes ejected from galactic singularities.

The second hypothetical black hole ejected is of the magnitude of 100,000 solar masses. Such a black hole will rotate to instability at a later period than the larger one of one million solar masses. Because of its smaller mass, the difference between the inward pull of gravity and the outward push of centrifugal force assisted by the atomic particle forces in the body will be greatly reduced. Such a body cannot expel any truly massive part of itself without permanently disrupting the whole internal structure. At instability, it cannot maintain its integrity. There is a mass point (not necessarily the one I am discussing) at which a black hole must disperse most of its mass as numerous smaller black holes all around it or outward in a few directions. Such a disruption will create a globular halo region in space in which these singularities will evolve into numerous stars.

The third hypothetical black hole ejected is of 1,000 solar masses. Because it is even smaller than the 100,000 solar mass singularity it will journey farthest from the galactic black hole over a longer period of time before it achieves instability. However, at instability, it does not break apart as described above. Because of its relatively small mass, at instability the difference between the inward pull of gravity and counter centrifugal force aided by internal atomic forces is much smaller. Therefore, only the surface of this minute body will mass be ejected. Only a minute fraction of the surface layer of collapsed matter is shed as super hot plasma into surrounding space. This process reduces the mass of the black hole, but only by a very small amount.

The singularity is still rotating at immense velocity with a minutely reduced surface gravity thus permitting centrifugal force to rip away additional layers of collapsed matter. Once this process commences, it builds to a climax of expelling layer after layer of surface material over a period of days, weeks, or months, depending on the magnitude of the original mass. This, I contend, is the proper analysis and description of a supernova. The ultimate result of this action drastically reduces most of the mass of the body and further reduces the rotational velocity of the black hole below the speed of light. Since the mass of that body has been so greatly diminished during the supernova, the gravitational force that has contained the mass in a collapsed state can no longer maintain that condition. The internal atomic forces of the particles pushing outward must then be accommodated. To accommodate these forces which are in competition with gravity, the body is converted at the end of the supernova process into a pulsar, while the supernova of an even smaller black hole gives rise to a white dwarf star. White dwarf stars have been observed ejecting and exhibiting shells of expanding gas accelerating outward radially as an expanding globe.[173]

PULARS

Based on Electro-Gravitic Theory, since pulsars and white dwarf stars emerge from supernovae of black holes expelled from the center of the galaxy along its arms, they should be located where new stars are born—that is, in the arms of spiral type galaxies. Pulsar distribution

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[173]N. Henbest, M. Marten, *The New Astronomies*, (Cambridge, England, 1986), pp. 194-195.

ought to be greatest in number just outside the nucleus of the galaxy, and at greater distance be diminished in number, and become rare beyond a certain radial point from the galactic center. This is exactly what is found:

> "The pulsars appear to be more or less randomly scattered over the sky, but there is a significant concentration of sources toward the galactic plane. *Pulsars distributed similarly to the young stars of the galaxy.*"[174] (Emphasis added)

A pulsar, over time, can "move as much as 1,500 light years away from its place of birth."[175] This still places them in the region where new stars form. Shklovskii states, "At a distance beyond 15,000 pc [parsecs: a parsec is equal to 3.26 light years] from the galactic center, pulsars are altogether absent."[176] This distribution conflicts with the traditional paradigm because large stars capable of collapsing into pulsars exist well beyond the 15,000 parsec limit. If pulsars are the leftovers of large stars, they should be found where large stars exist beyond the pulsar radius.

Furthermore, "Pulsars are known to be high velocity objects traveling at speeds of several hundreds of kilometers per second . . . [these speeds] are equivalent to over a million kilometers per hour."[177] On the basis of these velocities, Shklovskii found,

> "Most pulsars have such a great forward speed that they ought to leave the galaxy eventually. It follows that old pulsars should form a vast quasi-spherical halo around our galaxy, hundreds of thousands of light years across. Yet nothing of the kind is observed."[178]

Why is this quasispherical halo of pulsars absent given their great outward velocities? Based on Electro-Gravitic Theory, pulsars evolve into protostars long before they can leave the galaxy. As the pulsar evolves to a protostar, its outward motion will slow because its electromagnetic repulsion between it and the central singularity weakens while at the same time, it is pushing against the whirlpool effect of the galactic, magnetic field. These phenomena cause its motion outward to swerve and become more and more circular so that its motion is no longer outward, but more circular with respect to the galactic core. Thus, it cannot leave the galaxy to form a halo hundreds of thousands of light years across.

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[174]*Encyclopaedia Britannica, Macropaedia*, Vol. 15, (London, 1978), pp. 267-268; see, also, *McGraw-Hill Encyclopedia of Science and Technology*, Vol 11, (New York, 1982), p. 91.

[175]*McGraw-Hill Encycl. of Sci. & Tech., loc. cit.*

[176]Shklovskii, *Stars, Their Birth, Life, and Death, op. cit.*, p. 325.

[177]David H. Clark, *Superstars: How Stellar Explosions Shape the Destiny of Our Universe*, (New York, 1984), p. 152.

[178]Shklovskii, *Stars . . . , op. cit.*, p. 324.

Some astronomers, in fact, seriously question the entire process that stellar collapse can produce a quasar. Herbst and Assousa admit "The exact mechanism by which a star becomes a supernova is not yet known."[179]

R. P. Kirschner comments:

> "The train of events leading to a supernova of Type I [which occur in both spiral and elliptical galaxies, all have very similar light curves] is more mysterious than that leading to one of Type II [which only occur in the arms of spiral galaxies, which exhibit various light curves], since a Type I supernova is expected to be the explosion of a star about as massive as the Sun. Since such a star can comfortably settle down to being a white dwarf, something unusual must happen for it to explode as a supernova."[180]

Shklovskii admits, "We should emphasize at the outset that modern science does not yet have a genuine theory of stellar explosions at its disposal."[181] J. S. Gallagher and S. Starfield also comment:

> "It is clear that there are few problems relating to the novae that we may consider as solved, and many phenomena for which we have yet even to identify the nature of the underlying physical processes."[182]

Nigel Calder adds:

> ". . . While not denying the possibility of collapse beyond the white dwarf stage, they doubt whether even nuclear forces can halt the collapse of the stage of a neutron star. An exhaustive, massive star, according to them, just goes on shrinking and disappearing from our universe."[183]

The kinetic energy of the stars' mass, as it falls inward, produces a momentum of such magnitude that it becomes impossible to halt at a certain stage. But then comes the energy problem. Remember that traditional theory maintains that pulsars come from large stars that have lost most of their energy by atomic fusion. The question is: How do these stars, thereafter, as pulsars generate the immense energies that they are observed to emit? "The energy emitted by pulsars is not small; the crab nebula pulsar puts out thousands of times as

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[179]D. Herbst, S. Assousa, "Supernovas and Star Formation," *Scientific American*, (August, 1979), p. 138.

[180]Robert P. Kirschner, *Scientific American,* (December 1976), p. 94.

[181]Shklovskii, *Stars, op. cit.*, p. 288.

[182]J. S. Gallagher, S. Starfield, "Theory and Observation of Classical Novae," *Annual Review of Astronomy and Astrophysics,* G. Burbidge, *et al.*, eds., Vol. 16, (Palo Alto, Calif., 1978), p. 210.

[183]Nigel Calder, *Violent Universe, op. cit.*, pp. 38-39.

much energy as does the sun."[184] Shklovskii, on this matter, states: "We must admit that today there is no generally quantitative theory for radio emissions of pulsars."[185] Furthermore, the crab nebula pulsar has been emitting "thousands of times as much energy as the Sun for about a 1,000 years.[186]

This, again, appears to be a contradiction. The star that collapsed into a pulsar had supposedly used up almost all its hydrogen fuel by converting it into energy. Yet it evolves into a body that produces thousands of times as much energy as a giant star for millions of years. Add to this the traditional concept that a pulsar is born from a supernova event, "A nova is equivalent in energy release to roughly 1,000 years of solar output. A supernova releases as much energy in its first 24 hours as the sun produces in a billion years."[187] Only if the pulsar is of immense mass can it generate more energy than a star.

Based on traditional theory, pulsars are born from massive stars, while observations indicate that the largest known star in our galaxy is 55 times more massive than the Sun. Therefore, the remnant materials created by a supernova should not exceed approximately 50 to 60 or so solar masses. However, R. Morris claims:

> "Since supernova remnants have been observed, the amount of stellar material thrown off in the explosion can be calculated; it turns out that this can be as much as ten or a hundred solar masses."[188]

If the remnant left is 60 to 100 solar masses, the star that became a supernova had to be more massive than its remnant—that is, more massive than any star ever observed in the Milky Way, something that does not exit in any galaxy, as far as is known.

The remnant itself offers traditional theory another massive contradiction. The traditional theory of element formation suggests that atoms above those of hydrogen and helium are generated in the cores of stars which when they nova or supernova, distribute these heavier elements in space to be formed with other stars and planets. Therefore, the remnants of supernovae should be fairly rich in various atoms with atomic weights above hydrogen and helium. But in the Crab Nebula, the central pulsar is not surrounded by a vast cloud of various atoms. The "red lacy network of long and sinuous glowing *hydrogen* filaments. The filaments emit the spectrum characteristic of diffuse nebula."[189] "The composition of these nebulae show almost a uniform chemical composition regardless of the [central] object. This material

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[184]G. O. Abell, *Realm of the Universe, op. cit.,* p. 396.

[185]Shklovskii, *Stars . . . , op. cit., p. 349.*

[186]Abell, Realm . . . , *loc. cit.*

[187]Ben Bova, *The New Astronomies, op. cit.,* p. 697.

[188]R. Morris, *The End of the World*, (New York, 1980), pp. 34-35.

[189]*Encyclopaedia Britannica, Macropaedia*, Vol. 24, (Chicago, 1986), p. 769.

is predominantly *hydrogen* (about 65 percent by weight or 90 percent by number of the atoms)."[190] (Emphasis added in both citations)

Robert P. Kirschner writes:

> "The relative abundance of these elements [heavier than helium] in the supernova is not very different from their abundance in the sun if the supernovae synthesize heavy elements out of lighter ones in the course of their explosion. None of that material is initially seen in the rapidly expanding debris."[191]

If a pulsar is formed after a star has exhausted most of its hydrogen fuel, how is it possible that pulsars with calculated masses of over 3.0 solar masses emit enough hydrogen fuel to power 6.5 to 65 stars as massive as the Sun? This contradiction in the evidence itself seems an overwhelming obstacle to the theory that pulsars are really burnt out, collapsed, giant stars. Martin Harwit frankly admits:

> "Even now, however, we have no theories that satisfactorily explain just how a massive star collapses to become a neutron star [a pulsar]. We know that neutron stars are possible in our universe, but only because we see they are there—not because we understand how they form."[192]

M. Ruderman's comment on theoretical research is telling: "Theoreticians have apparently found it easy to understand them [pulsars] for they have produced not only a theory of pulsars, but dozens of theories of pulsars."[193] The theory proposed here, which explains not only pulsars, but an entire range of astronomical objects, is that in order to generate these fairly massive objects and their ongoing emissions of enormous amounts of energy, one has to begin with a far more massive body and, from that greater, mass will exist the huge reserve of potential energy.

If Electro-Gravitic Theory is correct, it should also explain pulsar behavior inexplicable by the traditional astrophysical model. One of the major problems with pulsars is that they "glitch," that is, they sometimes quite suddenly rotate more rapidly. The Vela pulsar's "rotational rate increased by a mere two parts per million. If this were to happen to the Earth, the day would be only 0.2 of a second shorter."[194] But strangely enough, pulsars also

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[190]*Ibid.*, p. 793.

[191]Robert P. Kirschner, "Supernovae In Other Galaxies," *Scientific American*, (December, 1976), p. 94.

[192]Martin Harwit, *Cosmic Discovery,* (New York, 1981), p. 243.

[193]M. Ruderman, *Annals of the New York Academy of Sciences*, (February 15, 1980) in Larson, *The Universe of Motion, op. cit.,* p. 239.

[194]George Greenstein, *Frozen Star*, (New York, 1983), p. 81.

"antiglitch," that is, they suddenly slow down.[195] However, in both cases, the pulsars return to their earlier velocity over a relatively short period. The usual explanation that was offered for the sudden speed up of the pulsar rotation was that the tiny inch high mountains on such a compact body were settling causing a kind of pulsar quake. However, this idea is no longer accepted.[196] The sudden antiglitch, or sudden slowing of pulsars, implies that they are expanding. However, there is little known to explain antiglitches.

How does Electro-Gravitic Theory explain the observed temporary speeding up and slowing down of the rotation of pulsars? Previously it was pointed out that pulsar emission of electromagnetism is enormous compared to the Sun. Since energy and mass are equivalent, the pulsar must be losing its mass through these emissions. Thus, as the pulsar's mass is gradually diminished, the gravitational pull at the surface is also reduced. Over a period of time, this reduction of the surface gravity becomes attenuated sufficiently in certain areas to respond and rise minutely in a millisecond jump upward. This expansion of the volume caused the pulsar to slow. What must not also be overlooked is that the galactic electromagnetic field may also send a slightly larger charge to a pulsar and do as it does on Earth. *viz.*, slow its rotation temporarily. The speed up mechanism may be the reverse, *viz.*, that a small reduction in the galactic electromagnetic field, as on Earth, causes it to speed up temporarily. I am inclined to suggest that ripples in the galactic electromagnetic field plays a dominant role in pulsar glitches and antiglitches.

There is also another inexplicable problem of pulsars called "nulling," which Greenstein describes thus:

> "The most remarkable thing about it [nulling] is that it comes completely without warning. Nothing prior to a null gives any warning that it is about to occur. The beacon does not slowly fade to invisibility but completely vanishes. Such abrupt fluctuations are relatively common in pulsars, and they last a few seconds to a matter of minutes."[197]

One may correctly wonder what possible mechanism can completely shut down the electromagnetic radiation emissions of a body that is flooding the space surrounding it with vast flows of energy. In describing the power of one of these outward flows of radiation, Greenstein states of the Crab Nebula pulsar:

> "From the outskirts of the [Crab] nebula the object [pulsar] responsible for the bursts—the 'lighthouse' emitting the flashes—is too small to be seen. The largest telescope we have would not be capable of spotting it from there.
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> "I move in toward the heart of the Crab. The level of radioactivity rises . . . it comes from the pulsar. The radiation exerts a noticeable pressure, and it is this force that accelerates the nebula's [cloud] expansion. . . .

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[195]William R. Corliss, *Mysterious Universe*, (Glen Arm, Md., 1979), pp. 579-580.

[196]Greenstein, *Frozen Star, op. cit.*, pp. 93-96.

[197]*Ibid.*, p. 56.

> "I move still closer . . . to within 93 million miles of the pulsar, the distance of the Earth from the Sun. The pulsations are overwhelming. On average, the illumination is brighter than sunlight: concentrated into bursts, the level of which is blinding. A storm of radiation—electrons and protons—pour from the pulsar outward into the nebula. No shielding imaginable would suffice to protect against it. It would be enough to shred a planet. It may even be that, long ago, a system of worlds did swing about the pulsar in steady orbits, but if so, they would have been on fire, violently boiling under the impact of the terrible radiation. From each [planet] a vast plume of vaporized rock would have streamed outward. The planets would have looked like comets. None could survive til now. . . . [as one comes quite close to the pulsar one is] enveloped in cosmic fire: superheated plasma, intense electric currents. Massive lightning strokes flare . . . [closer yet]
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> "The rotating magnetic field grows to such unthinkable intensities that atoms are deformed."[198]

Then, without warning, all this vast outflow of radiation ceases instantaneously and a massive, unreal calm pervades the environment for seconds to minutes when, again, without warning, the vast outflow of radiation explodes outward, instantaneously. What can accomplish such a stupendous feat?

One of the fundamental principles of Electro-Gravitic Theory is that collapsed matter forms a lattice structure which gives rise to internal electromagnetism in celestial bodies. After a pulsar, through its emissions, has shed a sufficiently large part of its mass, the surface will expand radially. But, in order to maintain a stable lattice throughout the entire body, the structure of that lattice must readjust and reorganize itself to conform to the near constraints of gravity pulling inward and atomic forces pushing outward. To readjust and reorganize, the entire lattice takes but a few seconds to minutes, but, while this restructuring process is operating, the pulsar lacks a lattice and, therefore, cannot generate its electromagnetic field. Once the lattice is reformed, the pulsar explodes, so to say, in an instance, with renewed electromagnetic emissions.

And yet, there is more. Rudolf Kippenham, in his book *100 Billion Stars,* states about another basic anomaly regarding pulsars,

> "The pulsars pose another problem for astronomers. Based on the many pulsars already known, it is estimated that our galaxy may contain as many as a million active pulsars. We have also been tracking remote galaxies for decades to find out how many supernovae, on average, explode in them in a hundred years. For once we know that we can estimate the number of neutron stars that have recently originated in our own Milky Way. It now appears as if there are more pulsars in space than could possibly have formed through supernovae explosions. Does that perhaps mean that pulsars can also originate via other means? Are some of them perhaps the result of more peaceful, less spectacular, events than stellar explosions?"[199]

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[198] *Ibid.*, pp. 6-7.

[199] Rudolph Kippenham, *100 Billion Stars*, (New York, 1983), p. 150.

The answer to this question is "yes." If a black hole is moving on a highly oblique trajectory along the arms of a spiral galaxy wherein the arms are tightly wrapped around the nucleus, it will rotate faster, but do so much more gradually over a far longer period of time. A black hole, moving more radially outward away from the galactic nucleus will be able to rotate to instability in a very short time compared to the one moving outward more gradually. The slower outward moving body will become only slightly unstable for relatively short periods and throw off mass in very short bursts. The black hole, at these times, will, for a few seconds, emit tremendous bursts of energy and, in so doing, reachieve stability. It may do this over its entire life before it finally emerges from this stage as a pulsar. The usual explanation for the bursts of immense radiation is that gas is drawn in onto a pulsar which generates a thermonuclear flash. This may be so for X-ray bursters, but what, then, of the far more powerful emission of gamma-ray bursters. Bradley E. Schaefer, writing in *Scientific American,* gives us the following description.

> "Approximately once per day a burst of very intense gamma radiation emanates from some completely unpredictable part of the sky. The duration of the burst is typically between one second and 10 seconds, although some bursts have been as short as .01 second and others have been as long as 80 seconds. During this time, the burst brightens into visibility, varies randomly in intensity, and then fades back to invisibility. With few exceptions, no more than one burst has come from exactly the same direction and none has been positively identified with a previously known object."[200]

According to Corliss, "Gamma bursters generate more power per unit volume than any other object in the universe. In one second, they can produce as much energy as the sun does in a week."[201] Now, if these bursters were standing relatively in the same spot as pulsars do in the galaxy, they would, after a few years, all be associated with the same point in the sky. Those moving either toward or away from Earth along their trajectories would, however, tend to appear in a discrete position. Nevertheless, in terms of Electro-Gravitic Theory, after a burst of gamma-ray energy, the black hole continues its outward migration for a relatively long enough period of time before it bursts again and, therefore, cannot be observed at the same point in the sky. There are, perhaps, forty theories of these bursters, all of them consistent with current theoretical and observational evidence, but not coherent with all other aspects of pulsar behavior, as Electro-Gravitic Theory is.

Lastly, we come to the problem of why pulsars, isolated in the vastness of space, have rotation periods that slow down at so great a pace. The Earth's rotation, supposedly, because of the tidal pull of the moon, has been slowing gradually over the past 4.5 billion years, yet it has not come to rest. However, Pulsar NP 0532 pulsing 30 times a second, according to present calculations of its rotational velocity, will come to a stop in about 10 million years if its current

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[200]Bradley E. Schaefer, "Gamma-Ray Bursters," *Scientific American,* Vol. 252, (February, 1985), p. 52.

[201]Corliss, *Stars, Galaxies, Cosmos, op. cit.,* p. 71.

rate of slowing continues.[202] Greenstein remarks that pulsars, "situated in the void of interstellar space, ought to continue rotating indefinitely, and the fact that they are not points to some new, unsuspected process."[203]

Electro-Gravitic Theory shows that the slowing of pulsar rotation is due to both an electromagnetic, as well as a gravitational process. As the pulsar radiates its mass into space, its electromagnetic field is reduced in strength. Electro-Gravitic Theory postulates that this reduction must cause a body to rotate less rapidly. In terms of the gravitational effect, the theory also postulates that with a reduction in energy caused by massive radiation, the pulsar must expand outward. In so doing, like a skater extending his/her arms, the rotation of the pulsar must also be reduced.

WHITE DWARF STARS

There are also several problems associated with white dwarf stars that are difficult or impossible to accommodate within the present theory of star formation and death, but which are well in accord with Electro-Gravitic Theory. According to established theory, there should be a great many cool red-colored white dwarfs, but "An anomaly has been found in number and relative frequency of cool, red white dwarfs. It had been expected that these would be very common but, in fact, [these] objects more than 10,000 times fainter than the sun are rare."[204] Because the white dwarfs cool very gradually, they go from white to yellow, to orange, to red in color. That is, they age slowly, over billions of years and produce less heat. Their red color is an indication of their age.

Thus, they should be the most numerous of the white dwarf population. But Greenstein admits exactly the opposite is the case: white dwarfs containing helium, carbon, or metal [red dwarfs] are about twenty percent as numerous as those containing dominantly hydrogen [the white type dwarfs]."[205] He also informs us that our galaxy is too young to permit white dwarfs to cool and become black. "There are . . . no black dwarfs in our galaxy; it is yet too young."[206] Therefore, our galaxy should exhibit a population predominantly of red dwarfs and, instead of eighty percent being white and twenty percent red, the reverse should be true, with the red dwarfs predominating over the white. This is a clear contradiction to the established model.

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[202]F. M. Bramley, *op. cit.*, p. 82.

[203]Greenstein, *op. cit.*, p. 61.

[204]Jesse L. Greenstein, "White Dwarf Star," *McGraw-Hill Encycl. of Sci. and Tech.*, Vol. 14, (New York, 1977), p. 558.

[205]Jesse L. Greenstein, "White Dwarf Star," *Encycl. of Science and Tech.*, Vol. 19, (New York, 1997), p. 526.

[206]Jesse L. Greenstein, "Dying Stars," *Frontiers in Astronomy,* (San Francisco, 1970), p. 154.

Nevertheless, this is well in agreement with Electro-Gravitic Theory. Since red dwarfs evolve into young stars, they are constantly losing members of that population. While the population ratio contradicts the established theory, it fully confirms that of this theory.

On the other hand, Electro-Gravitic Theory claims that these white dwarfs evolve into newborn stars and very few should ever last long enough in the red stage before becoming a young star.

Earlier it was shown, via the Hertzsprung-Russell diagram, that their evolution from main sequence stars to the white dwarf stage makes no sense in terms of that theory. However, of greater significance with respect to Electro-Gravitic Theory, is that it predicts that as the white dwarf loses mass through its electromagnetic emissions, it expands outward. The more massive the white dwarf, based on theory, the smaller should be its size. According to Shklovskii, "the more massive a white dwarf, the *smaller* the radius."[207]

Greenstein explains the theory thus:

> "Strangely, according to the theory, the greater the mass of a white dwarf, the smaller its radius. This follows, however, from the degenerate-gas law, which predicts a gas pressure, for a given density, sufficient to counteract gravitational pressure only when the star is greatly collapsed. The inverse relationship of mass to radius is not affected, as it is in other stars, by temperature, luminosity or energy production."[208]

By this argument, Greenstein claims that with depth, as in normal stars, the temperature rise is different for white dwarfs. That is, the temperature rise is only large enough to offset the mass above.

This would make perfectly good sense if Greenstein did not also tell us: "*Radius and Temperature* of white dwarfs show no correlation. Stars of various radii occur at all temperatures. . . . This is evidence that dwarf stars cool down without further gravitational collapse.[209] A body cannot cool (even a white dwarf star) based on established theory, without contracting. Thus, the explanation of the temperature-radius structural size of white dwarfs, within established theory, cannot be valid. As was pointed out above, the masses of white dwarfs are more theoretically than empirically known.

In terms of Electro-Gravitic Theory, the temperature-radius structural size of white dwarfs is only related to its electromagnetic emission and temperature. The hotter stars are smaller in size, but more massive, while the cooler stars are larger in size, but less massive. What I am arguing is that more massive bodies generate greater energy than less massive ones, which is one of the key principles of Electro-Gravitic Theory. The main sequence stars emit energy based on this concept, as well; more massive stars generate greater temperatures than less massive stars. Because of this discrepancy in established theory, I further maintain that the

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[207]Shklovskii, *Stars, op. cit.*, p. 165.

[208]Jesse L. Greenstein, "Dying Stars," *Frontiers in Astronomy, op. cit.*, p. 149.

[209]*Ibid.*

masses of white dwarf stars are far greater than assumed and that when precisely accurate measurements of forty to fifty such stars are made, it will be found that the hotter white dwarfs are smaller in size than the cooler ones but more massive.

This analysis may contradict accepted understandings of this matter, but it follows directly from the theory. If established theory was correct, the temperatures of the atmospheres of these stars would reflect their surface temperatures, which must relate to the gas pressure and show a systematic relationship to size. That it does not debunks the theory.

The reason I use such strong negative language is for the following reason: we are being asked to accept the concept that the temperature of a white dwarf star, isolated in interstellar space, which requires an internal source of heat to warm its atmosphere, is not related to that internal temperature. That is, these stars cool down from white hot bodies to red ones over billions of years and they do so without any relationship of the atmospheric temperature to that of the surface temperature ratio which can be the only source of heat. What atmospheric source would raise the temperature of these white dwarf stars 10,000°F or more for billions of years which, for the same area as the Sun, is much hotter than the Sun, unless it is the heat within the star? What would heat the atmosphere of a white dwarf above the surface temperature of the Sun for billions of years unless it is internal heat?

The second reason I reject the established theory is, based on the concept that the atmosphere is heated from below by the white dwarf's internal heat, that over billions of years as the star loses this heat, the temperature-pressure ratio concept demands that the star contract—not expand. But the established theory requires just the opposite. The explanations are (as I see them) totally contradictory.

If white dwarf stars are the remains of those on the main sequence stars that used up their hydrogen and helium and then exploded, they should contain very little of these elements if any at all, which they do, and the atmosphere of these stars should remain stable. However, Larson points out:

> ". . . the question is what causes this shift from a hydrogen atmosphere [in earlier white dwarfs] to a helium atmosphere as the white ages. The astronomers have no answer to this question. As explained by James Liebert in a 1980 review article, 'The existence of nearly pure helium atmosphere degenerates over a wide range of temperatures has long been a puzzle. [James Liebert, *Annual Review of Astronomy*, 1980] The 'cooler [older] helium-rich stars,' he reports, are 'the most numerous kind of white dwarf.' FURTHERMORE, THE CONCENTRATION OF STILL HEAVIER ELEMENTS IN THE ATMOSPHERES OF THESE STARS IS ALSO TOO HIGH TO BE EXPLAINABLE ON THE BASIS OF CURRENT ASTRONOMICAL THEORY. Since the interior of the white dwarf is in an unusual physical state . . . the matter in the atmosphere, which is [in a] normal [state], must have been accreted from the environment. Liebert points out that
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> 'The metals in the accreted material should diffuse downward while the hydrogen should remain in the convective [atmospheric] layer. Thus, the predicted metal-to-hydrogen ratios would be *at or below* (interstellar) values, yet real DF-DG-DK [dwarf F, dwarf G, dwarf K] stars have calcium-to-hydrogen abundance ratios ranging from about solar to well above solar [amounts].'

> "The only possibility that Liebert is able to suggest as a solution to the "puzzle' is that hydrogen accretion [from space] must be 'blocked by some mechanism.' This is clearly a 'last resort' kind of hypothesis, lacking in plausibility."[210] (Capitalization added)

In essence, early/young white dwarfs have mainly low mass hydrogen in their atmospheres which, over time, becomes richer and richer in heavier helium and heavier atoms such as calcium and even metals. But if these various atoms were captured from interstellar space surrounding the star, it would capture more and more hydrogen which is more abundant in space than these heavier atoms. Furthermore, the great density of these white dwarf stars creates an extremely large surface gravity field which would pull heavy atoms down to the surface more strongly than lighter ones like hydrogen and helium. Therefore, the chemical composition of a white dwarf's atmosphere should reflect a composition of hydrogen and possibly some helium.

In terms of Electro-Gravitic Theory, these materials are not accreted from space but are being freed from the interior as the dwarf loses mass and expands. The first atoms liberated are the lightest, then the heavier follow over time. The surface temperature of these stars is sufficiently hot to allow the various atoms to mix in the atmosphere.

One final point about white dwarf star anomalies is that every once in a while the star may lose sufficient mass so that it explodes outward throwing off surface mass into space. These events, like novae, are part of the process of expansion. Some expansion goes on gradually, others are more violent as observed in the recurrent nova W Z Sagittae, which exploded in 1913, exploded again in 1946, brightening about 1,000 times."[211]

The evolution of white dwarf stars, in terms of their numbers, their mass to size ratios, and the chemical composition of their atmospheres, is in full congruence with Electro-Gravitic Theory. All in all, I. M. Levitt states of the formation and evolution of white dwarf stars, which is not very different 25 years later,

> "The entire picture of the formation of the white dwarf is hazy and ill-defined. There are so many details lacking that, at best, the description of the evolutionary process becomes an exercise in conditioned speculation."[212]

NEBULAE AND YOUNG STARS

Present gravitational theory holds that supernovae and novae give rise to large expanding nebulae at the center of which is found a star made up of collapsed or degenerate matter which is indeed the case.

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[210]Larson, *The Universe of Motion, op. cit.,* pp. 175-177.

[211]Greenstein, *Frontiers in Astronomy, op. cit.,* p. 153.

[212]I. M. Levitt, *Beyond the Known Universe, From Dwarf Stars to Quasars*, (New York, 1974), p. 54.

Shklovskii believes this is undeniable. "There can be no question, but that the stable object into which the nucleus of a planetary nebula should be a white dwarf."[213] L. H. Aller and W. Liller make the very same claim. "Our evidence indicates that the [central stars in planetary nebulae] evolve into white dwarfs."[214] Thus, there was no expectation that the central stars of these nova type events would ever be hot young stars. Therefore, no newborn or O type stars or Wolf Rayet stars, which are extremely young stars, should ever be the significant central star at the center of such a nebula. The star that supposedly exploded threw off most of its mass and what ever remained behind imploded to become a pulsar or white dwarf. But this expectation is not always the case. Wolf Rayet stars and small O type stars are very often found "which are central stars of planetary nebulae."[215] What this illustrates is that extremely small black holes can give rise to very small young stars as well as dwarfs and pulsars. Other astronomers, such as Dean B. McLaughlin, say "From their luminosities, which are similar to the Sun on the average, we are forced to conclude that they are small superdense stars SOMEWHAT LIKE WHITE DWARFS, but not so extreme."[216] (Capitalization added) What is observed inside the novae is a star like a white dwarf but not one. According to Robert Burnham, "Virtually all known post-nova stars are objects of the same peculiar type, hot bluish subdwarfs of small radius and high density, apparently intermediate between the main sequence stars and the true white dwarfs."[217] In essence, after the nova occurs, the star is close in appearance to a newborn, blue-white O type or Wolf Rayet type star. What is being suggested is that the evolution is not toward greater and greater collapse into a white dwarf, but greater and greater expansion into a normal main sequence star. Levitt claims that "while a fraction of the white dwarfs are generally related to the planetary nebulae at least half or more [of the nebulae] may have evolved from normal stars [seen at their centers]."[218] Now, why would an ancient star which had used up its various atomic fuel collapse inward to create a stupendously hot Wolf Rayet or O type star when the theory predicts the central body should be a white dwarf.[219] This is in total contradiction to the theory. Having burned up its fuel the star cannot create another star.

The problem with conventional theory is that these stars are supposedly very small, with very low masses and could never collapse further and become white dwarfs. The traditional

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[213]Shklovskii, *Stars, . . . op. cit.,* p. 198.

[214]L. H. Aller, W. Liller, *Nebulae and Interstellar Matter,* B. Middlehurst, W. Liller, eds., (Chicago, 1968), p. 483.

[215]Anne B. Underhill, *Annual Review of Astronomy and Astrophysics,* Vol. 6, (Palo Alto, Calif., 1968), p.39; see also, G. Abetti, M. Hack, *Nebulae and Galaxies*, (New York, 1969), p. 65.

[216]Dean B. McLaughlin, "What Became of the Novae?" *Sky & Telescope*, (May, 1946), p. 5.

[217]Robert Burnham, Jr., *Burnham's Celestial Handbook*, (New York, 1961), p. 218.

[218]Levitt, *Beyond the Known Universe, op. cit.,* p. 54.

[219]*The Fact on File Dictionary of Astronomy,* Revised Illingworth ed., (New York, 1985), p. 284.

theory suggests that old giant red stars of quite low mass nova and collapse down to white dwarfs. At the opposite side of their theoretical mass they are not massive enough to generate the heat and luminosity of O type or Wolf Rayet stars. However, in order to generate these temperatures and luminosities, the Wolf Rayets associated with O and B [type] stars"[220] should have masses averaged at ten times that of the Sun.[221] The O and B type stars are from 20 to 40 or more times the mass of the Sun, as indicated on the Hertzsprung Russell diagram. These masses are necessary if one accepts conventional theory to generate surface temperatures anywhere from 12,000°K to 18,000°K, and others among the hottest stars that exist,[222] According to C. S. Beals, seven Wolf Rayet stars had surface temperatures between 59,000°K to 110,000°K, while L. H. Aller gives some Wolf Rayet stars temperatures of 20,000°K to 130,000°K.[223] This theory suggests that the supposedly tiny Wolf Rayets found in the nebulae are actually much more massive and astronomer R. Strothers, looking at the requirements of mass to generate these great temperatures, "assumes [contrary to all the observational knowledge] that Wolf-Rayet stars are very massive."[224] These facts drove Shklovskii to suggest Wolf Rayet stars in planetary nebulae are "freaks." They are too small to generate these high temperatures and too small to collapse down to white dwarfs. In essence, they do not fit anywhere on the Hertzsprung Russell diagram and contradict conventional theory at every turn. But based on Electro-Gravitic Theory, they are, nonetheless, dense, massive stars and are able to generate their high temperatures and luminosities because of their extremely large mass.

This phenomenon is also in full agreement with Electro-Gravitic Theory since it is based on the principle that such O type Wolf Rayet and white dwarf stars reflect some of the earliest stages of stellar development.

As is well observed, young stars are born in nebulae of dust and gas. The Crab Nebula is some 60,000 billion miles across, about ten light years.[225] Its shell of hot gas and dust has been expanding since its supernova occurred. This was observed in 1,054 A.D. Therefore, as seen from Earth, this expanded shell over about a 1,000 year period was expanding at an average velocity of many billions of miles per year. The nova of an even smaller black hole should do the same, but at a much slower rate of expansion. For example, an early white dwarf star, NGC 7027 is estimated to have had its nova about 2,000 years ago. But apparently, because its black hole was so much smaller than that which produced the Crab Nebula, its shell of material is accelerating outward at only 22 kilometers or 13 miles per second, and its bright

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[220]Underhill, *op. cit.*, p. 67.

[221]Illingworth, *Fact on File Dictionary of Astronomy, op. cit.*, p. 416.

[222]Underhill, *op. cit.*, p. 186.

[223]*Ibid.*, p. 194.

[224]*Ibid.*, p. 212.

[225]Greenstein, *Frozen Star, op. cit.*, p. 5.

nebula is only about 0.2 light years across.[226] Generally, the expanding shells of dwarf star, pulsar, Wolf Rayet or O type star will be indicative of the size of the black hole from which it was derived.

But what happens when a large number of black holes spin to instability in a certain region of space or one black hole breaks up into many black holes? They will emit gas and dust in all directions in stellar winds that will encounter one another and buffet one another to produce a great nebula cloud such as that in the constellation of Orion in which a great many young stars are being created. The dust and gas clouds of such galactic nebulae, in which star birth is observed, is derived from novas, supernovas and planetary novae. But, as we pointed out earlier, it has been shown that such clouds are too thin to generate enough mass at one point to create enough gravitational pull and gather additional mass to form a star. This precisely is the same problem we encountered with galaxies.

And here also we encounter phenomena that contradict established theory. A group of astronomers from Cornell University have located an immense cloud of cold hydrogen gas some 30 thousand light years outside the Milky Way, which contains one billion times the mass of the Sun.[227] Although it is rotating, it is not doing so uniformly. This cloud, a billion times more massive than the Sun, based on the gravitational condensation model, is an ideal environment for the development of stars. Nevertheless, there are no stars or protostars observed in this cloud. While it should produce stars, none are observed or reported in it. That no stars are forming is a clear contradiction to the gravitational condensation model.

Now this theory claims black holes evolve into pulsars, white dwarfs, and early type stars and, therefore, these should exhibit indications in congruence with the theory. Pulsars at their magnetic poles are flashing immense energies into space. But black holes emit jets of material when they spin to instability and, therefore, jets of material would be expended from such bodies especially in their later stages when their masses are sufficiently reduced to allow mass to be expelled. It must be remembered that the smaller the black hole, the weaker is its ability to generate powerful jets. But when it becomes a protostar, it has expanded greatly and its surface gravity so greatly attenuated that jets of material will more easily be able to escape far out into space. This does not negate the possibility of remnants of jets from pulsars or white dwarf stars being eventually found.

For example, in the constellation Cassiopeia, an object which may be a white dwarf or pulsar exhibits an "an intense, compact, central powerhouse from which jets seem to be squirting."[228] Even the Crab Nebula seem to have a faint jet.[229] But what is more significant in the Orion nebula where new stars are forming we learn,

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[226]N. Henbest, M. Marten, *The New Astronomy, op. cit.,* pp. 94-95.

[227]*1985-1986 The Science Almanac*, Bryan Bunch ed., (New York, 1984), pp. 94-95.

[228]"A Riddle Wrapped in a Mystery Inside an Enigma," *Sky & Telescope,* Vol. 61, (1981), p. 391.

[229]"The Crab's Mysterious Jet," *Sky & Telescope,* Vol. 65, (1983), p. 26.

> "D. J. Axon and K. Taylor have described new optical spectra indicating very high-velocity winds in the most famous region of star formation in the heavens, the Orion Nebula. Their spectra point toward the existence of a biconical pattern of outflow and suggest the presence of a substantial disc of molecular gas and dust grains close to a putative stellar source of excitation, located in the giant molecular cloud behind the nebula."[230]

The researchers concluded that the most reasonable model for these two jets is a large star generating powerful winds in opposite directions. This conclusion has now been confirmed by observation of other nebulae and directly of protostars within them emitting bipolar jets. D. E. Thomsen informs us:

> "It goes around every six hours, a fast clip for a star, and it seems to be throwing off large amounts of matter. The evidence is in the changes, a cyclic shift to the red [as the jet turns away from view] and the blue[as the jet turns in our direction] of the spectral emission line hydrogen alpha. The shift toward the red and the blue indicates that the matter emitting the hydrogen alpha [spectrum] light is coming off the star not in a spherically symmetrical way, but in a bipolar way, in oppositely directed [D. K.] Duncan says the calculated velocity is 400 kilometers [240 miles] per second just escape velocity from the star."[231]

In the nebulae R and T Corona Australis, Ray Wolstencroft from the Royal Observatory at Edinburgh, found two stars,

> ". . . which are still embedded in the large cloud from which they were born. Wolstencroft found that both have faint jets of gas extending from them, and that these two jets are parallel to each other, and to the long axis of the large "parent' cloud."[232]

The phenomenon has now been well recognized to be occurring within nebulae where stars are born, as stated by Charles J. Lada.

> "It is now generally believed that during the earliest stages of evolution, most, if not all, stars undergo a phase of very energetic mass ejection, frequently characterized by the occurrence of massive bipolar outflows of cold molecular gas. These outflows appear to be driven by strong stellar winds."[233]

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[230]Ben Zuckerman, "High Winds in Orion," *Nature,* Vol. 309, (1984), p. 403.

[231]D. E. Thomsen, "Stellar Evolution Spins a Surprise Stage," *Science News,* Vol. 125, (1984), p. 388.

[232]"Young Stars Have Discs and Jets," *New Scientist*, (August 22, 1985), p. 25.

[233]Charles J. Lada, "Cold Outflows, Energetic Winds, and Enigmatic Jets Around Young Stellar Objects," *Annual Reviews of Astronomy and Astrophysics*, Vol. 23, (Palo Alto, Calif., 1985), p. 267.

Scientists understand that the rotational velocities of these stars though rapid could not expel such powerful jets at the rotational poles and W. J. Welch, *et al.,* ask "What produces the jets? In some ways these molecular jets resemble the highly energetic outflow phenomena in radio galaxies."[234] The reason they are so similar is that they are based on the same process as delineated in Electro-Gravitic theory.

HOT YOUNG STAR AND MASS EJECTION

The basic principle of this theory is that stars evolve by loss of mass via radiation emissions and mass ejection by super rapid rotation or combinations of both. As scientists maintain that mass and energy are components of one another, to generate heat and visual light, even higher frequency radiations demand a greater change of mass into energy. Therefore, pulsars of immense mass and surface gravity emit primarily highly energetic radiation. White dwarfs do the same, but every once in a great while, they nova and eject gas and dust into the surrounding space. When these evolve to protostars, they are generating powerful stellar winds as they emit mass both via radiation and directly from their fast spinning surfaces. According to Underhill, the main sequence Wolf Rayet stars are radiating away tremendous amounts of energy; they "are losing mass at a rate in the neighborhood of one solar mass in 5 x 10^5 years,"[235] or one solar mass every 500,000 years.

O and B type stars are emitting mass from their surfaces especially giant O and B types.[236] Marcia Bartusiak points out that

> "Once a star ignites, it fuels . . . [a] cosmic hurricane with its own stellar winds, which can reach speeds of hundreds of miles per second. This has been one of the more surprising findings to come out of modern astronomy's snooping into the inner workings of a molecular cloud: Large young [O, B, and A type] stars shed tremendous amounts of matter right after their birth. . . . Theorists are hard pressed to understand why."[237]

She goes on to show that

> ". . . huge amounts of material flow out of young massive stars with the masers [high energy molecules of OH, H_2O and SiÓ and others] riding outward on the shock wave like cosmic surfers. The more massive the newborn star, the more pronounced the weight loss."[238]

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[234]W. J. Welch, *et al.,* "Gas Jets Associated with Star Formation," *Science,* Vol. 228, (1985), p. 1389.

[235]Underhill, *op. cit.,* p. 212.

[236]Illingworth, "Mass loss," *Fact on File Dictionary of Astronomy, op. cit.,* p. 225.

[237]Marcia Bartusiak, *Thursday's Universe,* (New York, 1988), p. 16.

[238]*Ibid.,* p. 19.

This, again, is what Electro-Gravitic theory suggests.

The same mass loss condition is also well observed in T Tauri stars which are young stars. According to Greenstein,

> "A . . . peculiarity of the T Tauri stars is that they are all rapidly ejecting material into space. Apparently gases rising from the surface of these stars are somehow accelerated and forced beyond the domain of the stars' gravitational control. (The force responsible for the explosion is evidently not centrifugal, because the stars cannot be rotating rapidly enough for that.) In the spectra of many T Tauri stars, one can actually see absorption lines of this material that are displaced by Doppler shifts, indicating that the expelled material is flowing out of the star at velocities of as much as 200 to 300 [120 to 180 miles] per second. There is no evidence that this material ever returns to the star. It is completely ejected, these stars must lose a substantial proportion of their mass. L. V. Kuhi of the University of California at Berkeley has calculated that a typical T Tauri star, when in its most active phase of evolution, sheds material at the rate of one solar mass in about 30 million years, and that by the time it matures into a stable star, it may have lost as much as a third of its original mass."[239]

Since the rotation of these T Tauri stars is too slow to eject matter from its surface, another mechanism is required. That mechanism may be the great heat of the more dense matter below the surface forcing the gases outward with tremendous kinetic energies to overcome the gravitational pull of the star.

This mass loss slows as the stars age, but the stars continue to lose mass all through their lives until they end up as giant diffuse balls of hot plasma and hot atoms and swell up into giant red stars where they remain until they are swallowed up by the black hole residing at the heart of their galaxy.

CHEMICAL MAKE UP OF STARS

Based on the thermonuclear model for the generation of stellar energy, the great temperatures that occur at the cores of stars are postulated to produce heavy elements. The surface temperatures even of the hottest stars are millions of degrees below temperatures at which heavy elements can be fused from lighter ones. Struve explains it thus:

> "In the past few years we have come to realize that the fundamental process in stellar evolution is the gravitational contraction of a mass of gas. In its earliest stage, this gas is an extremely tenuous interstellar cloud containing some 1,000 hydrogen atoms per cubic centimeter at a temperature perhaps only a few hundred degrees above absolute zero. . . .
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> "As the cloud contracts, its internal temperature rises until nuclear reactions start. The first of these, at about a million degrees, consists of the destruction of the rather rare elements lithium, beryllium, and boron, produces relatively little nuclear energy and a small amount of helium.

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[239]Greenstein, *Frontiers in Astronomy, op. cit.*, p. 145.

> "Because the energy release is small, the star continues to contract until its central temperature is at five million degrees. At this stage (on the main sequence in the H[ertzsprung] R[ussell] diagram) thermonuclear fusion of hydrogen into helium sets in. Because of the great abundance of hydrogen, the star can now release an enormous amount of energy at a controlled rate. . . .
>
> "Eventually [after billions of years], when much of the available hydrogen supply has been converted into helium, the contraction resumes, and the central temperature reaches several hundred million degrees. . . ."[240]

At these temperatures, it is proposed that the heavy atoms fuse from lighter ones and thus when the star explodes and becomes either a white dwarf or pulsar, the cloud ejected into space carries these heavy atoms. When the constituents of those clouds condense in another region of space, the heavy elements in it are collected with hydrogen and helium into a new star which then exhibits these more massive elements.

Nevertheless, the oldest stars in the Milky Way—the old red giants—which were the first stars to form from the first clouds of hydrogen gas, some six or seven billion years ago, should not exhibit heavy elements in their spectra. There had been no prior stars before them to fuse hydrogen into these more massive atoms. Bart J. Bok claims these old red grants in globular clusters "seem to be the oldest objects in the Milky Way."[241] Therefore, since they were the first stars to form, neither metals nor other heavy atoms could have existed in the clouds from which they formed. But if they do indeed contain metals and other heavy elements, the convention theory of stars obtaining their heavy elements would be in stark contradiction to the theory for their chemical composition. But Larson points out that the old red giants closer to the nucleus of the Milky Way "have substantially greater metal content."[242] Bok states, "The spread of ages for globular clusters conflicts with current models of how the galaxy evolved."[243] Harwit also admits:

> "There also seems to exist abundant evidence that stars, at least in our galaxy and M31 [Andromeda the closest spiral galaxy to the Milky Way] have an increasingly great metal abundance as the center of the galaxy is approached. The nuclear region appears to be particularly metal rich. . . ."[244]

Because of this contradiction to traditional theory, Ivan King was driven to suggest that these ancient stars might really be younger than conceived. In a survey article in *Scientific*

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[240]Otto Struve, "Element Formation in Stars," *The Evolution of Stars,* T. Page, W. Page eds., (New York, 1968), pp. 240-241.

[241]Bart J. Bok, "The Milky Way Galaxy," *Scientific American,* (March, 1981), p. 110.

[242]Dewey Larson, *The Universe of Motion, op. cit.,* p. 117.

[243]Bok, *Scientific American, op. cit.,* p. 111.

[244]Martin Harwit, *Astrophysical Concepts*, (New York, 1973), p. 43.

American, he reviewed the conflict between the length of time the globular cluster ages and the age of the universe, wondering "Even more of a mystery is how globular clusters acquired any heavy elements at all, given that the big bang is thought to have produced only hydrogen and helium. The observed metal abundance . . . is not insignificant."[245]

Because of the serious nature of this contradiction, William R. Corliss in evaluating this problem stated

> "Three of the hypotheses being challenged here are: (1) The place (age) of the globular clusters in the evolutionary history of the universe; (2) the validity of 'metallicity' as an indicator of stellar age; and (3) the hypothesis that the fusion of light elements is the basic energy source of stars."[246]

He gave it a rating of "1," which means the "Anomaly cannot be explained by modifications of present laws; therefore, as a phenomenon, it requires an explanation which is revolutionary."[247]

This is once again well in accord with Electro-Gravitic Theory. As stars age, they burn away their mass via thermal and electromagnetic radiation emissions which leave behind to be observed the original elements with which they were born. That is, the older an old red giant star, the greater its abundance of these elements. Based on the tenets of Electro-Gravitic Theory, these stars were originally born in the arms of the galaxy and evolved to old age and then, because they lacked strong magnetic fields, gradually travelled toward the center of the galaxy arriving there at the oldest period of their evolution. Thus, the gradient of metallicity with radial distance from the nucleus of the galaxy is well in accord with this theory and in complete disagreement with conventional theory.

A further problem with the fusion of elements at the cores of massive stars is that these elements are actually observed in their atmospheres. One of these elements, technetium 99, is radioactive, which has a half-life of 212,000 years and is produced as a fission product in nuclear reactors.[248] But this is also true of other heavy atoms that are radioactive, as Aller explains:

> "Furthermore, the technetium in the S stars appears to be about as abundant in these stars as the neighboring elements [in the Periodic Table], ruthenium and molybdenum. The implication is that all these [heavy] elements were built in the S stars and that these objects have lifetimes of about 200,000 years. How the star gets the heavy element from the core to the surface without exploding provides an impressive challenge to theoreticians."[249]

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[245]Ivan King, "Globular Clusters," *Scientific American,* Vol. 252, (June, 1985), p. 79*ff*.

[246]Corliss, *Stars, Galaxies, Cosmos, op. cit.,* p. 64.

[247]*Ibid.*, p. 2.

[248]*Encyclopaedia Britannica, Micropaedia*, Vol. IX, (Chicago, 1982), p. 859.

[249]*Ibid., Macropaedia,* Vol. 17, p. 602.

The existence of these materials in measurable amounts in the atmospheres of these stars represents an "impressive challenge" because if, as is presented, technetium, ruthenium, and molybdenum are only produced in the star's central core, they will, by radioactive decay, disappear before they can reach the upper atmosphere of the star to be observed.

It is calculated that a photon, moving at the speed of light, striking hydrogen or helium atoms in the Sun, being absorbed and reemitted, takes about 30 million years to reach the Sun's photosphere and fly off into space.[250] These various radio active elements could never make this trip under these conditions in a shorter time period and, thus, would have decayed to other elements. Ferris in dealing with this contradiction states:

> "Had the technetium atoms . . . originated billions of years ago in the Big Bang, they would since have decayed and there would be too few of them left to show up today in S stars or anywhere else. Yet, there they were. Clearly the stars knew how to build elements beyond iron, even if the astrophysicists didn't."[251]

According to Shklovskii, "Only nuclear reactions in the surface layers of the stars can account for the presence of technetium [ruthenium and molybdenum] lines in type S stellar spectra."[252] The problem is that the low temperatures in the stellar atmospheres are just too low and prevent the fusing of these massive elements. These stars also contain zirconium (ZrO) < lanthanum, yttrium, barium . . . scandium and vanadium."[253]

The problem with technetium, ruthenium, and molybdenum is a decisive problem for conventional theory, but again, not for Electro-Gravitic theory. This theory claims that these elements were released from the edge of the condensed core of the collapsed matter of the star and, therefore, this core is far beneath the stellar atmosphere. The theory suggests that the core of the star is at one great density in a lattice condition of collapsed matter from which elements are evaporating at immense heat along with other electromagnetic emissions.

It is further suggested that most of the outer layers of the star are not very dense, but are extremely light in density. That is, that the atmosphere above the core of the star is tenuous and not highly dense with depth. Only if the deep atmosphere outside the core is tenuous can these radioactive substances reach the surface before decaying. There is simply no escape from this conclusion.

Those imbued with the view that stars became more and more dense with depth to the very center, and that there can be no massive, immense, hot core of collapsed matter at great depth, are contradicted by the presence of these radioactive elements in these stars' atmospheres. But there is a clear form of evidence that contradicts the conventional view of stellar energy production and directly supports the concept that deep below the star's surface is a massive hot

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[250]Ralph Juergens, "Stellar Thermonuclear Energy: A False Trail," *KRONOS,* Vol. IV, No. 4, (Summer 1979), p. 21.

[251]Ferris, *Coming of Age in the Milky Way, op. cit.,* p. 276.

[252]Shklovskii, *Stars, op. cit.,* p. 144.

[253]Illingworth, "S Stars," *Fact on File Dictionary of Astronomy, op. cit.*, p. 366.

ball of condensed matter exfoliating hot atoms, ions, and radiation into a tenuous atmosphere which will be analyzed further.

VARIABLE STARS

Variable or Cepheid variable stars are stars that pulsate becoming brighter over a period of from one to 70 days and then dimming over similar periods, many of which are quite regular. Their surface materials expand radially causing the volume and surface area of the star to increase and, being bigger, the star appears much brighter than when it contracts and is smaller in size.

One of the major problems related to this regular pulsation is to determine the mass of these stars. While some of these stars are in binary relationships with others, the motions of the orbits of the companion stars is so slow that there is still not sufficient time to calculate their orbits and, from this data, derive their masses. To get around this vexatious problem, reference to their luminosities within conventional theory has been employed. While this has lead to fairly good compatibility, the resultant pulsation light curves and frequencies simply do not match the calculated masses. As John R. Percy writes:

> "Unfortunately, when astronomers try to reproduce the shape of a cepheid's light curve and possible pulsation frequencies, they can do so only if they assume a much smaller mass, perhaps only half of that calculated in other ways. It may be that this cepheid mass problem results from an unfortunate combination of minor gaps in our knowledge. Or there may be at least one glaring omission in our models, such as neglect of magnetic fields."[254]

By taking the conventional model as the correct paradigm, the masses of these large stars[255] must be reduced by half or more, which is in fundamental contradiction with all the other data regarding their light curves and frequencies. However, if the main mass of the star is located in its core, which is emitting atoms and ions at different rates, allowing these hot, gaseous materials to expand, this theory will explain this behavior.

Su-Shu Huang raises the fundamental problem regarding the process that causes a star to expand and contract.

> "The other point of interest in the study of cepheids concerns the physical nature of pulsation. Why do some stars pulsate while others, like the Sun [which will be shown is incorrect] do not? How does a star pulsate? . . .
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> "The theory of stellar pulsation was advanced by Arthur Eddington in 1917-1918. It is assumed that every part of the star oscillates adiabatically along its radius in unison, although the amplitude of oscillation varies with radius. While the theory predicts the

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[254]John R. Percy, "Cepheids: Cosmic Yardsticks, Celestial Mysteries?" *Sky & Telescope,* Vol. 68, (1984), p. 517.

[255]Illingworth, *Fact on File Dictionary . . . op. cit.,* p. 58.

> periods of various intrinsic variables quite well, it gives the wrong phase relation between light and velocity variations. For according to this theory, a pulsating star should be brighter and hotter when contracting, and cooler and fainter when expanding. Actually, the converse is true."[256]

As the gases in the atmosphere of a star fall inward, it is well understood that the atoms or ions of the gas will be closer together and under greater pressure. Thus, when a cepheid's atmosphere contracts producing higher pressures, it should generate higher temperatures as well. But instead of the temperature rising with these high pressures, the temperature actually drops. Conversely, when the star expands and its upper atmosphere is under lower pressure, the particles in the gas are farther apart and should cool; but in this case, as the star expands, its atmosphere becomes hotter. R. Burnam puts the entire concept in clear perspective stating,

> "A peculiar fact . . . is that the maximum brightness occurs near the time of most rapid expansion, while minimum brightness coincides with the most rapid contraction. This is contrary to any theory which assumes *a simple pulsation of the entire stellar body.* It might indeed seem that the star should be brightest and hottest shortly after the contraction has brought it to a state of highest density and pressure."[257] (Emphasis added)

But, the pulsation does not have to be produced by the "entire stellar body" expanding. If the dense core is emitting super hot materials into a tenuous low mass, low density atmosphere, as it exfoliates these from its surface, additional hot atoms and ions rapidly diffuse through the atmosphere heating it and causing it to expand. Only in a tenuous atmosphere can this heating process occur; it cannot occur in one that is greatly adiabatic; that is, the pressure rises significantly with depth.

The cause of this variation in the core of the star, I can only surmise, is caused by the core expanding in jumps (glitches and antiglitches) in its final late stages of emission before the star becomes a super red giant. That is, for older stars, when the pulsation ultimately stops, the core has completely diffused all its matter and ceases to be a Population I, main sequence star. Its thin mass has become uniformly distributed and its heat is merely the immense remnant of its residual former condition, cooling down. It is, then, an old red Population II star. The expansion is related to the lack of a massive central core that can pull the material of the atmosphere toward the core.

This condition, I claim, occurs when the old star has reached the end of its maturity and its core no longer is in equilibrium, (equilibrium being the amount of mass and energy emitted by the core being nearly equal to the mass and energy emitted by the star). Because the core has been greatly diminished in mass, its pulsations begin, at first, small in size and duration, then grow larger in size and duration. It is suggested that, from this mature, main sequence stage, equilibrium is impossible to maintain, and the core emits its final mass and radiation in glitches and antiglitches until the star ends its life as an old red giant. The theory suggests all

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[256]Su-Shu Huang, "Cepheids," *McGraw-Hill Encyclopedia of Sci. and Tech.*, Vol. 2, (1977), p. 684.

[257]Burnham, *Burnham's Celestial Handbook, op. cit.,* p. 590.

(and it means "all") main sequence stars end their mature lives in only this way. Robert P. Kraft describes the behavior of the cepheids thus:

> "The most important advance in our knowledge of the cepheids . . . came . . . with Walter Baade's discovery that the stars of the universe may be divided into two major populations. To Population I, made up of young, hot, short-lived stars, he assigned the brighter and longer-period cepheids that appear in the arms of spiral galaxies. The fainter and short-periods cepheids associated with the globular clusters that swam around the center of galaxies Baade placed among the older and long-lived stars of Population II. While astronomers now believe that Baade's two populations represent an over simplification and that stars are more continuously graded in age, the cepheids seem mostly to belong to the extreme ends of the population spread.
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> "At present, we imagine that the young Population I cepheids represent a phase in the life of any star. If we plot the color (that is, the temperature) of stars against their absolute luminosity (their intrinsic brightness corrected for distance), most of them occupy a rather well-defined 'main sequence.' . . . To the right of the main sequence is a scattering of other stars, most of them 'red giants.' Between the main sequence and the red giants is an[other] 'instability strip' [of pulsation] containing cepheids. . . . As the star passes through this strip, in the course of a few million years, its pulsation slows and lengthens in period. Upon reaching the end of the strip it ceases to pulsate and becomes a[n old] red giant."[258]

In fact, it may well be that all main sequence stars pulsate but at such low distances radially that they cannot be detected by present instrumentation. An excellent example of a low pulsating star with a dense core and tenuous atmosphere is, in fact, a description of the Sun. Ralph E. Juergens summarizes the evidence thus:

> "Early in 1975 H. A. Hill of the University of Arizona reported that he and several colleagues had found the Sun to be oscillating in brightness with variable cycles lasting from a few minutes to nearly one hour [like variable stars]. Hill suggested that the oscillations might be due to mechanical waves (similar to sound waves) delivering energy from the core of the Sun to the surface in as little as 25 minutes. This is to be compared with something like 30 million years for radiant energy continually obstructed by the high opacity of solar gases, to make the same trip.
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> "Hill reasoned that if energy is being brought to the surface by such waves, perhaps the Sun's core is cooler than supposed and particularly too cool for neutrino-producing reactions to take place.
>
> "But there remained the possibility that mechanical waves might be produced as a result of the more-or-less routine violence that characterizes the atmosphere of the Sun. So Hill's findings, by themselves, provoked little alarm over the health of the Thermonuclear theory.
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> "However, in the British journal *Nature* for January 15, 1976, pulsations of another kind were reported independently by research teams from the [old] Soviet Union [now

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[258]Robert P. Kraft, "Pulsating Stars and Cosmic Distances," *New Frontiers in Astronomy*, (San Francisco, 1975), pp. 202-203.

Russia] and Britain. And this 'new' effect, apparently a regular expansion and contraction of the Sun with a period of 2 hours and 40 minutes, strikes another blow at the accepted theory of the Sun.

"A. B. Severny, V. A. Kotov, and T. T. Tsap of the Crimean Astrophysical Observatory observed the Sun's magnetic fields and were surprised to find evidence of a periodic rise and fall of the entire solar surface. The amplitude of the oscillations [up and down of the Sun's surface] was about 10 kilometers [6 miles].

"According to the investigators, 'the simplest interpretation is that we observe purely radial pulsations. The most striking fact is that the observed period of 2h 40 min is almost precisely the same as . . . if the Sun were to be an homogeneous sphere.' This is equivalent to saying that the Sun pulsates as if, like a balloon, its gases were of uniform density throughout its body. Such a condition, of course, differs radically from almost any solar model one can imagine, for gravity could be expected to increase the density enormously toward the center.

"The Soviet team suggested two possible explanations for its findings: 'The first alternative is that nuclear . . . reactions are not responsible for energy production in the Sun. Such a conclusion, although rather extravagant, is quite consistent with the observed absence of appreciable neutron flux from the Sun. . . .' The second possibility is that the pulsations are not purely radial motions, but are harmonics of a more fundamental gravity wave affecting the Sun. But there seemed to be little enthusiasm for this latter suggestion: 'It seems strange, however, that this high harmonic [should be] dominant.'

"The British observers, J. R. Brookes, G. R. Isaak, and H. B. van der Raay, of the University of Birmingham, discovered the same radial pulsation of the Sun quite independently and by an entirely different technique based on slight shifts in the positions of spectral lines. Like the Soviets, they pointed out that 'Current models predict a period of [about] 1h[our] corresponding to a steep density increase in the solar interior, in marked contrast to the observed . . . period, which is consistent with a nearly homogenous model of the Sun.'"

"Two University of Cambridge theorists, J. Christensen-Dalsgaard and D. O. Gough, who commented on the newly discovered pulsations in the same issue of *Nature,* emphasized the unlikelihood that any model can be devised for the Sun to accommodate both the observed radial oscillation and the thermonuclear theory.

"Nigel Weiss, a *Nature* scientific correspondent added: 'The observers suggest that the [2 hour, 40 minute oscillation] is indeed a fundamental radial pulsation of the Sun. If so, this measurement would upset the established theory of stellar structure and, with it, many astrophysicists."[259]

If the Sun is to produce thermonuclear energy at its central core, the density of the gases must grow greater and greater with depth to achieve a temperature of 15 million degrees. Therefore, the pressures of the overlying gases must increase at a rate sufficient for the pressure to rise enough to generate this temperature. But concomitant with this, the body of the Sun can only expand and contract at a rate commensurate with this density and that rate is about one hour. To oscillate a little more slowly means that the gases in the Sun are at a lower density.

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[259]Ralph E. Juergens, "Stellar Thermonuclear Energy: A False Trail?" *KRONOS,* Vol. IV, No. 4, (Summer, 1979), pp. 21-22.

To oscillate to an even slower rate means an even lower density, and at one hour and 40 minutes, 66 percent greater than one hour, means the density of the Sun would be too low to create a pressure and temperature at the core that would be hot enough to generate thermonuclear reactions at the appropriate rate to heat the Sun.

Although astronomers believe that this oscillation may be due to disturbances in the outer regions of the Sun, they completely forget that these regular oscillations are features of variable stars. What they are doing is treating the Sun's oscillations as one phenomenon and that of the variable stars as another, when they very well may be explained by the same process. Remember that, for the cepheid variables, the only method for heating the expanding gases was for them to be tenuous enough to allow heat from below to rise rapidly through the atmosphere. By the same token, the scientists claimed that, for the Sun to oscillate so slowly, meant its gases were so tenuous that they behaved like a balloon. What Electro-Gravitic theory claims is that both of these phenomena are governed by the same process. In both, a hot, dense core is exfoliating mass and radiating into a low mass, low density atmosphere which responds to this by rising and then falling. This, it is suggested, is the only process which will comfortably explain and fit the data for cepheids and the Sun.

However, let us get back to the concept that there is sufficient turbulence in the Sun's outer regions to cause it to exhibit this oscillation. This question has to do with the forces that cause turbulence in various mediums. Since this question is of such crucial importance the following citation is somewhat lengthy. If the Sun possesses a fairly dense atmosphere, growing more so with depth and convection, driving material and heat to the surface, then the surface of the Sun will show this by exhibiting powerful turbulent movements in its photosphere that are observable. However, Juergens informs us,

> "One of the strangest aspects of the photosphere is its lumpy structure. Under conditions of good astronomical 'seeing' instead of presenting the surface of uniform brightness that might be expected, the photosphere shows up as discrete patches of high luminosity in a field of less luminosity. The effect is not unlike looking down on closely packed, fluffy clouds . . . .
>
> "[O]n the basis of modern photographic observations and what is now understood concerning photospheric temperatures, it may be said that the Sun's bright envelope consists almost entirely of distinctly formed blobs of hot plasma.
>
> "For some years, this puzzling composite quality of the photosphere was referred to as its 'rice-grain structure'. From this evolved the more prosaic terms *granulation* . . . and granule. . . . So now one speaks of a photosphere that exhibits granulation in its texture, or consists of millions of individual granules. . . .
>
> "It was known that granules average perhaps 1,000 kilometers [600 miles] in diameter and that they come and go on the solar surface in lifetimes measured in minutes. Sometimes budding granules would seem to push up from below, shouldering aside older ones or replacing others that had expired. New granules frequently bloomed with vertical motions greater than 1,000 kilometers per hour, but lateral motions with respect to the background field were much slower and were seldom observed (C. Minnaert, "The Photosphere," *The Sun,* G. Kuiper, ed., [Chicago 1953], p. 171).
>
> "In any case, the effects of turbulence in the Earth's atmosphere made seeing them difficult.

"A major advance in the study of granulation came . . . . mounted by Martin Schwarzchield . . . in the late 1950s . . . [when] telescopes were carried into the stratosphere by balloons . . . [which in] 1959 yielded a number of excellent photographs of solar granulation.

"In the early 1960s investigators . . . obtained a series of high-quality images of the photosphere on motion-picture film. . . . [Time-lapse] projection of their film showed that 'the lifetime of an individual granule is very hard to define.' Several small granules may join to form a large one, which grows in size and intensity until its length may exceed 2,000 kilometers [1,200 miles]. Then the large granule splits into smaller ones and diminishes in intensity. Such fragments unite with adjacent small granules to form another large one, which also grows and brightens until it splits about eight minutes later (P. S. McIntosh, *Sky & Telescope*, Vol. 27, [May 1964], p. 280) . . . .

". . . The stratoscope pictures showed that most of the surface is covered with granules and that the darker areas consist primarily of gaps between the granules (H. Zirin, *The Solar Atmosphere,* [1966], p. 281). A few years ago, estimates of the total number of granules present at a given moment to about two million. After studying the stratoscope photos, however, O. Namba and W. Diemel concluded that the figure should be increased to about six million. (*Solar Physics,* Vol. 7, [1969], p. 167).

"M. Minnaert, the late director of Utrecht Observatory in Holland and a leading solar physicist, reflected the view of perhaps 99 percent of his colleagues when he once stated 'the study of the granulation demonstrates that some photospheric layers at least are in constant turbulent motion' and that this is evidence of convection. (M. Minnaert, *op. cit.*, p 169.)

"J. A. Hynek, as director of Dearborn University at Northwestern University, spelled it out for the non-specialist: 'Most astronomers are now fairly certain that these bright cells are the tops of columns of hot gases being rapidly transported from "subsolarian" depths to the surface. As they cool, these columns began to sink. And as an effect of cooling they lose their brilliance, appear dark by contrast to hot ascending columns. . . . It seems that the Sun's surface is like a patchwork of blindingly brilliant geysers, each 100 thousand square miles in area violently erupting every few minutes.' (J. Hynek, *Challenge of the Universe,* [1962], p. 83.)

"Mysteriously, however, the granules fail dismally to live up to such billings. True enough, observers report rapid upward motions and the speedy growth and decay of granules. *But, the motions are nevertheless orderly, the growth cycles disturbingly non-violent.* [Emphasis added] Such effects hardly qualify for characterization in terms of turbulent eruption.

"Though the point is seldom conceded, the established theory of stellar energy is embarrassed by the mild behavior of the Sun's photospheric granules.

"Many years ago F. R. Moulton, an astronomer . . . remarked that the photosphere 'must be a region of violent convective currents, for heat could not be *conducted* to the surface anywhere nearly so rapidly as it radiated away.' (F. Moulton, *An Introduction to Astronomy* [New York, 1906], p. 143.) HOWEVER, WERE GRANULATION REALLY DUE TO TURBULENT CONVECTION, WE SHOULD EXPECT THE BRIGHT AREAS WHERE THE HOTTER GASES WELL UPWARD TO EXHIBIT ENTIRELY RANDOM FORMS. Roughly hemispherical forms might well be abundant, but for the most part, the CHAOTIC TURBULENCE SHOULD HEAVE UP MASSES OF HOT BRIGHT GAS

WITH DISORDERED, HIGHLY CONTORTED OUTLINES. [Capitalization added] Yet observed granules appear highly ordered, giving every appearance of being distinct 'nodules' . . . distorted only by crowding or by merging and splitting tendencies.

"Furthermore, were the dark regions of the photosphere simply areas of turbulent subsidence, where gases cooled by radiation fell back toward the interior to be reheated, we should expect them to have equally chaotic form. In reality, however, 'there is a striking topological symmetry between the brighter-than-average and darker-than-average areas; (L. Goldberg, E. Dyer, Jr., "The Sun, *Science in Space,* L. Berkner, H. Odishaw, eds. (New York, 1963), p. 26) there is not the slightest resemblance between their forms, and there is not even approximately equal sharing of the available surface area between them. The darker areas 'appear as networks of lanes or "canals" running between the brightest granules.' (G. Abetti, *Solar Research,* [New York, 1963], p. 26).

"The idea of turbulent convection delivering endless loads of energy upward from the unseen depths of the Sun conflicts not only with the ordered structure of the photosphere, but also with the observable integrity of individual granules . . . among full-blown individual granules . . . there is little indication of the violent mixing and rolling to be expected in a homogeneous fluid stirred by strong convection currents.

"Each granule seems to fulfill a localized function; when its job is done, it retires from the scene quite unobtrusively by simply fading, splitting into lesser components, or subsiding. Yet, during most of its lifetime, it behaves as if it were bound and bounded by forces or conditions presenting barriers to lateral motion or diffusion.

"The peculiar mode of rotation of the photosphere also argues against the idea of turbulent convection. Near the solar equator the period of rotation is about 25 days. At higher latitudes the period lengthens and near the poles identifiable photospheric features take about 35 days for a complete [rotational] turn. Long ago it was remarked that if strong convection were actually present, 'it is not clear that these vertical currents might not rather speedily bring about uniformity of rotation.' (Moulton, *op. cit.,* p. 418) [That is, if columns of gas are all rising in the same way inside the dense Sun, then they would cause the layers of the Sun in which they are embedded to have the same period of rotation at all latitudes.]

"Considerations like these led astrophysicists to attempt explanations for granulation in terms of an effect known as *non-stationary convection.*

"When a very thin layer of molten wax, for example, is kept heated in a flat pan over a low flame, the surface of the liquid breaks up into well-defined polygons and takes on the appearance of a mosaic pattern. The individual polygons are known as Bernard cells. . . . The phenomenon giving rise to the cells is called *stationary convection.*

"(In the mid-1950's, M. Block found that the cells 'disappeared when a surface-active layer of molecular thickness was spread on the liquid [wax]. Evidently they were caused by the temperature-dependence of the surface tension'. 'Bernard beautifully regular 'convection cells' resulted from capillarity and not from convection. . . .'—thus reports E. Orowan (E. Orowan, *Scientific American*, Vol. 221, (November 1969), p. 103). However, if convection is not responsible for Bernard's cells, the fact does not seem to have come to the attention of solar physicists.)

"If the depth of the molten wax is moderately increased, the Bernard cells assume less regular [polygonal shape and more circular shape] and the term *non-stationary convection* is applied. The overall appearance of the liquid surface in this state is reminiscent of photospheric granulation in the best photographs.

"Quite naturally, when this phenomenon came to the attention of astronomers, it was quickly seized upon as a possible explanation for photospheric granulation. Some were carried away with enthusiasm. . . . For example, G. Abetti insisted that 'An interesting fact has thus been established from the photographs: the appearance of the solar surface is due to effects of 'non-stationary' convection. (G. Abetti, *op. cit.,* p. 26) Others, such as J. C. Brandt, were rather dogmatic: 'By analogy with classical studies of convection, we expect a cellular flow pattern—say with hot gases rising in the middle at the cell and the cool gases sinking at the cell boundary. The solar granulation . . . is apparently the result of the penetration of these cellular motions into the photosphere.' (J. Brandt, *The Physics and Astronomy of the Sun and the Stars,* [New York, 1966], p. 30)

"At this point we are prompted to ask whether, by analogy or otherwise, we should really 'expect a cellular flow pattern' to be evident in the solar photosphere.

"The question of applying classical studies of convection to the photosphere comes down to questioning the propriety of equating an effect observed in a molten way or some other liquid with another observed in the tenuous plasma of the Sun's lower atmosphere. According to the principles of the physics of fluids, this is appropriate if certain relevant matters are taken into consideration.

"One of these matters is the well-known Reynolds number, a dimensionless measure that combines several physical parameters and pinpoints conditions under which a moving fluid will behave this way [exhibiting laminar flow] or that way [exhibiting turbulent flow]. The number is essentially a ratio between forces tending to accelerate a fluid medium and viscous forces that resist such acceleration. Under given conditions, motions in one fluid—liquid gas or plasma—will be unlike those in another fluid unless their respective Reynolds numbers are approximately the same.

"When the Reynolds numbers of any fluid exceeds a critical value, [2,000 to 3,000] flow in that fluid due to convection or any other accelerating force will be turbulent and highly complex.

"Minnaert once published an analysis of photospheric behavior in terms of the Reynolds number. He found the critical value to lie near 10^3. The actual Reynolds number of the photosphere, as calculated from observable characteristics of the plasma, turned out to be in excess of 10^{11}, which is to say, at least 100 billion times greater than the critical value. Clearly, then, any convective motion in the photosphere should be violently turbulent and highly disordered, as Minnaert pointed out. (M. Minnaert, *op. cit.,* p. 171)

"Practically in the next breath, however, Minnaert asserted that 'The variable forms of the granules and their short lifetimes are evidence of nonstationary convection.'

"Such an abrupt about-face is startling. Apparently Minnaert, himself, was disquieted; he immediately went out to minimize his non sequitur by suggesting ways and means for disregarding the classical theory of turbulence to make things come out right for the photosphere. (*Ibid.*, pp. 173-174)

"A second matter to be weighed in judging whether we should expect cellular-flow patterns in the photosphere is the *Rayleigh number.* . . . It takes into consideration other variables, including temperature gradients, depths of convective layers, and density gradients. Again, the number has a critical value beyond which instability and turbulence set in.

"And again, the photosphere is a disappointment.

"'If one calculates the Rayleigh number appropriate to the bottom of the solar photosphere, one finds that it exceeds the critical value by five powers of ten and,

> therefore, the solar granulation should, on this basis, be an entirely random phenomenon. THE FACT THAT THE OBSERVED GRANULES HAVE A PRONOUNCED CELLULAR STRUCTURE AND A BRIGHT-DARK ASYMMETRY HAS NOT YET BEEN EXPLAINED BY THEORY.' [Capitalization added] (L. Goldberg, E. Dyer, Jr., *op. cit.*, p. 327)
>
> "Many facile assertions to the contrary, it becomes increasingly obvious that photospheric granulation is explainable in terms of convection only if we disregard what we know about convection. . . ."[260]

Undoubtedly, there is convection from below the photosphere, but it is laminar and not turbulent, as these cells indicate. Both the Reynolds and the Rayleigh number will decrease in a tenuous medium. In the simplest terms, "the Reynolds number . . . is the product of velocity, density, and diameter, divided by the viscosity."[261] It becomes obvious in the equation of the medium:

$$\frac{\text{velocity x density x diameter}}{\text{viscosity}}$$

that if we lower the density, the Reynolds number will become smaller. Consider pushing sand upward through a vertical pipe at 1,000 miles per hour. The sand has a viscosity that creates much friction with other grains and thus creates great resistance to the flow. But, because the force behind it is so great, it must move. What will happen, given this set of circumstances, is the flow will be highly chaotic and, where the pipe ends, the sand will not flow out smoothly, but in highly random bursts of all sizes. If we put a tenuous plasma in the pipe under the same conditions, it will have a viscosity such that it will create far, far less resistance to flow and can exit the pipe creating bubbles or cells. The question the Rayleigh number determines is, do we get a wave as the material leaves the pipe that is explosive (a shock wave), or continual flow of the wave which does not create a shock wave. This difference can be seen when a jet plane passes overhead. If it moves through the medium at, say, 500 miles per hour, it can make a loud noise; but if it dives and breaks the sound barrier, the shock wave creates an explosion. If the plasma in the Sun is as dense as believed, then there would be few if any regular granules appearing at the surface; rather, the surface would be erupting constantly with explosions of all sizes, and granules, if any, of all sizes. This is not what is observed.

To conclude, the evidence of the radioactive elements technetium, ruthium, and molybdenum in the photospheres of stars which would take many millions of years to reach the surface, proves the atmosphere beneath the surface of stars is highly tenuous; were it as dense as proposed, these elements would decay away deep within the star before reaching the surface. The oscillation of cepheid variable stars, which become hotter during expansion and cooler during contraction, also proves the atmosphere beneath the surface of stars is highly tenuous; were it as dense as proposed, the star would become hotter from contraction which squeezes hot

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[260]Juergens, *KRONOS, op. cit.*, pp. 29-34.

[261]*Encyclopaedia Britannica Macropaedia*, Vol. 11 (Chicago, 1982), p. 788.

atoms closer together, creating greater numbers of collisions, and kinetic energy in the gas. But this does not occur and can only do so in a highly tenuous medium which loses heat rapidly. The oscillation of the Sun like the cepheids and especially its granulations instead of exhibiting a photosphere of constant explosive eruptions over nearly all the Sun exhibits laminar convection which will only occur in a tenuous solar atmosphere. Each of these phenomena point unambiguously to the concept presented here that the Sun's atmosphere is not as dense as considered.

Furthermore, if as this evidence clearly indicates, stellar atmospheres are quite tenuous, then the mass of stars must be concentrated at their cores. In order for, say, the Sun to have a mass of 1,000 times that of Jupiter with a highly tenuous atmosphere demands that the core make up in mass for the small mass of the atmosphere.

This does not mean to suggest that we should see down to that core through the low density atmosphere. The gases are so hot that their brilliance occludes seeing to the core.

SOLAR NEUTRINOS

If the Sun and stars are as dense in their structure as assumed by the conventional model, and are generating thermonuclear energy to maintain sufficient heat to offset their collapse, this energy should exhibit itself by producing neutrinos. Juergens, writing in 1979, nicely sums up the search for these subatomic particles up to that time.

> "The certainty that the Sun generates its prodigious outpourings of energy through thermonuclear reactions deep in its interior has been with us about half a century. But now, suddenly, suspicions are being voiced that this may not be the case at all.
>
> "Doubts have been raised by recent findings on several fronts.
>
> "Probably the most distressing of these discoveries concerns the sub-atomic particles called *neutrinos*, which ought to be showering down on us from the Sun, but apparently aren't. Suppose we let John N. Bacall and Raymond Davis, Jr., two researchers who have followed this trail for a long time, tell part of the story.
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> "'For the past 15 years we have tried, in collaboration with many colleagues in astronomy, and physics, to understand and test the theory of how the sun produces its radiant energy. . . . All of us have been surprised by the results: there is a large, unexplained disagreement between observation and the supposedly well-established theory. *This discrepancy has led to a crisis in the theory of stellar evolution;* many authorities are openly questioning some of the basic principles and approximations in this supposedly dry (and solved) subject. [Emphasis added]
>
> "'. . . Most natural scientists believe that we understand the process by which the Sun's heat is produced—that is, in thermonuclear reactions that fuse light elements into heavier ones, thus converting mass into energy. However, no one has found an easy way to test the extent of our understanding because the Sun's thermonuclear furnace is deep in the interior, where it is hidden by an enormous mass of cooler, material. . . .
>
> "'There is a way to directly and quantitatively test the theory of nuclear energy generation in stars like the sun. Of the particles released by the assumed thermonuclear reactions in the solar interior, only one has the ability to penetrate from the center of the sun to the surface and escape into space: the neutrino. Thus, neutrinos offer us a unique possibility of "looking" into the solar interior. Moreover, the theory of stellar aging by

thermonuclear burning is widely used in interpreting many kinds of astronomical information and is a necessary link in establishing such basic data as the ages of the stars and the [cosmic] abundance of the elements. The parameters of the sun (its age, mass, luminosity, and chemical composition) are better known than those of any other star, and it is in the simplest best understood stage of stellar evolution. The quiescent main sequence stage. Thus, an experiment designed to capture neutrinos produced by solar thermonuclear reactions is a crucial one for the theory of stellar evolution. . . .' (*Science*, Vol. 191, [January 23, 1976], p. 264)

"In the beginning, neutrino astronomy was hailed as a new branch of science. Confidence ran high that the thermonuclear theory would be fully substantiated. In 1965, the first naturally occurring neutrinos—produced in the bombardment of the Earth's atmosphere by cosmic rays—were detected by F. Reines, co-discoverer of the first manmade neutrino from an atomic reactor. Reines' ingenious detector, located nearly two miles underground in a South African mine to shield out all radiation from the surface except the highly penetrating neutrinos, proved that neutrinos are produced in natural atomic reactions and can be detected.

"Davis soon set about the construction of a similar device to search for solar neutrinos. His was built almost a mile from the surface in the Homestake Gold Mine at Lead, South Dakota.

"By 1967, the detector was in operation, and the first, terse announcement of results was released: 'solar neutrinos were not detected in the first 48 days of exposure. . . .' (*Science News*, (September 30, 1967).

"A few months later, on the basis of Davis' further inability to capture solar neutrinos, F. J. Dyson of the Institute for Advanced Study at Princeton, New Jersey, reported to the American Physical Society that there was 'something fundamentally wrong' with the theory of the Sun. ("Doubts Are Cast on Theory of Sun," *The New York Times,* [February 1, 1968])

"But dismay was slow in surfacing. After the first full year of fruitless effort in the search for solar neutrinos, *Science News* commented (July 20, 1968) that 'it is a testament to the persistence of neutrino astronomers and to the strength of their theoretical base that their intensive search for these ghost particles still goes on.' Another four years were to pass the 'intensive search' continuing without interruption before V. Trimble and Reines, discussing 'The Solar Neutrino Problem—A Progress(?) Report,' would concede that 'The conflict between observation and the theoretical prediction of the flux of . . . neutrinos from the sun has advanced from being merely difficult to understand to being impossible to live with.' (*Reviews of Modern Physics,* Vol. 45, [January, 1973], p. 1)

"At a meeting of the International Astronomical Union in Warsaw late in 1973, W. A. Fowler of the California Institute of Technology reported that the status of the theory had gone from bad to worse. Instead of detecting about one neutrino per day, as previously estimated—and this only ten percent of the predicted number, the experimenters were recording only about one per month, and even this one might well be of extraneous origin. Actually, 'the number of [solar] neutrinos reaching the earth . . . may even be essentially zero.' (*Scientific American*, [January, 1974], p. 50)

"Trimble and Reines, in their review article of 1973, remarked that 'The critical problem is to determine whether the discrepancy is due to faulty astronomy, faulty physics, or faulty chemistry.' It seems likely, however, that the true 'fault' for the present predicament of solar physics will be found to lie not in astronomy, not in physics, and not

in chemistry, but in certain fundamental assumptions upon which all research into the workings of the Sun and the stars has been built.

"The null result of the solar neutrino experiments, which still go on has been a fact of astrophysical life for more than a decade. The theory that prompted this research has been scrutinized, modified, fine tuned and polished, but the discrepancy remains. At the very lest, therefore, it can be said that neutrino astronomy, by failing to find neutrinos coming from the Sun, has raised serious doubt as to the validity of the 'conventional wisdom' (Bacall and Davis) concerning stellar energy production."[262]

However, the search has continued up to the present with other experiments employing different materials to detect solar neutrinos. Davis' devise used carbon tetrachloride-cleaning fluid. A second solar neutrino experiment was set up in the Kamiokande metal mine, half way round the world in the Japanese Alps, 185 miles west of Tokyo, which uses water. This was followed by Kamiokande II, which could reveal only those neutrinos of higher energies like those at Homestake in Dakota.

"By April 1990, the Kamiokande team had results from more than 1,000 days of data taking. These showed the detector had observed 0.46 times [46 percent] the number of neutrino interactions predicted. . . ."[263]

This experiment was followed by GALLEX standing for Gallium Experiment which could capture neutrinos, not with the higher energies as sought at Homestake and Kamiokande II, but with low energies indicative of the basic proton-proton behavior that converts hydrogen to helium in the Sun.

". . . in 1990, . . . the first results from a gallium detector were announced—and they took almost everyone by surprise. The new detector found far fewer neutrinos than the standard solar model predicted; indeed, it seemed almost oblivious to the neutrinos from the basic proton-proton reaction [supposedly operating in the core of the Sun]!"[264]

Another gallium detector was built on a much larger scale in the Caucasus mountains called SAGE for Soviet-American Gallium Experiment, and the results was just as surprising.

"There are altogether eight reactor vessels in the SAGE detector which between them contain 60 tonnes of gallium. . . . SAGE started working initially with 30 tonnes of gallium in four reactors and after 18 months or so of preliminary testing, data collection began in earnest at the beginning of 1990. In June 1990, the team working on the detector revealed their first results, at the *Neutrino '90* conference held at CERN in Geneva. The

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[262]Ralph E. Juergens, "Stellar Thermonuclear Energy: A False Trail?" *KRONOS*, Vol. 4, No. 4, (Summer, 1979), pp. 18-21; see, also, Lewis M. Greenberg in same issue, pp. 25-26.

[263]Catherine Sutton, *Spaceship Neutrino*, (Cambridge, England, 1992), p. 162.

[264]*Ibid.*, p. 169.

results were surprising indeed, for SAGE appeared to have detected no solar neutrinos at all!

"The standard solar model predicts a capture rate in a gallium detector of 132 SNU [solar neutrino units], due largely to the capture of the abundant neutrinos from the proton-proton reaction."[265]

Wick C. Haxton, writing in 1995 in the *Annual Review of Astronomy and Astrophysics*, frankly admitted "The solar neutrino problem has persisted for almost three decades. Recent results for Kamiokande, SAGE and Gallex indicate a pattern of neutrino fluxes that is difficult to reconcile with plausible variations in standard solar models."[266]

Several models have been proposed, one in which particles of cold dark matter called WIMPs or "weakly interacting massive particles" were invoked to cool the core of the Sun sufficiently to limit the number of proton-proton reactions and, thus, limit the number of neutrinos liberated. If the core of the Sun was cooled slightly, it would produce fewer neutrinos and the various lower counts of them at neutrino observatories would be in alignment with this hypothetical cooling mechanism. John Gribbin in his book *Blinded by the Light,* followed the search for WIMPs closely but on the last page was forced to the admission that "there is still no positive detection of a WIMP in an experiment on Earth."[267]

Thomas J. Bowles and Vladimir N. Gavin, writing in 1993, write,

"All four operating solar neutrino experiments observe significant deficits [of neutrinos] below SSM [standard solar model] predictions. . . . Many Nonstandard Solar Models [such as the WIMPs theory] have been put forward to provide a means of reducing the [Sun's] core temperature. However, these have proven to be ad hoc solutions, which encounter problems in trying to reproduce other measured quantities of the Sun."[268]

They go on to say the chlorine (Homestake) results remain "an enigma for almost 20 years and no clear conclusion to the solar neutrino problem ever proved possible from the chlorine data alone,"[269] and add "Recent analyses . . . of the consistency of the combined chlorine, Kamiokande, and gallium results concludes that the results are highly inconsistent with any astrophysical explanations."[270]

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[265]*Ibid.*, p. 172.

[266]*Annual Review of Astronomy and Astrophysics*, Vol. 33, (Palo Alto, Calif. 1995), p. 459.

[267]John Gribbin, *Blinded by the Light*, (New York, 1991), p. 225.

[268]Thomas J. Boules, Vladimir N. Gavin, "The State of the Solar Neutrino Problem," *Annual Review of Nuclear and Particle Science,* Vol. 43, (Palo Alto, Calif., 1993), p. 151.

[269]*Ibid.*, pp. 151-152.

[270]*Ibid.*

With data so negative to the standard solar model, new explanations were sought and found. That solution was to change the model of the neutrino from a particle without mass to one with a tiny mass. Since neutrinos were of three types, electron, muon and tau, it was possible (if they contained mass) for them to oscillate from one form to another by interactions with dense matter in the Sun. Since the Davis Homestake experiment only captures electron neutrinos it would miss the muon form.

> "In 1978 Lincoln Wolfenstein at the Carnegie Mellon University in Pittsburgh, [sic] realized that neutrino oscillations should be modified by matter. This is because at the low energies of the solar neutrinos, electron-neutrinos have a means of interacting with electrons in ordinary matter that is not open to muon-neutrinos or tau-neutrinos. . . .
>
> "The net effect of this additional interaction for electron-neutrinos is that any mixing depends on the density of electrons in the matter through which the neutrino is travelling. The centre of the Sun is very dense—ten times as dense as lead—whereas, at the surface the density drops close to that of space. In 1985, S. P. Mikhayev and Alexei Smirnov, at the Institute for Nuclear Research in Moscow, realized that as neutrinos travel from the centre [of the Sun] the degree of mixing will change, and should, in fact, pass through a maximum along the route to the surface. And this could be enough to change the original electron-neutrinos into muon-neutrinos.
>
> "In this way, Smirnov and Mikhayev were able to explain neutrino oscillations without the need for an unnaturally large amount of mixing. The intrinsic mixing would be small; it would be the enhancing effect of the electron-neutrino interactions with electrons that would make the mixing sufficient to change neutrinos from one state to another.
>
> "The MSW (Mikhayev-Smirnov-Wolfenstein) effect captured the imagination of many physicists as being perhaps the most plausible reason for the missing solar neutrinos. Unlike some other explanation it does not demand completely new physics, such as with the WIMPs. . . .
>
> "In the Standard Model [of the atom], neutrinos have no mass, and so no kind of neutrino oscillations can occur. If the MSW effect proves to be really at work on solar neutrinos, it will provide a valuable key to unlocking physics beyond the Standard [Atomic] Model."[271]

Hans Bethe at Cornell University, deeply committed to the Standard Solar Model, pointed to the MSW model in March 1986 when he published a paper titled "Possible explanation of the solar-neutrino problem" in *Physical Review Letters*. Nevertheless, "The first results from Kamiokande II dealt a fatal blow to Bethe's solutions, for although this experiment could detect only relatively high energy solar neutrinos, it detected, if anything, more neutrinos than the chlorine experiment [at Homestake]."[272]

That is, Davis' Homestake experiment could only detect low energy neutrinos while Kamiokande II high energy ones. The process of conversion creates fewer high energy neutrinos from those that are not converted. If Bethe's analysis was correct, the Kamiokande II

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[271] *Sutton, Spaceship Neutrino, op. cit.*, pp. 166-168.

[272] *Ibid.*, p. 173.

experiment should have exhibited fewer muon-neutrinos than the number of electro-neutrinos at Homestake. Just the opposite results occurred. In June 1990, Bethe and John Bacall reworked the original paper and submitted one titled "A solution of the solar neutrino problem," omitting the word "possible" to *Physical Review Letters*. Their solution was to suggest that, instead of only a few electron-neutrinos being converted by the MSW mixing effect, most were converted. Therefore, the larger number of high energy neutrinos would be dominant compared to low energy ones. They assumed that the mixing created far greater high-energy neutrinos than thought possible. Sutton calls "These conclusions . . . tantalising to the extreme."[273] They were extreme and turned out to be contradicted by further research.

Since Kamiokande could detect these more energetic, massive neutrinos, the Kamiokande observatory was tremendously enlarged. It was made highly sensitive to these particles and was renamed Super-Kamiokande. Haxton's comments on this development are significant:

> "We do have one candidate, solution that works extremely well: the MSW mechanism. The required new physics has deep implications for particle physics and cosmology. Yet this physics is not exotic—the requirements of massive neutrinos and mixing are common assumptions in extensions of the standard electroweak model. The elegance of this solution makes it difficult to maintain one's scientific skepticism. The notion that the sun was perfectly designed to enhance the mixing of neutrinos . . . has too great an emotional appeal.
>
> "Fortunately, the solution to the solar neutrino problem does not have to be decided by community vote; the issue will be resolved by hard-nosed experimentation SNO [Sidney (Australia) Neutrino Observatory] and Super-Kamiokande are just a year away and they may crack this 30-year-old-problem."[274]

Although Super-Kamiokande can detect three times the number of neutrinos compared to other observatories, the news was the same.

> "Speaking at the 18th Texas Symposium on Relativistic Astrophysics, held here [Chicago] on 15 to 20 December [1996], Yoji Totsuka of the University of Tokyo, spokesperson for Japan's Super-Kamiokande detector, said that the count rate at the newly constructed detector confirms a mysterious deficit from the sun."[275]

But even more damaging to the MSW model is the difference in results between daytime and nighttime measurements, as reported by Dennis Normile in June 19, 1998, *Science,* p. 1839.

> "In the MSW scenario, the number of neutrinos detected should fluctuate from day to night, when Earth's rotation places the planet's entire mass between the sun and the

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[273] *Ibid.*

[274] Haxton, *Annual Review of Astron. and Astrophy., op. cit.,* p. 500.

[275] James Glanz, "Japan's 'Super' Site Confirms Deficit," *Science,* Vol. 275, (January 10, 1997), p. 159.

> detector. The effect should be largest for neutrinos that travel straight through the Earth's dense core. . . .
>
> "So far, researchers have not found any day-night effect, and there appears to be no enhancement of the oscillation effect for neutrinos coming through Earth's core. The new results don't doom the MSW theory, however: under certain parameters, the effect might not be seen for neutrinos flowing through the Earth."

If as known muon-neutrinos are created in the Earth's upper atmosphere by cosmic radiation, and solar muon-neutrinos are added to them from the daylight side, as measured from the daylight side, then the same muon-neutrinos from both sources should also pass through the Earth's core when measurements were made when Super-Kamiokande was turned away from the Sun. Since this was not found, the solution was to suggest that the muon-neutrinos, traveling through the Earth to get to the detector, oscillated into tau-neutrinos, which the detector was not equipped to discover.

Interestingly, the low energy electron-neutrinos showed that during the day and night periods, equal numbers. This result can only make sense if the Sun is generating fewer numbers day and night. The same applies to all the other measurements from the other neutrino observatories implying that the Sun's neutrino flux is basically less than the theory allows for and thus the theory may well be invalid. (See Dennis Normile, "Weighing In on Neutrino Mass," *Science,* Vol. 280 [June 12, 1998], p. 1690.) But this view was unacceptable and another idea was put forth to yet again salvage the standard solar model.

That other theory is called the "just-so" hypothesis, as Normile goes on to explain on the same page.

> "In . . . the 'just-so' scenario, solar neutrinos oscillate in a vacuum. In that picture, the number that changes into an undetectable form should depend on the neutrino's energy and distance from the fact that calculations of where particle oscillation is likely to peak requires that the oscillation length be nearly equal to Earth's orbital radius."

Thus, low energy solar neutrinos in the dense innards of the Sun by mixing make contact with electrons and are converted to high energy muon neutrinos, but in space they oscillate into a form that is undetectable. The beauty of this parameter in space is that these neutrinos should vanish altogether well beyond the Earth's orbital radius. By placing the Earth at the edge of the solar radius at which the weak energy solar neutrinos have decayed away, the Standard Solar Theory still survives or barely survives.

This author offers two views of the situation to attempt to explain the contradictions. One is that the MSW effect can be made to work (changing the standard solar model) as suggested by Haxton who admits "This is a very speculative departure from the standard model of how the Sun works."[276]

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[276]Bertram Schwarzchild, "Can Helium Mixing Explain the Solar Neutrino Shortages?" *Physics Today*, (March 22, 1997), p. 22; see, also, A. Cumming, W. Haxton, *Physical Review Letters,* Vol. 77, (1996), p. 4286.

The other model advocated by Bacall would rather suggest that the answer to the problem lies in particle physics and that the model of the atom must be flawed.[277] My own conclusion is that expressed by Gribbin several years ago.

> "My own feeling . . . is that none of the current crop of ideas is likely to prove the sole solution to the solar neutrino problem. . . . It may be, after all, that we need *both* new physics and a better solar model to explain all the puzzles."[278]

Electro-Gravitic Theory, which suggests solar radiation is produced by another process than thermonuclear reactions in the Sun may, in time, be examined and supported by the evidence. The astrophysical Standard Solar Model has failed to be substantiated by observational data for three decades and the theories to explain the paradoxes and contradictions are becoming more and more ad hoc and unrelated to reality. Because that model holds such sway among researchers, it would be next to impossible for them to cast it aside, since with the fall of that theory, all astrophysics must be reorganized and little, if anything, developed by thousands of researchers over the last 70 or so years contained in hundreds of journals and thousands of articles and books would become invalid. This is simply too horrendous a thought to contemplate and so I believe the model will be defended for many years to come, but Jay M. Pasachoff's observation made in 1978 still holds, for the present.

> "The neutrino experiment is one of the most interesting to be carried out in astronomy in recent years, and seems to be giving the most profound and unexpected results. The least that we can conclude is that until the matter is settled, we must treat all the theoretical predictions about stellar interiors with a bit of caution."[279]

But the evidence regarding the nature of the solar interior, *vis à vis* solar neutrinos, has still not sunk in, and it is inconceivable to those imbued with the conventional theory to conceive that their theory lies in disarray and ruins.

As can be seen, the theory of stellar origins is fraught with unresolved problems and contradictions. The same applies to the structure of stellar evolution. Even the models of stellar masses related to this evolution, is in disarray. The chemicals found in S stars is a clear contradiction to the conventional theory. The nature of the oscillating variable stars runs contrary to conventional expectations. Solar granulation with respect to Reynolds and Raleigh numbers is also at odds with the theory and we still find no adequate explanation for the missing solar neutrinos.

When nearly every area of traditional theory of stellar origin and evolutions is laden with so many problems, it seems rather clear that the model is being maintained not because of the evidence but in spite of the evidence. When a cosmological theoretical model is held contrary

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[277] *Ibid.*

[278] Gribbin, *Blinded by the Light, loc. cit.*

[279] Jay M. Pasachoff, *Astronomy Now, op. cit.*, p. 135.

to the evidence, we may have a repetition of what occurred in ancient Greece during the Hellenistic period. Aristarchus pointed to a new model of cosmology which suggested the planets and the Earth revolve around the Sun. It was rejected based on a series of spurious analyses. Do we face the same situation today? Will generations of astronomers and astrophysicists continue to uphold a theory with such a plethora of problems, paradoxes and contradictions? The human race may, indeed, have to live for an extremely long time before this monumental cosmological failure collapses.

ORIGIN AND EVOLUTION OF SOLAR SYSTEMS

John S. Lewis, writing in 1990, fully admits after reviewing the various models to explain the solar system,

> "The study of the origin and evolution of the solar system, is still in its infancy."[280]

As had been expected, with all the exploration of the solar system, convergence upon one theory was expected. Carl Sagan also admits that the problem of solar system formation "remains largely unresolved."[281] R. S. Lewis, citing Don L. Anderson of the California Institute of Technology, was also (after much space exploration) forced to admit of the Moon, "All the classical theories of lunar origin are still with us—capture, fission and dual planet accretion."[282]

As of this time (1999) further research has led to the discovery of other planetary systems and as we will see, they do not support the current conventional models that explain how the solar system came into being. They, rather flatly, contradict them.

There are a few concepts that explain the way the solar system formed. One is that a nebulous cloud which condensed to form the Sun gave rise to the planets as described by Robert S. Richardson.

> "The solar system originally consisted of a vast disc-shaped mass of gas at high temperature which was rotating slowly in the direction in which the planets now revolve in their orbits. As this mass of gas lost heat by radiating into space, it cooled. As the mass cooled it also shrank; owing to this shrinking it had to rotate faster. This effect is seen when a skater spinning on one foot with his arms extended wraps them around his body. When he moves his arms in, he spins more rapidly. That is, a spinning body has a certain quantity of rotation (*angular momentum*) as it is called in technical language). . . . As the rotating mass of gas continues to shrink and rotate faster there came a time when the centrifugal force at its edge became equal to the force of gravitation acting inward, and when this happened a ring of matter was left behind at the [Sun's] equator. The mass continued to contract until eventually another ring was left off, and another and another,

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[280]*The New Solar System,* 3rd ed., J. K. Beatty, A. Chaikin, eds., (Cambridge, Mass., 1990), p. 288.

[281]I. S. Shklovskii, Carl Sagan, *Intelligent Life in the Universe*, (New York, 1966), p. 161.

[282]Richard S. Lewis, *From Vinland to Mars*, (New York, 1996), p. 306.

> as many rings being sloughed off as there are planets in the solar system. These rings would hardly be the same size all the way around. One part [of the ring] would be larger than the rest and this would gradually attract the remainder of the ring to it. This mass of gas formed from the rings is the material from which a planet condenses. The planetary nebula would itself shrink also leaving rings which condensed into satellites."[283]

Jagjit Singh points out this concept will not work.

> "But when we apply these ideas quantitatively, we find that the nebular mass could never have spun so fast as to break up into separate rings."[284]

Hannes Alfven and Gustaf Arrhenius, in *Evolution of the Solar System*, point out that the "formation of planets and satellites by a gravitational contraction of a gas cloud, also meets the same angular momentum difficulty as does star formation."[285] For a gas cloud to contract it must condense inward and generate so much angular momentum that the planets formed would spin far too rapidly compared to the spin rates known. To accomplish this they admit, "one has to invent some braking mechanism. . . . No such mechanism is known."[286] They, therefore, conclude "We have shown that the formation of planets and satellites by collapse of a gas cloud is unacceptable."[287] To overcome this inherent problem, the new theory is that grains of dust in the cloud accrete which form planetesimals, which form belts that fall together to form planets. But there are also many serious difficulties with this theory.[288] For example, if the planetesimals are captured from highly elliptical orbits instead of forming an embryonic small planetary mass to gravitationally capture other planetesimals to add mass, instead, they may fragment the incipient planet.[289]

They also point out the time problem related to accretion for certain planets.

> "The planetesimal accretion theory encounters some apparent difficulties. One of these is that, if planets are accreting by capturing grains moving in elliptical orbits in their neighborhood, one can calculate how long a time is needed before most of the grains are accreted to a planet or satellite. As shown by Safronov (1960), the time which Neptune and

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[283]Robert S. Richardson, *The Fascinating World of Astronomy*, (New York, 1960), pp. 190-191.

[284]Jagjit Singh, *Great Ideas And Theories of Cosmology*, (New York, 1961), p. 204.

[285]Hannes Alfven, Gustaf Arrhenius, *Evolution of the Solar System*, (Washington, D. C., 1976), p. 176.

[286]*Ibid.*

[287]*Ibid.*

[288]*Ibid.*, pp. 189-227.

[289]*Ibid.*, p. 178.

Pluto require to capture most of the grains in their environment is several times the age of the solar system."[290]

On the other hand, if planetesimals are in roughly a circular belt, coorbitally near the small embryonic planet, a fundamental gravitational process stops the entire process from proceeding. Tom Van Flandern explains the contradiction as related to docking procedures in space.

> "Suppose you are piloting a rocket and trying to dock with a space station in orbit around the Earth. Let us assume that you start in the same orbit as the space station, but following some distance behind it. If you use your ground-based intuition, you will fire your rockets to propel yourself toward the space station in order to dock with it. This is what early astronauts and cosmonauts did, and they found docking almost impossible. Firing your rockets to propel yourself ahead adds energy to your orbit, increasing its average height [above the Earth] and period, causing you to lose velocity as you climb in height, and putting you into an orbit which takes longer than the space station to get around the Earth. . . . The result is you fall further behind.
>
> "To catch up, you must fire retro-rockets. Although this slows you momentarily, you quickly regain that speed as you drop to a lower orbit which takes less time to get around the Earth and you gain on the space station."[291]

With respect to a planetesimal being captured in a coorbital belt near, say, Jupiter, Van Flandern explains,

> "Now consider the case of an asteroid orbiting the Sun in or near Jupiter's orbit. Such asteroids actually exist: they are called 'Trojan Asteroids.' Why aren't they eventually swept up by Jupiter?
>
> "Let us assume that the asteroid is approaching Jupiter from behind. Jupiter's gravity begins pulling on the asteroid, which accelerates it toward Jupiter. This is just exactly analogous to a rocket firing to increase its velocity toward a space station ahead, as we have already discussed. The result of Jupiter's pull is that the asteroid must drop back in its orbit, away from Jupiter because the asteroid is moved to an orbit with a longer period by the tug of Jupiter. Conversely, if the asteroid is [directly] ahead of Jupiter, Jupiter's tug slows it down, drops it into a shorter-period orbit, which causes it to move further ahead of Jupiter. Such an asteroid would 'librate' back and forth in Jupiter's orbit relative to Jupiter (while always moving ahead relative to the Sun. Its orbit is stable, and it cannot ever be swept up by Jupiter.
>
> "In order to be able to penetrate Jupiter's sphere of influence, or to collide with Jupiter, an object's orbit must allow it to attain velocities relative to Jupiter which exceed Jupiter's own ability to cancel. Objects in orbits very similar to Jupiter's always have velocities similar to Jupiter's, so can never be swept up by Jupiter. (This is contrary to the often-invoked idea that planets all condensed from a collapsed cloud of material moving in

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[290] *Ibid.*, p. 189.

[291] Tom Van Flandern, *Dark Matter Missing Planets & New Comets*, (Berkeley, Calif., 1993), pp. 135-136.

> orbits similar to their own. This remains true even if the period of the planet were slowly changing due to friction in a resisting medium ['drag'], or tides.)"[292]

Therefore, contrary to contemporary theory, planets cannot form from dust and gas clouds nor from planetesimals in the solar system. The influence of the Sun precludes this. Van Flandern also shows that not only can't a planet accrete from such materials, but that a planet cannot capture another body as a satellite under these same conditions.

> "Conversely, if an object's orbit is far enough away from Jupiter's that it can attain relative velocities large enough to penetrate Jupiter's sphere of influence, these relative velocities are too high for capture—not only gravitationally (which, as we have seen, can never happen), but also by tidal or gas drag forces. A gas cloud around a planet would have to remove more velocity in a single close approach to Jupiter than Jupiter's own gravitation could remove before the object reached the edge of Jupiter's sphere of influence. This would require a gas cloud so dense that captured objects would decay in it from drag and [fall into and] disappear into Jupiter's atmosphere. . . . An object cannot reach the edge of a planet's [gravitational] sphere of influence from . . . [far] outside [of it] without reaching a relative velocity which approximates escape velocity at that distance from the planet, and such an object cannot reasonably be captured."[293]

Jagjit Singh, after reviewing all the various conventional theories and ad hoc hypotheses associated with them, claimed

> "From the foregoing review of the latest theories it would seem that none of them provides a satisfactory and conclusive answer to the cosmogonic [solar system] riddle. Most of them attempt to envisage physical processes that are likely to account for some of the observed features of our solar system with varying degrees of reasonableness and plausibility. But none of them is able to take the entire gamut of these features in the broad sweep of its stride. What is, therefore, required is a new synthesis of the various points of view from the several theories that is in better accord with present-day physical and chemical data."[294]

Nevertheless, Van Flandern has put his finger on the point which clearly will allow planets to be captured by the Sun from interstellar space. In this respect, I am discussing gas giant planets such as Jupiter, Saturn, Uranus, and Neptune. What all discussions of planetary capture from interstellar space have overlooked is that, unlike the solar system, the orbits of stars and brown stars such as Jupiter, beyond a certain distance from the center of spiral galaxies do not have orbits that follow Kepler's laws of planetary motion. Inside the solar system planetary bodies (and all bodies) exhibit Keplerian motion as discussed by Marcia Bartusiak.

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[292]*Ibid.*, pp. 141-142.

[293]*Ibid.* p. 142.

[294]Singh, *Great Ideas and Theories of Modern Cosmology, op. cit.*, pp. 229-230.

> "By the 1970s, however, the problem of the missing mass was brought closer to home. By then, both radio and optical telescopes were beginning to reveal curious rotations in both the Milky Way and nearby galaxies which suggested that galaxies contained more mass then previously assumed. Astronomers always took it as a matter of course that stars in a spiral galaxy would revolve around the galaxy's core like planets in the solar system whose motions adhere to Newton's laws of gravitation. Newton recognized that the gravitational attraction between a planet and the Sun follows a simple rule of thumb. The attraction between two celestial objects is inversely proportional to the square of the distance between them. That means that if the distance between the Earth and the Sun were doubled, their mutual gravitational grip would lessen by a factor of four. Triple the distance, and the attraction would fall off to a ninth of its original strength, and so on.
>
> "The distance between a planet and the Sun also determines the planet's orbital velocity. 'In the solar system, the planets all orbit the Sun with velocities that get smaller and smaller as they get farther from the Sun, the systems center of mass,' explained Vera Rubin of the Carnegie Institution of Washington [who discovered the evidence of these motions in spiral galaxies]. 'So the inner planets go fast and the outer planets go slow. That's just a direct response to Newton's law.'
>
> "But to everyone's surprise, observers discovered that galaxies weren't acting like [a] gigantic solar system at all.
>
> "In spiral galaxy after spiral galaxy, the Carnegie group saw that stellar material on the outer edges of a disk travels around at speeds much faster than theory has estimated."[295]

At a point somewhat beyond the galactic nucleus, stars all circle the Milky Way and all other spiral galaxies at nearly the same velocity. This is true for all spirals, as James Trefil states, "In fact, *no* galactic rotation curve has ever been observed to turn over and become Keplerian. All of them remain flat out to distances of 200,000 to 300,000 light years."[296]

Although the average orbital velocity is about 200 kilometers per second the stars in the neighborhood have varied velocities, some going slightly slower than the Sun, some slightly faster.

This fact has profound significance for the formation of solar systems. Tom Van Flandern has explained that if an asteroid is in an orbit directly behind Jupiter, as it is pulled by gravity toward Jupiter, its additional speed causes it to move farther away from the Sun than Jupiter and, thus, fall behind that planet along its orbit. The same consideration applies to an asteroid directly ahead of Jupiter. But in that case, the pull of Jupiter will cause it to drop closer to the Sun than Jupiter, and, thus, speed away from that planet along its orbit. However, this will not occur, nor can such a scenario occur, to a star with a brown dwarf star, such as Saturn, ahead or behind it. (While scientists make a distinction between a brown dwarf star and a gas giant planet, this author does not.) If, as is presented here, stars are born from novae and supernovae, as well as from more gentle nonexplosive disruptions of black holes, then tiny black holes will also be released that rapidly evolve into brown dwarf stars. The birth of such planets

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[295]Marcia Bartusiak, *Thursday's Universe*, (New York, 1988), pp. 189-190.

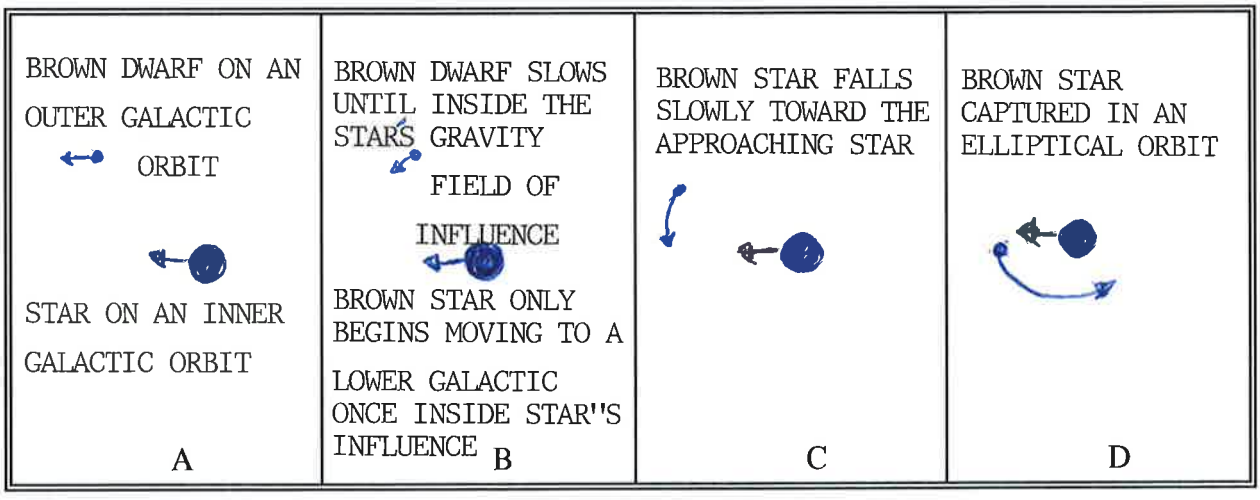
[296]James Trefil, *The Dark Side of the Universe*, (New York, 1988), p. 90.

is like that of the stars. Therefore, the galaxy will contain untold billions of such bodies all in orbit, like the stars around the galaxy and these can be captured.

While in the solar system an asteroid ahead or behind a planet will rise or fall to a greater or lesser distance from the Sun and cannot be captured by a planet, a brown dwarf star in interstellar space, ahead or behind a star, will not rise or fall in the same manner. It is not influenced by Keplerian considerations! This is especially important for brown dwarfs ahead of the star and slightly farther from the galactic center than the inner star that will capture it. Since the brown dwarf star is slightly more distant from the galactic center than the main sequence star, it will have a longer orbital path to follow. But, since it may also be traveling at or near the same velocity as the inner star, that star must have a shorter orbital path and catch up to the brown dwarf. This would be similar to a circular track with one auto on the inside against the inner rail and one auto on the outside rail. If both autos start traveling at near the same speed, the inner auto having less distance to travel will, over several laps around the track, catch up to the outer autos, as would the inner main sequence star do with the outer brown dwarf star.

As the larger main sequence star approaches the outer smaller brown dwarf, it will gradually slow the brown dwarfs forward velocity. But the brown dwarf will not fall in toward the core of the galaxy because Keplerian motions play no role in the motion of either star until they are quite close. What must happen is that the brown dwarf will continue to slow as the larger star approaches and then only when that star is relatively close will the dwarf star cease traveling along its orbit and begin to accelerate toward the larger one moving inward to a lower and lower orbit until it is closer to the center of the galaxy than the star. However, it is moving against the electromagnetic gradient, so that before it can achieve escape velocity, it will be in the larger star's sphere of influence and, therefore, must be captured in a prograde orbit!

Figure 8



If the brown dwarf has, by the same mechanism, captured another brown dwarf, both forming a binary system, then both stars will be captured. The closer brown dwarf, when

capture takes place, will end up as an inner planet, and the more distant brown dwarf as an outer planet to that star. In this way, as stars sweep around the spiral galaxy in their orbits, they will, over time, capture all the brown dwarfs in their paths. As long as brown dwarfs and main sequence stars are being created, this capture mechanism will continue to operate. The orbits of these captured planets will be elliptical at first, but will become circularized as their magnetic fields, masses, and distance from the parent body with its magnetic field mass and distance interact.

Brown dwarf stars, on the other hand, at a closer orbit to the center of the galaxy than the main sequence star in its near neighborhood will approach that star from behind. This approach will cause it to accelerate forward more and more rapidly until its orbit is curved to the star and it passes the star rising to a higher orbit from the galactic center. It's orbit does not become highly elliptical because it is being acted upon by the galactic gravitational and electromagnetic field, which is everywhere around it, of fairly equal force. The magnetic force field, rotating with the galaxy, causes that brown dwarf star's orbit to become more and more circular. At some point during the evolution of the brown dwarf's orbit or after it has been circularized outside but near the orbit of a main sequence star, it will be approached from behind by the larger star and also be captured. This process will also allow stars to capture other stars and form double, triple, or other groupings of stars that are in orbit around one another.

If this theory is correct, then stars that have planetary systems will exhibit a range of brown dwarf masses that will be captured at a range of distances from their primary star. If conventional theory is correct, planetary systems other than that of our Sun's will exhibit orbits for their brown dwarfs like Saturn or Jupiter that are around five times or more distant from their primaries than the Earth is from the Sun.

In October of 1995, a team of astronomers led by Michel Mayor of Geneva Observatory, Switzerland, developed instruments that measured the Doppler shifts of stars sufficiently accurate to detect planets around stars. With the help of graduate student Didier Queloz, they began observations of Pegasi 51 in 1994 and soon discovered the star's velocity varied at a regular pace of 4.2 days. The size and period of the variation suggested it was orbited by a planet with about half the mass of Jupiter. The 4.2 day orbit compared, say, to Mercury, which circles the Sun in 88 days, meant that this brown dwarf was orbiting Pegasi 51 closer than Mercury's orbits the Sun! This finding was in direct contradiction to the nebular theory of solar system formation.[297]

> "Conventional theory predicts that . . . [other] solar systems would resemble our own, with small, rocky planets like Mercury, Venus, Earth, and Mars near the central star, and cool gas giants like Jupiter, Saturn, Uranus and Neptune on the outskirts."[298]

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[297]Ken Crosswell, *Planet Quest*, (New York, 1997), pp. 180 *ff.*

[298]Stephen P. Maran, "Planets Around Other Stars are Hot Hot Hot," *Smithsonian,* Vol. 28, No. 6, (September 1997), p. 74.

This discovery caused much dismay among those wedded to conventional theory and so an ad hoc theory was invented to explain how a Jovian sized planet could migrate from over 5 times the Earth's distance from the Sun to about one twentieth the Earth's distance.

An immense amount of dust was hypothecated to act as a frictional brake. The giant planet plowing into the immense disk of dust was slowed sufficiently so that it migrated inward to its primary.

> "Some observers, however, are skeptical that 51 Pegasi's planet formed farther out [and then migrated inward]. 'If you want my opinion,' said Geoffrey Marcy [a professor at the University of California at Berkeley], 'I think what's happening here is that we scientists are doing what we always do: hanging on to the paradigm until the last possible moment. . . . I would bet that we're going to learn later that giant planets can form closer in [than 5 astronomical units] and that we've been deluded by our own solar system."[299]

In time, another star with a brown dwarf close to it was discovered, "55 Cancri B . . . closer to its star than Mercury is to the Sun [is]-racing around in . . . just over two weeks. . . ."[300] Then others were discovered around Tau Bootis A and Upsilon Andromedae.[301]

Now if these planets formed from rings of dust and gas circling a star, their orbits, like those of Jupiter, Saturn, Uranus, and Neptune, should be highly circular. This was one of the main concepts in explaining the regularity within the solar system.

William Hartmann and Ron Miller, in analyzing the latest view of condensation of a gas-dust cloud into planetesimals into planets, inform us:

> "Soviet researchers . . . also concluded that Earth and the other planets must have originated during a step-by-step buildup from small colliding grains called planetesimals. Soviet scientist, O. Yu Schmidt, in particular, set the stage for the understanding of planetesimals. He argued in the 1950s that the regularities or the orbital and other motions in the solar system required that planets aggregate from millions and millions of small bodies. The regularities include. . .
>
> "Concentric circular orbits."[302]

But if this is the case, then none of the newly discovered planetary systems should exhibit gas giant planets with highly elliptical orbits compared with the highly circular orbits of the gas giant planets in the solar system.

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[299]*Crosswell Planet Quest, op. cit.*, pp. 197-198.

[300]Maran, *Smithsonian, loc. cit.*

[301]Crosswell, *Planet Quest, op. cit.*, "Figure 39," p. 209.

[302]William K. Hartmann, Ron Miller, *The History of Earth*, (New York, 1991), p. 30.

However, new planetary systems containing brown dwarfs have been discovered which travel along highly elliptical orbits, as Maran explains:

> "Some other new planets, which I call the 'eccentrics,' have pronounced elliptical orbits. This is in clear contrast to the near-circles traversed by Earth and its neighboring planets. The eccentrics' orbits take them out great distances, whence they plunge back toward their stars, moving faster and faster. On an eccentric planet such as 70 Virginis B, winter is long, summer is short, and the contrast [because of the great distance in winter and short distance in summer to that planet's star] may be exceptional. Stranger yet is the eccentric 16 Cygni Bb [a double star] which revolves around 16 Cygni B, . . . has a most pronounced elliptical path by any known planet. By one estimate . . . [it] comes within 56 million miles of its star . . . at nearest approach and swings out to more than 250 million miles from the star at the opposite end of the orbit. (In our solar system . . . [its] path would take it from well inside the orbit of Venus to far beyond Mars and into the asteroid belt.)"[303]

Maran points out "The biggest controversy is not over what the new planets look like, but how they got where they are."[304] Presently that there are at least six theories to explain these contradictions to the nebular theory,[305] but the one concept that requires no extra ad hoc theories is the capture model presented here. Stars may capture planets of all sizes at all distances and can convert them to follow circular orbits. Those with highly elliptical orbits may have been recent acquisitions that have not yet had time to be circularized, or more probably, have interacting magnetic fields and masses that require that their final orbit is a highly eccentric one. Of all the planetary systems around main sequence stars discovered thus far (1999), in terms of gas giants' distance from their primary and/or eccentricity, only one has a planet in a circular orbit beyond the five astronomical distance from its primary. All the others are too close to their respective stars or are distant with highly elliptical orbits.

This process still does not explain the formation of terrestrial planets, such as Mercury, Venus, Earth, Mars, and the Moon. This, however, can occur when a new gas giant planet is captured in a system with other gas giants. The newcomer will be caught on an elliptical orbit and, as its orbit is being circularized, it will have opportunities to collide with the others in the system. These collisions will create larger planets when the two fuse into one, but will also generate immense amounts of dust and other materials that will be ejected throughout that solar system. The concept that gas giant planets can collide and form a larger planet was presented by Fred Rasco, a theorist at M.I.T. Rasco claims,

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[303]Maran, *Smithsonian, loc. cit.*

[304]*Ibid.*, p. 76.

[305]*Ibid.*

> "'We start with the idea that it's plausible to form four or five Jupiters in a young solar system,' he says; 'that's pretty much inevitable . . . with that many giant planets around though, they'll certainly be getting in each other's way. Based on computer models, there are two things that can happen. About half the time two or more Jupiters will collide and fuse into a single planet. . . .'
>
> "'The other half of the time the planets will merely have a close encounter. When that happens, one of the planets will be flung out of the system. . . . The other big planet would be slung toward the star taking up a highly eccentric cometlike orbit. Such an orbit cannot last long. . . . [Eventually] After millions of years, the planet ends up in a circular orbit close in to the star.'"[306]

While this theory does explain gas giants in close circular orbits to stars and others with highly elliptical orbits, the concept does not contradict the capture model presented by this author. What must follow a collision of gas giants that fused to form a newer, larger planet is that immense amounts of material would be hurled into interplanetary space during that catastrophe. This concept may well explain the novalike description of Saturn that Velikovsky outlined in his unpublished book, *In the Beginning*. What would follow when such a collision occurs is the process that Raymond A. Lyttleton delineated in his book, *Man's View of the Universe*. He claims that if a gas giant planet is embedded in a massive cloud of dust and debris,

> ". . . a large planet at somewhat near Jupiter's present distance from the Sun, the resulting body would rotate in a few hours because of the indestructible rotational momentum drawn into it. With increasing size, its power to draw in material would increase and its resulting speed of rotation would do so too, and eventually render it unstable as a single mass because of centrifugal force. It can only get out of this embarrassing condition by breaking into two very unequal pieces (mass ratio 10 to 1) with the smaller one thrown completely away from the larger portion, to be identified with the present Jupiter. At the surface of Jupiter the escape speed is now about 40 miles a second (59 km/sec) so the smaller piece would easily be thrown right out of the solar system. *The same process of breaking up would produce a string of droplets* between the two pieces as they separated, and it is even possible that the whole of *the terrestrial group of planets* and Jupiter's four great satellites *were produced this way as droplets*. We have seen that their combined mass is less than one percent of that of Jupiter."[307]

However, it is also probable that collisions of gas giant planets will permit parts of their cores made up of iron and silicates to be ejected as terrestrial planets. If this analysis is correct, then stars with both terrestrial and gas giant planets can form, but significantly, the smaller terrestrial ones may orbit their primary outside the inner gas giants. Presently, with the equipment that exists today, there is no way to observe such terrestrial planets outside the gas giants in close orbit to their star. In perhaps twenty to twenty-five years, instrumentation may

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[306]Dana Berry, "Impossible Planets," *Discover*, (September, 1997), p. 82.

[307]R. A. Lyttleton, *Man's View of the Universe*, (Boston, 1961), p. 36.

be available to observe such planets, and this theory will, thus, be corroborated. The prediction is quite unambiguous. There should exist in some cases terrestrial planets both inside and outside gas giant planets orbiting other stars (not in all, but in some cases).

The theory presented suggests that all solar systems have a long and varied history and that they were not formed at one time, as uniformitarian astronomy claims. Planets of various sizes and orbits once existed in the solar system, and its present arrangement is the final outcome of the last capture, collision and fission event. Since other gas giant planets are being created in the Milky Way, it is possible that, in time, one or a binary of two of these may enter the solar system and initiate another series of planetary orbital disruptions and catastrophes. In earlier times, collisions with gas giants would have produced these effects and also generated millions of comets and asteroids into surrounding space that are observed today in and around the solar system. The theory presented here is that terrestrial planets are born through catastrophes, as Velikovsky claimed.[308]

The desire of astronomers to sanction a safe and secure solar system through their uniformitarian conceit, that little or nothing has changed in our system, has created a false sense of solar system stability that is, as Velikovsky said, "wishful thinking." Once this new view is accepted, it becomes relatively easy to understand how Mars recently had an ocean in its northern hemispheric lowland basin and rivers in its southern continental highlands. That reason is that Mars was closer to the Sun recently for untold millions of years. A very near catastrophic collision removed Mars' water and atmosphere recently and cast the planet into its more distant orbit.

Once this view is accepted, pole shifts and plate tectonic shifts of the Earth in recent times become relatively easy to understand and explain the global planetary Ice Ages and Interglacial ages. Once this view is accepted, the volcanic nature of Venus is relatively easily understood. It is a newborn fissioned planet in its early cool-down stage of development. The immense tilt of Uranus is relatively easily explained by one of these events. The breakup of a satellite in orbit around Saturn by such a recent event giving rise to its ring system is also relatively easy to explain. The retrograde rotation of Venus and its synodic near lock on the Earth follows from the same consideration.

Catastrophism, so long rejected by the scientific community, for uniformitarianism, has made it virtually impossible to envisage the grand sweep and simplicity of historical astronomical events that explain so much of what is observed in our little arena of the galaxy. Catastrophism is the neglected key to the past history of the Earth, the solar system, the galaxies, and the universe. It is also the key to the future history of all these arenas of creation. As Thomas A. Mutch, *et al* pointed out, it is only uniformitarian "prejudice" that stands in the way of these catastrophic concepts.

> "Today we refuse to believe that catastrophic, interplanetary collisions have warped Earth's history. A hundred years hence, when the large impact scars on other planets are familiar landscapes, will we feel the same."[309]

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[308]Immanuel Velikovsky, *Worlds in Collision*, (New York, 1950)

[309]Thomas A. Mutch, *et al., The Geology of Mars*, (Princeton, N.J., 1976), p. 93.

In fact, the theory suggests that all massive celestial structures, galaxies, stars, and planets, comets and asteroids, are born through celestial catastrophes. Catastrophe is elemental in such births. The differences between the theory presented here and conventional theory is that catastrophism is the fundamental process of creation of all celestial bodies, while in traditional theory, wedded to uniformity, no such allowance is made for these creations.

CONCLUSION: ENTROPY

"I want to know how God created this world. I am not interested in this or that phenomenon, in the spectrum of this or that element. I want to know His thoughts, the rest are details."

Albert Einstein in
Timothy Ferris,
Coming of Age in the Milky Way
(New York, 1988), p. 177

"The Universe is in fact a botched job, but I suppose we will have to make the best of it."

Dennis Sciama in George
Smoot, Keay Davidson,
Wrinkles in Time
(London, 1993), p. 86.

"Astronomers seem to live in terror that someday they will discover something important."

Sir Fred Hoyle,
Home Is Where the Wind Blows
in Michael Hawkins,
Hunting Down the Universe
(Reading, Mass., 1997), p. 71.

"Big-bang cosmology is a form of religious fundamentalism, as is the furor over black holes, and this is why the peculiar states of mind have flourished so strongly over the past quarter century. It is in the nature of fundamentalism that it should not relate, in any verifiable, practical way, to the everyday world. It is also necessary for fundamentalistic belief that it should permit the emergence of gurus, whose pronouncements can be widely reported and pondered on endlessly—endlessly for the reason that they contain nothing of substance, so that it would take an eternity of time to distill one drop of sense from them. Big-bang cosmology refers to an epoch that cannot be reached by any form of astronomy, and, in more than two decades, it has not produced a single successful prediction."

Sir Fred Hoyle,
Home Is Where the Wind Blows
(Mill Valley, Calif., 1994),
pp. 413-414.

For those who would criticize this theory of cosmology because it was not published in an establishment scientific journal, I suggest that modern cosmology is not willing to entertain ideas that undermine conventional theory. In his book *Hunting Down the Universe,* Michael Hawkins, an astronomer at the Royal Observatory in Edinburgh, Scotland, openly admits

> "Indeed, it takes almost suicidal courage to leave the herd and challenge the authority of the astrophysical establishment. Typically, papers expressing genuinely new ideas are refused publication by referees of reputable scientific journals on the ground that they undermine the generally accepted principles of physics. Those who persist in writing such papers are usually sidelined from the astronomical community by their peers."[310]
>
> "Survivors in the field of astronomy not only avoid any work that might be seen as dissent, but cannot afford even to mention dissident ideas."[311]

Halton Arp, an internationally renowned astronomer who was driven out of the United States astrophysical community for challenging the concept of the redshift, writes,

> "I am moved to think of Sir Fred Hoyle. . . . At one time he was director of the Institute of Theoretical Astronomy in Cambridge, England. But in spite of, or perhaps because of, his being one of Britain's leading scientists and intellectuals, certain academic maneuvering took place and he resigned the directorship. . . . A few years after the resignation, I was dining at high table in one of Britain's most noted colleges. The don on my left enquired during dinner whether I knew Fred Hoyle. When I said I did and that I thought highly of him, this professor looked around furtively, lowered his voice to a whisper and said, 'He is a great scientist who was treated very badly around here.' The statement did not surprise me, but I can never forget the fearful whisper in which it was spoken, as if we were in some kind of occupied country."[312]

Raymond A. Lyttleton, the English cosmologist, emphatically states in an article entitled "Geophysics the Sick Man of Science,"

> "In order to be a famed . . . scientist and belong to the inclusive club of fully accepted . . . scientists in their *unknown* thousands, one must kneel on the hassock and swear allegiance to certain tenets regardless of any scientific consideration. . . .
>
> "These [tenets, one of which is the Big Bang theory of cosmology] must be held with religious fervor, dissenters are just not to be tolerated, the devotees feeling if their right and indeed duty, to defend the creed against all criticism by any means of chicanery and of sharp-practice within their power, however crude or improper, so long as they judge they

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[310]Michael Hawkins, *Hunting Down the Universe*, (Reading, Mass., 1997), p. 15.

[311]*Ibid.*, p. 77.

[312]Halton Harp, *Quasars, Redshifts and Controversies*, (Berkeley, Calif., 1987), pp. 169-170.

can get away with it, but all the time representing themselves to the world as acting with judicial calm in the best interests of science."[313]

Geoffrey Burbidge, a world renowned astronomer, describes how the astronomical community destroyed the work of Halton Arp.

> "The community of astronomers is totally polarized by this argument [regarding discrepant redshifts of certain galaxies]. Most do not want to hear about it. The strong disbelievers hold that those who propose or believe in this hypothesis are variously naive, mistaken, ignorant of how to do statistics, overly zealous or worse. They claim that . . . [Arp's evidential claims] are not reproducible, that we have no theory to explain these phenomena, and that we should recant, and that in fact the red shift controversy is over: that is, the *status quo* has been maintained. This last statement is often made in meetings to which the proponents of unorthodoxy are either not invited, or not allowed to speak."[314]

Burbidge adds:

> "The other part of the learning process has been unpleasant, probably because I have a strong instinct for fair play. It may be argued that this is no substitute for good judgment. But neither are the tactics that have been used by those who want to maintain the *status quo*. These include interminable refereeing, blackballing of speakers at meetings, distortion and misquotation of the written word, rewriting of history."[315]

Hannes Alfven, a Nobel Prize laureate who has presented his own theory of cosmology, which he has been unable to have published in any astronomy journal, discusses the situation thus:

> "The (above) mentioned conditions and quite a few others have led to disagreement between a very strong establishment (E) and a small group of dissidents (D) to which the present author belongs. This is nothing remarkable. What is more remarkable and regrettable is that it seems to be almost impossible to start a serious discussion between E and D. As a dissident is in a very unpleasant situation, I am sure that D would be very glad to change their views as soon as E gives convincing arguments. But the argument 'all knowledgeable people agree that . . . ' (with the tacit addition that by not agreeing, you demonstrate that you are a crank) is not a valid argument in science. If science issues were decided by Gallup Polls and not by scientific arguments, science will very soon be petrified forever."[316]

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[313]Raymond A. Lyttleton, "Geophysics the Sick Man of Science," *ISCDS*, Vol. 5, (December, 1984), p. 3.

[314]Geoffrey Burbidge, "Anatomy of Controversy," *Sky & Telescope*, (January, 1988), p. 40.

[315]*Ibid.*, p. 42.

[316]Hannes Alfven, *American Scientist*, Vol. 76, (1988), p. 247.

These condemnations of the power elite within establishment cosmological science do not mean to suggest that all researchers within this body are power driven or capable of discreditable behavior. Not in any way; many are open, but they understand that what happened to Hoyle, Arp, Alfven, Lyttleton, all significant members of their community, can happen to them should they tread the dissident road. Therefore, as an outsider and amateur researcher, the theory presented here will never be evaluated in terms of the falsifiable test that will be presented in the Appendix to test this theory. Researcher Bernard Lovell maintains,

> "No one acquainted with the contortions of theoretical astrophysicists in the attempt to interpret the successive observations of the past few decades would exhibit great confidence that the solution in favour of the hot Big Bang would be the final pronouncement in cosmology."[317]

Or as Burbidge describes how the Big Bang is defended,

> "As is always the case when scientific questions are really fundamental, new ideas which, if they prevail, will over overthrow the old ones, are resisted by all means, in the name of science, but by any means that come to hand.[318]

While Irwin Shapiro explains how Big Bang theorists salvage that dogma when observations contradict it,

> "All chains of reasoning in cosmology are elastic. Almost any observation interpreted to support one observation can, in the hands of a moderately adroit theoretician, be reinterpreted to support the opposite."[319]

In spite of several books that have debunked most of the evidence of the Big Bang theory,[320] as well as the present book which superficially resembles that theory, that theory dominates.

This new hypothesis makes a fundamental claim that no other theory makes or follows in any detail the route taken by this author, namely that electromagnetism is the fundamental counter force in celestial space to gravity and governs a host of celestial phenomena. Recently, new evidence was presented that this researcher claims is in full harmony with my motion theory. According to Charles Seife,

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[317]Bernard Lovell, *Cosmology Now, op. cit.*, p. 8.

[318]G. de Vaucoleurs, *Sky & Telescope*, (August, 1978), p. 151.

[319]Irwin Shapiro, *Technology Review*, (MIT, December, 1975).

[320]John Boslough, *Masters of Time*, (Reading, Mass., 1992); Eric Lerner, *The Big Bang Never Happened*, (New York, 1991); Dewey Larson, *The Universe of Motion,* (Portland, Or., 1984); Tom Van Flandern, *Dark Matter Missing Planets & New Comets*, (Berkeley, Calif., 1993); Sir Fred Hoyle, *Home is Where the Wind Blows*, (Mill Valley, Calif., 1994).

"Gravity may not be working as advertized. Spacecraft hurtling through the solar system have been behaving so bizarrely that some scientists wonder whether our theories of gravity are wrong.

"'We've been working on this problem for several years and we accounted for everything we could think of,' says John Anderson, a planetary scientist of NASA's Jet Propulsion Laboratory in Pasadena.

"In 1972, NASA launched Pioneer 10 in the direction of Jupiter. For a quarter of a century, radio signals have been beamed to the spacecraft and reflected back to Earth as it continued its odyssey to the outer solar system and beyond. By studying the red shift of the returning radio waves—how 'stretched out' they are—NASA scientists have been able to work out how fast the probe is travelling. Pioneer 10 seems to be slowing more quickly than it should.

"The signals bouncing back from Pioneer 10 are far from clean. The Earth revolves around the Sun, stretching and compressing the audio waves periodically. The probe also occasionally corrects its course so that its antenna remains pointing towards the Earth. But scientists have a good handle on these effects and can cancel them out.

"That is, they thought they could, until Anderson's team started analyzing Pioneer 10 data collected since 1987. They found a systematic anomaly, as if Pioneer 10 were receiving an extra tug from the Sun's gravity. The disagreement is 80 billionths of a centimeter per second squared, a tiny rate of deceleration that would take more than 650 years to bring a car travelling at 60 kilometers an hour (38 miles per hour) to halt. But to scientists used to working with absolute precision it is a glaring discrepancy.

"What could be to blame? A fuel leak was quickly ruled out—Pioneer 10's gauges show no unexpected loss of fuel. Aerodynamic drag from the interstellar medium also, couldn't be involved, as there just isn't enough material to account for the effect. Thermal radiation from the spacecraft's batteries would also be to puny, and would be emitted in all directions rather than pushing the probe towards the Sun. An unknown asteroid couldn't be responsible, either. 'We ruled out other sources of gravitation,' says Anderson."[321]

The space probe contains some electronic equipment and this is moving in the magnetic field of the Sun. Although there is a repulsion involved, based on this theory, it is also known that the Sun's magnetic field sweeps not only outward, but turns with the Sun. Planet's imbedded in that field are moving in the direction that the solar magnetosphere is revolving, but Pioneer 10 is like a boat crossing a river and riding not with the magnetic current, but across it. The spacecraft also has generated a tiny magnetic field and that field is encountering the revolving, resisting solar field. Thus, over time, it has begun to slow it down. The fact of the matter is that Pioneer 10's behavior is not unique. Seife continues:

"If just one spacecraft were being affected, the discrepancy would be infuriating, but certainly not enough to start questioning current theories of gravity. But Pioneer II, launched in 1973 toward the other end of the solar system . . . , is also slowing at about the same rate. The Ulysses probe, launched in 1996 towards Jupiter, before swinging into an orbit that took it over the Sun's poles, had an even larger anomalous pull towards the

[321]Charles Seife, "If the force is with them," *New Scientist*, (September 12, 1998), p. 4.

> Sun. Data from Galileo, now orbiting among Jupiter's moons, appears to show the same effect."[322]

In the Ulysses case, the slowing is naturally more anomalous because it traveled directly over the Sun's magnetic pole and was pushing through the Sun's magnetic field where it was the strongest. The Galileo space probe orbiting Jupiter has an orbit which causes it, like Pioneer 10 and 11, to cut through the revolving Jovian magnetosphere repeatedly and, thus, it is slowing, as well. The scientists do not wish to question the possibility that gravity is not the sole force in celestial motion are going through the data to see if they can discover "some kind of systematic effect that has corrupted the data."[323]

> "But until someone can identify an error in the data, outlined in a paper to be published in *Physical Review Letters,* the possibility that the team has broken new ground in physics remains. 'There's a small probability that it's very important,' says Anderson."[324]

The question is, can four different spacecraft, of which two are outside the solar system, another orbiting around Jupiter, and yet another orbiting the Sun over its poles, all exhibit systematic problems of the same nature. It does seem very probable that they could all be affected by a similar force that would bring about systematically the same behavior. The test offered in the Appendix of this work will determine this question quite directly.

The theory presented here, regarding stellar evolution, claims that all galaxies and stars are born from black holes of a range of masses and the stars then evolve to pulsars and white dwarf stars to main sequence stars and thence to old red giants and supergiants. Once born, they do not change character and become some other main sequence star or turn back into a quasar or white dwarf. Their character is set and does not change while they live their mature life on the main sequence. What the conventional theory suggests is that some stars explode and turn themselves into bodies of degenerate matter, or that some stars can gather unto themselves immense amounts of gas and dust to change into another star while on the main sequence. My theory claims all stars move to the right of the Hertzsprung-Russell diagram, never to the left.

Typical of what Disney calls "Conventional Wisdom of the Dominant Group,"[325] under the chapter heading "Illusions and Assumptions," is one paradox (actually a contradiction) well-known as the Algol Paradox. More massive stars, based on conventional theory, evolve to old age more rapidly than less massive stars, because they are very hot and burn their fuel up rapidly. Thus, if two stars of different mass form a binary system, the more massive star should become a red giant or red supergiant, (having evolved more rapidly) and the smaller, less massive star should still be a main sequence star, (having evolved more slowly) and not having

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[322] *Ibid.*

[323] *Ibid.*

[324] *Ibid.*

[325] Disney, *The Hidden Universe, op. cit.,* p. 209.

achieved old age as a red giant. Based on the present theory of stellar evolution, in all binary systems with stars of clearly different masses, the red giant should be the more massive star. But according to W. K. Hartmann,

> "Here lies the paradox. The more massive B or A star should be the one to expand first, yet the less massive star is the more evolved giant. Why? Is there a fundamental mistake in our theory of stellar evolution?"[326]

The assumptions are that these binaries are formed, from the outset, of both star's birth, even though this is not really known; and that capture after birth cannot, or rarely ever, occurs. To get out of this situation, it is conjectured that the larger, more massive star was originally the smaller, less massive one orbiting close enough to the original, more massive star. Then, as the more massive one aged and expanded, the smaller star pulled the gases from the big one. It thus pulled and captured so much gas that it became much more massive and also stayed young because it had new fuel to burn atomically. Thus, the original, more massive, hot star, which had aged, expanded, and was becoming an old red giant or supergiant, was now a small, cooler star. In essence, the large old star became a smaller younger star and the small young star became an old large one. They exchanged their masses and ages.

Thereafter, when the latter (not the original) large star collapses into a white dwarf, the entire process is reversed, forming what is known as a cataclysmic binary in which the white dwarf now pulls the gases of the other star to it periodically to create immense bursts of energy as these gases fall onto its dense surface and explode. Shklovskii presents the concept thus:

> "It seems that the hot component has already passed through its evolution and, at some epoch in the past, transferred much of its material to its companion star. But now the companion is returning the favor by restoring to the evolved star the material 'borrowed' many millions of years ago."[327]

But, if this was truly the case, then the originally more massive star, which had used up most of its fuel and had begun to expand, would be transferring gas with low fuel content. The originally less massive star would be receiving this mass with low fuel content and thus it would burn more rapidly the smaller amount of fuel it would have. It, too, would expand and the gas transfer would recur pulled back to the original star which would start the cycle once again. In the end, we would end up with two stars roughly of the same age and mass, which is never found with these particular stars.

> "The most striking feature of . . . [these] binary systems is the fact that in every case known, it is the secondary (less massive) component which appears to be at the Roche Limit [the distance where it can remove gas from the larger star], while its more massive

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[326]William K. Hartmann, *Astronomy: The Cosmic Journey*, (Belmont, Calif., 1978), p. 337.

[327]Shklovskii, *Stars, op. cit.*, p. 214.

component remains well within the limiting surface [where it cannot hold its outer gases from being pulled away by the smaller star]."[328]

Shouldn't there be at least one case in which the stars are young enough to be observed where this transfer process has just commenced? That such an unfalsifiable or untestable proposition is elevated to an accepted explanation suggests that the conclusion is incorrect. As pointed out earlier in the motion theory, only stars without strongly repelling, electromagnetic fields will form close binaries. The main sequence O, A or B giant main sequence stars rotate at great velocity and, thus, possess powerful, repelling, magnetic fields; thus, they will not form extremely close binaries with others that also have relatively strong, repelling, magnetic fields. This case of the Algol paradox fully conforms with this motion theory, but significantly with Electro-Gravitic, stellar, evolutionary theory presented here, as well.

Stars once born do not become other types of stars! The process of stellar birth and evolution of both theories can be best compared by observing them on the Hertzsprung-Russell diagram. In this diagram, Figure 9, the conventional theory shows the evolution of a typical G type star [Su-Shu Huang "Life outside the solar system, *New Frontiers in Astronomy*, (San Francisco, 1975), p. 108].

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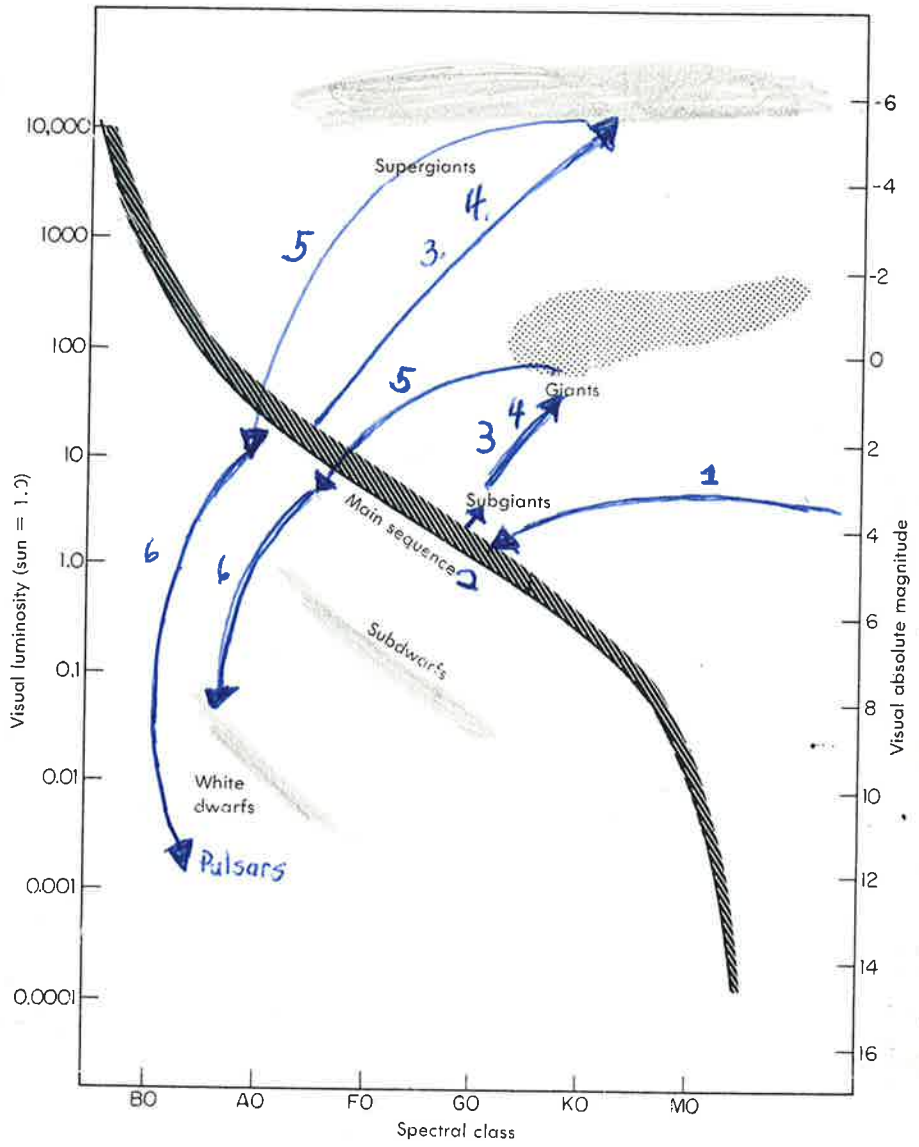
[328]Zdenek Kopal, "Binary Stars," *McGraw-Hill Encyclopedia of Science and Technology*, Vol. 2, (New York, 1977), p. 187.

Figure 9



According to conventional theory,

1. The star is formed from dust and gas as it contracts.
2. The star lives most of its life on the main sequence.

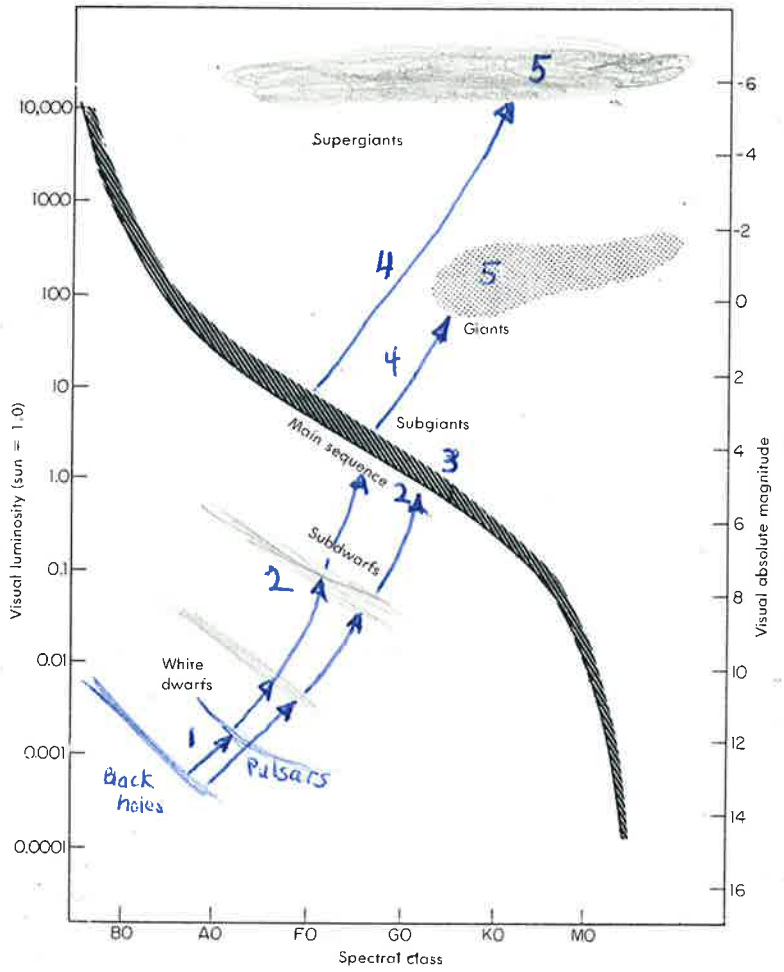
3&4. The star expands to an old red giant.

5. The star pulsates as a cepheid variable.
6. The star contracts inward to form a white dwarf. If it is a large, massive star, it contracts and forms a pulsar.
7. The white dwarf loses energy and becomes a black dwarf.

All stars following the conventional theory go through very similar forms of movement on the Hertzsprung-Russell diagram. The smallest stars remain red giants. The stars move right and left, up and down through the diagram throughout their evolution.

However, this convoluted path of stellar evolution is not required by Electro-Gravitic Theory, which is seen in Figure 10. All stars follow one direct path in evolution.

Figure 10



1 or 1&2. Black hole spins to violent instability forming a white dwarf or slowly to nonviolent instability forming protostars and sometimes main sequence stars.

2. The white dwarf or pulsar glitches and expands to a protostar and then a main sequence star.
3. The star lives most of its life on the main sequence.
4. The star ages turning red and pulsates as a variable star becoming a red giant.
5. The star remains a red giant until absorbed by a black hole.

All stars, based on Electro-Gravitic theory, follow this direct route without exception, only the larger black holes may become pulsars rather than white dwarfs prior to their further evolution. As can be seen, the route of evolution for all stars is not up and down, right and left, but a direct line from left of the Hertzsprung-Russell diagram to the upper right side. *All roads in stellar evolution lead to the second law of thermodynamics.* We begin with immensely massive, compact, highly latticed, energetic bodies, spinning at immense velocity that evolve to bodies that are ever less massive, less compact, less energetic, latticed bodies, spinning at ever smaller velocity. In the end we left with an extremely large ball of low density gas, of low mass, low energy, no lattice and no or little spin. Surely this route of development makes for a far greater and more rational understanding of stellar evolution than the convoluted route offered by conventional theory.

There is an aesthetic beauty as well as a rational, evidential simplicity to Electro-Gravitic theory completely lacking in the traditional concept that would not be there if my theory was invalid. What is being presented is the concept of Occam's Razor, which suggests that nature is parsimonious with its forms and energies.

What the traditional theory suggests is that stars originate spinning rapidly, with great energy from condensation of dust-gas clouds. But the scientific literature states the dust-gas clouds are too tenuous to form stars and if they did, the stars should be spinning far more rapidly than they do. The stars, as they age, expand and slow their spin rates until they halt or almost halts rotating, as old red giants and supergiants. Then they pulsate, when almost all their energy is gone, and collapse into stupendously rapid, rotating white dwarfs and pulsars, which then, emit immense amounts of new energy. The stars were originally diffuse clouds of gas and dust, then very dense bodies of gas which become large spheres of diffuse gas, which become tremendously dense as white dwarfs. Not only does the present theory of stellar evolution require stars to move up and down, right and left, on the Hertzsprung-Russell diagram, but the stars first spin rapidly, then slower, and then extremely slowly or actually halt spinning. But then they spin again to enormous rotational velocity. The theory also claims the stars are of a typical size, but then become much larger in size, as red giants or supergiants, and then become extremely small in size. The theory claims the stars are brilliantly luminous at birth, then less so on the main sequence, then grow brighter because of expansion into their red giant-supergiant stage, then even more brilliant at novae or supernovae to become white dwarfs, though small in size, which then fade from blue-white to red to black.

Every aspect of the traditional model is required to change first in one direction, then the other, including the stars themselves, as was pointed out with the Algol Paradox and the cataclysmic variables.

Not a single parameter of Electro-Gravitic Theory changes direction repeatedly on the HR diagram. The entire concept is based on entropy, or the breakdown of form and energy in each instance. We begin with highly organized form, a dense lattice, and end up with a low density, amorphous globe of gas. We begin with a great mass and, through loss of mass and energy, we end up with a smaller mass. We begin with a highly rotating body and end up with little or no rotation. We start out with a body giving off highly energetic emissions, and end with a body giving off extremely weak emissions. The fundamental law of entropy is the hallmark of Electro-Gravitic theory. Thus, I reiterate this conclusion, yet again.

The masses of stars start out large, and go in only one direction to smaller and smaller masses. The spin rates of the earliest pre-stars start out as immensely rapid and go in only one direction, to ever slower rotation, then to little or no rotation. The energy of the earliest pre-stars is immense and goes in only one direction, to ever smaller energies. The density of the earliest pre-stars is also immense and goes in only one direction, to ever smaller density. All roads of stellar evolution lead to the second law of thermodynamics and follow the aesthetic beauty and rational, evidential economy of Occam's Razor. I suggest the same applies to galactic birth and evolution, as well, and that a kind of Hertzsprung-Russell diagram will one day apply to it, as well. The evolution of galaxies exhibits all these forms of entropy.

Other problems with the Big Bang theory vanish in terms of Electro-Gravitic Theory. For example, the problem of expansion and the isotropic nature of the cosmic background radiation. If the universe is only about fifteen billion years old and was created by the expansion of material in every direction, then it should exhibit more radiation consistently from one portion of the sky. As F. W. Stecker writes in the *Astrophysical Journal,*

> "There is a mystery concerning the evolution of the universe which is of profound and fundamental significance. When we look over the sky, we can see radiation that was emitted when the universe was very young and which later scattered off the matter content of the universe . . . [15 billion] years ago. At that time, it had a temperature of . . . [around 1,000] times its present temperature of . . . [around 3° Kelvin], orders of magnitude higher than the redshift of the farthest quasar. But the ultimate source of the radiation, annihilation of particles and antiparticles with all masses allowable at corresponding temperatures, lies at much earlier, hotter epochs. The 3K microwave background radiation is remarkably isotropic—to within better than one part in a thousand.
>
> "The puzzle comes in when we consider that, as time goes on, we see more and more of the universe as distant regions come within our 'particle horizon,' . . . Thus, we are now seeing 3K microwave radiation from parts of the universe which apparently were never in causal contact, since even radiation traveling at the speed of light, would not have had time to cross from one region to another. How, then, could they be in such apparent thermal equilibrium? Or, putting it another way, how could one region have known to adjust its temperature to that of the unknown other region?"[329]

If, as is contended, the universe is trillions of years old and was not created all at one time, but over immense stretches of time, then every region will have had galaxies born in it and their accumulated radiation would even out to a general level. By removing the epoch of creation from one event fifteen billion years ago to trillions of events over trillions of years scattered throughout space, one arrives at a fairly low constant background radiation. Occam's Razor, again in simple terms, supports Electro-Gravitic Theory.

Related to this is the anomaly of ultra-high energy cosmic rays. If the universe was formed fifteen billion years ago, then all the powerful forms of radiation should have been greatly attenuated and they should, like the general cosmic background radiation, be at extremely low level, but this is not the case, as Alan Watson explains:

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[329]F. W. Stecker, "Asymptomatic Freedom in the Early Big Bang and the Isotropy of the Cosmic Microwave Background," *Astrophysical Journal,* Vol. 235, (1980), p. L1.

> "High-energy fragments of matter originating beyond our solar system bombard the Earth's atmosphere continuously. These fragments, which are mainly atomic nuclei, are called cosmic rays, and the most energetic have energies well above the highest reached by [Earth based] particle accelerators. How nature arranges to give single atomic nuclei kinetic energies up to 25 joules—energy sufficient to raise a 1-kg weight to a height of 2½ metres—is one of the outstanding mysteries of high energy astrophysics. Recent results suggest that the most energetic particles come from outside our galaxy; if so, high-energy cosmic-ray sources are as powerful as some of the most powerful X-ray and radio sources."[330]

Again, if galaxy creation is still ongoing, and some quasars and radio galaxies are closer to our region of space than assumed, then they will generate these powerful energetic cosmic rays that will reach our galaxy and planetary system still at high energy levels.

The search for exotic particles of dark matter needed to close the universe and cause it to collapse inward to renew the cycle of galaxy and stellar rebirth also vanishes. This theory shows that the universe is in constant renewal and also in constant destruction of matter.

All the great paradoxes, contradictions, and anomalies that are explained by Electro-Gravitic Theory, vanish and fit nicely with Occam's Razor. What Immanuel Velikovsky said on October 14, 1953 at Princeton University, has been my guide to this work, which I quote in full because of its significance to me as I was then in my first year of college.

> "What I want to impress upon you is that science today, as in the days of Newton, lies before us as a great uncharted ocean, and we have not yet sailed very far from the coast of ignorance. . . . The age of basic discoveries is not yet at its end, and you are not latecomers, for whom no fundamentals are left to discover. As I see so many of you today, I visualize some of you, ten or twenty or thirty years from now, as fortunate discoverers, those of you who possess inquisitive and challenging minds, the will to persist, and an urge to store knowledge. Don't be afraid to face facts, and never lose your ability to ask questions: Why? and How? Be in this like a child.
>
> "Don't be afraid of ridicule; think of the history of all *great* discoveries. I quote Alfred North Whitehead:
>
> "'If you have had your attention directed to the novelties of thought in your own lifetime, you will have observed that almost all really new ideas have a certain aspect of foolishness when they are first produced.'
>
> "Therefore, dare.
>
> "And should even the great ones of your age try to discourage you, think of the greatest scientist of antiquity, Archimedes, who jeered at the theory of Aristarchus, twenty-five years his senior, that the earth revolves around the sun. Untruth in science may live for centuries, and you may not see yourself vindicated, but dare.
>
> "Don't persist in your idea if the facts are against it; but do persist if you see facts gathering on your side. It may be that even the strongest opposition, that of figures, will crumble before the facts. The greatest [American] mathematician who ever walked on these shores, Simon Newcomb, proved in 1903 that a flying machine, carrying a pilot, is a

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[330]Alan Watson, "Messengers from Outer Space," *New Scientist,* Vol. 99 (1983), p. 257.

mathematical impossibility. In the same year, 1903, the Wright brothers, without mathematics, but by a fact proved him wrong.

"In religion, the great revelations and the great authorities—the founding fathers—belong to the past, and the older the authority, the greater it is. In science, unlike religion, the great revelations lie in the future, the coming generations are the authorities; and the pupil is greater than the master, if he has the gift to see things anew.

"All fruitful ideas have been conceived in the minds of the nonconformist, for whom the known was still unknown, and who often went back to begin where others passed by, sure of their way. The truth of today was the heresy of yesterday.

"Imagination coupled with skepticism and an ability to wonder—if you possess this bountiful nature—will hand you some of the secrets out of her inexhaustible store. The pleasure you will experience in discovering truth will repay you for your work; don't expect other compensation, because it may not come. Yet dare."[331]

Although the strongest argument of numbers has been raised against the theory presented here, the experiment that is presented in the Appendix will determine the validity of those numbers and this theory.

FALSIFIABILITY AND TESTABILITY

The entire foundation of this theory rests on one testable, falsifiable concept, namely that there is a counterforce to gravity, and that force is interplanetary, interstellar, intergalactic electromagnetism. Karl Popper, the great English philosopher of science, in his works outlined a method of determining whether or not an empirical theory such as the one offered in this book is scientific. The theory must be both testable and falsifiable. Tom Van Flandern sums up the concept thus:

"The logical deductions from a theory or model are its 'predictions.' They must be compared with reality, for any hypothesis which purports to be of value, that it be 'falsifiable'; that is, that it be able to make predictions which, if false, invalidate the theory. . . . For a hypothesis to gain acceptance, it must predict things seemingly of low probability that will invalidate the theory if the predictions are wrong. The convincing power of the predictions will be proportional to how much at risk the theory is placed by them. This is why it is usually a sign of a bad theory if it must be 'patched' as a result of a bad prediction or even a prediction it simply failed to make at all.

"Scientists today have fallen into the very bad habit of no longer demanding that theories be falsifiable. It comes from the frustration of having no reasonable alternative theories readily at hand. So when the prediction of a theory fails, the easiest course of action is to patch the theory, rather than go back to fundamentals and devise a whole new theory."[332]

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[331]Immanuel Velikovsky, "Forum Address," *Earth in Upheaval*, (New York, 1955), pp. 299-301.

[332]Van Flandern, *Dark Matter, Missing Planets & New Comets, op. cit.*, p. 362.

The test that is being presented in the Appendix of this book puts the entire scope of the theory at risk. If that test fails to conform with the prediction offered, then this theory has been completely invalidated, nothing less. No theory of cosmology has ever offered the concept that in the coldness of space, electromagnetism can significantly affect the motion of a celestial body. In fact, James Warwick specifically presented a calculation of this fact with regard to binary magnetic stars in close orbit about one another with their dipoles pointed directly at each other.[333] What this author was able to demonstrate was that such stars, especially the Ap type, with strong magnetic fields, never form close binaries (spectroscopic binaries) with any other star. They are single or have distant companions.[334] Even M. Floguet, the French astronomer, looking at the evidence admitted, "The magnetic fields seem to play an important role in the relation between binarity and the Ap [magnetic star] phenomenon."[335]

In spite of the fact that gravity would swamp out magnetism by billions of times, these stars do not gather close partners to them as other non-magnetic stars do, and which seems to suggest that magnetism, contrary to Warwick's calculations, is strong. There is not a single astronomer nor a single physicist who would today suggest that magnetic fields in space can, in any significant form as they presently exist, could ever affect, in a major way, the orbital properties of a magnetic body is space. To these scientists, the concept is simply without merit. Therefore, if the test introduced below proves they are wrong, then the theory will have been shown to be basically valid.

However, the following test is not only one to validate or invalidate Electro-Gravitic Theory, but also to test the establishment's own theory, that only gravity and inertia are the fundamental forces of celestial motion. Thus, not only will the test answer the question of any role electromagnetism may play in celestial motion, it will determine, for all time, the concept that electromagnetism, and especially magnetism, are counter forces to gravity. Although I would prefer to run the test with a charged-magnetized spacecraft, for this crucial experiment, I am offering a test only of magnetism's effects. As I was given to understand, it is difficult to have a charged body which will not discharge its energy into the surrounding environment. Nevertheless, the test is as follows:

If one were to place a highly magnetized low mass hollow ball in space in a highly circular orbit around the Earth outside the Earth's magnetic field, the determination of the effect of magnetism on the orbit of that ball can be measured. It is taken as a given that the magnetic resonance of space is known such that it will not affect the orbit of such a magnetic orbiting body. Since the orbit of the ball is outside the Earth's magnetosphere, where it cannot be influenced by that magnetic field, nor by that of the distant sun, its orbit should not change significantly in a few days, weeks or months. However, if the orbit of the ball should change significantly in a few days, weeks or months, then it will prove that magnetism is a potent force in celestial motion.

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[333] *KRONOS*, Vol. X, No. 3, (1985), pp. 10-11.

[334] Charles Ginenthal, *Carl Sagan & Immanuel Velikovsky*, (Tempe, Ariz., 1995), pp. 358-359.

[335] M. Floquet, "Les Étoiles Ap Binaries," *Astronomy and Astrophysics Abstracts,* Vol. 30, Part I, (1983), p. 439.

I have submitted the test offered in the following Appendix to NASA, the European Space Agency, The Japanese Space Agency, and the Israeli Space Agency. Each of these authorities have refused to carry out this test. At a meeting in Portland, Oregon, Dr. Tom Van Flandern informed me that all kinds of tests, even tests submitted by public school children have been accepted and tested in space by NASA. Thus, it is quite discouraging to run into this wall of rejection. I mentioned such a test in my book, *Carl Sagan & Immanuel Velikovsky* (Tempe, Ariz., 1995), p. 360, and claimed this test will not be performed based strictly on the "politics of science." Thus, the theory remains in limbo until that space test is carried out.

In *Science Frontiers,* No. 119, Sep-Oct, 1998, page 1, under the heading, "Astronomy" an article "The End of the Old Model Universe," by Peter Coles is discussed.

> "That cosmology is in flux is apparent in the following sentence found in *Nature.*
>
> "'The standard ideas of the 1980s about the shape and history of the Universe have now been abandoned—and cosmologists are now taking seriously the possibility that the Universe is pervaded by some sort of vacuum energy, whose origin is not at all understood.'
>
> "Does this mean that the Big Bang, the mainstay of astronomy we were taught in school, is now being cast aside? . . .
>
> "But try as they may, cosmologists have not been able to coax the Big Bang model to explain the large-scale lumpiness and structure of the galaxies and galaxy clusters. One problem with the Big Bang is that is has too many free parameters—too much theoretical slack. This better model, to use the words of P. Coles, should be more 'exciting' and 'stranger' something 'perhaps not even based on General Relativity.'"[336]

The author, Corliss, then asks the following question about the "vacuum energy" of space presented in the *Nature* article. "If a vacuum is defined as 'a volume devoid of mass,' how can it contain energy when $E=mc^2$?" In essence, Electro-Gravitic Theory posits an energy pervading space—electromagnetism—which influences the motion of celestial bodies which can, indeed, be tested and falsified, while certain scientists suggest the vacuum of space itself is a source of energy without any mass from which to derive this force, and which cannot be understood, let alone tested.

In essence, astronomers have invented a negative form of relativity, energy derived from the vacuum of space to explain a greater expansion rate of the universe that suggests there is a counter force to gravity. But they will also posit cold, dark matter to enhance the gravitational effects seen in the rotations of spiral galaxies to slow the universe's expansion. They are putting both, a heretofore unknown form of energy—zero vacuum energy—and an unknown form of matter—cold, dark matter—into space to speed up expansion and slow down the expansion of the universe. This cannot be good science, good rationality, or any form of insight into the cosmos.

This view of cosmological physics, dominated by mathematical equations, suffers from what Ludwig Wittgenstein suggested was a fallacy, as Hawkins explains.

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[336]Peter Coles, "The End of the Old Model Universe," *Nature*, Vol. 393, (1998), p. 741.

"Following in the tradition of Hume, Wittgenstein maintained that, not only is inductive reasoning more interesting and more important for our understanding of the objective world, but [that] formal logic and mathematics are just meta languages or languages about languages. They are pseudo languages and as such, tell us nothing about the real world, since such meta-languages represent no more than our way of thinking about our way of thinking. Meta-languages are self-referential and, hence, viciously circular. They are systems of tautologies. They cannot get beyond themselves. Therefore, we cannot get at the truth about the way things are [in cosmology] through formal or mathematical logic, . . .

"There is a great deal of substance to Wittgenstein's idea that we are often led into incoherence through the fallacy that formal logic and mathematics, somehow, represent the natural order of the universe. But the most common result of this fallacy is the belief that, what is unassailable in mathematical physics, must represent immutable truths about nature. This leads many physicists into the illusion that they can access essential reality directly by mathematical reasoning alone, and that there are some universal truths about which we cannot be wrong, even if they conflict with the evidence.

"In Newton's day, his compelling worldview must have seemed completely unassailable. It is an excellent, self-consistent theory which all the available evidence seemed to confirm. But what we often overlook is the extent to which good theories shape their own evidence. By the same token, evidence that conflicts with a cherished theory is very seldom believed. This was demonstrated in Eddington's classic solar eclipse observations to test the theory of general relativity. Although at the time his results were taken to be conclusive confirmation of Einstein's theory, recent analysis of the data indicates that the errors, in fact, swamp any discernible effect. It seems that the theory's compelling beauty clouded Eddington's judgment and allowed him to conclude that his data confirmed it. This is even a time-honored astronomical tradition. For instance, Ptolemy undoubtedly . . . fudged evidence in order to sustain his geocentric model of the Universe."[337]

The theory presented here is a totally new *weltanschauung* that, if valid, overthrows the worldview of cosmology that has stood as the modern, classic explanation of the Universe. On every level of approach and evidence, it conflicts with traditional-conventional cosmology and as seen from the eyes and minds of those imbued with the rightness of the Big Bang theory, stands all reason, evidence, and logic on its head. But that is exactly how the view of Aristarchus and Copernicus was seen by the great and small of their day. Aristarchus and Copernicus had placed the conventional cosmology of their time upright, squarely on its feet. It will take great courage for anyone today to accept the force of logic, evidence, and the inevitable congruence of these with the new *weltanschauung* presented in this analysis.

Isaac Newton, on the last page of the *Philosophiae naturalis principia mathematica*, nevertheless spoke of a new force—electricity and magnetism—that had been discovered and wondered what, if anything, it might apply to in terms of celestial motion.

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[337]Hawkins, *Hunting Down the Universe, op. cit.*, pp. 47 and 49.

> "And now we might add something concerning a certain, most subtle, spirit which pervades and lies hidden in all gross bodies; by the force and action of which spirit the particles of bodies attract one another at near distances, and cohere if continuous; and electric bodies operate to great distances, as well repelling as attracting the neighboring corpuscles, . . . But these are things that cannot be explained in a few words, nor are we furnished with that sufficiency of experiments which is required to an accurate determination and demonstration of the laws by which the electric and elastic spirit operates.[338]

It is this force which I wish to test in its possible application to celestial mechanics and also to the possibility of its application to interplanetary, interstellar, and intergalactic space as a possible mechanism by which the human race may travel in space.

However, Sir James Jeans has dared to suggest:

> "The type of conjecture which presents itself somewhat insistently is that the centres of galaxies are of the nature of 'singular points' at which matter is poured into our universe from some other, and entirely extraneous dimension, so that, to a denizen of our universe, they appear as points at which matter is being continuously created."[339]

Charles A. Whitney, astronomer at Harvard, discusses V.A. Ambartsumian and enlarged upon this:

> "During the 1940s, the Soviet astronomer, V. A. Ambartsumian suggested that enormous quantities of matter, for the most part invisible, are being ejected from the centers of galaxies. His suggestion seemed incredible at the time, but it was based on some undeniable facts. He did not claim to explain *why* the matter was being ejected; he put forth the speculation as a framework for further research. In a sense, the idea was beyond arguing, because the evidence, one way or the other, was too slim. But many astronomers have kept it in the back of their minds and they now think that it is being confirmed."[340]

These suppositions, of course, do not come close to the revolutionary theory presented here. They were presented to show that main stream astronomers do suspect that there may be another process for galaxy and stellar formation similar to the one presented here.

Electro-Gravitic Theory is monumental heresy, but, in coming time, may be shown to be valid. If such should occur, I hope that this work will also be recognized as the original formulation of the theory and be given it due place in the annals of science. Since I have little hope of receiving recognition for this work by those whose vision of cosmological reality dominate today, I paraphrase Sir Edmond Halley: I hope that a candid posterity will remember

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[338]Sir Isaac Newton, *Principia*, Vol. II, Transl. Andrew Motte (in 1729) and revised by Florian Cajori, (Berkeley, Calif., 1962), p 547.

[339]Fred Hoyle, *Home is Where the Wind Blows*, (Mill Valley, Calif., 1994), p. 419.

[340]Charles A. Whitney, *The Discovery of Our Galaxy*, (New York, 1971), p. 276.

that the new cosmology arose from a follower of Immanuel Velikovsky who initiated the view that electromagnetism must play a role in celestial mechanics. This theory is based upon his conception and if tested and found to be correct, then it is the fervent hope of this author that Velikovsky's opening of this cosmological door and my passing through it will, in time, be seen by future generations for its scientific value. As Whitney suggests:

> "If Ambartsumian was correct in guessing that matter is streaming from the centres of galaxies, we may be witnessing the births of vast stellar systems. If that is true, astronomers stand at the brink of another revolution."[341]

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[341] *Ibid.*, p. 278.

APPENDIX

MEASUREMENTS OF THE ELECTROMAGNETIC PROPERTIES OF "SPACE"[1]

George R. Talbott

PROPOSAL SUMMARY

The electrical permittivity and magnetic permeability of "free space" are handbook values used daily in electrical engineering. Once vacuum permittivity is measured, the associated permeability is fixed and the inverse of the square root of their product is the free space velocity of light. It is commonly assumed that permittivity and permeability in remote space are constant and equal to the laboratory handbook values. It is also commonly believed that both magnetic and electrical field intensities are negligible and unvarying as functions of spatial position, as long as the electromagnetic sensing apparatus is in remote space, far removed from any planetary or other source. It is further assumed that the constant of gravitation, the so-called "proportionality constant," relating gravitational attractive force to the Newtonian product of masses divided by the square of the distance separating the mass centroids, is totally unrelated to electrical quantities such as electrical charge. Since inertial navigation, celestial mechanics and the dramatically successful control of the trajectories of space vehicles do *not* require the explicit use of any electrical terms, this final assumption appears to be above educated criticism.

Our proposal consists of a practical design of measurements and computations, using both electrical engineering and celestial mechanics, to determine whether the above-specified assumptions are valid. The theoretical basis of our proposal comes from several sources, the most important of these being the research of Sir Arthur Stanley Eddington in his *Fundamental Theory*. The practical basis of our proposal will be apparent in the experiments we have designed, which are described with complete working examples. In particular, we specify a detailed, quantitative and fully practical method of measuring shifts in both magnetic field intensity and magnetic permeability, and of distinguishing between these two shifts so that one can know if one or both are occurring as functions of remote space position.

The experiment, which uses working computations in celestial mechanics, may be summarized as follows: A highly magnetized vehicle is sent on a trajectory in remote space, that is, space in which the magnetic field of any planet is negligible. The magnetic field should be of the order used in magnetic resonance imaging. The computations of celestial mechanics allow us to know the trajectory anticipated due to classical assumptions. Signal analysis allows us to track the actual trajectory of the vehicle. (Both celestial mechanics and digital filter/ Fourier mathematics programs for accomplishing these tasks are given in the Technical Appendix.) We wish to see if the classically anticipated and actual trajectories are identical within the margins of error allowable in modern celestial mechanics.

Unless these or similar investigations are made, it is merely an exercise in debate to establish a popular scientific opinion. One can argue, for example, that the rate at which signals are propagated from space vehicles to the Earth indicates that the free space permittivity and permeability hold throughout "empty space." Or that there is nothing in "space" which would allow shifts in these quantities, that "empty space" has no physical properties, and so on. But Eddington, who was certainly as aware as any physicist today of the meaning of the gravitational constant, derived it (gamma) from scalars and electrical quantities. No one is arguing about the Cavendish Experiment, or about the routine affairs of space guidance. Our proposal is designed only to encourage and describe *experiments*, with accompanying *data processing calculations*, yielding knowledge, rather than debates, on the electromagnetic properties of "space."

FIELD CONSIDERATIONS

This discussion is included to indicate why one might expect the investigation of electromagnetic factors in space to be fruitful. It should be recognized, in the first place, that the velocity of light within any medium is dependent upon the polarity of that medium. The residual polarity of space fixes the upper limit of the so-called "in vacuo velocity of light." Space polarity is a practical quantity, measured by the electrical permittivity of space. Secondly, electrically "neutral" materials can be strongly affected by electrical fields, as in the case of water exposed to intense and non-uniform electrical fields. The experimental results are not subtle. Since Peter Debye's research on electrical dipole moments, and Linus Pauling's subsequent studies of chemical bond energies, it has been recognized that electrically "neutral" molecules, molecules having no residual charge as in the case of "molecule ions," can be reoriented by the action of external electrical fields.

Technical Appendix 1 shows my demonstration that molecules of fluoroester (bis(1H,1H,7H-perfluoroheptyl) dl-camphorate) having a dipole moment of 3.14 debye units can, when rotated against a clean metal surface, induce eddy currents in that surface. This is a clear case of an electrically neutral body able to generate electrical currents as if charged. There can be no question that this happens. The electrical currents increase as the angular velocity of the dipoles is increased, and since this velocity is quantized, the current levels are also quantized, and in exact correspondence to what one would expect using the Schrodinger equation for a rotating dipole. The results of this experiment are presented to emphasize the fact that one cannot dismiss Eddington's assertion that gravitational phenomena are deducible from electrical quantities simply by noting that gravitational attraction is independent of electrical charge, whereas coulombic attraction requires charged bodies. Prior to Debye's work, one could certainly argue that the motion of electrically neutral dipoles could not produce electrical currents, or that electrical forces could not affect neutral dipoles. The point is that electrical events very possibly underlie the universal constant of gravitation, and that when we have an explanation of that constant, that is, a deduction of gamma from more primitive factors, the deduction, like Eddington's, will require electrical theory. At the present time, the universal constant of gravitation is only an observational consequence. Gamma was implicit in Kepler's Third Law of Motion, and Isaac Newton used Johannes Kepler's work with his own observations to arrive at a numerical specification of gamma. As Gottfried Wilhelm Leibniz (1646-1716), who understood the facts, often complained, gamma has no explanation, no connection with the other facts of physics. The general theory of relativity allows a geometrical treatment of gravitation, but the mystery remains.

Technical Appendix 2 shows Eddington's deduction of gamma, using the charge/ mass ratio of the hydrogen ion. The end result is simple in form. Gamma is determined (exactly) by multiplying a (meaningful, non-arbitrary and justified) dimensionless number by the square of the ratio of unit electronic charge to hydrogen atom mass. It is now possible, using dimensionless ratios, electrical charges and distances, to predict anything that can happen in any gravitational context. The equation we shall write can be substituted in every case for the gravitational inverse square law. It adds nothing whatever (at this time) to what we can do in

inertial navigation and celestial mechanics, but it does begin to disclose the supporting structure of gravitation. We shall group the scalars in the equation to indicate meaningful interpretations. The following list of symbol definitions will be followed throughout this paper, and both quantities and dimensions are specified to facilitate practical application.

DEFINITIONS OF SYMBOLS

$$\gamma = 6.6665 \times 10^{-8}\ cm^3\ gm^{-1}\ \sec^{-2}$$

$$F_F = 9573.56\ emu\ gm^{-1}$$

$$M_h = 1.67368 \times 10^{-24}\ gm$$

$$M_e = 9.10924 \times 10^{-28}\ gm$$

$$M_p = 1.67277 \times 10^{-24}\ gm$$

$$M_\mu = 1.83 \times 10^{-25} gm$$

$$M_0 = 1.23 \times 10^{-25} gm$$

$$N_u = (\frac{3}{2})(136)(2^{256}) = 2.36216 \times 10^{79}$$

$$R_u = 9.33544 \times 10^{26}\ cm$$

$$C = 2.99776 \times 10^{10}\ cm\ \sec^{-1}$$

$$\pi = 3.14159$$

$$h = 6.62908 \times 10^{-27}\ erg\ \sec$$

$$e = 4.8025 \times 10^{-10}\ esu = 4.8 \times 10^{-10}\ gm^{\frac{1}{2}}\ cm^{\frac{3}{2}}\ \sec^{-1}$$

These symbols represent, in order, the universal gravitational constant, the ratio of unit charge (in emu) to mass of the hydrogen atom, the mass of the hydrogen atom, the mass of the electron, the mass of the proton, the mass of the mu meson, Eddington's reference mass, Eddington's particle count, the Einstein universe radius, the in vacuo velocity of electromagnetic waves, a practical value of pi, Planck's constant, and the unit electronic charge. The mechanical equivalent of esu (the electrostatic unit) is shown, to establish dimensional sense.

Whenever two masses, here M_1 and M_2, attract one another, Eddington's equation correctly shows the force of that attraction:

$$F = \frac{\Pi}{\sqrt{N_u}}(\zeta_1)\frac{M_p}{M_e}\frac{M_1 M_2}{M_h^2}\frac{e^2}{R^2}\ gm\ cm\ \sec^{-2}$$

$$\beta = \frac{137}{136}$$

$$\zeta_1 = \beta^{1/6}(\frac{9}{20})^{1/2}$$

This equation amounts to a product of four scalars and a squared ratio of unit electronic charge to distance:

$$S_1 = \frac{M_1}{M_h}\ ,\ S_2 = \frac{M_2}{M_h}\ ,\ S_3 = \frac{\pi}{\sqrt{N_u}}\zeta_1\ ,\ S_4 = \frac{M_p}{M_e}$$

$$K_E = S_3 S_4\ ,\ \gamma = K_E(\frac{e}{M_h})^2$$

$$F = S_1 S_2 S_3 S_4(\frac{e}{R})^2$$

The expression for gamma is of special importance and is fully derived in Appendix 2:

$$\gamma = (\frac{\Pi}{\sqrt{N_u}}\zeta_1)(\frac{M_p}{M_e})(\frac{e}{M_h})^2\ cm^3\ gm^{-1}\ \sec^{-2}$$

$$\gamma = 6.6665\ x\ 10^{-8}\ cm^3\ gm^{-1}\ \sec^{-2}$$

$$F = \gamma\frac{M_1 M_2}{R^2}\ gm\ cm\ \sec^{-2}$$

These relations, and specially those shown in Appendix 1, indicate, at the very least, that the connection between mechanical quantities and electrical quantities is open to research. It is not a closed matter. In the next section, we propose experiments to study the electrical properties in outer space.

ELECTRICAL PROPERTIES IN SPACE

The following definitions of symbols will be used in this discussion of magnetic fields. The accompanying diagram (Figure 1, page 46) will show the proposed method of differentiating shifts in magnetic permeability from shifts in external magnetic field intensity.

DEFINITIONS OF MAGNETIC FIELD SYMBOLS

H_m = *magnetic field intensity , permanent magnet*

μ_p = *magnetic permeability of medium*

m_m = *magnetic pole strength*

B_m = *flux density of magnet*

A = *field area of magnet*

Φ_m = *magnetic flux , permanent magnet*

dL = *incremental distance on loop*

R_s = *distance , loop element , unit pole sensor*

a = *radius of loop*

ι = *electrical current*

B_s = *flux density of ring (loop)*

B_{ws} = *flux density of solenoid*

N = *number of turns on solenoid*

L = *length of solenoid*

It has been known since the work of Michael Faraday that there is an essential difference between the field of a permanent magnet and that of a current carrying conductor, or of a configuration such as a solenoid. The permanent magnet's field strength can be attenuated by interposing a shield of high magnetic permeability between the magnetic pole and the magnetic sensor. Thus the field intensity of any permanent magnet is given by the ratio of pole strength to the

product of squared distance (between pole and sensor) and magnetic permeability. The flux density of the magnet is equal to the product of magnetic field intensity and magnetic permeability. Therefore, the *flux density* of a permanent magnet is *independent* of the magnetic permeability. Any coil moving in such a field will have an induced electromotive force (EMF) which depends only upon the pole strength and distance. Multiplying this flux density by the field area yields the number of lines cutting a coil moving in the field. These relations are shown in the following equations:

$$H_m = \frac{m_m}{\mu_p R_s^2} \quad , \quad B_m = \mu_p H_m = \frac{m_m}{R_s^2}$$

$$\Phi_m = B_m A$$

The field intensity of a solenoid is wholly independent of the magnetic permeability of the medium separating solenoid and sensor. Since there is no magnetic permeability term in the denominator of the equation for solenoidal field strength, it follows that when we compute the flux density of the solenoid by multiplying the field strength by the medium's magnetic permeability, we have a permeability dependent flux. Thus, the *flux density* of a solenoid is *dependent* upon the magnetic characteristics of the medium. In the following equations and diagram (Figure 2, page 46), we show a derivation of the equation for finding the magnetic flux density and flux of a solenoid ***at any point in the field, internal or external to the windings***:

$$B_s = \int dB_s \sin(\beta) = \mu_p \int \frac{\imath\, dL \sin(\theta)\sin(\beta)}{R_s^2}$$

$$\sin(\beta) = \frac{a}{R_s} \ , \ \sin(\theta) = 1 \ , \ \theta = 90° \ , \ \int dL = 2\pi a$$

$$B_s = \frac{2\pi \mu_p \imath a^2}{R_s^3} \ , \ B_s = \frac{2\pi \mu_p \imath a^2}{(a^2 + b^2)^{3/2}}$$

$$dB_{ws} = B_s(x)\frac{N}{L}dx \ , \ dB_{ws} = 2\pi \mu_p \imath \frac{N}{L}\frac{a^2}{(a^2 + x^2)^{3/2}}dx$$

$$x = a\cot(\Psi) \ , \ dx = -a\csc^2(\Psi)d\Psi$$

$$B_{ws} = -2\pi \mu_p \frac{N\imath}{L}\int_{\beta}^{\alpha} \sin(\Psi)d\Psi = 2\pi \mu_p \frac{N\imath}{L}(\cos(\alpha) - \cos(\beta))$$

$$\Phi_s = B_{ws}A$$

The sensor we propose for the study of electrical and magnetic properties of space uses the foregoing principles. Two magnetic fields are established, one from a permanent magnet and the other from a solenoid. A rotating coil is placed in each field, so that the coil's windings will cut the field at right angles to the field's direction (Figure 3, page 47). If the current in the solenoid is specified in abamperes, then the flux density in gauss, multiplied by the field area of the coil, gives maxwells of flux. The maxwells cut per unit time, multiplied by ten to the minus eighth power, yield volts of EMF induced in the sensing coil.

If there is a shift in environmental magnetic permeability with no shift in environmental magnetic field intensity, then the EMF in the solenoidal sensor will shift, but the EMF in the magnet sensor will remain constant. If there is a shift in environmental field intensity, then both sensors will show a proportionate shift.

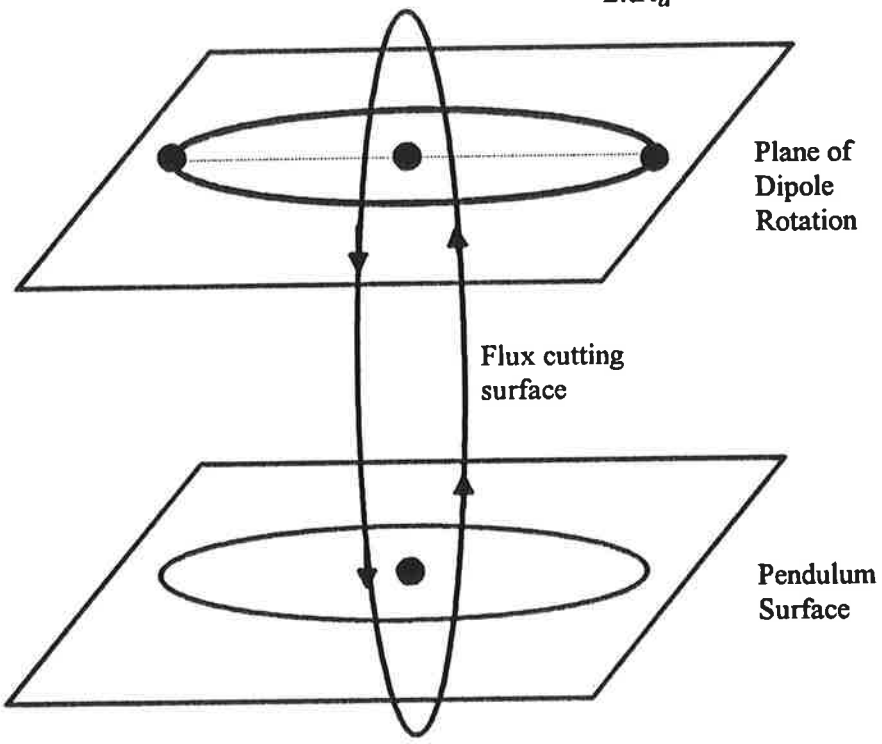
The papers, "Celestial Mechanics Program Documentation," "Digital Signal Processing, Fourier Mathematics" and "Curve Fitting," not included in this report, represent comprehensive data processing tools for this study. The ideal mode of study, that of placing a highly magnetized vehicle in remote space, is not necessary provided a highly-magnetized satellite is made to orbit the Earth. In the celestial mechanics document, a detailed method for analyzing the moving image of a focal plane sensor to find the actual orbit of a satellite under observation is given. The method for computing the anticipated orbit of satellites is also given in that document. The magnetic field of the Earth can be taken into account in the observa-

tions, since its magnitude and the EMF it can induce at various altitudes are well-known.

Accompanying the magnetic measurements described above, it is desirable to continuously monitor the dielectric constant of space. As stated in the proposal summary, we are fully aware of the laboratory determination for the electrical permittivity of free space and of the relationship of that quantity to the in vacuo velocity of light. We have neither found any reports about measurements of electrical permittivity in space nor received any experimental assurance that this quantity is invariant during space missions. The proposed measurement of permittivity should use a sealed capacitor in which the plates are separated by a laboratory-established vacuum. The sensing capacitor should be exposed to the remote space environment, that is, its plates should be separated by whatever medium space itself provides. For each capacitor, the capacitance is read as the ratio of electrical charge on one of the plates to the potential difference over the plates. The ratio of the sensing capacitance to the lab-vacuum capacitance is the dielectric constant of space at the time the measurement was made.

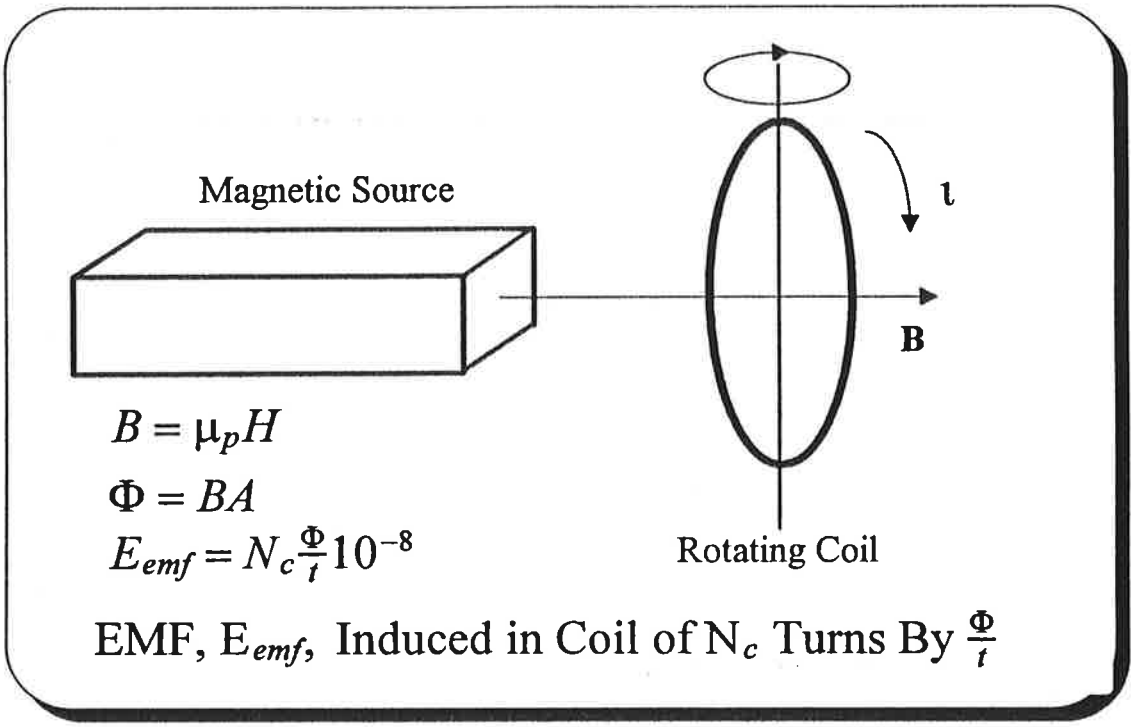
This concludes our proposal for measurements to be performed in a space mission. The material which follows is included to show that electrical quantities are indeed relevant to so-called "neutral matter."

$$\mathfrak{l} = \frac{qv}{2\pi R_d}$$



$$\mathfrak{l}_c = \frac{E_{emf}}{R_e}$$

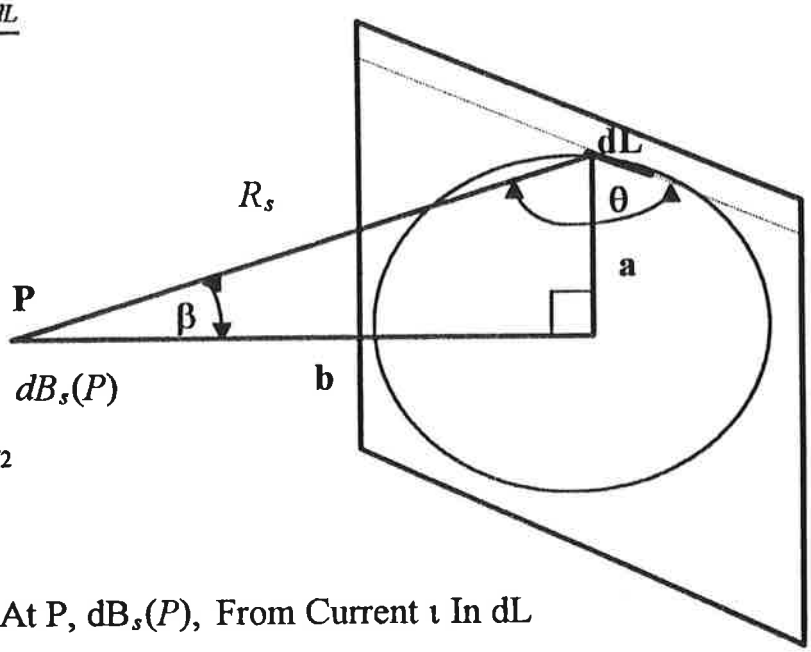
Dipole Induced Eddy Currents


Magnetic Source
ι
B
$B = \mu_p H$
$\Phi = BA$
$E_{emf} = N_c \frac{\Phi}{t} 10^{-8}$
Rotating Coil
EMF, E_{emf}, Induced in Coil of N_c Turns By $\frac{\Phi}{t}$

$$dB_s(P) = \frac{\mu_p \iota \sin(\beta) dL}{R_s^2}$$

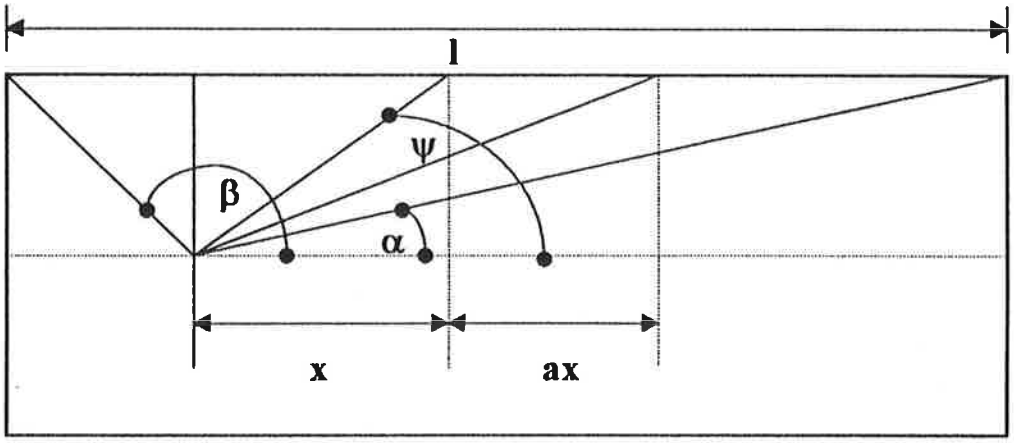
$$\sin(\beta) = \frac{a}{R_s}$$

$$dB_s(P) = \frac{\mu_p \iota a dL}{R_s^3}$$



$$R_s^3 = (a^2 + b^2)^{3/2}$$

Incremental Flux At P, $dB_s(P)$, From Current ι In dL



Incremental Flux At P, $dB_{ws}(P)$, From Current ι In dX

$$dB_{ws}(P) = 2\pi M_p \iota \frac{N}{L} \frac{a^2}{\left(a^2+x^2\right)^{3/2}} dx$$

$$x = a\cot(\Psi), ; dx = -a\csc^2(\Psi)d\Psi$$

$$T_0 = \frac{a^2}{\left(a^2+x^2\right)^{3/2}} dx = \frac{a^2}{\left(a^2+a^2\cot^2(\Psi)\right)^{3/2}} \bullet (-a\csc^2(\Psi)d\Psi)$$

$$T_0 = \frac{a^2}{\left(a^2\left(1+\cot^2(\Psi)\right)\right)^{3/2}} \bullet (-a\csc^2(\Psi)d\Psi)$$

$$T_0 = \frac{a^2}{\left(a^2\csc^2(\Psi)\right)^{3/2}} \bullet (-a\csc^2(\Psi)d\Psi)$$

$$T_0 = \frac{d\Psi}{\csc\Psi} = \sin\Psi d\Psi$$

Appendix 1: Quantized Eddy Currents from Rotating and Neutral Molecular Electrical Dipoles

The theory given here was verified through practical engineering measurements which employed a pendular accelerometer. The sensor consisted of one polymerically-coated pendulum, used as a control, and one extremely clean pendulum, whose metal surface was in immediate contact with a highly polar flotation fluid.

A summary of pendular accelerometer operation follows: A pendular displacement occurs in proportion to the acceleration experienced by the instrument. This displacement moves an electrical pickoff coil into a fixed, alternating current field such that the number of flux lines cut by the coil, and hence the EMF induced in it, is a function of pendular displacement. The EMF is amplified and fed into a motor. The angular velocity of the motor armature is a function of the EMF applied. The motor turns a set of paired, permanent magnets in such a way that the poles remain opposed, but pairs of opposite poles rotate about the induction element of the pendulum, inducing eddy currents in it. A force will act on the pendulum at right angles both to the current direction (the plane of the pendulum) and the magnetic field direction, and this force (F=H x ev) will move the pendulum toward its zero position. The acceleration of the system attached to the pendulum is thus given by the revolutions per minute (RPM) of the magnets. At the meter's constant velocity, the magnets remain stationary and the pendulum will remain at its zero position. While accelerating, the pendulum will occupy an equilibrium position between the zero position and the position it *would* occupy in absence of the rotating magnets. The pendulum "floats" in a high density flotation fluid, so that it is suspended in a virtually "frictionless" attachment.

Next, consider the flotation fluid. Hydrogen atoms terminating the chains of bis(1H,1H,7H-perfluoroheptyl) dl-camphorate are practically bare protons due to the high electronegativity of adjacent fluorine atoms. These bare protons cause the fluoroester to have a high electrical dipole moment. The stoichiometric prediction, based on calculations of bond angles and electronegativities, yielded a moment of 3.56 debye units. Subsequent calculations from electrical and optical measurements yielded a moment of 3.14 debye units. The rotational energy is quantized, i.e., the energy can assume only certain eigenvalues. The polar molecules are rotated by currents in the meter's induction element and, therefore, generate an electrical field of their own. Since the rotational energy of the dipoles are quantized, and since the electrical field created by them is dependent upon the frequency of their rotation, it follows that the field is also quantized. Thus, transitions from one eddy current level to another occur in discrete, discontinuous leaps. The electrical field of the dipoles is not "cancelled out" by thermal agitation of the molecules, because 1. the molecules are strongly attracted to the pendulum surface and 2. the molecules will align themselves with the eddy currents induced by the rotating magnets. Since the dipoles wetting the surface are extremely close to the induction element, eddy currents are induced as the molecules rotate against the surface. These dipole-induced eddy currents are registered as erratic pendulum displacement.

Tests were conducted with a coated pendulum and with a bare pendulum. The computations of eddy current magnitude, and of the quantum steps involved, were verified. An accelerometer containing the coated pendulum showed no eddy current interference from the dipoles. When a bare pendulum was used, the predicted effect occurred. A list of definitions follows:

$$q = charge\ on\ molecular\ dipole$$

$$R_d = distance\ separating\ charge\ elements$$

$$v = rotational\ velocity$$

$$L = 2\pi R_d = dipole\ current\ path$$

$$M_d = reduced\ dipole\ mass$$

$$I = dipole\ moment\ of\ inertia$$

$$R_e = electrical\ resistance\ of\ pendulum\ surface$$

$$\mu_d = q R_d = dipole\ moment$$

$$n = quantum\ integer\ ,\ 1\ ,\ 2\ ,\ 3\ ,\ \ldots$$

$$\iota = dipole\ induced\ eddy\ current$$

The physics of the quantized electrical currents is given in the following equations:

$$\iota = \frac{qv}{L} \ , \ \mu_d = qR_D$$

$$v = (n^2 + n)^{1/2} \frac{h}{2\pi R_D M}$$

$$\iota = (n^2 + n)^{1/2} \frac{qh}{2\pi R_D ML}$$

$$L = 2\pi R_D \ , \ I = MR_D^2$$

$$\iota = (n^2 + n)^{1/2} \frac{qh}{4\pi^2 I}$$

$$P = \iota^2 R_E = (n^2 + n)[\frac{qh}{4\pi^2 I}]^2 \ R_E$$

$$B = \mu_p \int \frac{\iota \, dL \sin(\theta)}{R^2}$$

$$R = R_d \ , \ \theta = 90^\circ, \ \sin(\theta) = 1, \ \int dl = 2\pi R_D$$

$$B = \frac{\mu_p \iota}{R_D^2} 2\pi R_D = \frac{2\pi \iota \mu_p}{R_D}$$

$$B = \frac{\mu_p}{R_D}(n^2 + n)^{1/2}[\frac{qh}{2\pi I}]$$

$$\Phi = BA = B(\pi R_D^2)$$

$$E_{emf} = [\frac{\Phi}{t \ x \ 10^8}] = [\frac{B\pi R_D^2}{t \ x \ 10^8}]$$

Appendix 2: Eddington's Derivation of Gamma; Eddington's Reference Mass and The Mu-Meson

The logical starting point in using Eddington's work is an explanation of his "reference mass." This mass does not appear in the catalogues of "fundamental particles," but it *is* required in a deduction of the mass ratio of proton to electron. Eddington achieves that deduction in his famous quadratic. The reference mass is related to the mass of the mu-meson. This is shown in the following collection of equations, whose definition of terms have been given in the body of this paper:

$$M_{\mu} = 1.83 \; x \; 10^{-25} gm \; x \; C^2 = 1.647 \; x \; 10^{-4} erg$$

$$M_{\mu} = \frac{\sqrt{N_u}}{R_u} \frac{h}{2\pi C} = 1.83 \; x \; 10^{-25} gm$$

$$M_0 = \frac{\sqrt{N_u}}{R_u} \frac{h}{2\pi C} \beta^{1/6} (\frac{9}{20})^{1/2} gm$$

$$M_0 = M_{\mu} \; x \; \zeta_1 = 1.23 \; x \; 10^{-25} gm$$

$$M_h = \frac{136}{10} M_0, \; [\frac{1}{M_0} = \frac{136}{10} \frac{1}{M_h}]$$

$$\frac{R_u}{\sqrt{N_u}} = \frac{136}{10} \frac{h}{2\pi M_h C} \beta^{1/6} (\frac{9}{20})^{1/2} cm$$

Eddington's quadratic equation is now constructed and then solved to yield the masses of proton and electron as functions of the mass of the muon-related reference mass:

$$M_h = (M_e + M_e) = \frac{136}{10} M_0$$

$$\mu = \frac{M_e M_p}{M_e + M_p} = \frac{1}{136} M_0, \quad [M_h \mu = M_e M_p]$$

$$m^2 - M_h m + M_h \mu = 0$$

$$m_j = \frac{M_h \pm (M_h^2 - 4 M_e M_p)^{1/2}}{2}$$

$$m_1 = \frac{m_e + M_p + M_p - M_e}{2} = M_p$$

$$m_2 = \frac{M_e + M_p - M_p + M_e}{2} = M_e$$

$$10 m^2 - 136 M_0 m + M_0^2 = 0$$

$$m_1 = 1.67 \ x \ 10^{-24} gm \ , \ m_2 = 9.1 \ x \ 10^{-28} gm$$

The deduction of gamma, the universal constant of gravitation, requires three starting equations. The first is the cosmological equation of Einstein. The second is given above, in our summary of the mathematics of the reference mass. The third is an equation which derives (nearly) the Faraday constant from the ratio of the unit electronic charge to the mass of the hydrogen atom. (The modern Faraday constant used in physical chemistry is less than one percent different from this result.) The three starting equations are now given:

$$\frac{R_u}{N_u} = \frac{\gamma M_h}{\pi C^2} \qquad [1]$$

$$k_1 = \frac{136}{10}\left(\frac{9}{20}\right)^{\frac{1}{2}} \beta^{\frac{1}{6}}$$

$$\frac{R_u}{\sqrt{N_u}} = k_1 \frac{h}{2\pi M_h C} \qquad [2]$$

$$F_F = \frac{e}{M_h C}\beta^{-24} \qquad [3]$$

From equation 2 and dimensionless groupings of terms, we have the following relations:

$$\frac{R_u}{\sqrt{N_u}} = \frac{136}{10}\frac{h}{2\pi M_h C}\beta^{1/6}\left(\frac{9}{20}\right)^{1/2}$$

$$137 = \frac{hC}{2\pi e^2}\frac{C}{C} = \frac{hC^2}{2\pi C e^2}$$

$$\frac{R_u}{\sqrt{N_u}} = \frac{136}{10}\left(\frac{9}{20}\right)^{1/2}\beta^{1/6}\left(\frac{h}{2\pi C}\right)\frac{C^2}{e^2}\frac{e^2}{C^2}\frac{1}{M_h}$$

$$\frac{R_u}{\sqrt{N_u}} = \frac{136\ 137}{10}\left(\frac{9}{20}\right)^{1/2}\frac{\beta^{1/6}}{M_h}\left(\frac{e^2}{C^2}\right)$$

From equation 1, the following simple but pivotal form is derived:

$$\frac{R_u}{N_u} = \frac{\gamma M_h}{\pi C^2}$$

$$\frac{R_u}{\sqrt{N_u}} = \frac{\gamma M_h}{\pi C^2}\sqrt{N_u}$$

Combining equation 1 and equation 2, the following is obtained:

$$T_1 = \frac{M_h C^2}{e^2 \sqrt{N_u}}$$

$$T_1 \sqrt{N_u} \frac{\gamma M_h}{\pi C^2} = T_1 \frac{136\ 137}{10} \left(\frac{9}{20}\right)^{1/2} \frac{\beta^{1/6}}{M_h} \left(\frac{e^2}{C^2}\right)$$

$$\frac{\gamma M_h^2}{e^2} = \frac{136\ 137}{10} \left(\frac{9}{20}\right)^{1/2} \frac{\pi \beta^{1/6}}{\sqrt{N_u}}$$

And from equation 3, we get this:

$$F_F^2 = \frac{e^2}{M_h^2 C^2} (\beta^{-1/24})^2$$

$$F_F^2 C^2 = \left(\frac{e}{M_h}\right)^2 \beta^{-1/12}$$

$$\frac{\gamma}{F_F^2 C^2} = \gamma \left(\frac{M_h}{e}\right)^2 \beta^{1/12}$$

Gamma is obtained directly by combining the above results, as shown here:

$$\frac{\gamma}{F_F^2 C^2} = [\frac{136\ 137}{10}(\frac{9}{20})^{1/2}\frac{\pi\beta^{1/6}}{\sqrt{N_u}}]\beta^{1/12}$$

$$\gamma = \frac{136\ 137}{10}(\frac{9}{20})^{1/2}\frac{\pi\beta^{1/4}}{\sqrt{N_u}}F_F^2 C^2$$

$$F_F^2 = (\frac{e}{M_h})^2\beta^{-1/12}$$

$$\gamma = [\frac{137\ 136}{10}](\frac{9}{20})^{1/2}\frac{\pi\beta^{1/4}}{\sqrt{N_u}}\beta^{-1/12}(\frac{e}{M_h})^2$$

$$\frac{M_p}{M_e} = \frac{137\ 136}{10}\ ,\ \zeta_1 = \beta^{1/6}(\frac{9}{20})^{1/2}$$

$$\gamma = \frac{M_p}{M_e}\zeta_1\frac{\pi}{\sqrt{N_u}}(\frac{e}{M_h})^2$$

The practical arithmetic is finally given:

$$K_E = \frac{\pi}{\sqrt{N_u}}\zeta_1\frac{M_p}{M_e} = 8.0885\ x\ 10^{-37}$$

$$\gamma = K_E(\frac{e}{M_h})^2$$

$$(\frac{e}{M_h})^2 = 8.2364\ x\ 10^{28}\ \frac{esu^2}{gm^2}$$

$$\gamma = 6.663\ x\ 10^{-8}\ cm^3 gm^{-1}\sec^{-2}$$

This result has been available since 1948, when Cambridge University Press published Eddington's *Fundamental Theory* in a fine edition edited by Sir Edmund Whittaker. Eddington died in November, 1944.