Unification of Physics

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Theory of Everything. The main goal of Common Sense Science is to develop a unified theory that explains the structure of matter and predicts its motions by a single force law. A Theory of Everything has broad appeal among physicists:

> Many scientists now believe that a TOE is a distinct possibility in the near future. It would be prudent, then, to ask just what one might expect of a theory that seems to cover 'everything' in its wake. Davies and Brown have considered just this question (Davies and Brown, *Superstrings, A Theory of Everything*). Their criteria are simple. A TOE must explain (1) matter, (2) the forces affecting matter, and finally (3) the space-time framework of matter as well as unify the quantum and relativity theories.... The foremost task in theoretical physics must be to unify the quantum and relativity, the discrete and continuous aspects of physical reality and nature.... [1]

Criteria (1) and (2) are undoubtedly legitimate. But criterion (3) has been intractable, and this writer sees no possibility or value in integrating theories known to be flawed, no matter how popular they may be. Even Einstein was unable to "create a Theory of Everything, a comprehensive set of equations to describe all matter and energy in the universe.... Einstein's failure arose from the incompatibility between his Theory of General Relativity (which explains the behavior of matter over large scales) and Quantum Mechanics (which tells us how small things like atoms and electrons work)." [2]

A TOE must include physical mechanisms for the exchange of energy — and explain forces; arguments from energy alone are usually inadequate without a mechanism for the exchange of energy. Without the causal relationships imbedded in mechanisms, deductions from the considerations of energy alone are inconclusive. *Our approach integrates a deformable physical model with its self-field, neither of which can exist without the other.* I will explain below just how a particle and fields are brought together in a single theory by the Ring Model — without the contradiction that is postulated by the absurd notion of wave-particle duality.

Classical Electrodynamics. Careful research performed in the nineteenth century uncovered details of the structure of matter and the fundamental nature of electromagnetic fields and forces. These discoveries showed that matter is composed of a few elementary particles with some structural features that were suggested by the order of the Periodic Table of Elements. Moreover, Clerk Maxwell combined the force laws discovered by Coulomb, Ampère and Faraday into a theory of electromagnetics that explained and unified much natural phenomena — such as light, color, X-rays, and magnetic effects — into a single theory so successful that it launched the Industrial Revolution and modern technologies of radio, television, communications, computers, electric utilities, and others. By applying

the Scientific Method, "the scientific community thought that it was on the verge of solving all of the problems of the universe and physical reality with its current theories at the end of the nineteenth century." [1]

The Principle of Unity. Fundamentally, the Principle of Unity is based on the assumption of *order* in the universe so that phenomena can be described and laws can be stated with the expectation that they will be the same the next time they are tested. "The third basic scientific premise is that nature is united. We life in one world.... What we find to be true here in this place will, under similar conditions be true everywhere in the universe." [3] Specifically, science can be conducted any place, any time, and with microscopes or telescopes.

At a fundamental level, two models of matter is *one too many*, as William of Occam (the razor guy) would have it. Likewise, a *universal force law* is preferred to a plethora of laws, and *causality* is expected to maintain the relationships between matter and fields.

Einstein's Bad Idea. About 1916, Albert Einstein urged upon us the concept that *space is a physical entity* with properties and powers to interact with light and matter. He supposed space to be "real" even for the case of a perfect vacuum. In his own words:

> The principle of inertia, in particular, seems to compel us to ascribe physically objective properties to the space-time continuum [4, *p.* 55].
>
> ... the properties of the space-time continuum which determine inertia must be regarded as field properties of space, analogous to the electromagnetic field [4 *p.* 56].

Furthermore, Einstein claimed that *inertial mass* is equal to *gravitational mass*, in order to imply that space can account for gravitation:

> A little reflection will show that the law of the equality of the inert and the gravitational mass is equivalent to the assertion that the acceleration imparted to a body by a gravitational field is independent of the nature of the body. For Newton's equation of motion in a gravitational field, written out in full, is
>
> (Inert mass) · (Acceleration) = (Intensity of the gravitational field) · (Gravitational Mass)
>
> It is only when there is numerical equality between the inert and gravitational mass that the acceleration is independent of the nature of the body [4 *p.* 57].

The fully-developed Theory of General Relativity (GRT) asserted that space (and the space-time continuum) is "curved" or shaped by the presence of massive objects like stars and galaxies of stars. The effect of the curved space-time continuum is supposed to be a *gravitation field* which can act upon other massive objects and can bend light. The idea of a *field* or *continuum* reflects the continuity of the space-time structure. Here we see a fundamental difference between Relativity Theory and Quantum Theory:

> The barrier between the continuity of the field and the discreteness of the quantum has so far proven impossible to surpass from either direction. All unification theories, especially the quantum-based theories of physical reality, suffer from the same philosophical problem. The quantum and relativity are mutually incompatible under

present circumstances. Any quantum-based theory of physical reality must explain everything in terms of the discrete nature of particles, while any relativity-based theory must proceed from the continuity of the space-time structure [1].

A second fundamental difference between Relativity and Quantum Theory emerged when atomists asserted that Nature has the power to create "quantum fluctuations." By the fertile imagination of modern atomists, "quantum fluctuations" were asserted to be the active process by which Nature caused The Big Bang, quantum-tunneling, virtual-particles of zero-point energy, the infamous "quantum leap" of orbiting electrons, and the spontaneous emission of force-carrying particles (bosons) by the material particles (fermions). In Einstein's Relativity, space is *passive*; but in Quantum Theory, space and Nature are *actively* creating and controlling the processes just mentioned.

The Discrete and The Continuous. Observations of particles, say an electron striking a spot on a cathode-ray tube, show the particle to be a localized object. Quantum Theory is based on the *discrete nature* of energy or matter. But Relativity Theory is based on the *continuous nature* of space and energy. Many physicists believe that unification of QT and RT is impossible:

> *"The compelling point about the simultaneous occurrence of these two revolutions (relativity and the quantum) is that when their axiomatic bases are examined together, as the basis of a more general theory that could encompass explanations of phenomena that require conditions imposed by both theories of matter (such as current 'high energy physics'), it is found that the widened basis, which is called 'relativistic quantum field theory', is indeed logically inconsistent because there appear, under a single umbrella, assertions that logically exclude each other." (Mendel Sachs, Einstein Versus Bohr: The Continuing Controversies in Physics. LaSalle, Illinois: Open Court, pp. 236-237 (1988)*
>
> Sachs is, of course referring to the logical and mutually exclusive nature of the quantum (the discrete) and the field (the continuous) [1].

Failure of Quantum Models. The existence of discrete particles in nature is not satisfied by

> a point (as in Quantum Theory) or any mathematical entity (such as a one-dimensional string) because real material particles are extended in all three of the normal dimensions of space. So, the field can never be reduced to the discrete quantum. The quantum theory, by definition, is not a proper basis for a complete theory of physical reality [1].

Electrons cannot be point-particles, as just stated, because only finite-size electrons have the experimentally observed properties:

1. An electron has a non-zero *magnetic moment* equal to the product of current and area the current encloses. But a point-like Quantum Electron of zero radius and zero area *predicts a moment of zero instead of the measured moment.* For this reason, the magnetic moment of a Quantum Electron is assigned by fiat and said to be an "inherent property."
2. An electron has a non-zero *spin (angular momentum)* equal to the product of its mass, rotation velocity, and radius. But a point-like Quantum Electron of zero radius predicts

a spin of zero instead of the measured spin. For this reason, the spin of a Quantum Electron is assigned by fiat and said to be an "inherent property."

3. A point-like Quantum Electron of zero radius must have an infinite mass density (and energy density) — a foolish proposition for the real world. For this reason, the *mass* of a Quantum Electron is assigned by fiat and said to be an "inherent property."
4. Electrons act like little antennas that absorb and emit radiation. But according the laws of induction, and "real-world" antenna technology, the *energy exchanged* by an antenna is proportional to its size. Point-like antennas do not work; neither do point-like electrons.

Structure of Matter. The Spinning Charged Ring Model [5] unifies matter and forces by accounting for *discrete particles that generate self-fields* by electromagnetic induction. Figure 1 shows a particle consisting of charge at the surface and circulating around the circumference. The object is a "particle" with localized features such as its size, shape, boundary, position and orientation. It has boundaries, beyond which none of its substance (electric charge) exists.

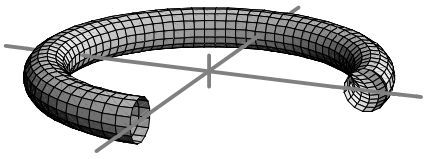

Figure 1
Spinning Charged Ring
Model of Elementary Particles

Three-quarter section shown, not to scale (The ring is very thin). Electric fields not shown here.

The Spinning Charged Ring also has a real, physical *extension*. Figure 2 shows the electric and magnetic fields that are generated by the circulating charge. These self-fields exert balanced pressures at the surface of the ring that hold the charge in a fixed shape.

The charge of the particle cannot maintain its shape unless the fields are present. And the fields get their shape and intensity from the charged particle. The Ring Model is an integrated electrical system. *In this simple arrangement, the Ring Model provides the unification of matter (charge) and forces (from self-fields) by the consistent laws of electromagnetism.*

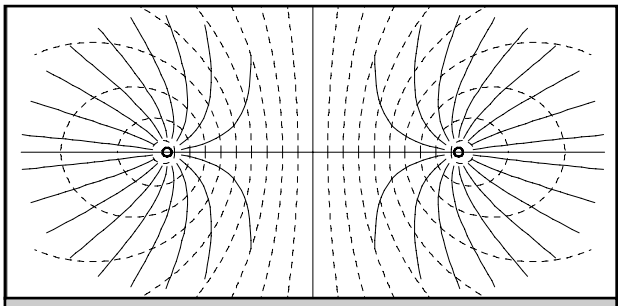

Figure 2
Fields of Spinning Charged Ring

Electric field lines (solid) and magnetic field lines (dashed) generated by the ring (small circles).

Discrete Properties of the Ring Model. As expected, the *discrete properties* are those that relate to the particle itself. Important quantum features of the Ring Model as found in the electron and proton are:

1. The particles each have *one unit of electric charge* attached of $\pm 1.60218 \times 10^{-19}$ Coulomb.
2. The particles each have *one unit of magnetic charge* generated by the circulating charge, a magnetic flux equal to $\pm 4.1309 \times 10^{-15}$ Weber.

3. The product of electric charge and magnetic charge is equal to Planck's Constant *h*.
4. The self-energy of the Ring divided by its emitted frequencies yields Planck's Constant *h, i.e.* $E = h f$ [6]. (Note that the Ring Model predicts Planck's Constant.)
5. The Ring Model predicts the quantization of angular momentum in the electron [6].
6. The Ring Model predicts the Photoelectric Effect [7].
7. The charged particles have *inertia* (electromagnetic, inertial mass) and resist attempts to change their velocity. The Charged Particle Model shows the origin of inertial effects and provides the mechanism for Newton's *law of inertia*, $F = m a$ [8, 9].

Continuous Properties of the Ring Electron.

1. Particles have surrounding fields that exert force on other remote, charged particles (the mechanism for action-at-a-distance).
2. The Ring Model predicts the observed line spectra of hydrogen, included wavelengths recently discovered by Labov and Bowyer [10].
3. The particles generate fields of coherent radiation with diffraction effects observed as "matter waves" [11].
4. The particles generate fields of coherent radiation that cause interference patterns observed in double-slit experiments.
5. The Ring Model predicts the observed features of Blackbody Radiation [7].

Conclusions for Explaining Matter. By associating *charge* with matter and by the electromagnetic effects of charge, the Ring Model successfully explains and predicts the *properties of matter* (Criterion 1 for a unified Theory of Everything). We turn now to an explanation of the *forces affecting matter*, Criterion 2, and we will propose the electromagnetic force as the candidate for a *universal force law.*

Forces Affecting Matter [9, 12]. A brief review of the historical theories of forces affecting matter starts with Aristotle's Theory of Contact Action and ends with the Universal Force Law being proposed by Lucas [13, 14].

Contact Action. More than two millennia ago, Aristotle (384-322 BC) presented his view that forces are transmitted by *mechanical contact* [15]. He stated that "every object is pushed, pulled, carried, or twirled by whatever is in contact with it." And he argued that "matter cannot act where it is not." He asserted the following axioms to support his belief in force by direct mechanical contact: (1) There are no voids in the universe. (2) Every motion has a moving cause. (3) The mover must be in contact with the thing moved. (4) For every motion there is an unmoved First Mover. Aristotle's theory was consistent with the *law of cause and effect*, and even accounted for the flight of birds through the atmosphere. But "contact action" cannot account for the force of magnetism or gravity acting over a distance in the void of space.

Action-at-a-Distance. Galileo (1564-1642), more than any other "set the Scientific Revolution in motion and pulled modern science out of ancient natural philosophy."

"Galileo established mathematical laws describing the motion of falling bodies," performed experiments to learn about nature, and provided "the foundation of classical mechanics" [16]. Other scientists began to follow his methods of observation and explanations based on *causality*.

Isaac Newton (1642-1727) was born in the year Galileo died. His *law of gravity* described the force of gravitation between two objects; *e.g*, the attraction between the sun and the earth. This was "action-at-a-distance" or "far-action." This concept of forces between two objects was a much different concept than Aristotle's "contact action." Newton did not know what mechanism caused gravity, and he was careful to state only that there was a force between the two objects separated by a large distance. Newton's laws were *empirical laws* developed to predict empirical observations.

Gilbert (1544-1603), Coulomb (1736-1806), and Ampère (1775-1836) discovered additional forces between magnetic poles, charged particles, and current elements. Without providing an explanation, the new force laws for these electrical effects specified the precise magnitude of forces acting over a *distance between two objects*. By this time, it was becoming evident to everyone that force laws all predicted forces that decreased with the square of the distance — the inverse-square law.

Michael Faraday (1792-1867) and Clerk Maxwell (1831-1879) investigated and explained the dynamic forces of electricity and magnetism. They introduced an important new concept of *energy fields* to explain "action-at-a-distance" — how one body attracts or repels a second distant body. *These electric and magnetic fields are "real" because they contain energy.* While fields filled vast regions of the universe, "space" could still be regarded as nothing more than a concept of location.

Space Mediums. At this time in history, most physicists supposed that all waves were carried, or formed, by the properties of a wave medium. Many therefore assumed that light must be carried by a medium, and a word was coined to name the medium that carries light-waves: the *luminiferous aether.* By these (invalid) deductions, the luminiferous aether and other less-likely entities were invented and assumed to fill space and even give space certain properties. But the aether was not detected, and the Michaelson-Morley experiment convinced Einstein and most others that these *space mediums* did not exist.

Space. How ironic, then, that Einstein's conjecture *that space has properties* came to be extrapolated by modern atomists to become a standard feature of Quantum Theory: Today, *space is regarded as a physical entity with properties* that account for "quantum fluctuations" and all natural processes. Even space itself is quantized and "foamy," with each volume cell containing a small amount of momentum that can bend light passing through it.

Atomists have not been content with quantizing matter, and they proposed quantization of space and time:

> The frothiness of space and time is predicted by many theories that attempt to meld Einstein's theory of gravity and quantum mechanics.
>
> For 5 years, physicists have hoped that a flaw in Einstein's special theory of relativity might reveal that space and time aren't smooth at the smallest scale, but fuzzy

> and foaming. Now that tantalizing prospect has vanished in a puff of gamma rays. Two independent measurements of cosmic gamma rays show that Einstein was right after all — and that current plans to detect the foam are doomed. "The results rule out these possibilities on empirical grounds," says Floyd Stecker, a theoretical astrophysicist at NASA's Goddard Space Flight center in Greenbelt, Maryland." [17]

The Common Sense Approach to Space. Common Sense Science has developed and verified models of matter and theories of force without any reference to "space"; we think that *"space" is absolutely nothing* but a concept of expanse and location. The neglect of "space" (as a physical entity) gives us one less entity in the task of describing physical reality — and makes a TOE possible. The real physical entities seem to be *electric charge* and *electromagnetic fields*.

Field Theory for Moving Charge Elements. The research of Faraday provides conclusive evidence in the reality of electromagnetic fields. These fields provide a scientific explanation for the important physical theory of action-at-a-distance. But an error-free theory of electrodynamics has been elusive, despite the efforts of such skilled physicists as Weber, Maxwell and Einstein. The elements of error (in electrodynamics) have been uncovered by Charles W. Lucas, Jr., who recently proposed a superior force law that eliminates the historical errors. [13, 14].

Electromagnetic Field Theory depends upon the force laws specified by Coulomb, Ampère, and Faraday. As implemented by Potential Theory, all of these laws imply *conservation of energy*. Electrodynamics in Field Theory is based on Faraday's Law where time enters to specify rates of natural processes; this *law of magnetic induction* prohibits the exchange of energy by electromotive forces from magnetic flux capture where an object is point-like without spatial extent to capture flux. *Point-like particles* are incompatible with Electromagnetic Field Theory which denies the existence of infinite energy density, as well as magnetic moment, and angular momentum in objects of zero extent. Electromagnetic Field Theory requires physical models with size, structure, distribution and motion of charge to relate forces on and between objects by use of the fundamental force laws. In this respect, Field Theory provides a causal explanation for the role of inertial mass that Newton's *laws of mechanics* could only assume and specify [12].

The current version of electrodynamics is based on a point-particle idealization that is embedded in Maxwell's equations [18]. This approximation to a point-like particle omits some induction effects that are important at high velocities of moving charge. The point-particle approximation has necessitated the invention of Relativity Theory in order to describe high-speed electrical phenomena and the invention of Quantum Mechanics to describe the stable states of the atom.

One of Maxwell's equations starts with Faraday's *law of magnetic induction* which states that the electromotive force around a circuit is proportional to the time-rate-of-change of magnetic flux linking the circuit. In Faraday's original law, induction effects come from the relative velocity between the electric charge and magnetic fields.

Jackson [19] (and others, see reference [20]) use Stoke's Theorem to put Faraday's Law in differential form. Jackson does *not* perform the Galilean Transformation to get the electric (**E**) and magnetic (**B**) fields in the same frame of reference. As a result, he obtains a

result that is invalid for high velocity. A second theory, Einstein's Special Relativity Theory (SRT), is needed in order to obtain agreement with experiments on high-velocity bodies. Not only is field transformation lost in converting from the integral form to the differential form, but an additional point-particle approximation is made to obtain the final form of the differential equation [18].

In order to integrate the equation and obtain a simple equation for inductive effects, the integral is assumed to vanish. But the integral vanishes over an arbitrary surface only for point-particle (and some spherical) sources. For finite-size elementary particles, the surface must account for the induced fields and feedback effects. Induction fields exist in the space surrounding the particle, but the approximation omits the effects from induction that become most important at high velocities. Thus, the final equation excludes finite-size effects and portions of induced fields. Maxwell's equation for magnetic inductance is *not* equivalent to the fundamental *laws of electrodynamics* and fails for high-speed phenomena where internal charge rearrangement and induced field effects are the largest.

Despite these errors, Faraday and Maxwell produced a viable theory of "field-contact actions." Two bodies didn't actually have to touch each other directly, but the field of each one could act across some distance to create a force on the other. The electric and magnetic fields could explain many observed forces, but since they propagate with finite speed, any fields from the distant stars are not a significant factor in inertial forces on earth.

The Force of Inertia. "In addition to gravity, Newton claimed, there existed another fundamental force of nature." In the *Principia*, Newton said that inertia is the "innate force of matter," with "a power of resisting, by which every body, as much as in it lies, continues in the present state, whether it be of rest, or moving uniformly forward in a right line."

> Inertia manifests itself as follows. When the driver of a car slams on the brakes, his body is flung forward on the steering wheel. Some force must be pushing the body. This is the force of inertia. Where does it come from? This has become one of the deepest riddles of science [15].
>
> In Newton's mind, the force of inertia was very different from the force of gravity. Gravity was called forth by the presence of another body. It depended upon the size of the other body and its location.... *Inertia was quite different. It was not an interaction between two particles or extended bodies. The Creator seemed to have built inertia permanently into every particle.* The inertia force would lie dormant in matter, then suddenly spring into action without collaborating with other matter.... [T]he force of inertia is the oddball among...the forces of nature [15].

Is there a special point in Absolute Space that defines an inertial reference frame? "If the force of inertia lay dormant in matter until it was roused by the acceleration of the substance; what gave this force its direction in space...? 'Acceleration' and 'deceleration' have no meaning unless the motion is expressed relative to another object. Where is this other object which determines the direction of the force of inertia?"[15]

Does "space" have a preferred point of reference to use in force equations? Newton found an answer by "inventing" Absolute Space. "Nevertheless, he had a nagging doubt whether this unique space could ever by found and pinned down. In the *Principia* he actu-

ally wrote: 'It follows that absolute rest cannot be determined from the position of bodies in our region.'" [15]

The mystery of inertia was dispelled in 1977 by the innovative approach of Barnes, who applied the Galilean Transformation to an accelerated electron and its self-fields [8]. *This work was successful because it analyzed the electrodynamics of an accelerated particle of finite-size.*

Theories of Relativity. More by hype than by scientific necessity, one particular theory of electrodynamics has gained prominence, *i.e.*, Einstein's Special Relativity Theory. Einstein himself gives a frank and fair assessment of the theory in the introduction of his paper [21], properly titled "On the Electrodynamics of Moving Bodies." Einstein begins by noting that application of Maxwell's electrodynamics to moving bodies leads

> to asymmetry which does not agree with natural phenomena. Let us think of the mutual action between a magnet and a conductor. The observed phenomena in this case depends only on the relative motion of the conductor and the magnet, while according to the usual conception, a distinction must be made between the cases where the one or the other of the bodies is in motion [21].

Einstein sides here with natural phenomena against Mach, aetherists, and Absolute Space and defines the "Principle of Relativity." His first postulate conforms to the *law of cause and effect*, and many people find it to be credible.

Einstein introduced the second postulate of SRT with an apology:

> …we…introduce the further assumption, an assumption which is at the first sight quite *irreconcilable* with the former one that light is propagated in vacant space, with a velocity *c* which is independent of the nature of motion of the emitting body [21, emphasis added].

The only justification given by Einstein for adopting "irreconcilable" postulates is to claim they bring about "a simple and consistent theory of electrodynamics of moving bodies on the basis of the Maxwellian theory for bodies at rest" (emphasis added to indicate the contradiction!). By assuming the "Principle of Constancy," he not only achieved the symmetry observed for the force law of magnetism but also accounted for effects observed in bodies with high velocity mass increase and length compression. (Because compression of an object is of physical origin, Lorentzian "length compression" is a better term than Einsteinian "length contraction".) SRT became a useful tool for predicting the motions of bodies moving at high velocity precisely where Maxwellian electrodynamics (as then conceived) failed. Einstein's theory could predict forces observed for objects accelerated to very high velocities approaching the speed of light; to do so, *he gave up the Principle of Causality with respect to the propagation velocity of light.* This marked the end of Classical Science and eroded commitment to the Scientific Method.

A decade later, Einstein presented the General Relativity Theory to predict gravitation on the basis of *space* described by Riemannian mathematics with a curvature of space different from the SRT curvature. Einstein thought that two theories were needed to describe the same space, but he hoped a *unified theory* could be found to replace them.

Einstein himself acknowledged that the postulates for SRT are equivalent to the mathe-

matical formulation of Minkowski, while GRT is equivalent to the mathematical formulation of space and time given by Riemann. Einstein's two Theories of Relativity are based on mathematical descriptions applied to the relative distance and motion of "two points" or a "point-mass of electricity" [21, *pp.* 6, 9, 12, 18, 21, *etc.*] a method that ignores actual distribution of charge in real bodies. These theories, like others being compared in this paper, predict the dynamic forces on moving objects. We note additional common features of SRT and GRT that (1) no aether is acknowledged, nor (2) is any other reference made to Absolute Space.

Force Mediated by Exchange of Particles. Quantum Theory adopts the atomistic view (1) that matter consists of point-like particles called *fermions* and (2) that forces between objects are carried by other particles called *bosons*, which are exchanged randomly and spontaneously between the fermions. QT makes no attempt to relate the fundamental properties of mass, spin, or moment to a physical model but, rather assumes these properties are inherent in point-like, elementary particles. QT incorporates the Standard Model of Elementary Particles as a mathematical description of statistical processes operating in accordance with *randomness* which must exceed Planck's Constant as specified by the Heisenberg Uncertainty Principle. Fundamentally, QT regards all objects as described by *waves* unless and until an *object* is observed or measured. Indeed, the mathematical description of the wave is regarded as the best way to describe and predict natural phenomena, and a precise physical description of an object's properties is considered to be impossible and unnecessary.

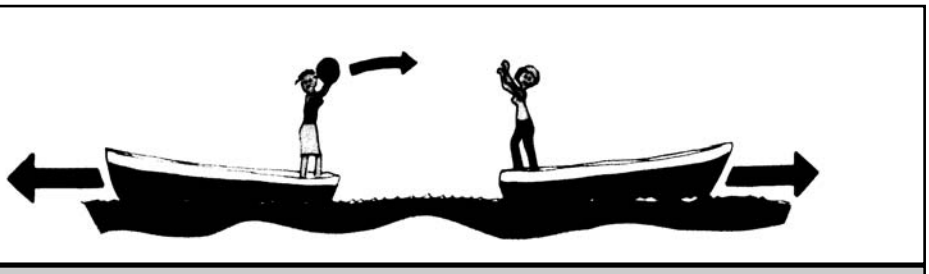

Figure 3.
In Quantum Theory, exchange of particles is responsible for forces.

In spite of the enormous benefit from technology developed on the basis of electromagnetic Field Theory, modern Quantum Theory has adopted conflicting ideas of the ancient Greek philosopher-scientists. In the modern version of Atomism, forces between particles are not exerted by fields reaching across space but by photons, mesons or gluons; these force-carrying "particles" known as *bosons* [22, 23] are emitted spontaneously and randomly to "mediate the forces" between the material particles known as fermions. While quantum effects have usually been limited to the domain of nuclei and elementary particles, recent frustration with gauge theories have led some to make statements about quantum effects in macro-sized objects. Robert Walgate describes how bosons are imagined to travel between objects to attract or repel another object:

> Force Carriers. What causes a force between one particle and another at a distance? Modern physics answers: the exchange of yet other particles. Imagine two

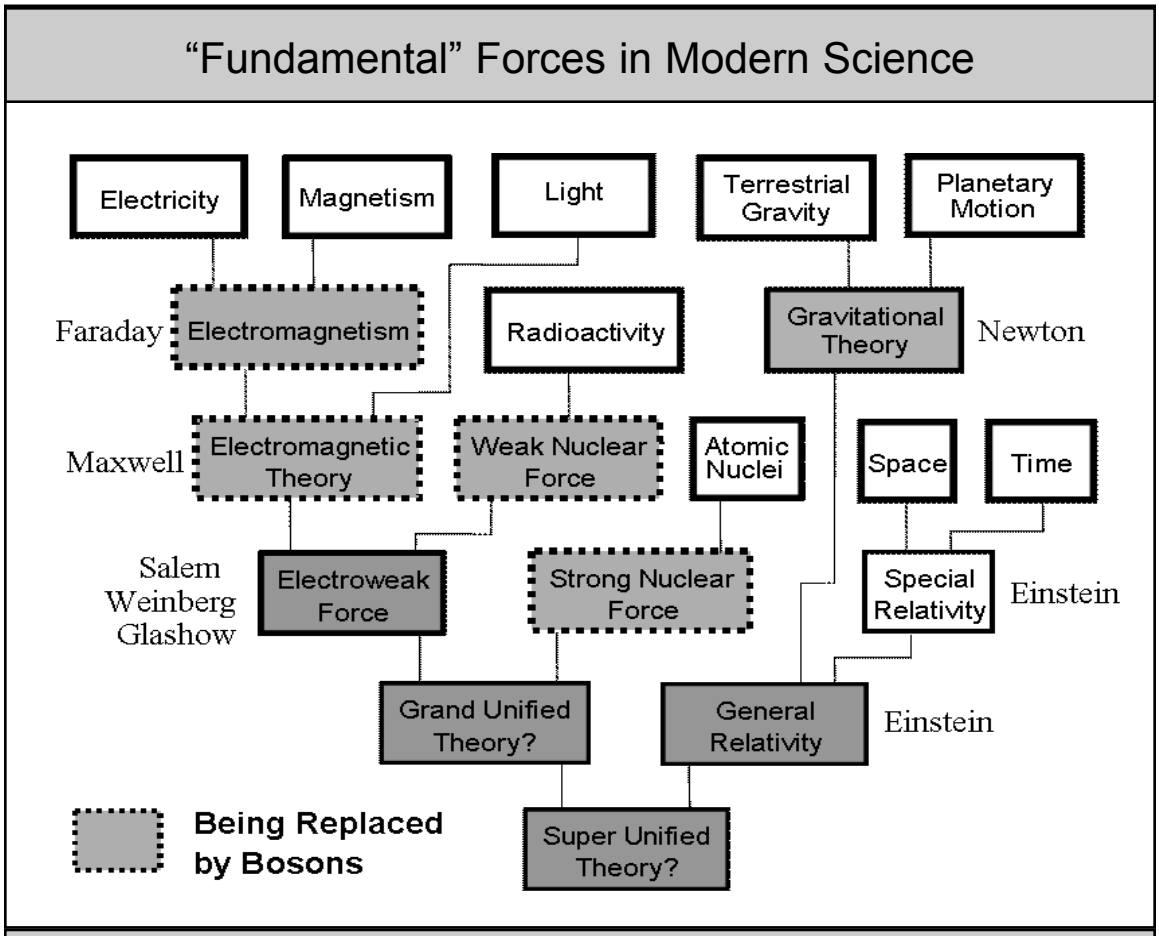

Figure 4
Unification of the Forces of Nature.

The chart shows a popular concept hoped to unify forces that predict fundamental natural phenomena. Evidently, unification of forces is more a goal than an achievement. (Basic features of the chart were taken from the CERN website.)

skaters throwing a ball at one another. The act of giving momentum to the ball in throwing it and of receiving momentum in catching it pushes the skaters apart. This accounts for repulsive forces. But in quantum mechanics, which affects small-scale phenomena, there is a strange extension and delocalization of events that allows a seemingly impossible event: one skater throws the ball away from the other, in the opposite direction, but the other skater is still able to catch the ball. A little thought shows that if such events were possible as they are in the world of elementary particles they would cause an attractive force between the skaters [22].

All the "force particles"…that are exchanged between the matter particles…are bosons. This also is significant: it means that photons, for example, can build up in the same state to construct the magnetic field around a magnet, or the electric field around an electric charge [22].

Other assertions of Quantum Mechanics are just as incredible as the idea that a particle travels the wrong direction to make contact with a second particle, including the contra-

diction between the two quotes above that "quantum mechanics, which affects small scale phenomena" also explains the large-scale phenomena of attraction and repulsion between two magnets. (Recently, apologists for Quantum Theory seem more inclined to apply the small-scale quantum aspects of quantum force theories to macro-size objects — apparently in hope of unifying their theories of Nature.)

Atomists claim that random events mediated by force-carrying particles govern the interactions between objects and between light and matter. Bosons (force-carrying particles) seemed particularly well suited to explain forces over short distances but remain unable to account for events outside the atom. (How can photons of light carry forces through opaque objects, as magnetic fields do?)

In Quantum Theory, low-energy photons are supposed to carry the force between electrons, medium-energy mesons are supposed to carry the force between the more massive protons and neutrons, and high-energy gluons are supposed to carry the force that holds quarks together in protons and neutrons. There are "too many particles" needed in QT. Clearly, QT is not unified within itself, nor with Relativity Theory.

Unified Theory of Forces. Modern physics is attempting to construct a unified theory of forces that combines the "four known forces" (Strong, Weak, Electromagnetic, and Gravitation) into a single Unified Force. Figure 4 shows the relationship of fundamental natural phenomena (blocks with white background) and various theories of force transmission (gray background). The chart suggests that more work is required on existing force theories and new ideas are needed.

Dark Energy. Since Figure 4 was created, cosmologists of The Big Bang persuasion have announced the universe is expanding at an ever-increasing rate. And, to account for this amazing expansion, a new form of energy known as Dark Energy and a new force has been declared to augment the previous four forces. The newly hypothesized force is said to be *gravity-in-reverse*, *i.e*. a force of repulsion that causes the Universe to expand.

Of course, those who believe in Dark Energy are further away from unifying the forces into a single force. But, Dark Energy may not be real, and many think that the entire Big Bang Cosmology is about to be toppled [24]. A supporting *law of cosmology* (the Hubble Law) may be invalid. A world-class astronomer states:

> The observational evidence has become overwhelming, and the Big Bang has in reality been toppled [25, *p.* ii].
>
> There is now a fashionable set of beliefs regarding the workings of the universe, greatly publicized as the Big Bang, which I believe is wildly incorrect [25, *p.* 2].

A prominent spokesman for modern physics states in an article on cosmology and universal characteristics that "Dark energy is most mysterious and disturbing." [26]

Universal Force Law. Recently, Lucas returned to the original experiments of Ampère on forces between currents. He assumed three-dimensional Euclidean Space and applied the Galilean Transformation, producing an equation of force that is superior to all previous work (of Newton, Weber, Maxwell, and Einstein). Results to date are impressive for predicting forces on particles moving with very high velocities [13, 14].

Furthermore, as the higher terms of acceleration and jerk are being included, a gravitation field has been found. This work may be the Universal Force Law that explains all the forces with the same theory and equation.

Conclusions on TOE. The unification of physics is almost a reality. This advance of physical theory is the result of derivations based on (1) three-dimensional space, (2) the Galilean Transformation, (3) the Ring Model of elementary particles, (4) self-field effects, (5) the electromagnetic character of matter and forces, and (6) the new Universal Force Law developed by Lucas [13].

The modern paradigms of physics, Quantum Theory and Relativity Theory, both hold that space is a physical entity and attempt to predict natural phenomena from this false premise.

The Ring Model brings together the real physical entities, charge and field energy, into a single self-consistent electrodynamics theory that predicts the known natural phenomena. The new Theory of Everything addresses the entire scope of *matter* and *forces* throughout the entire universe. The Universal Force Law proposed by Lucas applies at all scales, from atomic to galactic environments. Likewise, the Ring Model applies for objects ranging in size from the smallest elementary particle to atoms and molecules, and to aggregates of matter as large as the Great Wall of Galaxies.

Astronomer Halton Arp published data showing that the stellar red-shift is *not* a Doppler effect of the expanding universe, but may be caused by something inherent in matter (or hydrogen gas, to be more specific) [25]. The Ring Model provides an explanation for reddening of starlight by the enlargement of electrons in the presence of intense magnetic fields that permeate areas of the sky emitting the red-shifted light.

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