

Symmetry of Nature Confirms Universal Electrodynamic Force Law

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A new version of the electrodynamic force, derived from a more perfect union of the axiomatic and empirical scientific methods, has explained more electrodynamic data including radiation and radiation reaction than previous versions based on Maxwell's equations and Einstein's Special Relativity Theory. It has given rise to the constraint that all elementary particles consist of closed charge loop structures. A new three-dimensional electrodynamic theory of elementary particles has resulted which explains more elementary particle data than the Standard Model of relativistic quantum electrodynamics which uses many adjustable fundamental constants of unknown origin. The new electrodynamic force law has been used to derive a new improved force of gravity and a new improved force of inertia. These improved versions of the force of gravity and inertia explain more phenomena, including mass and the quantization of gravity, than previous versions. The conjecture has been made that this new version of the electrodynamic force law is the universal force law. This candidate for the universal force has a unique symmetry which is a combination of spherical and chiral symmetry. Evidence is presented that elementary particles, atoms, nuclei, molecules, crystals, plant leaves, plant flowers, plant seed pods, solar systems, and galaxies exhibit this symmetry. Thus the symmetry of nature on all size scales provides a qualitative confirmation of the proposed universal electrodynamic force law.

1. Introduction

In the 1860's Maxwell combined four of the 6 empirical equations of electrodynamics plus the point particle approximation plus the linear field superposition assumption plus the invention of the displacement current inside the capacitor in order to obtain his consistent set of wave equations [1]. These were not adequate to explain all of electrodynamics so Einstein's Special Relativity Theory and the Copenhagen version of quantum mechanics were invented to fill in the gaps and complete electrodynamics.

Special relativity theory and quantum mechanics were based upon interpretations of certain key experiments, i.e. the Michelson-Morley experiment of 1886, the Einstein photoelectric experiments of 1905, the blackbody radiation work of Planck, and the bending of starlight when passing near the rim of the sun. As time passed these experiments upon which relativity theory and quantum mechanics were based improved and their data no longer supported these extensions of electrodynamics.

1.1. Michelson Morley Experiment of 1886

In 1851 Hippolyte Fizeau performed an experiment to measure the relative speeds of light in moving water [2]. A modified version of the Fizeau experiment was performed by Michelson and Morley in 1886 [3]. The original analysis of these experiments appeared to indicate that Galilean relativity was inadequate to explain the results. When Einstein introduced his Theory of Special Relativity in 1905, it was able to explain the Michelson-Morley experiment of 1886 and the explanation of the experiment seemed satisfactory.

Then Ewald [4] in 1912 and Oseen [5] in 1915 discovered the extinction effect and defined the extinction theorem which states

that the speed of light will approach the speed c/n relative to the medium where n its index of refraction. The Extinction Theorem also defines the minimum path length for its applicability. This distance depends strongly on the index of refraction of the medium and the wavelength of light. For visible light in optical glass it is less than a micron, for visible light in air about a millimeter, and for visible light in the intergalactic medium a few parsecs.

No one applied the extinction theorem to the analysis of the Michelson-Morley experiment until Fox [6,7] did it in the 1960s. By the 1960s Special Relativity had received the status of a politically correct theory, and no one paid attention to Fox's work. So Renshaw [8] published a more detailed analysis of the Michelson-Morley experiment in 1996. In that paper he showed that taking into account the extinction effect in the analysis of the data makes Special Relativity Theory's assumption that the speed of light is constant in all reference frames $c' = c$ invalid and Galilean relativity correct after all. The results can be seen in Fig. 1.

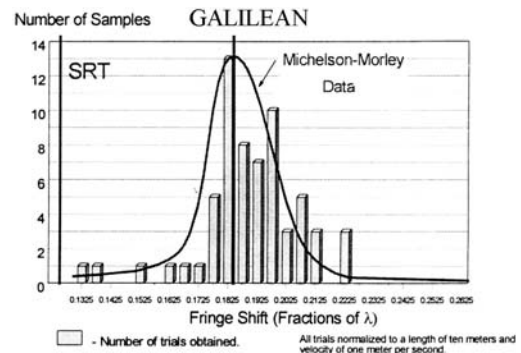


Fig. 1. Michelson-Morley Experiment Data Corrected for Extinction Effect [8]

1.2. Photoelectric Effect

In 1887 Hertz and Hallwachs [9-11] discovered simultaneously that ultraviolet light incident upon crystalline metallic sodium (Na) surfaces caused ejections of negatively charged particles later identified as electrons. This was the discovery of the photoelectric effect.

In 1905 Einstein published the Nobel Prize winning paper “On a Heuristic Viewpoint Concerning the Production and Transformation of Light” [12] in which he suggested the existence of discrete quanta of light now called “photons”. Later experiments [13] found that the photoelectric effect using ultraviolet light was significantly reduced on the same metals if they had an amorphous structure versus a crystalline structure. (See Fig. 2) These experiments seemed to suggest that light does not exist as discrete quanta, but as waves. The crystalline lattice serves as an antenna array to receive sufficient energy from the waves to eject an electron from an atom. If the antenna is too small, as in the case of amorphous metals, the photoelectric effect occurs much more weakly at the same wavelength as shown in the graph of Fig. 2.

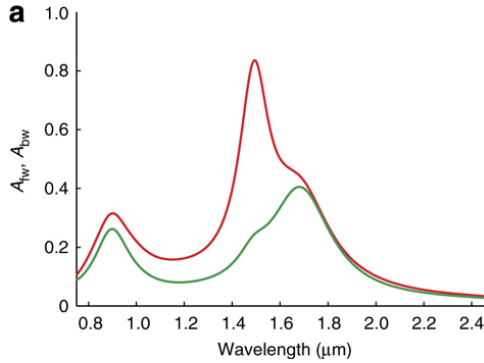


Fig. 2. Absorption of Light on Optical Antenna Array [13]

Also in 1905 Einstein published his Special Theory of Relativity [14] that appeared to offer a satisfactory explanation of the Michelson and Morley experiment. According to the Theory of Special Relativity it is necessary to correct Maxwell’s Equations for the effects of the finite velocity c of light. This correction was not based on the discovery of a new force, as Newton required, but on the hypothesis that light is a particle (photon) and that the speed of light is finite and independent of the motion of the source. This correction was made to Maxwell’s equations resulting in a relativistic covariant formulation of electrodynamics. (See equations 1-3) Note Eq. (4) suggests that mass might be an electrodynamic quantity, since mass is associated with c^2 .

$$\vec{E}(\vec{r}, \vec{v}) = \frac{q}{r^2} \frac{(1 - \beta^2) \hat{r}}{(1 - \beta^2 \sin^2 \theta)^{3/2}} \quad (1)$$

$$\vec{B}_i(\vec{r}, \vec{v}) = \frac{\vec{v}}{c} \times \vec{E}(\vec{r}, \vec{v}) = \frac{q}{r^2} \frac{(1 - \beta^2) \vec{\beta} \times \hat{r}}{(1 - \beta^2 \sin^2 \theta)^{3/2}} \quad (2)$$

$$\vec{F}(\vec{r}, \vec{v}) = q \left[\vec{E}(\vec{r}, \vec{v}) + \frac{\vec{v}}{c} \times \vec{B}_i(\vec{r}, \vec{v}) \right] \quad (3)$$

$$E = mc^2 \quad (4)$$

1.3. Blackbody Radiation

In 1858 Balfour Stewart performed experiments on the thermal radiative emissive and absorptive powers of polished plates of various substances compared with the radiative emissive and absorptive powers of lamp-black surfaces at the same temperature [15]. This was the first measurement of black body radiation. In 1859, not knowing of Stewart’s work, Gustav Robert Kirchhoff reported the coincidence of the wavelength of spectrally resolved lines of absorption and of emission of visible light at the same temperature [16-18]. The term blackbody radiation was introduced by Kirchhoff in 1860. It has a specific spectrum and intensity that depends only on the temperature of the body. See Fig. 3.

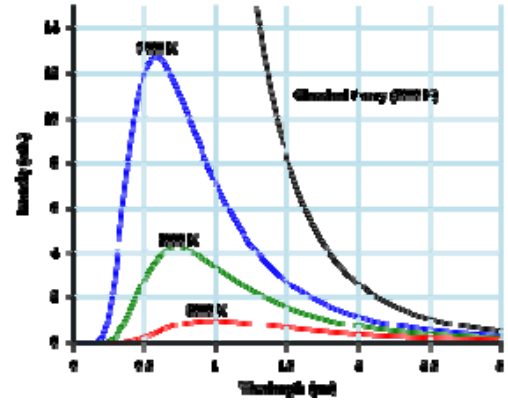


Fig. 3. Blackbody Radiation Spectrum vs. Temperature [19]

Max Planck developed a mathematical formula or description of blackbody radiation in 1900 [20,21] by treating a blackbody as a collection of oscillators in thermal equilibrium that could only radiate energy in quantized amounts according to the law

$$I_\lambda(T) = \frac{2hc^2}{\lambda^5} \frac{1}{e^{hc/\lambda k_B T} - 1} \quad (5)$$

The quantization of the energy radiated was evidence for the theory of quantum mechanics. However in recent years Bergman [22] showed that the quantization occurs in the standing waves structures of finite size charge rings. Lucas developed a classical electrodynamic theory of elementary particles composed of finite size closed charge loop structures [23] and then derived the blackbody radiation formula [24] for atoms composed of these finite size elementary particles. Thus the blackbody radiation spectrum no longer uniquely supports the Copenhagen interpretation of quantum mechanics with its unphysical idealizations and approximations.

1.4. Gravitational Bending of Starlight

Einstein’s General Theory of Relativity predicts that the path of light is bent when it passes close to a massive body. Sir Arthur Eddington [25] verified this prediction when he observed the bending of starlight by the Sun during a solar eclipse in 1919. Thus the sun, quasars and other astronomical bodies should be able to serve as a kind of gravitational lens.

As NASA began its space programs to investigate and confirm these crude findings by Eddington using a telescope as a star passed by the rim of the sun, a different picture emerged. The bending of the starlight observed by Eddington was caused

by the thin plasma rim of the sun not General Relativity theory. Furthermore at distances of 2, 3, 4 times the radius of the sun, which was beyond the plasma rim, no bending of starlight is observed. However, General Relativity theory still predicts a measurable amount of bending at those distances. See Fig. 4 which shows what General Relativity Theory predicts. Fig. 5 shows what is measured by NASA at various distances from the sun.

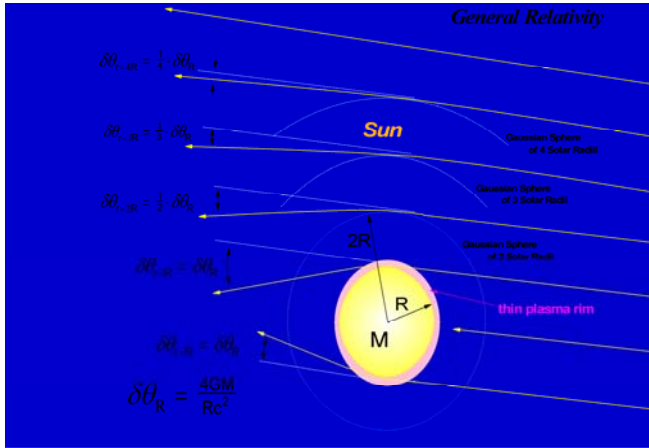


Fig. 4. General Relativity Predicted Bending of Starlight [26]

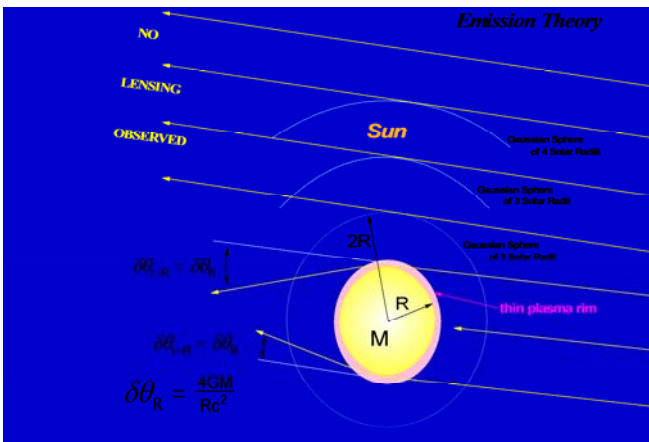


Fig. 5. Observed Bending of Starlight by the Sun [26]

1.5. Point Particle Approximation

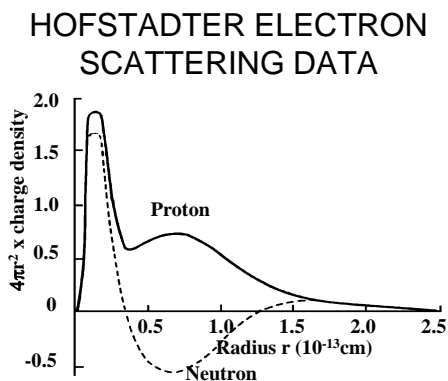


Fig. 6. Electron Scattering Data for Proton & Neutron [27]

With the advent of accelerators and scattering experiments the size and shape of elementary particles were measured as shown in Fig. 6. Elementary particles were not point particles as

assumed in Maxwell's equations that were modified by Einstein's special relativity theory to obtain equations (1-3). However, despite these inconsistencies, the relativistic equations (1-3) for the fields of charged particles moving near the speed of light were confirmed in accelerator experiments with charged particles moving at constant velocities.

2. New Version of Electrodynamic Force

A new version of the electrodynamic force has been derived [28] from a more perfect union of the axiomatic and empirical scientific methods than was previously obtained by Maxwell. This electrodynamic force was derived from the complete set of 6 empirical laws of electrodynamics plus Galilean invariance. By using the complete set of empirical equations instead of the partial set that Maxwell used, this new version of electrodynamics does not need to be supplemented by quantum mechanics and relativity theory. The covariant relativistic results of equations (1-3) are obtained from feedback effects on finite-size particles according to Lenz's Law without any reference to relativity theory. The explanation of the Michelson-Morley experiment of 1886, the photoelectric effect, blackbody radiation law of Planck, the bending of starlight by gravitational masses are all explained without relativity theory and the Copenhagen version of quantum mechanics. Quantum effects in this approach are due to standing charge waves in the finite-size structures of elementary particles.

2.1. Differences with Maxwellian Version

Although the constant velocity version of this new electrodynamic force law is the same as relativistic Maxwellian version, there are very significant differences as follows:

1. No point particle approximation or idealization
2. No Heisenberg Uncertainty Principle to allow non-conservation of energy and momentum for short periods of time
3. No fictitious displacement currents inside capacitors
4. No use of the vector potential which is illegal now that magnetic monopoles have been discovered [29] and the divergence of the magnetic field is no longer zero.
5. No need for relativity theory. Finite-size feedback effects give the same results via Lenz's Law.

The new version of the electrodynamic force is not based on the vector potential approach, but on conservation of energy, momentum, and charge. It is based on the incorporation of Lenz's empirical electrodynamic law which describes non-linear effects, and conservation of energy and momentum for dynamic magnetic phenomena. Thus a true conservative potential can be defined and extended to include acceleration a and radiative reaction da/dt terms which are not legally derived in the relativistic quantum electrodynamic approach due to the constant velocity basis of relativity theory and the use of the flawed vector potential approach.

2.2. Implications for Elementary Particles

In the derivation of the empirically confirmed radiation reaction law a boundary condition was obtained for all elementary particles that radiate. This boundary condition is that they must consist of closed charge loop structures [30]. This result is in

conflict with the fundamental assumptions of the relativistic quantum electrodynamic Standard Model of elementary particles which is based on idealized point particles. Thus it is no surprise that this new version of electrodynamic has given rise to a more complete theory of elementary particles [23] that is able to explain by means of combinatorial geometry the complete set of observed elementary particles, their internal structure, their rest mass and excited states, and their decay modes. Whereas the Standard Model uses 25 adjustable constants based on unknown yet to be discovered physics, the new electrodynamic force law approach uses no adjustable constants and still explains more data.

2.3. Implications for Gravity and Inertia

Poincare [31], one of the founders of relativity theory with Einstein, pointed out from meta theory (the theory of theories) a logical criterion for scientific theories that “no two fundamental theories may use the same fundamental constant” such as c . Each fundamental theory needs to have its own unique fundamental constants. Electrodynamics uses c in the wave equation $\lambda f = c$. Special Relativity theory uses c in $E = mc^2$. The Copenhagen version of Quantum Mechanics uses c in the fundamental energy quantization formula $E = h\nu = h(2\pi/\lambda)c$. General Relativity Theory uses c in the Einstein field equations $R_{\mu\nu} - \frac{1}{2}g_{\mu\nu}R + g_{\mu\nu}\Lambda = (8\pi G/c^4)T_{\mu\nu}$. Poincare predicted that all of the theories are fundamentally electrodynamic in nature.

Based on the guidance from Poincare, the new version of electrodynamics was used to derive the force of gravity [32] and the force of inertia [33] following the method used by Assis [34, 35] to derive the force of gravity for the Weber electrodynamic force law. In this approach the force of gravity is due to the force between vibrating neutral electric dipoles. The statistically averaged v/c , v^2/c^2 , v^3/c^3 terms average to zero as expected, but the v^4/c^4 terms average to an always attractive force of the right magnitude for gravity. However, there were two terms obtained and some new unexpected properties of gravity.

The first term was a radial term equivalent to Newton's Universal Law of Gravitation as expected. From it one could define the gravitational mass in terms of the charge, frequency of oscillation and amplitude of oscillation of the vibrating neutral electric dipoles.

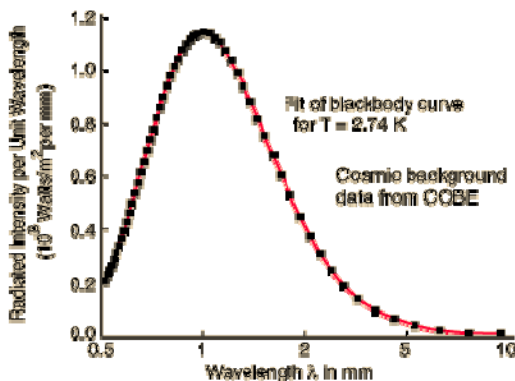


Fig. 7. Fit of Vibrating Neutral Electric Dipole Decay Radiation to Cosmic Microwave Background Radiation

Also this result implied that the force of gravity had to be decaying over time, because all vibrating neutral electric dipoles must decay by giving off radiation over time. The bigger the gravitational body, the slower the decay over time due to re-absorption of the radiation on other vibrating neutral electric dipoles. When the frequency spectrum of the radiation was calculated it was found to be identical to the cosmic microwave background radiation [36] with data from COBE shown in Fig. 7.

The second term was proportional to $\vec{r} \times (\vec{r} \times \vec{v})$, causing a spiraling motion and requiring quantization for stability. This second term explained the origin of the modern version of Bode's quantization law [37] for the orbits of planets and moons in our solar system as shown in the Fig. 8.

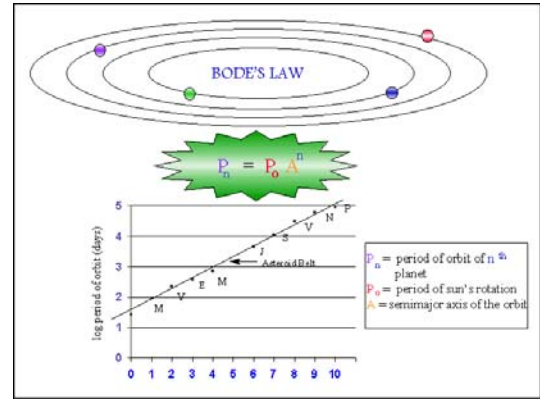


Fig. 8. Bode's Quantization Law for Planets

In a similar manner the inertial force was calculated as the force between a unit charge and a vibrating neutral electric dipole. Again two terms were obtained and some new unexpected properties of inertia.

The first term was the expected equivalence of Newton's universal force of inertia. From $F_I = m_I a$ the inertial mass definition could be obtained in terms of the charge, frequency, and amplitude of vibration of the vibrating neutral electric dipoles. The inertial and gravitational masses were found to be equal. No previous theory had been able to prove from theory the equivalence of the gravitational and inertial masses.

The second term was proportional to $\vec{r} \times (\vec{r} \times \vec{v})$, giving rise to a force counteracting the first for extreme rotational velocities. This term was able to explain for the first time the unusual gyroscope experiments of Eric Laithwaite [38].

Also the decay of the force of gravity and the force of inertia was able to explain the higher than expected rotational velocities of the outer spiral arms of spiral galaxies without having to resort to the invention of dark matter. Relativity theory needs a universe of 95% dark matter to explain the motion of the spiral arms of spiral galaxies and the expansion of the universe.

3. The Universal Force Law is Electrodynamic

3.1. Conjecture

Currently scientists recognize four fundamental forces, i.e. the gravitational force, the electrodynamic force, the strong interaction force within elementary particles, and the weak nuclear interaction force responsible for nuclear beta decay. Unlike the first two forces, these last two forces have very short ranges on

the order of the size of an elementary particle. Since the new electrodynamic force law takes into account finite-size effects, it is assumed that it already takes into account the effects these forces were invented to describe. Thus following the example of Newton and assuming that all force laws are universal force laws until proven otherwise, the conjecture is made that the new electrodynamic force law is the universal force law, since it already describes gravity and inertia very well.

3.2. Implications for the Symmetry of the Universe

The normal way to confirm theories in science is to compare the mathematical formula derived by the theories with the experimentally observed data. This is normally a quantitative comparison. However there is another way that is recognized in our courts of law.

In a court of law a person can be uniquely identified by their fingerprint. The fingerprint is not the usual quantitative object. The human fingerprint consists of a symmetry with irregularities. It is the irregularities or imperfections in the symmetry that uniquely identify a person.

In the case of the physical universe it may be possible to identify the correct universal force law by its deviations from spherical symmetry. This qualitative proof would be a necessary but not a totally sufficient type of proof to confirm a universal force law. However, the proof from symmetry may be sufficient to discredit candidate theories for the universal force.

The new universal force law including all acceleration terms is

$$\vec{F}(\vec{r}, \vec{v}, \vec{a}) = \frac{qq'}{r^2} \frac{(1 - \beta^2) \hat{r} + 2r\vec{a}/c^2}{\left[1 - \left\{\hat{r} \times (\hat{r} \times \vec{\beta})\right\}^2\right]^{1/2}} - \frac{qq'(1 - \beta^2)}{r^2} \frac{(\hat{r} \cdot \vec{\beta}) \hat{r} \times (\hat{r} \times \vec{\beta}) - \hat{r} \times (\hat{r} \times r\vec{a}/c^2)}{\left[1 - \left\{\hat{r} \times (\hat{r} \times \vec{\beta})\right\}^2\right]^{3/2}} \quad (6)$$

The first term in the non-relativistic limit is spherical. The second term has chiral symmetry due to the triple cross product vector terms.

The word chiral comes from the Greek for "hand". The most commonly known example of chiral symmetry is the mirror symmetry shown in the left and right hand. In quantum field theory [39], chiral symmetry is a possible symmetry of the Lagrangian under which the left-handed and right-handed parts of Dirac fields transform independently. The chiral symmetry transformation can be divided into a component that treats the left-handed and the right-handed parts equally, known as vector symmetry, and a component that treats them differently, known as axial symmetry.

4. Evidence from Symmetry for Universal Force

A combination of spherical and chiral symmetry produces a combination of left and right hand mirror symmetry combined with a spiraling motion. It results in symmetry patterns based on the prime numbers 1, 3, 5, 7, 11, 13, ...

4.1. Evidence from Elementary Particles

From the universal electrodynamic force a theory of elementary particles has been developed [23]. The first table gives all the combinatorial geometry combinations of single and parallel secondary and tertiary fibers to form a primary fiber. These combinations form a set of building blocks from which all the elementary particles are formed in later tables.

Chart of PRIMARY FIBER STRUCTURES

All Combinations of Secondary and Tertiary Fibers To Form A Primary Charge Fiber

Particle	Fiber Structure	Charge	Spin
d	\downarrow	$-e/3$	$1/2$
\bar{d}	\uparrow	$+e/3$	$1/2$
π^0	\downarrow, \uparrow	0	0
ν_e	$\hat{\downarrow}$	0	$1/2$
$\bar{\nu}_e$	$\hat{\uparrow}$	0	$1/2$
u	$\hat{\downarrow}$	$+2e/3$	$1/2$
\bar{u}	$\hat{\uparrow}$	$-2e/3$	$1/2$
s	$\hat{\downarrow}, \uparrow$	$-e/3$	$1/2$
\bar{s}	$\downarrow, \hat{\uparrow}$	$+e/3$	$1/2$
π^-	$\hat{\downarrow}, \downarrow$	$-e$	0
π^+	$\uparrow, \hat{\uparrow}$	$+e$	0
π^0	$\hat{\downarrow}, \hat{\uparrow}$	0	0
ν_μ	$\hat{\downarrow}, \hat{\downarrow}$	0	$1/2$
$\bar{\nu}_\mu$	$\hat{\downarrow}, \hat{\downarrow}$	0	$1/2$

Table 9. Chart of Primary Fiber Structures

In this theory all elementary particles are formed from 1, 3, 5 or 7 primary charge fibers. The tables below give the structure of the leptons and baryons. Note that in the Fiber Structure column the primary fibers are separated by a ",". If the primary fiber has internal structure, it is enclosed in a parenthesis ().

CHART of LEPTONS

Particle	Quark Structure	Fiber Structure	Charge (e)	Spin	Principal Decays
e^-	None	$(\downarrow, \downarrow, \downarrow)$	-1	$1/2$	
ν_e	None	$\hat{\downarrow}$	0	$1/2$	
μ^-	None	$(\downarrow, \downarrow, \downarrow), \hat{\downarrow}, (\hat{\downarrow}, \hat{\downarrow})$	-1	$1/2$	$(\downarrow, \downarrow, \downarrow) + \hat{\downarrow} + (\hat{\downarrow}, \hat{\downarrow})$ $e^- + \bar{\nu}_e + \nu_\mu$
ν_μ	None	$(\hat{\downarrow}, \hat{\downarrow})$	0	$1/2$	
τ^-	None	$(\downarrow, \downarrow, \downarrow), \hat{\downarrow}, (\hat{\downarrow}, \hat{\downarrow}, \hat{\downarrow})$	-1	$1/2$	$(\downarrow, \downarrow, \downarrow) + \hat{\downarrow} + (\hat{\downarrow}, \hat{\downarrow}, \hat{\downarrow})$ $e^- + \bar{\nu}_e + \nu_\tau$ $(\downarrow, \downarrow, \downarrow), (\hat{\downarrow}, \hat{\downarrow}), (\hat{\downarrow}, \hat{\downarrow}, \hat{\downarrow})$ $e^- + \bar{\nu}_\mu + \nu_\tau$ $(\downarrow, \downarrow, \downarrow), \hat{\downarrow}, (\hat{\downarrow}, \hat{\downarrow}, \hat{\downarrow}), (\downarrow, \uparrow)$ $e^- + \bar{\nu}_e + \nu_\mu + \nu_\tau + \pi^0$
ν_τ	None	$(\hat{\downarrow}, \hat{\downarrow}, \hat{\downarrow})$	0	$1/2$	$\rho^- + \nu_\tau$

Table 2. Chart of Leptons

Note all of the leptons have chiral symmetry. Even the τ , which has three forms has chiral symmetry in every form.

CHART of BARYONS (SPIN 1/2)

Particle	Quark Structure	Fiber Structure	Charge (e)	Spin	Principal Decays
p	udu	$\bar{u}, \downarrow, \bar{u}$ $(\bar{u}, \downarrow, \bar{u})$	+1	1/2	Not observed
n	dud	$\downarrow, \bar{u}, \downarrow$ $(\downarrow, \bar{u}, \downarrow), (\bar{u}, \bar{u}), (\downarrow, \uparrow)$ $n \quad \nu_\mu \quad \pi^0$	0	1/2	$\bar{u}, \downarrow, \bar{u} + (\downarrow, \downarrow, \downarrow) + \bar{u}$ $p + e^- + \bar{\nu}_e$
Λ	dus	$\downarrow, \bar{u}, (\bar{u}, \uparrow)$ $\downarrow, \bar{u}, (\bar{u}, \uparrow), \bar{u}, (\downarrow, \uparrow)$ $\Lambda \quad \nu_e \quad \pi^0$	0	1/2	$\bar{u}, \downarrow, \bar{u} + \bar{u}, \downarrow, (\downarrow, \uparrow)$ $p + \pi^-$ $\downarrow, \bar{u}, \downarrow + (\bar{u}, \bar{u}) + (\downarrow, \uparrow)$ $n + (\pi^0 + \pi^0)$
Σ^+	usu	$\bar{u}, (\bar{u}, \uparrow), \bar{u}$ $\bar{u}, (\bar{u}, \uparrow), \bar{u}, \bar{u}, (\downarrow, \uparrow)$ $\Sigma^+ \quad \bar{\nu}_e \quad \pi^0$ $\bar{u}, (\bar{u}, \uparrow), \bar{u}, \bar{u}, (\downarrow, \uparrow), (\downarrow, \uparrow), (\downarrow, \uparrow)$ $\Sigma^+ \quad \bar{\nu}_e \quad \pi^0 \quad \pi^0 \quad \pi^0$	+1	1/2	$(\bar{u}, \bar{u}) + (\downarrow, \uparrow) + \bar{u}, \downarrow, \bar{u}$ $(\pi^0 + \pi^0) + p$ $\uparrow, \bar{u}, (\downarrow, \uparrow) + \downarrow, \bar{u}, \downarrow, (\bar{u}, \bar{u}), (\downarrow, \uparrow)$ $\pi^+ + n$
Σ^0	dus	$\downarrow, \bar{u}, (\bar{u}, \uparrow)$ $\downarrow, \bar{u}, (\bar{u}, \uparrow), \bar{u}, (\downarrow, \uparrow)^*$ $\Sigma^0 \quad \nu_e \quad \pi^0$	0	1/2	$\downarrow, \bar{u}, (\bar{u}, \uparrow), \bar{u}, (\downarrow, \uparrow)$ $\Lambda + \gamma$
Σ^-	dds	$\downarrow, \downarrow, (\bar{u}, \uparrow)$ $\downarrow, \downarrow, (\bar{u}, \uparrow), \bar{u}, (\downarrow, \uparrow), (\bar{u}, \bar{u}), (\downarrow, \uparrow)$ $\Sigma^- \quad \nu_e \quad \pi^0 \quad \nu_\mu \quad \pi^0$	-1	1/2	$\downarrow, \bar{u}, \downarrow, (\bar{u}, \bar{u}), (\downarrow, \uparrow) + \bar{u}, \downarrow, (\downarrow, \uparrow)$ $n + \pi^-$
Ξ^0	sus	$(\bar{u}, \uparrow), \bar{u}, (\bar{u}, \uparrow)$ $(\bar{u}, \uparrow), \bar{u}, (\bar{u}, \uparrow), \bar{u}, (\downarrow, \uparrow), \bar{u}, (\downarrow, \uparrow)$ $\Xi^0 \quad \nu_e \quad \pi^0 \quad \bar{\nu}_e \quad \pi^0$	0	1/2	$\downarrow, \bar{u}, (\bar{u}, \uparrow), \bar{u}, (\downarrow, \uparrow) + (\bar{u}, \bar{u}) + (\downarrow, \uparrow)$ $\Lambda + (\pi^0 + \pi^0)$
Ξ^-	dss	$\downarrow, (\bar{u}, \uparrow), (\bar{u}, \uparrow)$ $\downarrow, (\bar{u}, \uparrow), (\bar{u}, \uparrow), \bar{u}, \bar{u}, (\downarrow, \uparrow), (\downarrow, \uparrow)$ $\Xi^- \quad \nu_e \quad \bar{\nu}_e \quad \pi^0 \quad \pi^0$	-1	1/2	$\downarrow, \bar{u}, (\bar{u}, \uparrow), \bar{u}, (\downarrow, \uparrow) + \bar{u}, \downarrow, (\downarrow, \uparrow)$ $\Lambda + \pi^-$
Λ_c^+	udc	$\bar{u}, \downarrow, (\bar{u}, \downarrow, \uparrow)$	+1	1/2	not established

Table 10. Chart of baryons

4.2. Evidence from Atoms

The new version of electrodynamic leads to a new physical model of the atom [40] in which the finite size electrons are in the shape of a ring. See the symmetry of the magnetic flux line/ plane of the neon atom in Fig. 9.

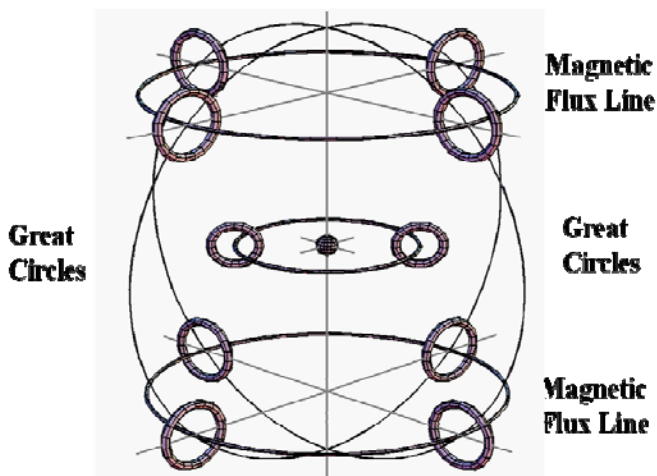


Fig. 11. Magnetic Flux Line Symmetry of Neon Atom

In this model neon has three magnetic flux lines/planes. As one can see from Fig. 9 helium would have only 1 magnetic flux line. Argon would have five magnetic flux lines or planes plus a second flux line in the central plane with helium. Xenon has seven flux lines. This same symmetry structure can be seen in the structure of the planet Saturn in Fig. 10. Note the rings of differ-

ent latitude and the excess number of rings in the equatorial plane.



Fig. 12. Structural Symmetry of Planet Saturn

4.3. Evidence from Nuclei

The new version of electrodynamic leads to a new physical model of the atomic nucleus [40] in which the finite size electrons, and protons are in the shape of a ring. See the symmetry of the electron and proton groupings of the oxygen-16 nucleus in Fig. 11. Note that the neutrons in the nucleus polarize to form an electron and a proton. Each of these particles participates in forming shells of opposite sign charge in the nucleus. For the oxygen-16 nucleus, when the three shells of 8 nucleons of + - + charge form, there are 8 triplet groupings of proton, electron and proton particles. For He-4 nuclei, when the 3 shells of 2 nucleons of + - + charge form, there are 2 triplet groupings of proton, electron and proton particles. For Sn-118 nuclei, when the 5 shells of 18 nucleons of + - - + charge form, there are 18 quintuplet groupings of proton, electron, proton, electron and proton particles. Also the Sn-118 nuclei have 3 shells of 32 nucleons of + - + charge form. These form 32 triplet groupings of proton, electron and proton particles. All other nuclei have only partially complete shells of nucleons with chiral symmetry.

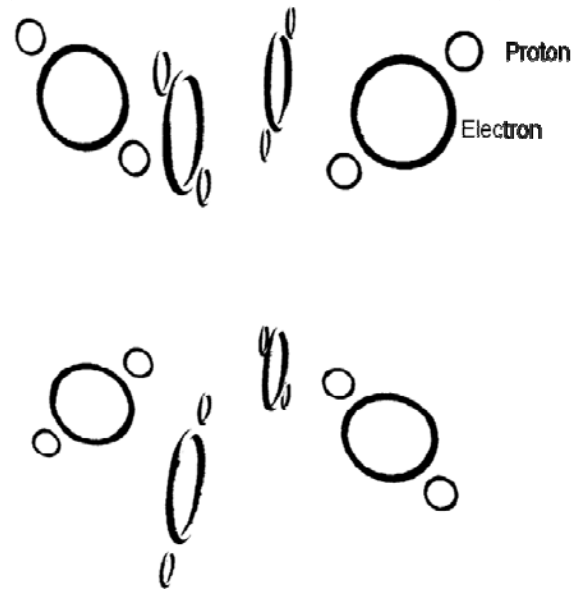


Fig. 13. Triune Symmetry of Oxygen-16 Nucleus

4.4. Evidence from Molecules

The new model of the atom based on finite-size ring shaped electrons gives rise to a new mechanism for the binding of atoms

to form molecules. Instead of orbiting valence point electrons performing Fig. 8 orbits about two nuclei to bind them together, stationary ring electrons bind atoms together magnetically. Each electron acts as a small ring magnet. Combinatorial geometry can then be used to determine the complete set of possible configurations just as it was in the case of elementary particles and the atom.

Fig. 12 shows various types of molecular bonds involving carbon atoms in organic chemistry. Note the cubic structures displaying a triune symmetry in multiple ways as predicted by combinatorial geometry.

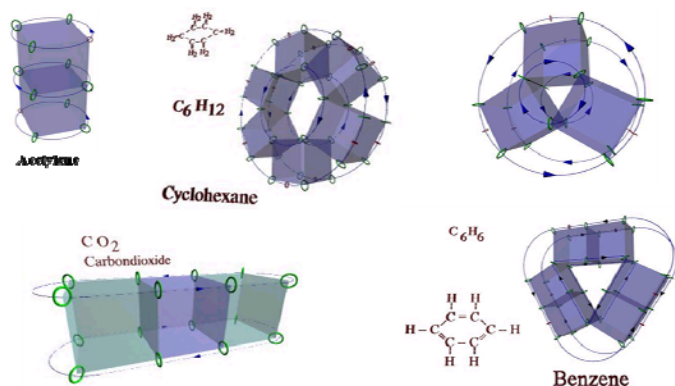


Fig. 14. Triune Symmetries of Carbon Molecules

Fig. 13 shows the single spiraling symmetry of the structure of starches Amylose and Amylopectin.

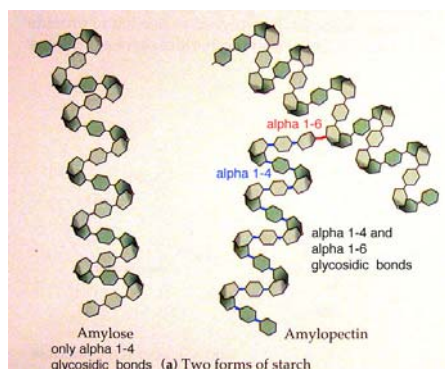


Fig. 15. Single Spiraling Symmetry of Starch Molecules

Fig. 14 shows the spiraling triune symmetry of the protein collagen.

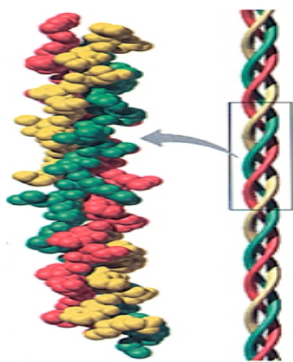


Fig. 16. Triune Symmetry of Protein Collagen

Figs. 15 and 16 show the five-fold pentagonal spiraling symmetry of DNA.

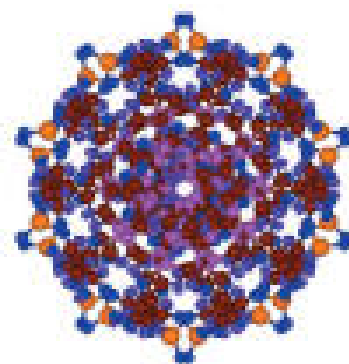


Fig. 17. Pentagonal Longitudinal Symmetry of DNA

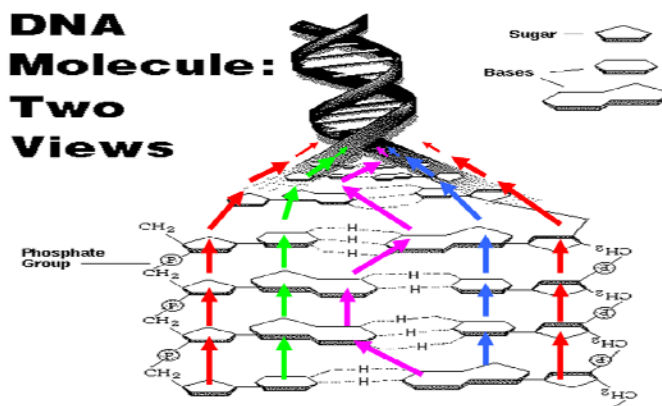


Fig. 18. Pentagonal Spiraling Symmetry of DNA

Fig. 16 of DNA shows that five stacks of carbon ring structures define five different fibers which are color coded in the diagram. In traditional chemistry the outer fibers are defined as polymers, but the interior fiber structure of the genes is ignored. These representative samples show the 1, 3, 5 fold symmetries in molecules resulting from chiral symmetry.

4.5. Evidence from Crystals

Chiral symmetry can be seen in many types of crystals. One of the best demonstrations is in the photographs of snowflakes by the California Institute of Technology [41] in Fig. 17. Note the top snowflake has one primary axis of symmetry. The bottom row of snowflakes has three axes of primary symmetry and 3, 5, 7 secondary axes of symmetry off the primary axes going from left to right.

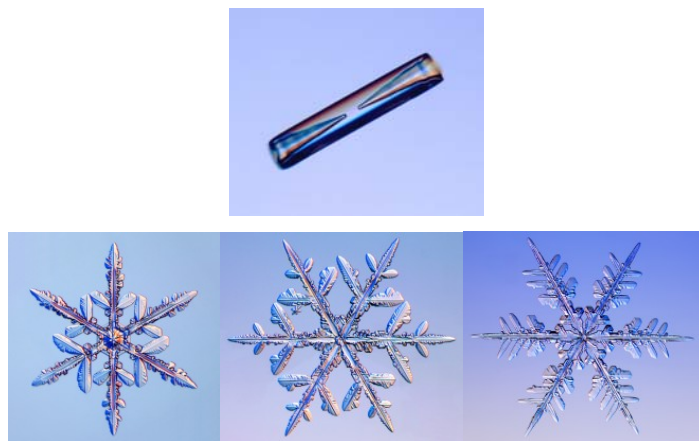


Fig. 19. Symmetry Patterns of Snowflake Crystals

Despite the fact that no two snowflakes are identical, the California Institute of Technology has not been able to find and photograph one that does not have chiral symmetry.

4.6. Evidence from Leaves, Flowers and Seed Pods

Chiral symmetry can be seen in the pattern of leaves on the stalk of a plant when observed from above. Fig. 18 shows the spiraling of leaves on the stalk and triune axial symmetries.



Fig. 20. Leaf Symmetry Patterns on Plant Stalk

Chiral 1,3,5,7,... symmetry can be seen in the internal pattern of a leaf and in its vein structure as shown in Fig. 19.

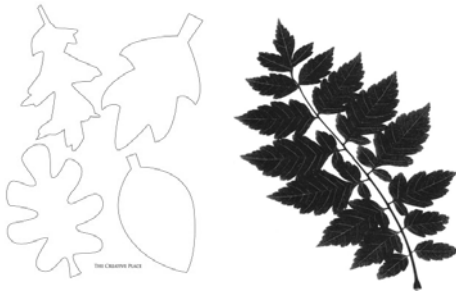


Fig. 21. Internal Leaf Symmetry Patterns

Chiral symmetry can be seen in the 1,3,5,7 symmetry patterns of petals in a flower as seen in Fig. 20. Note that the Poinsetta and rose have multiple chiral symmetry patterns in the various layers of the flower.



Fig. 22. Symmetry Patterns in Flowers



Fig. 23 Symmetry in Structure of Plant Seed Pods

Chiral symmetry with spiraling can also be seen in the structures of seed pods as shown in Fig. 21.

4.7. Evidence from the Solar System

Chiral symmetry can be seen in the structure of the planets such as Saturn as seen in Fig. 10. This structure is the same as that of the atom.

Chiral symmetry can also be seen in the orbits of the planets and moons. Fig. 22 shows the orbits of the moons of Jupiter. Note the spiraling of the moon orbits around the orbit of Jupiter and the similarity to the DNA molecule. Note the quantization of the periods and radii of the orbits is also like that of DNA.

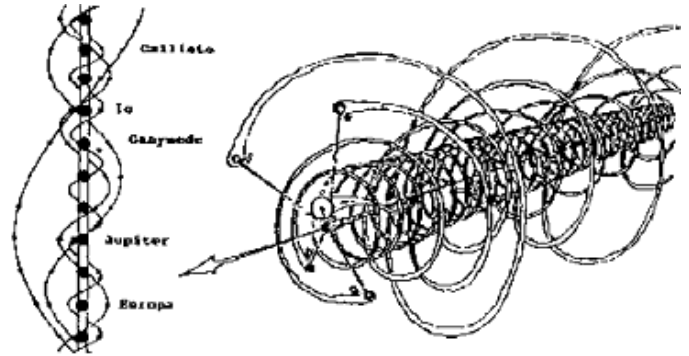


Fig. 24. Symmetries of Orbits of Jupiter's Moons [42]

4.8. Evidence from Galaxies

Chiral symmetry can be seen in the structure of spiral galaxies such as our own Milky Way galaxy as shown in Fig. 23. Note that there are 7 spiral arms.

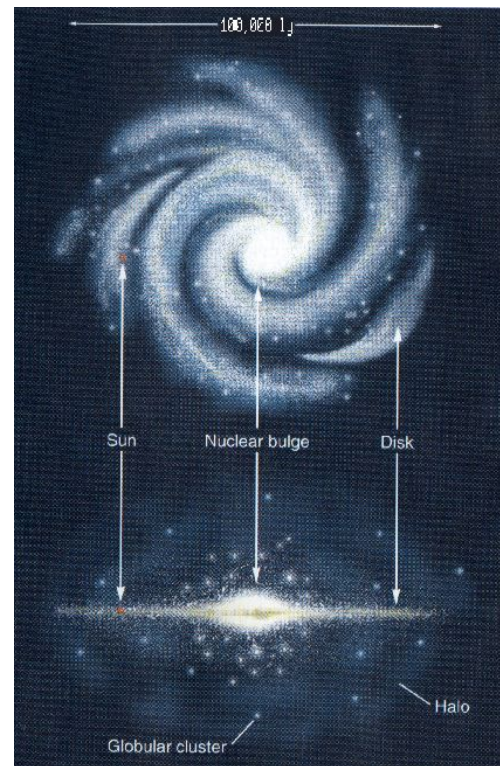


Fig. 25 Symmetry of the Milky Way Galaxy [43]

In addition to spiral galaxies there are ring galaxies. They exhibit the spiraling of 3 fibers composed of millions of stars as shown in Fig. 24.

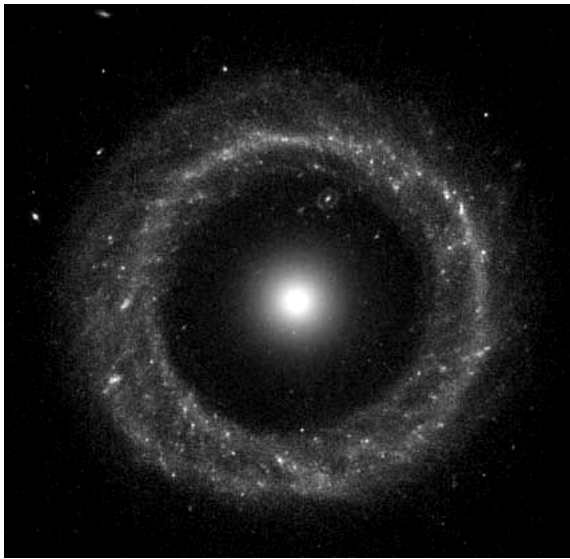


Fig. 26. Symmetry of Hoag's Object a Ring Galaxy [44]

5. Conclusion

Upon examination of the structures of elementary particles, nuclei, atoms, molecules, crystals, plant stalk leaf patterns, plant leaf structure, plant flower structure, plant seed pod structures, planet structures, orbits of planets and moons in the solar system, spiral and ring galaxy structures, it appears that chiral symmetry is manifested on all size scales in the universe and in a variety of ways.

The form that the symmetry takes is not identical on all size scales. For instance the symmetry of the structure of the planet Saturn is very similar to the symmetry of the structure of the atom. The symmetry of the orbits of the moons of Jupiter is very similar to the symmetry of the structure of the DNA molecule. The symmetry of the structure of a ring galaxy is very similar to the symmetry of the structure of the electron and some other elementary particles. However, an examination of these chiral symmetries shows that they are different from one another.

The form that the chiral symmetry takes varies due to a number of factors. There appears to be a balance between the spherical and the chiral symmetry in the electrodynamic force equation. Both symmetries are present all the time. A familiar example would be the 3 leaf clover and the 4 leaf clover. In the 3 leaf clover the chiral term dominates over the spherical term. In the more rare 4 leaf clover the spherical term dominates. There is even a 5 leaf clover. However, if one looks at the symmetry of the lobes of the clover leaf or the symmetry of the number of veins in the clover leaf, one will usually find the other symmetry present.

Based on the observed evidence for chiral and spherical symmetry in elementary particles, nuclei, atoms, molecules, crystals, plant leaf arrangement on the stalk, plant leaf structure, plant flower structure, plant seed pod structure, solar system structure, and galaxy structures, it appears that the symmetry of everything in the universe is consistent with the proposed universal electrodynamic force. Thus the symmetry of the universe provides some consistent necessary evidence in favor of this universal force. Symmetry alone is not sufficient to completely justify a universal force theory. It is also necessary that any universal

force theory be able to produce mathematical equations that can describe quantitatively all observed phenomena in the universe.

When the competing theories of the universe based on relativity theory and quantum mechanics are examined, it appears that they do not consistently support the observed combination of spherical and chiral symmetry. For those theories this combination of spherical and chiral symmetry is just one of many possible symmetries with no particular physical reason for it to be the correct symmetry. Thus symmetry is a problem for these theories at the present time.

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