A Classical Electromagnetic Theory of Elementary Particles

Part 2, Intertwining Charge-Fibers

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Abstract. A new classical electrodynamics approach is presented in this paper to explain the existence of all the observed elementary particles, their internal symmetries, their principal decay modes and their principal interactions. This classical approach is based on the plasma physics experiments of Winston Bostick with plasmons that indicate how continuous charge-fibers exist without radiating energy and can be combined to build larger complex stable structures with great tensile strength.

In particular, a model consisting of classical electromagnetic intertwining charge-fibers in continuous loops is presented that explains the existence of all the observed elementary particles. It explains the physical origin of the 6 quarks and 6 leptons of the Standard Model. Furthermore it explains the physical origin of the 26 dimensions of the String Theory and the 10 dimensions of the Supersymmetric String Theory. Finally it explains how 6 of the Supersymmetric String Theory dimensions curl up to be non-observable.

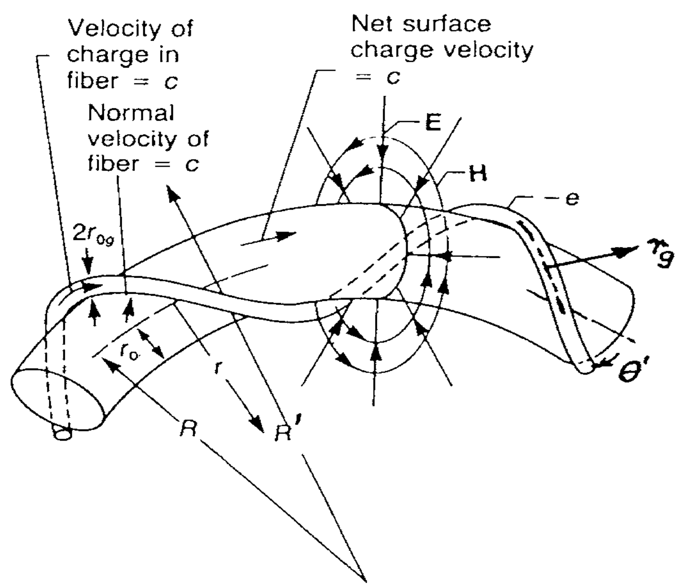

Figure 2.
Bostick's Toroidal Charge-Fiber Ring

Democritus defined the "atom" to be the smallest piece of matter—with hooks on it to hold things together. If he had only closed the hook to form a loop, he would have gotten it right! The tiny closed charge-fiber loop is the real "atom" of matter. This initial draft of a new purely classical electromagnetic model of elementary particles appears capable of accomplishing the scientists' goal of a unified theory of elementary particles and forces in a simply elegant manner with Platonic beauty. It is significant to the Judeo-Christian community, because it is purely electromagnetic in origin in agreement with their Scriptures. Also the model shows remarkable symmetry in the design of elementary particles uniquely identifying them with the triune Creator-God. The model is based on the Biblical and classical notion of cause and effect instead of the random chance of Quantum Theory. It has strong cosmological implications.

The Classical Electromagnetic Charge-Fiber Model. Toward the end of the nineteenth century most scientists were of the opinion that all the universe was electromagnetic in origin

[14]. There was great optimism at that time that even gravity would turn out to be electromagnetic in origin, since it had the same $1/R^2$ dependence as the electric force.

With the rapid succession of new scientific discoveries of the twentieth century, scientists were unable to keep pace with an electromagnetic explanation. As a result many new theories were added to science, *e.g.* Quantum Theory, Relativity Theory, Atomic Theory, Nuclear Theory, and Elementary Particle Theory.

This work is part of a larger work that seeks to build on the electrodynamics base of the nineteenth century and replace the rashly-introduced theories named above. Completely classical electrodynamics explanations for the structure of the atom [3,4,5], and the nucleus [6], as well as the emission spectra of the atom, black body radiation, and the photoelectric effect [7] have already been published. An Electromagnetic Theory of Gravity has been prepared for publication [20] along with an Electromagnetic Theory-of-Everything [21]. Also, a rigorous derivation of the origin of special "relativistic effects" due to the electrodynamic feedback effect from finite-size elastic charged particles has been published [8,20]. In all of these cases, the classical universal electrodynamics explanation based on finite-size charged elementary particles has proved to be superior in logic, describe more experimental data, and lead to a simpler theory than the one it is replacing.

In this same vein, a new completely classical electrodynamics Theory of Elementary Particles is introduced. It will be shown that this approach is superior to the Standard Model and the Supersymmetric String Model of Elementary Particles because it describes more elementary particles and their decay schemes, is far simpler, and satisfies more completely the logical standards underlying the scientific method.

Three Key Experiments. The key to developing an Electrodynamics Model of Elementary Particles is based upon a long history of papers [4]. For the purposes of this paper only the work of Arthur Compton, one of his last graduate students (Winston Bostick), and my own experiments will be referenced.

In 1917, Compton [9,10,11] published a series of experimental papers on the size and shape of the electron as determined by analysis of hard X-ray and gamma ray scattering from atoms. He showed that the results are consistent with scattering from thin flexible rings of charge, *i.e.* ring electrons. Compton also derived Owen's experimental law for fluorescent absorption of X-rays based on the electron ring model.

Starting in 1956 Bostick began developing plasma-focus devices and plasma-jet devices as part of the scientific effort to develop plasma fusion energy machines. With these devices he was able to demonstrate the existence of plasmoids. These spherical droplet-like charge structures were formed from charge-fibers. They were stable with a balance of internal forces. From scattering experiments with plasmoids Bostick discovered that the slender charge-fibers possessed a significant tensile strength.

In the late 1990's, gift shops in the United States began carrying a curiosity-device (perhaps based on Bostick's plasma jets) called a "Plasma-Force Ball" or a "Plasma Lightning Ball." This device is able to produce long charge-fibers that extend from a source at the center of a glass globe to the inner surface of the globe. By placing one's finger on the outer surface of the globe, where one of these charge-fibers ends on the inner surface of the globe, one can cause the fiber to split into multiple secondary fibers. Occasionally the primary fiber will split into multiple secondary fibers before it reaches the inner surface of the glass globe. These thinner secondary fibers split into multiple tertiary fibers upon contact with the inner surface of the glass sphere when your finger is in contact at the proper spot.

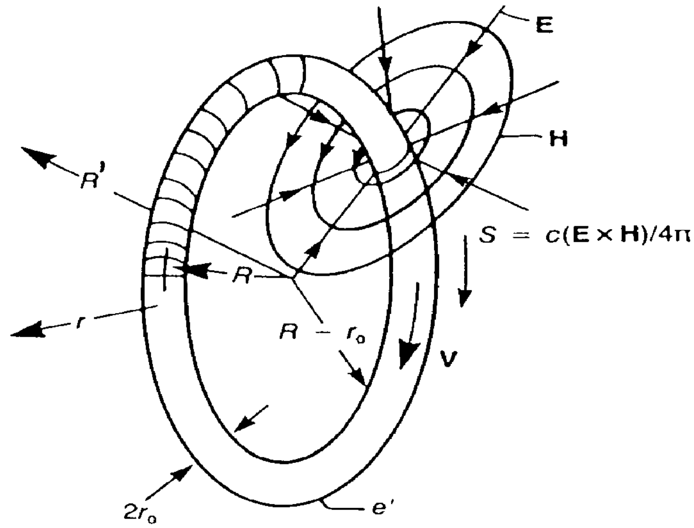

Figure 3.
Bostick's Toroidal Ring

Thus, experimentally it appears quite natural for charge-fibers to be complex such that there may be a primary charge-fiber that consists of multiple secondary charge-fibers—which in turn consist of multiple tertiary charge-fibers. The number of levels to which the primary charge-fiber may be physically subdivided beyond this is unknown, but three levels are sufficient to build a new Theory of Elementary Particles as explained below.

Charge-Fiber Ring Model of Elementary Particles. A new theory/model of elementary particles is presented below based on the three key experiments cited above. This model is completely compatible with classical electrodynamics. It is based upon the experimental observation that elementary particles, such as the electron, are composed of one or more charge-fibers or strings bound in a closed loop. From experimental observation the overall shape of charged elementary particles is a toroidal ring. Below is a list of some of the more important aspects of the model.

1. All elementary particles are composed of one or more primary continuous charge-fibers intertwined in a toroidal ring.

2. Primary charge-fibers may be complex, consisting of smaller intertwining secondary charge-fibers bound with higher binding energy due to $1/R^2$ force factor in the electromagnetic binding.

3. Secondary charge-fibers may be complex consisting of very small intertwining tertiary charge-fibers bound with very high binding energy due to the $1/R^2$ force factor in the electromagnetic binding.

4. The elementary charge-fibers have charge $+e/3$ or $-e/3$ where $-e$ is the total charge on the electron. (This is a reasonable assumption if the electron is a composite particle. The symmetry of the Table of Elementary charge-fiber particles suggests that they are composed of a small number of components. This was also the case for Mendeleyev's Table of Atoms, and led to the discovery of the electron, proton and neutron components. One argument used against this notion is the lack of experimental evidence for fractional charged particles. From the perspective of this model, there are no elementary particles with fractional charge to be observed.)

5. The observed chirality of the weak interaction requires that at least hadrons (particles that decay by the weak interaction) consist of an odd number of primary charge-fibers.

6. The total internal angular momentum of each charge-fiber in a particle is conserved in all interactions and decays. (Different internal rotating structures within primary fibers correspond to different types of angular momenta, each of which represent different conserved quantities according to Noether's Theorem.) The rotating secondary and tertiary fibers within a primary fiber have right- and left-handed helicity. (The helicity here corresponds in some sense to the chiral spinors of the electro-weak formulation. There the electromagnetic current can be written in terms of chiral spinors for right- and left-handed currents.)

7. All stable elementary particles consist of a single complex primary charge-fiber with total charge of 0 or $\pm e$.

8. In decay processes for unstable elementary particles involving multiple primary charge-fibers the charge-fibers making up the original toroid ring separate to form two or more new toroidal rings with the same total number of charge-fibers and the same total angular momentum. (This is equivalent to classical charge conservation and conservation of angular momentum. This is different from the Standard Model which only conserves the net charge and net angular momentum.)

9. Each charge-fiber in a toroidal ring of primary radius R can support multiple standing wave resonant states with wavelength = nR/m where $n = 1, 2, 3, \ldots$ $m = 1, 2, 3, \ldots$. (Note: Quantum Theories of point-particles require $m = 1$.)

10. Electron, muon, and taon neutrinos (spin = ½) and neutral pions (spin = 0) form vast clouds of neutral particles in the universe that help conserve various combinations of angular momentum in various elementary particle decay modes.

11. Generally the mass or total binding energy of a particle increases with the number of secondary and tertiary charge-fibers due to the $1/R^2$ factor in the electromagnetic binding forces.

12. The four types of fundamental forces with non-overlapping primary ranges shown in Chart 1 are really just different manifestations of the electromagnetic force due to the internal structure of matter.

$\downarrow$ represents an $-e/3$ charge-fiber loop

$\uparrow$ represents an $+e/3$ charge-fiber loop

$\overleftarrow{\Downarrow}$ represents two $-e/3$ charge-fibers intertwined with left-handed helicity to act as a larger charge-fiber

$\overrightarrow{\Downarrow}$ represents two $-e/3$ charge-fibers intertwined with right-handed helicity to act as a larger charge-fiber

$\overleftarrow{\Uparrow}$ represents two $+e/3$ charge-fibers intertwined with left-handed helicity to act as a larger charge-fiber

$\overrightarrow{\Uparrow}$ represents two $+e/3$ charge-fibers intertwined with right-handed helicity to act as a larger charge-fiber

$\overleftarrow{\Updownarrow}$ represents one $+e/3$ and one $-e/3$ charge-fiber intertwined with left-handed helicity to act as a larger charge-fiber

$\overrightarrow{\Updownarrow}$ represents one $+e/3$ and one $-e/3$ charge-fiber intertwined with right-handed helicity to act as a larger charge-fiber

$e^- = (\downarrow, \downarrow, \downarrow)$ represents one primary charge-fiber with three -*e*/3 secondary charge-fibers intertwined with left-handed helicity

$\nu_e = \overleftarrow{\Updownarrow} = \overleftarrow{\downarrow\uparrow}$ represents one primary charge-fiber with one -*e*/3 and one +*e*/3 charge-fibers intertwined with left-handed helicity

$\overline{\nu_e} = \overrightarrow{\Updownarrow} = \overrightarrow{\uparrow\downarrow}$ represents one primary charge-fiber with one +*e*/3 charge-fiber and one -*e*/3 charge-fiber intertwined with right-handed helicity to form the anti-particle

$\Sigma^\circ = \overleftarrow{\Uparrow}, \downarrow, (\uparrow, \overleftarrow{\Downarrow})$ represents three primary charge-fibers

- The first primary charge-fiber consists of two intertwined secondary charge-fibers with left-handed helicity.
- The second primary charge-fiber consists of a single $-e/3$ charge-fiber.
- The third primary charge-fiber in ( ) consists of a single secondary charge-fiber intertwined with two intertwined tertiary charge-fibers with left-handed helicity.

Chart 1. Table of Charge-Fiber Structure

13. All relativistic effects are due to the electromagnetic feedback effect of finite-size particles [8]. (Thus no additional Theories of Special and General Relativity are needed.)

14. All so-called "quantum effects" are due to conservation of angular momentum of charge-fibers and the absorption and emission of energy in standing-wave resonant states of charge-fibers. (Thus no separate theory of Quantum Mechanics is needed.)

15. The laws of electrodynamics (as derived from the fundamental laws of electrodynamics) are the same on all size scales and velocities. (This is a problem in logic for Quantum

Particle Symbol	Particle Name	Fiber Structure	Net Charge	Net Spin
d	Down Quark	$\downarrow$	$-e/3$	½
$\overline{d}$	Down Antiquark	$\uparrow$	$+e/3$	½
π^0	Neutral Pion Type 1	$\left(\downarrow,\uparrow\right)$	0	0
ν_e	Electron Neutrino	$\overleftarrow{\Updownarrow}$	0	½
$\overline{\nu}_e$	Electron Antineutrino	$\overrightarrow{\Updownarrow}$	0	½
u	Up Quark	$\overleftarrow{\Uparrow}$	$+2e/3$	½
$\overline{u}$	Up Antiquark	$\overrightarrow{\Downarrow}$	$-2e/3$	½
s	Strange Quark	$\left(\overleftarrow{\Downarrow},\uparrow\right)$	$-e/3$	½
$\overline{s}$	Strange Antiquark	$\left(\downarrow,\overrightarrow{\Uparrow}\right)$	$+e/3$	½
π^-	Negative Pion	$\left(\overleftarrow{\Downarrow},\downarrow\right)$	$-e$	0
π^+	Positive Pion	$\left(\uparrow,\overrightarrow{\Uparrow}\right)$	$+e$	0
π^0	Neutral Pion Type II	$\left(\overleftarrow{\Downarrow},\overrightarrow{\Uparrow}\right)$	0	0
ν_μ	Muon Neutrino	$\left(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right)$	0	½
$\overline{\nu}_\mu$	Muon Antineutrino	$\left(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow}\right)$	0	½
e^-	Electron	$\left(\downarrow,\downarrow,\downarrow\right)$	$-e$	½
e^+	Positron	$\left(\uparrow,\uparrow,\uparrow\right)$	$+e$	½
c	Charm Quark	$\left(\overleftarrow{\Uparrow},\downarrow,\uparrow\right)$	$+2e/3$	½
$\overline{c}$	Charm Antiquark	$\left(\downarrow,\uparrow,\overrightarrow{\Downarrow}\right)$	$-2e/3$	½
n	Neutron	$\left(\downarrow,\overleftarrow{\Uparrow},\downarrow\right)$	0	½
$\overline{n}$	Antineutron	$\left(\uparrow,\overrightarrow{\Downarrow},\uparrow\right)$	0	½
b	Bottom Quark	$\left(\overleftarrow{\Downarrow},\overrightarrow{\Uparrow},\downarrow\right)$	$-e/3$	½
$\overline{b}$	Bottom Antiquark	$\left(\uparrow,\overleftarrow{\Downarrow},\overrightarrow{\Uparrow}\right)$	$+e/3$	½
p	Proton	$\left(\overleftarrow{\Uparrow},\downarrow,\overleftarrow{\Uparrow}\right)$	$+e$	½
$\overline{p}$	Antiproton	$\left(\overrightarrow{\Downarrow},\uparrow,\overrightarrow{\Downarrow}\right)$	$-e$	½
t	Top Quark	$\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow},\overleftarrow{\Uparrow}\right)$	$+2e/3$	½
$\overline{t}$	Top Antiquark	$\left(\overrightarrow{\Downarrow},\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)$	$-2e/3$	½
ν_τ	Taon Neutrino	$\left(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow}\right)$	0	½
$\overline{\nu}_\tau$	Taon Antineutrino	$\left(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right)$	0	½

Chart 2.
Primary Fiber Structures

All combinations of secondary and tertiary charge-fibers to form a primary charge-fiber.

Mechanics which denies the validity of the radiation laws of electrodynamics on the microscopic scale.)

16. The laws of mechanics (as derived from the fundamental laws of electrodynamics) are the same on all size scales and velocities. (This is a problem in logic for the relativistic Quantum theories of the atom for *l* = 0 states.)

Particle Symbol	***Particle Name***	***Quark Structure***	***Fiber Structure***	***Net Charge***	***Net Spin***	***Principal Decay Modes***
e^-	Electron	None	$(\downarrow,\downarrow,\downarrow)$	-1	½	
ν_e	Electron Neutrino	None	$\overleftarrow{\Updownarrow}$	0	½	
μ^-	Negative Muon	None	$(\downarrow,\downarrow,\downarrow),\overrightarrow{\Updownarrow},(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow})$ $e^-\quad\overline{\nu}_e\quad\nu_\mu$	-1	½	$(\downarrow,\downarrow,\downarrow)+\overrightarrow{\Updownarrow}+(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow})$ $e^- + \overline{\nu}_e + \nu_\mu$
			$(\downarrow,\downarrow,\downarrow),(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow})$ $e^-\quad\overline{\nu}_\tau$			$(\downarrow,\downarrow,\downarrow)+\overrightarrow{\Updownarrow}+(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow})$ $e^- + \overline{\nu}_e + \nu_\mu$
ν_μ	Muon Neutrino	None	$(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow})$	0	½	
τ^-	Negative Taon	None	$(\downarrow,\downarrow,\downarrow),(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow}),(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow})$ $e^-\quad\overline{\nu}_\mu\quad\nu_\tau$	-1	½	$(\downarrow,\downarrow,\downarrow)+\overrightarrow{\Updownarrow}+(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow})$ $e^- + \overline{\nu}_e + \nu_\tau$
			$(\downarrow,\downarrow,\downarrow),(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}),(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow})$ $e^-\quad\overline{\nu}_\tau\quad\nu_\tau$			$(\downarrow,\downarrow,\downarrow)+(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow})+(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow})$ $e^- + \overline{\nu}_\mu + \nu_\tau$
			$(\downarrow,\downarrow,\downarrow),(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}),(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow})$ $e^-\quad\overline{\nu}_\tau\quad\nu_\tau$			$\downarrow,\overrightarrow{\Downarrow},(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow}),(\downarrow,\uparrow)+(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow})$ $\rho^- + \nu_\tau$
ν_τ	Taon Neutrino	None	$(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow})$	-1	½	

Chart 3. Leptons

The significance of these sixteen points will be made more explicit in the following sections which will explain the structure of each elementary particle and its principal decay schemes.

Tables of Elementary Particles with Internal Structure and Decay Modes. A number of symbols are used in the tables to indicate the charge-fiber structure of each elementary particle. Symbols readily available to word processors were chosen for ease of communication. They are shown in Chart 1.

Note that there are two orientations of charge-fiber loops, *i.e*. parallel and antiparallel in Chart 1. In both cases there is a stable binding condition. For the parallel case, the like charge-fiber loops repel electrically and attract magnetically due to Ampere's force. For the antiparallel case the

Particle Symbol	Particle Name	Quark Structure	Fiber Structure	Net Charge	Net Spin	Principal Decay Modes
p	Proton	udu	$\left(\overleftarrow{\Uparrow},\downarrow,\overleftarrow{\Uparrow}\right)$	+1	½	None Observed
n	Neutron	dud	$\left(\downarrow,\overleftarrow{\Uparrow},\downarrow\right)$	0	½	
			$\left(\downarrow,\overleftarrow{\Uparrow},\downarrow\right),\left(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right),\left(\downarrow,\uparrow\right)$ $n \quad \nu_\mu \quad \pi^0$			$\left(\overleftarrow{\Uparrow},\downarrow,\overleftarrow{\Uparrow}\right)+\left(\downarrow,\downarrow,\downarrow\right)+\overrightarrow{\Updownarrow}$ $p \quad + \quad e^- \quad + \bar{\nu}_e$
Λ	Lambda	dus	$\downarrow,\overleftarrow{\Uparrow},\left(\overleftarrow{\Downarrow},\uparrow\right)$	0	½	
			$\downarrow,\overleftarrow{\Uparrow},\left(\overleftarrow{\Downarrow},\uparrow\right),\overleftarrow{\Updownarrow},\left(\downarrow,\uparrow\right)$ $\Lambda \quad \upsilon_e \quad \pi^0$			$\left(\overleftarrow{\Uparrow},\downarrow,\overleftarrow{\Uparrow}\right)+\left(\overleftarrow{\Downarrow},\downarrow\right),\left(\downarrow,\uparrow\right)$ $p \quad + \quad \pi^-$
						$\left(\downarrow,\overleftarrow{\Uparrow},\downarrow\right)+\left(\overleftarrow{\Downarrow},\overrightarrow{\Uparrow}\right)+\left(\downarrow,\uparrow\right)$ $n \quad +\left(\pi^0 \quad + \quad \pi^0\right)$

Chart 4. Baryons with spin 1/2. Antiparticles are not shown. See reference [1].

oppositely charged fiber loops attract electrically and repel magnetically due to Ampere's force law. Due to a different radial dependence in the electric and magnetic forces, each case has a different equilibrium distance.

Before listing all the elementary particles in a table, it is instructive to consider all the possible combinations of single and parallel secondary and tertiary charge-fibers that could be made to form a primary fiber. See Chart 2. For ease of comparison with the Standard Model a correlation is made of these combinations with the various quarks and other particles. The $\bar{d}$ is the down antiquark, etc. Note that the fractional charge entries for primary fibers can be easily identified with the 12 quarks of the Standard Model. The other entries are for the leptons and the pions suggesting that they have a role more comparable to that of quarks.

Below is a table, Chart 3, of the light elementary particles called leptons. The antiparticle leptons can be constructed from the particle leptons and are not shown. The rows for each lepton give the various fiber structures of that particle according to its decay scheme assuming conservation of helicity or fiber angular momentum and total number of charge-fibers. The internal structure of these elementary particles is broken up into substructures and labeled for instructional purposes. Note that some leptons (such as the taon) have multiple sets of internal structures that decay into different particles. The difference in these structures is due to the addition of various neutrinos. In this Model of Elementary Particles, the universe is filled with neutrinos and one form of neutral pions that can readily attach to the core structure of an elementary particle, such as the electron, and cause it to have a different decay schemes. These neutrinos and neutral pions compose the "missing" or dark matter of the universe that astronomers seek.

Particle Symbol	***Particle Name***	***Quark Structure***	***Fiber Structure***	***Net Charge***	***Net Spin***	***Principal Decay Modes***
Σ^{+}	Positive Sigma	usu	$\overleftarrow{\Uparrow},\left(\overleftarrow{\Downarrow},\uparrow\right),\overleftarrow{\Uparrow}$	+1	½	
			$\overleftarrow{\Uparrow},\left(\overleftarrow{\Downarrow},\uparrow\right),\overleftarrow{\Uparrow},\overrightarrow{\Updownarrow},\left(\downarrow,\uparrow\right)$ $\Sigma^{+} \quad \upsilon_e \quad \pi^0$			$\left(\overleftarrow{\Uparrow},\downarrow,\overleftarrow{\Uparrow}\right)+\left(\overleftarrow{\Downarrow},\overrightarrow{\Uparrow}\right)+\left(\downarrow,\uparrow\right)$ $p \quad + \left(\pi^0 \ + \ \pi^0\right)$
						$\left(\downarrow,\overleftarrow{\Uparrow},\downarrow\right),\left(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right)+\left(\uparrow,\overrightarrow{\Uparrow}\right),\left(\downarrow,\uparrow\right)$ $n \quad + \quad \pi^{+}$
Σ^{-}	Negative Sigma	dds	$\downarrow,\downarrow,\left(\overleftarrow{\Downarrow},\uparrow\right)$	-1	½	
			$\downarrow,\downarrow,\left(\overleftarrow{\Downarrow},\uparrow\right),\left(\overleftarrow{\Updownarrow},\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right),\left(\downarrow,\uparrow\right)$ $\Sigma^{-} \quad \upsilon_\tau \quad \pi^0$			$\left(\downarrow,\overleftarrow{\Uparrow},\downarrow\right),\left(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right)+\left(\overleftarrow{\Downarrow},\downarrow\right),\left(\downarrow,\uparrow\right)$ $n \quad + \quad \pi^{-}$
Ξ^{0}	Neutral X	sus	$\left(\overleftarrow{\Downarrow},\uparrow\right),\overleftarrow{\Uparrow},\left(\overleftarrow{\Downarrow},\uparrow\right)$	0	½	
			$\left(\overleftarrow{\Downarrow},\uparrow\right),\overleftarrow{\Uparrow},\left(\overleftarrow{\Downarrow},\uparrow\right),\left(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right),\left(\downarrow,\uparrow\right)$ $\Xi^{0} \quad \upsilon_\mu \quad \pi^0$			$\downarrow,\overleftarrow{\Uparrow},\left(\overleftarrow{\Downarrow},\uparrow\right),\overleftarrow{\Updownarrow}+\left(\overleftarrow{\Downarrow},\overrightarrow{\Uparrow}\right)+\left(\downarrow,\uparrow\right)$ $\Lambda \quad + \left(\pi^0 \ + \ \pi^0\right)$
Ξ^{-}	Negative Xi	dss	$\downarrow,\downarrow,\left(\overleftarrow{\Downarrow},\uparrow\right)$	-1	½	
			$\downarrow,\downarrow,\left(\overleftarrow{\Downarrow},\uparrow\right),\left(\overleftarrow{\Updownarrow},\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right),\left(\downarrow,\uparrow\right)$ $\Sigma^{-} \quad \upsilon_\tau \quad \pi^0$			$\downarrow,\overleftarrow{\Uparrow},\left(\overleftarrow{\Downarrow},\uparrow\right),\overleftarrow{\Updownarrow}+\left(\overleftarrow{\Downarrow},\downarrow\right),\left(\downarrow,\uparrow\right)$ $\Lambda \quad + \quad \pi^{-}$
Λ_C^{+}	Charmed Lambda	udc	$\overleftarrow{\Uparrow},\downarrow,\left(\overleftarrow{\Uparrow},\downarrow,\uparrow\right)$	+1	½	None

Chart 4. Baryons with spin ½ (continued).
Antiparticles are not shown. See reference [1].

All of the tables of the heavier elementary particles below have a standard structure. For each elementary particle in the tables, the Standard Model definition of the particle is given in the first row for each particle. These elementary particles are defined in terms of the quarks of the Standard Model. The charge-fiber structure for these quarks is given in terms of this Electrodynamics Model for comparison sake. The rows below the first row for each elementary particle give the various full structures of that elementary particle according to the Electrodynamics Model and show its decay scheme assuming conservation of helicity or fiber angular momentum and total number of charge-fibers. Again the internal structure of these elementary particles is broken up into substructures and labeled. One can easily see from the tables that the Standard Model does not conserve the total number of charge-fibers nor helicity or fiber angular momentum, because it has only part of the total structure of elementary particles. The reason that part of the structure is missing appears to be due to the assumption of the

Particle Symbol	*Particle Name*	*Quark Structure*	*Fiber Structure*	*Net Charge*	*Net Spin*	*Principal Decay Modes*
Δ^{++}	Delta ++	uuu	$\overleftarrow{\Uparrow},\overleftarrow{\Uparrow},\overleftarrow{\Uparrow}$ $\overleftarrow{\Uparrow},\overleftarrow{\Uparrow},\overleftarrow{\Uparrow},(\downarrow,\uparrow),(\downarrow,\uparrow)$ $\Delta^{++}\quad \pi^0\quad \pi^0$	+2	3/2	 $(\overleftarrow{\Uparrow},\downarrow,\overrightarrow{\Uparrow})+(\overleftarrow{\Uparrow},\uparrow),(\downarrow,\uparrow)$ $p\quad +\quad \pi^+$
Δ^{+}	Delta +	uud	$\overleftarrow{\Uparrow},\overleftarrow{\Uparrow},\downarrow$ $\overleftarrow{\Uparrow},\downarrow,\overrightarrow{\Uparrow},(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}),(\downarrow,\uparrow)$ $\Delta^{+}\quad \upsilon_\mu\quad \pi^0$	+1	3/2	 $(\overleftarrow{\Uparrow},\downarrow,\overrightarrow{\Uparrow})+(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow})+(\downarrow,\uparrow)$ $p\quad +(\pi^0\ +\ \pi^0)$ $(\downarrow,\overleftarrow{\Uparrow},\downarrow),(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow})+(\overleftarrow{\Uparrow},\uparrow)$ $n\quad +\quad \pi^+$
Δ^{0}	Delta 0	udd	$\downarrow,\overleftarrow{\Uparrow},\downarrow$ $\overleftarrow{\Uparrow},\downarrow,\downarrow,(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}),(\downarrow,\uparrow)$ $\Delta^{0}\quad \nu_\mu\quad \pi^0$ $\overleftarrow{\Uparrow},\downarrow,\downarrow,(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}),(\downarrow,\uparrow),(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}),(\downarrow,\uparrow)$ $\Delta^{0}\quad \nu_\mu\quad \pi^0\quad \nu_\mu\quad \pi^0$	0	3/2	 $(\overleftarrow{\Uparrow},\downarrow,\overrightarrow{\Uparrow})+(\overleftarrow{\Downarrow},\downarrow),(\downarrow,\uparrow)$ $p\quad +\quad \pi^+$ $(\downarrow,\overleftarrow{\Uparrow},\downarrow),(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}),(\downarrow,\uparrow)+(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow})+(\downarrow,\uparrow)$ $n\quad +(\pi^0\ +\ \pi^0)$
Δ^{-}	Delta -	ddd	$\downarrow,\downarrow,\downarrow$ $\downarrow,\downarrow,\downarrow,(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow}),(\downarrow,\uparrow)$ $\Delta^{-}\quad \nu_\mu\quad \pi^0$	-1	3/2	 $(\downarrow,\overleftarrow{\Uparrow},\downarrow)+(\overrightarrow{\Downarrow},\downarrow),(\downarrow,\uparrow)$ $n\quad +\quad \pi^-$
Σ^{+}	Sigma +	uus	$\overleftarrow{\Uparrow},\overleftarrow{\Uparrow},(\overleftarrow{\Downarrow},\uparrow)$ $\overleftarrow{\Uparrow},\overleftarrow{\Uparrow},(\overleftarrow{\Downarrow},\uparrow),\overleftarrow{\Updownarrow},(\downarrow,\uparrow)$ $\Sigma^{+}\quad \nu_e\quad \pi^0$	+1	3/2	 $\downarrow,\overleftarrow{\Uparrow},(\overleftarrow{\Downarrow},\uparrow),\overleftarrow{\Updownarrow}+(\overleftarrow{\Uparrow},\uparrow)$ $\Lambda\quad +\quad \pi^+$

Chart 5. Baryons with Spin 3/2.
Antiparticles are not shown.

Standard Model that nature follows exactly the symmetry of irreducible groups.

An examination of Chart 2 for primary fiber structures reveals that there are many primary fiber structures on an equal footing with quarks in this model. They include *e*−, *e*+, *p*+, and *p*−, the neutral pions, and the neutrinos. Thus it appears that accelerator experiments and nuclear decay processes produce copious quantities of primary fiber structures as listed above. Only the quarks

Particle Symbol	*Particle Name*	*Quark Structure*	*Fiber Structure*	*Net Charge*	*Net Spin*	*Principal Decay Modes*
Σ^0	Sigma 0	uds	$\downarrow,\overleftarrow{\Uparrow},(\overleftarrow{\Downarrow},\uparrow)$	0	3/2	
			$\downarrow,\overleftarrow{\Uparrow},(\overleftarrow{\Downarrow},\uparrow),(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}),(\downarrow,\uparrow)$ $\Sigma^0 \quad \nu_\mu \quad \pi^0$			$\downarrow,\overleftarrow{\Uparrow},(\overleftarrow{\Downarrow},\uparrow)+(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow})+(\downarrow,\uparrow)$ $\Lambda \quad + (\pi^0 + \pi^0)$
Σ^-	Sigma –	dds	$\downarrow,\downarrow,(\overleftarrow{\Downarrow},\uparrow)$	-1	3/2	
						$\downarrow,\overleftarrow{\Uparrow},(\overleftarrow{\Downarrow},\uparrow)+(\overleftarrow{\Downarrow},\downarrow)$ $\Lambda \quad + \pi^-$
Ξ^0	Xi 0	sus	$(\overleftarrow{\Downarrow},\uparrow),\overleftarrow{\Uparrow},(\overleftarrow{\Downarrow},\uparrow)$	0	-1	
			$(\overleftarrow{\Downarrow},\uparrow),\overleftarrow{\Uparrow},(\overleftarrow{\Downarrow},\uparrow),\overleftarrow{\Updownarrow},(\downarrow,\uparrow),(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow}),(\downarrow,\uparrow)$ $\Xi^0 \quad \nu_e \quad \pi^0 \quad \bar{\nu}_\mu \quad \pi^0$			$\downarrow,(\overleftarrow{\Downarrow},\uparrow),(\overleftarrow{\Downarrow},\uparrow),\overleftarrow{\Updownarrow}+(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow})+(\downarrow,\uparrow)$ $\Xi^- \quad + (\pi^0 + \pi^0)$
Ξ^-	Xi –	dss	$\downarrow,(\overleftarrow{\Downarrow},\uparrow),(\overleftarrow{\Downarrow},\uparrow)$	-1	3/2	
			$\downarrow,(\overleftarrow{\Downarrow},\uparrow),(\overleftarrow{\Downarrow},\uparrow),\overleftarrow{\Updownarrow},(\downarrow,\uparrow),(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow}),(\downarrow,\uparrow)$ $\Xi^- \quad \nu_e \quad \pi^0 \quad \bar{\nu}_\mu \quad \pi^0$			$(\overleftarrow{\Downarrow},\uparrow),\overleftarrow{\Uparrow},(\overleftarrow{\Downarrow},\uparrow),\overleftarrow{\Updownarrow}+\overleftarrow{\Downarrow},\downarrow,(\downarrow,\uparrow)$ $\Xi^0 \quad + \quad \pi^-$
Ω^-	Omega –	sss	$(\overleftarrow{\Downarrow},\uparrow),(\overleftarrow{\Downarrow},\uparrow),(\overleftarrow{\Downarrow},\uparrow)$	-1	3/2	
			$(\overleftarrow{\Downarrow},\uparrow),(\overleftarrow{\Downarrow},\uparrow),(\overleftarrow{\Downarrow},\uparrow),(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}),(\downarrow,\uparrow)$ $\Omega^- \quad \nu_\mu \quad \pi^0$			$(\overleftarrow{\Downarrow},\uparrow),\overleftarrow{\Uparrow},(\overleftarrow{\Downarrow},\uparrow),\overleftarrow{\Updownarrow}+(\overleftarrow{\Downarrow},\downarrow),(\downarrow,\uparrow)$ $\Xi^0 \quad + \quad \pi^-$
						$\downarrow,(\overleftarrow{\Downarrow},\uparrow),(\overleftarrow{\Downarrow},\uparrow),\overleftarrow{\Updownarrow}+(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow})+(\downarrow,\uparrow)$ $\Xi^- \quad + (\pi^0 + \pi^0)$
			$(\overleftarrow{\Downarrow},\uparrow),(\overleftarrow{\Downarrow},\uparrow),(\overleftarrow{\Downarrow},\uparrow),\overleftarrow{\Updownarrow},(\downarrow,\uparrow)$ $\Omega^- \quad \nu_e \quad \pi^0$			$\downarrow,\overleftarrow{\Uparrow},(\overleftarrow{\Downarrow},\uparrow)+(\overleftarrow{\Downarrow},\uparrow),\overleftarrow{\Downarrow},(\downarrow,\uparrow)$ $\Lambda \quad + \quad K^-$

Chart 5. Baryons with spin 3/2 (continued). Antiparticles are not shown.

are not easily observed. This is probably due to their strong affinity to couple with other fibers. The neutrinos have a similar affinity and they are difficult to detect.

An examination of Chart 3 for leptons reveals that e^-, e^+, μ^-, μ^+, τ^-, and τ^+ consist of an odd number of primary charge-fibers which can have complex internal structure. All of the decays satisfy conservation of angular momentum of fiber helicity and total number of charge-fiber

Particle Symbol	***Particle Name***	***Quark Structure***	***Fiber Structure***	***Net Charge***	***Net Spin***	***Principal Decay Modes***
π^+	Positive Pion	$u\bar{d}$	$\overleftarrow{\Uparrow},\uparrow$	+1	0	
			$(\overleftarrow{\Uparrow},\uparrow),(\downarrow,\uparrow)$ $\pi^+ \quad \pi^0$			$(\uparrow,\uparrow,\uparrow)+\overleftarrow{\Updownarrow}$ $e^+ + \nu_e$
			$(\overleftarrow{\Uparrow},\uparrow),(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}),(\downarrow,\uparrow),(\downarrow,\uparrow)$ $\pi^+ \quad \nu_\mu \quad \pi^0 \quad \pi^0$			$(\uparrow,\uparrow,\uparrow)+\overleftarrow{\Updownarrow}+(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow})+(\downarrow,\uparrow)$ $e^+ + \nu_e + (\pi^0 + \pi^0)$
			$(\overleftarrow{\Uparrow},\uparrow),(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}),(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow}),(\downarrow,\uparrow)$ $\pi^+ \quad \nu_\mu \quad \bar{\nu}_\mu \quad \pi^0$			$(\uparrow,\uparrow,\uparrow),\overrightarrow{\Updownarrow},(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow})+(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow})$ $\mu^+ \quad \nu^\mu$
π^-	Negativ e Pion	$d\bar{u}$	$\downarrow,\overrightarrow{\Downarrow}$	-1	0	
			$(\downarrow,\overrightarrow{\Downarrow}),(\downarrow,\uparrow)$ $\pi^- \quad \pi^0$			$(\downarrow,\downarrow,\downarrow)+\overrightarrow{\Updownarrow}$ $e^- + \bar{\nu}_e$
			$(\downarrow,\overrightarrow{\Downarrow}),(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}),(\downarrow,\uparrow),(\downarrow,\uparrow)$ $\pi^- \quad \nu_\mu \quad \pi^0 \quad \pi^0$			$(\downarrow,\downarrow,\downarrow)+\overrightarrow{\Updownarrow}+(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow})+(\downarrow,\uparrow)$ $e^- + \bar{\nu}_e + (\pi^0 + \pi^0)$
			$(\downarrow,\overrightarrow{\Downarrow}),(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}),(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow}),(\downarrow,\uparrow)$ $\pi^- \quad \nu_\mu \quad \bar{\nu}_\mu \quad \pi^0$			$(\downarrow,\downarrow,\downarrow),\overrightarrow{\Updownarrow},(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow})+(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow})$ $\mu^- + \bar{\nu}_\mu$
π^0	Neutral Pion	$u\bar{u}$	$\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}$	0	0	$\gamma + \gamma$
			$(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}),(\downarrow,\uparrow)$ $\pi^0 \quad \pi^0$			$(\downarrow,\downarrow,\downarrow)+(\uparrow,\uparrow,\uparrow)+\gamma$ $e^- + e^+ + \gamma$
π^0	Neutral Pion	$d\bar{d}$	$\downarrow,\uparrow$	0	0	Not Observed
			$(\downarrow,\uparrow)$			

Chart 6. Pseudoscaler Mesons With Spin 0. Antiparticles Are Not Shown.

loops. The electron consists of a single primary charge-fiber. The muon has three primary charge-fibers. The taon has five primary charge-fibers. The only stable leptons, *i.e.* e, ν_τ, ν_μ, and ν_l, consist of a single primary charge-fiber. The muons and taon are seen to be just electrons coupled together with neutrinos in semi-stable states.

An examination of Chart 4 for spin ½ baryons shows that all the baryons consist of an odd number of primary charge-fibers satisfying chirality. Conservation of fiber angular momentum or fiber helicity and total number of charge-fibers holds for all decays. However, the fiber structure of each baryon is slightly different from what one would expect from the Standard Model. Standard Model structures due to associated quark structures are shown in bold. Using the charge-fiber approach to define the internal structure of quarks and thereby all hadrons, ones sees that the Standard Model is unable to conserve either total angular momentum/fiber helicity or total number of fiber loops. The only stable baryons consist of a single primary charge-fiber.

Since the Standard Model is based solely on symmetry, it only conserves net angular momentum and net charge. Thus it misses any neutrinos or neutral pions that make up principal fibers of the various elementary particles. In the charts 4-7, each Standard Model structure in bold type is given the more complete definition of the Electrodynamics Model. Only for the Electrodynamics Model structures can the principal decay modes be explained (which conserve fiber angular momentum or helicity and total number of charge-fibers).

An examination of Chart 5 for spin 3/2 baryons shows that these baryons also consist of an odd number of primary charge-fibers satisfying chirality. Conservation of angular momentum and total number of charge-fibers hold for all decays. Again one sees from the Standard Model information in the chart that it is unable to conserve either total angular momentum or total number of charge-fiber loops.

An examination of Chart 6 for spin 0 pseudo-scalar mesons reveals that they consist of an odd and even number of primary charge-fibers. Note that the Standard Model would suggest an even number of quarks or charge-fibers. Again all of the decays satisfy conservation of angular momentum and total number of charge-fiber loops. In order for this to be true, one must consistently use the definition of all the particles as defined by the Charge-Fiber Model. The Standard Model definitions do not have this sort of consistency. Note that ($\pi^0 + \pi^0$) is just the Standard Model neutral pion but is two different neutral pion particles in the Charge-Fiber Model.

An examination of Chart 7 for vector mesons with spin 1 reveals that they also consist of an odd and even number of primary charge-fibers. Again the Standard Model would suggest an even number of quarks or charge-fibers. All of the decays satisfy conservation of angular momentum and total number of charge-fiber loops.

In summary it appears that all stable elementary particles consist of only one primary charge-fiber. These are the electron, positron, proton, antiproton, the neutral pion, and the electron neutrino, muon neutrino, and taon neutrino. All particles consisting of multiple primary charge-fibers are electromagnetically unstable.

Some of the elementary particles identified as necessary to fill out various symmetry groups in the Standard Model, such as the Σ^o or Λ, are not unique groupings of charge-fibers from the viewpoint of the Charge-Fiber Model. Thus, from this perspective, some of them should not be considered as elementary particles.

The classical Electromagnetic Model of Elementary Particles above may not be unique. The model presented was designed to be as similar as possible to the Standard Model using fractional charges. Another model might be constructed using whole charges, but it would not be very similar to the Standard Model.

Elementary Particle Reactions. Historically there have been various approaches to elementary particle reactions that are based on conservation of energy and momentum plus various symmetries identified with particular quantum numbers. These approaches depend somewhat on the prevailing model of elementary particles at the time.

There is a general principle in particle physics called "crossing symmetry". If a reaction of the form

$$A + B \rightarrow C + D$$

is known to occur, any of these particles can be "crossed" over to the other side of the equation provided it is changed into its antiparticle and the resulting interaction satisfies energy and momentum conservation and other conservation laws. Thus it is possible to have

$$A \rightarrow \overline{B} + C + D$$

$$A + \overline{C} \rightarrow \overline{B} + D$$

$$\overline{C} + \overline{D} \rightarrow \overline{A} + \overline{B}$$

where the standard notation for antiparticle is an overbar.

The reverse reaction

$$C + D \rightarrow A + B$$

comes from the principle of "detailed balance" rather than from "crossing symmetry".

In the Charge-Fiber Model of Elementary Particles there are *crossing symmetry* and *reverse reactions* where the total number of charge-fibers is conserved as well as the angular momentum. Of course, conservation of energy and momentum can rule out some reactions.

Another approach to particle reactions has been in terms of PCT, *i.e.* Parity, Charge and Time-reversal invariance. Schwinger and Luders discovered the TCP Theorem and it was perfected by Pauli [15]. The TCP Theorem was based on the basic notions of Lorentz invariance, Quantum Mechanics, and the idea that interactions are mediated by fields. It had implications that were subject to experimental verification. If the theorem was correct, every particle must have precisely the same mass and lifetime as its antiparticle.

At first the TCP theorem was ignored, because everyone thought T, C, and P were all perfect symmetries individually. However, from the perspective of the Standard Model, it was discover-

Particle Symbol	*Particle Name*	*Quark Structure*	*Fiber Structure*	*Net Charge*	*Net Spin*	*Principal Decay Modes*
K^+	Positive Kaon	$u\bar{s}$	$\overleftarrow{\Uparrow},\left(\downarrow,\overrightarrow{\Uparrow}\right)$	+1	0	
			$\overleftarrow{\Uparrow},\left(\downarrow,\overrightarrow{\Uparrow}\right),\overrightarrow{\Updownarrow},\left(\downarrow,\uparrow\right)$ $K^+ \quad \overline{\nu}_e \quad \pi^0$			$\left(\overrightarrow{\Uparrow},\uparrow\right)+\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)+\left(\downarrow,\uparrow\right)$ $\pi^+ + \left(\pi^0 + \pi^0\right)$
						$\left(\overrightarrow{\Uparrow},\uparrow\right)+\left(\downarrow,\overleftarrow{\Downarrow}\right)+\left(\overrightarrow{\Uparrow},\uparrow\right)$ $\pi^+ + \pi^- + \pi^+$
			$\overleftarrow{\Uparrow},\left(\downarrow,\overrightarrow{\Uparrow}\right),\overrightarrow{\Updownarrow},\left(\downarrow,\uparrow\right),\left(\downarrow,\uparrow\right)$ $K^+ \quad \overline{\nu}_e \quad \pi^0 \quad \pi^0$			$\left(\uparrow,\uparrow,\uparrow\right)+\overleftarrow{\Updownarrow}+\left(\downarrow,\overleftarrow{\Downarrow}\right)+\left(\overrightarrow{\Uparrow},\uparrow\right)$ $e^+ + \nu_e + \pi^- + \pi^+$
			$\overleftarrow{\Uparrow},\left(\downarrow,\overrightarrow{\Uparrow}\right),\overrightarrow{\Updownarrow},\left(\downarrow,\uparrow\right),\left(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right),\left(\downarrow,\uparrow\right)$ $K^+ \quad \overline{\nu}_e \quad \pi^0 \quad \nu_\mu \quad \pi^0$			$\left(\overrightarrow{\Uparrow},\uparrow\right)+\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)+\left(\downarrow,\uparrow\right)+\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)+\left(\downarrow,\uparrow\right)$ $\pi^+ + \left(\pi^0 + \pi^0\right) + \left(\pi^0 + \pi^0\right)$
			$\overleftarrow{\Uparrow},\left(\downarrow,\overrightarrow{\Uparrow}\right),\left(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right),\left(\downarrow,\uparrow\right)$ $K^+ \quad \overline{\nu}_\tau \quad \pi^0$			$\left(\uparrow,\uparrow,\uparrow\right),\overleftarrow{\Updownarrow},\left(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow}\right)+\left(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right)$ $\mu^+ + \nu_\mu$
K^-	Negative Kaon	$s\bar{u}$	$\left(\overleftarrow{\Downarrow},\uparrow\right),\overleftarrow{\Downarrow}$	-1	0	
			$\left(\overleftarrow{\Downarrow},\uparrow\right)\overleftarrow{\Downarrow},\overrightarrow{\Updownarrow},\left(\downarrow,\uparrow\right)$ $K^- \quad \overline{\nu}_e \quad \pi^0$			$\left(\downarrow,\overleftarrow{\Downarrow}\right)+\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)+\left(\downarrow,\uparrow\right)$ $\pi^- + \left(\pi^0 + \pi^0\right)$
						$\left(\downarrow,\overleftarrow{\Downarrow}\right)+\left(\overrightarrow{\Uparrow},\uparrow\right)+\left(\downarrow,\overleftarrow{\Downarrow}\right)$ $\pi^- + \pi^+ + \pi^-$
			$\left(\overleftarrow{\Downarrow},\uparrow\right),\overleftarrow{\Downarrow},\left(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right),\left(\downarrow,\uparrow\right)$ $K^- \quad \overline{\nu}_\tau \quad \pi^0$			$\left(\downarrow,\downarrow,\downarrow\right),\overrightarrow{\Updownarrow},\left(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right)+\left(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right)$ $\mu^- + \nu_\mu$
K^0	Neutral Kaon	$d\bar{s}$	$\downarrow,\left(\downarrow,\overrightarrow{\Uparrow}\right)$	0	0	
			$\downarrow,\left(\downarrow,\overrightarrow{\Uparrow}\right),\overleftarrow{\Updownarrow},\left(\downarrow,\uparrow\right),\left(\downarrow,\uparrow\right)$ $K^0 \quad \nu_e \quad \pi^0 \quad \pi^0$			$\left(\overrightarrow{\Uparrow},\uparrow\right),\left(\downarrow,\uparrow\right)+\left(\downarrow,\overleftarrow{\Downarrow}\right),\left(\downarrow,\uparrow\right)$ $\pi^+ + \pi^-$
			$\downarrow,\left(\downarrow,\overrightarrow{\Uparrow}\right),\left(\overleftarrow{\Updownarrow},\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right),\left(\downarrow,\uparrow\right)$ $K^0 \quad \nu_\tau \quad \pi^0$			$\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)+\left(\downarrow,\uparrow\right)+\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)+\left(\downarrow,\uparrow\right)$ $\left(\pi^0 + \pi^0\right) + \left(\pi^0 + \pi^0\right)$

Chart 6. Pseudoscaler Mesons With Spin 0 (continued). Antiparticles are not included.

Particle Symbol	*Particle Name*	*Quark Structure*	*Fiber Structure*	*Net Charge*	*Net Spin*	*Principal Decay Modes*
D^-	Negative D	$d\bar{c}$	$\downarrow,\left(\downarrow,\uparrow,\overrightarrow{\Downarrow}\right)$	-1	0	
			$\downarrow,\left(\downarrow,\uparrow,\overrightarrow{\Downarrow}\right),\overleftarrow{\Updownarrow},\overleftarrow{\Updownarrow},\overleftarrow{\Updownarrow}$ $D^- \quad \nu_e\,\nu_e\,\nu_e$			$\left(\overleftarrow{\Downarrow},\uparrow\right),\overleftarrow{\Downarrow}+\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)+\left(\downarrow,\uparrow\right)$ $K^- \quad +(\pi^0 \quad + \quad \pi^0)$
						$\left(\overleftarrow{\Downarrow},\uparrow\right),\overleftarrow{\Downarrow}+\left(\downarrow,\overleftarrow{\Downarrow}\right)+\left(\overrightarrow{\Uparrow},\uparrow\right)$ $K^- \quad + \quad \pi^- \qquad \pi^+$
D^+	Positive D	$c\bar{d}$	$\left(\overleftarrow{\Uparrow},\downarrow,\uparrow\right),\uparrow$	+1	0	
			$\left(\overleftarrow{\Uparrow},\downarrow,\uparrow\right),\uparrow,\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow},\overrightarrow{\Updownarrow}$ $D^+ \qquad \nu_e\bar{\nu}_e\,\bar{\nu}_e$			$\overleftarrow{\Uparrow},\left(\downarrow,\overrightarrow{\Uparrow}\right)+\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)+\left(\downarrow,\uparrow\right)$ $K^+ \quad +(\pi^0 \quad + \quad \pi^0)$
						$\overleftarrow{\Uparrow},\left(\downarrow,\overrightarrow{\Uparrow}\right)+\left(\downarrow,\overleftarrow{\Downarrow}\right)+\left(\overrightarrow{\Uparrow},\uparrow\right)$ $K^+ \quad +(\pi^- \quad + \quad \pi^+)$
D^0	Neutral D	$c\bar{u}$	$\left(\overleftarrow{\Uparrow},\downarrow,\uparrow\right),\overrightarrow{\Downarrow}$	0	0	
			$\left(\overleftarrow{\Uparrow},\downarrow,\uparrow\right),\overrightarrow{\Downarrow},\overrightarrow{\Updownarrow},\left(\downarrow,\uparrow\right)$ $D^0 \qquad \nu_e \quad \pi^0$			$\downarrow,\left(\downarrow,\overrightarrow{\Uparrow}\right)+\left(\downarrow,\overleftarrow{\Downarrow}\right)+\left(\overrightarrow{\Uparrow},\uparrow\right)$ $K^0 \quad + \quad \pi^- \qquad \pi^+$
						$\downarrow,\left(\downarrow,\overrightarrow{\Uparrow}\right)+\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)+\left(\downarrow,\uparrow\right)$ $K^0 \quad +(\pi^0 \quad + \quad \pi^0)$
$D^-{}_S$	Negative Strange D	$s\bar{c}$	$\left(\overleftarrow{\Downarrow},\uparrow\right),\left(\downarrow,\uparrow,\overrightarrow{\Downarrow}\right)$	-1	0	Not Established
$D^+{}_S$	Positive Strange D	$c\bar{s}$	$\left(\overleftarrow{\Uparrow},\downarrow,\uparrow\right),\left(\downarrow,\overrightarrow{\Uparrow}\right)$	+1	0	Not Established

Chart 6. Pseudoscaler Mesons With Spin 0 (continued).
Antiparticles are not included.

ed that Parity symmetry was invalid for some reactions. Later the failure of CP symmetry was observed according to the Standard Model.

The principle of "detailed balance" follows directly from time-reversal invariance. According to this principle for corresponding conditions of momentum, energy, and spin, the reaction rate should be the same in either direction of the reaction. If PCT is an invariant symmetry, the failure of CP invariance implies that Time-reversal invariance must also fail. Thus the principle of "detailed balance" does not hold in all cases for the Standard Model.

From the perspective of the Charge-Fiber Model of Elementary Particles, the analysis of the experiments in which P and PC symmetry was broken is suspect, because the interpretation of

Particle Symbol	***Particle Name***	***Quark Structure***	***Fiber Structure***	***Net Charge***	***Net Spin***	***Principal Decay Modes***
B^-	Negative B	$b\overline{u}$	$\left(\overleftarrow{\Downarrow},\overrightarrow{\Uparrow},\downarrow\right),\overrightarrow{\Downarrow}$	-1	0	
			$\left(\overleftarrow{\Downarrow},\overrightarrow{\Uparrow},\downarrow\right),\overrightarrow{\Downarrow},\overleftarrow{\Updownarrow},\left(\downarrow,\uparrow\right)$ $B^- \quad \nu_e \quad \pi^0$			$\left(\overleftarrow{\Downarrow},\uparrow\right),\overleftarrow{\Downarrow}+\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)+\left(\downarrow,\uparrow\right)$ $K^- \quad + (\pi^0 \quad + \quad \pi^0)$
			$\left(\overleftarrow{\Downarrow},\overrightarrow{\Uparrow},\downarrow\right),\overrightarrow{\Downarrow},\left(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right),\left(\downarrow,\uparrow\right)$ $B^- \quad \nu_\mu \quad \pi^0$			$\downarrow,\left(\downarrow,\overrightarrow{\Uparrow}\right),\left(\overleftarrow{\Updownarrow},\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right)+\left(\downarrow,\overleftarrow{\Downarrow}\right)$ $K^0 \quad + \quad \pi^-$
B^+	Positive B	$u\overline{b}$	$\overleftarrow{\Uparrow},\left(\uparrow,\overleftarrow{\Downarrow},\overrightarrow{\Uparrow}\right)$	+1	0	
			$\overleftarrow{\Uparrow},\left(\uparrow,\overleftarrow{\Downarrow},\overrightarrow{\Uparrow}\right),\left(\downarrow,\uparrow\right),\left(\downarrow,\uparrow\right)$ $B^+ \quad \pi^0 \quad \pi^0$			$\downarrow,\left(\downarrow,\overrightarrow{\Uparrow}\right),\overleftarrow{\Updownarrow}+\left(\overleftarrow{\Uparrow},\uparrow\right),\left(\downarrow,\uparrow\right)$ $K^0 \quad + \quad \pi^+$
B^0	Neutral B	$d\overline{b}$	$\downarrow,\left(\uparrow,\overleftarrow{\Downarrow},\overrightarrow{\Uparrow}\right)$	0	0	
			$\downarrow,\left(\uparrow,\overleftarrow{\Downarrow},\overrightarrow{\Uparrow}\right),\overrightarrow{\Updownarrow},\left(\downarrow,\uparrow\right)$ $B^0 \quad \overline{\nu}_e \quad \pi^0$			$\downarrow,\left(\downarrow,\overrightarrow{\Uparrow}\right)+\left(\downarrow,\overleftarrow{\Downarrow}\right)+\left(\overrightarrow{\Uparrow},\uparrow\right)$ $K^0 \quad + \quad \pi^- \quad \pi^+$
			$\downarrow,\left(\uparrow,\overleftarrow{\Downarrow},\overrightarrow{\Uparrow}\right),\left(\overleftarrow{\Updownarrow}\right),\left(\downarrow,\uparrow\right)$ $B^0 \quad \nu_e \quad \pi^0$			$\left(\overleftarrow{\Downarrow},\uparrow\right),\overleftarrow{\Downarrow}+\left(\overrightarrow{\Uparrow},\uparrow\right),\left(\downarrow,\uparrow\right)$ $K^- \quad + \quad \pi^+$
η_C	Charmed Eta	$c\overline{c}$	$\left(\overleftarrow{\Uparrow},\downarrow,\uparrow\right),\left(\downarrow,\uparrow,\overrightarrow{\Downarrow}\right)$	0	0	
			$\left(\overleftarrow{\Uparrow},\downarrow,\uparrow\right),\left(\downarrow,\uparrow,\overrightarrow{\Downarrow}\right),\left(\overleftarrow{\Updownarrow},\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right),\left(\downarrow,\uparrow\right),\overleftarrow{\Updownarrow}$ $\eta_C \quad \nu_\tau \quad \pi^0 \quad \nu_e$			$\left(\overleftarrow{\Downarrow},\uparrow\right),\overleftarrow{\Downarrow}+\overleftarrow{\Uparrow},\left(\downarrow,\overrightarrow{\Uparrow}\right)+\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)+\left(\downarrow,\uparrow\right)$ $K^- \quad + \quad K^+ \quad + (\pi^0 \quad + \quad \pi^0)$
			$\left(\overleftarrow{\Uparrow},\downarrow,\uparrow\right),\left(\downarrow,\uparrow,\overrightarrow{\Downarrow}\right),\left(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right),\left(\downarrow,\uparrow\right)$ $\eta_C \quad \nu_\mu \quad \pi^0$			$\downarrow,\left(\downarrow,\overrightarrow{\Uparrow}\right)+\left(\overleftarrow{\Downarrow},\uparrow\right),\uparrow+\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)+\left(\downarrow,\uparrow\right)$ $K^0 \quad + \quad \overline{K}^0 \quad + (\pi^0 \quad + \quad \pi^0)$

Chart 6. Pseudoscaler Mesons With Spin 0 (continued).
Antiparticles are not included.

Particle Symbol	Particle Name	Quark Structure	Fiber Structure	Net Charge	Net Spin	Principal Decay Modes
ρ^{+}	Positive Rho	$u\bar{d}$	$\overleftarrow{\Uparrow},\uparrow$			
			$\overleftarrow{\Uparrow},\uparrow,\left(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right),\left(\downarrow,\uparrow\right)$ $\rho^{+} \quad \nu_{\mu} \quad \pi^{0}$	-1	1	$\left(\uparrow,\overrightarrow{\Uparrow}\right)+\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)+\left(\downarrow,\uparrow\right)$ $\pi^{+} + (\pi^{0} + \pi^{0})$
ρ^{-}	Negative Rho	$d\bar{u}$	$\downarrow,\overrightarrow{\Downarrow}$			
			$\downarrow,\overrightarrow{\Downarrow},\left(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right),\left(\downarrow,\uparrow\right)$ $\rho^{-} \quad \nu_{\mu} \quad \pi^{0}$	-1	1	$\left(\overleftarrow{\Downarrow},\downarrow\right)+\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)+\left(\downarrow,\uparrow\right)$ $\pi^{-} + (\pi^{0} + \pi^{0})$
ρ^{0}	Neutral Rho	$u\bar{u}$	$\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}$			
			$\overleftarrow{\Uparrow},\overrightarrow{\Downarrow},\left(\downarrow,\uparrow\right)$ $\rho^{0} \quad \pi^{0}$	0	1	$\left(\uparrow,\overrightarrow{\Uparrow}\right)+\left(\overleftarrow{\Downarrow},\downarrow\right)$ $\pi^{+} + \pi^{-}$
			$\overleftarrow{\Uparrow},\overrightarrow{\Downarrow},\left(\downarrow,\uparrow\right),\left(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right),\left(\downarrow,\uparrow\right)$ $\rho^{0} \quad \pi^{0} \quad \nu_{\mu} \quad \pi^{0}$			$\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)+\left(\downarrow,\uparrow\right)+\left(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow}\right)+\left(\downarrow,\uparrow\right)$ $(\pi^{0} + \pi^{0}) + (\pi^{0} + \pi^{0})$
ρ^{0}	Neutral Rho	$d\bar{d}$	$\downarrow,\uparrow$	0	1	Not Observed
φ	Phi	$s\bar{s}$	$\left(\overleftarrow{\Downarrow},\uparrow\right),\left(\downarrow,\overrightarrow{\Uparrow}\right)$			
			$\left(\overleftarrow{\Downarrow},\uparrow\right),\left(\downarrow,\overrightarrow{\Uparrow}\right),\left(\downarrow,\uparrow\right)$ $\varphi \quad \pi^{0}$	0	1	$\downarrow,\left(\downarrow,\overrightarrow{\Uparrow}\right)+\left(\overleftarrow{\Downarrow},\uparrow\right),\uparrow$ $K^{0} \quad \overline{K}^{0}$
			$\left(\overleftarrow{\Downarrow},\uparrow\right),\left(\downarrow,\overrightarrow{\Uparrow}\right),\left(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}\right)$ $\varphi \quad \nu_{\mu}$			$\overrightarrow{\Uparrow},\left(\downarrow,\overrightarrow{\Uparrow}\right)+\left(\overleftarrow{\Downarrow},\uparrow\right),\overleftarrow{\Downarrow}$ $K^{+} + K^{-}$

Chart 7. Vector Mesons With Spin 1.
Antiparticles are not included.

experiments was based on the Standard Model (which does not account for all the structure of the elementary particles nor all the contributions of neutral pions and neutrinos to these reactions). It appears that conservation of charge-fiber loops and angular momentum/helicity of charge-fiber loop structures guarantees P, C, and T invariance. Only from the viewpoint of the incomplete structures of the Standard Model are these symmetries broken.

Comparison with Standard Model. In the Standard Model all heavy particles (hadrons) are complex and composed of quarks. In the classical Electrodynamics Model, quarks correspond to some of the primary charge-fibers from which elementary particles are built. Chart 2 explains that the 12 quarks (6 quarks plus their 6 antiquarks) correspond to all the possible fractional charge combinations of single and parallel secondary and tertiary fibers with spin ½ and nonzero charge to form a primary fiber. The Charge-Fiber Electrodynamics Model presented describes the complex internal structure of quarks in terms of a very simple entity, a closed charge-fiber loop. *All elementary particles consist entirely of these simple intertwining loops, even leptons.*

Particle Symbol	***Particle Name***	***Quark Structure***	***Fiber Structure***	***Net Charge***	***Net Spin***	***Principal Decay Modes***
J/Ψ	J/Psi	$c\overline{c}$	$(\overleftarrow{\Uparrow},\downarrow,\uparrow),(\downarrow,\uparrow,\overrightarrow{\Downarrow})$	0	1	
			$(\overleftarrow{\Uparrow},\downarrow,\uparrow),(\downarrow,\uparrow,\overrightarrow{\Downarrow}),(\downarrow,\uparrow)$ $J/\Psi \quad \pi^0$			$(\uparrow,\uparrow,\uparrow)+\overleftarrow{\Updownarrow}+(\downarrow,\downarrow,\downarrow)+\overrightarrow{\Updownarrow}$ $e^+ \quad \nu_e \quad e^- \quad \overline{\nu}_e$
			$(\overleftarrow{\Uparrow},\downarrow,\uparrow),(\downarrow,\uparrow,\overrightarrow{\Downarrow}),(\downarrow,\uparrow),(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow}),(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow})$ $J/\Psi \quad \pi^0 \quad \overline{\nu}_\mu \quad \nu_\mu$			$(\uparrow,\uparrow,\uparrow),\overleftarrow{\Updownarrow},(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow})+(\downarrow,\downarrow,\downarrow),\overrightarrow{\Updownarrow},(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow})$ $\mu^+ \quad \mu^-$
						$(\uparrow,\overrightarrow{\Uparrow})+(\overleftarrow{\Downarrow},\downarrow)+(\uparrow,\overrightarrow{\Uparrow})+(\overleftarrow{\Downarrow},\downarrow)+(\overleftarrow{\Uparrow},\overrightarrow{\Downarrow})+(\downarrow,\uparrow)$ $\pi^+ + \pi^- + \pi^+ + \pi^- + (\pi^0 + \pi^0)$
Τ	Tau	$b\overline{b}$	$(\overleftarrow{\Downarrow},\overrightarrow{\Uparrow},\downarrow),(\uparrow,\overleftarrow{\Downarrow},\overrightarrow{\Uparrow})$	0	1	
			$(\overleftarrow{\Downarrow},\overrightarrow{\Uparrow},\downarrow),(\uparrow,\overleftarrow{\Downarrow},\overrightarrow{\Uparrow}),(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow}),(\downarrow,\uparrow),(\downarrow,\uparrow)$ $\mathrm{T} \quad \overline{\nu}_\mu \quad \pi^0 \quad \pi^0$			$(\uparrow,\uparrow,\uparrow),\overleftarrow{\Updownarrow},(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow})+(\downarrow,\downarrow,\downarrow),\overrightarrow{\Updownarrow},(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow})$ $\mu^+ \quad + \quad \mu^-$
			$(\overleftarrow{\Downarrow},\overrightarrow{\Uparrow},\downarrow),(\uparrow,\overleftarrow{\Downarrow},\overrightarrow{\Uparrow}),(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow}),(\downarrow,\uparrow),(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow}),(\downarrow,\uparrow)$ $\mathrm{T} \quad \overline{\nu}_\mu \quad \pi^0 \quad \nu_\mu \quad \pi^0$			$(\uparrow,\uparrow,\uparrow),\overleftarrow{\Updownarrow},(\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow})+(\downarrow,\downarrow,\downarrow),\overrightarrow{\Updownarrow},(\overleftarrow{\Updownarrow},\overrightarrow{\Updownarrow},\overleftarrow{\Updownarrow})$ $\tau^+ \quad + \quad \tau^-$

Chart 7. Vector Mesons With Spin 1 (continued).
Antiparticles are not included.

In the Standard Model, the ultimate number of quarks is unknown. According to this Electrodynamics Model there could be more combinations of secondary and tertiary fibers to form a primary fiber. These combinations are well defined and can be predicted.

Chart 3 explains the internal structure of hadrons in terms of quarks and intertwining fiber loops. A close examination of the loop structures of the various hadrons with conserved angular momentum represented by $\overleftarrow{\Updownarrow}$ or $\overrightarrow{\upuparrows}$ shows some inconsistencies of logic in the Standard Model. The decays of the various hadrons are not consistently explained by the Standard Model. The charge-fiber model shows the important role of neutrinos and neutral pions for the decay process in order to allow conservation of total charge and angular momentum.

The Standard Model includes six leptons and their antiparticles, but it can not say why there are six or tell if there may be more discovered in the future. It cannot describe the internal structure of a lepton like it does a hadron. The classical Charge-Fiber Model treats the hadrons and leptons on the same footing. In that sense it is more fundamental and also simpler.

The Standard Model incorporates five force-carrying particles, *i.e.* the photon γ for the electromagnetic force, the gluon g for the strong interaction force, and the Z and W^+ and W^- for the weak nuclear force. These forces are considered action-at-a-distance forces. The classical Electrodynamics Model has no force-carrying particles. All forces are contact electromagnetic forces on all scales, *i.e.* the fields of a charged particle remain attached to it until detached as radiation. However, the neutrinos ν_e, ν_μ and ν_τ and the neutral pion π^o play a significant role in controlling the systematics of particle decay.

Comparison with String Models. In the original String Models, the string has 26 spatial dimensions (degrees of freedom) including time. With the introduction of the Spinning String Model this was reduced to 9 spatial dimensions(degrees of freedom) plus time. In the Supersymmetric String Model, six of the spatial dimensions of the string somehow curl up and are not observable.

In the Charge-Fiber Model there are at least 3 x 3 x 3 = 27 spatial degrees of freedom due to 27 possible secondary and tertiary fiber loops plus time. Most of these degrees of freedom are due to the secondary and tertiary fibers which intertwine to make primary fibers. Thus the Charge-Fiber Model explains in terms of the internal structure of elementary particles how the various extra dimensions are "curled up" so as to be non-observable.

The *Supersymmetric String Model* is advertised as being capable of explaining the origin of both leptons and hadrons plus additional particles to be discovered. The charge-fiber Model already explains the origin of leptons and hadrons, as well as additional particles to be discovered. (Since the charge-fiber Model properly describes electromagnetic radiation, it is more complete than either the Standard Model or the Supersymmetric String Model.)

The Supersymmetric String Model is supposed to be capable of explaining the force of gravity and uniting it with the other forces in nature to form a Grand Unified Theory (GUT). For the classical charge-fiber Model, the GUT is the electromagnetic force. In this model, gravity is due to the electromagnetic attraction of radiating charge-fibers to one another [20].

Summary and Conclusions. This paper introduces a classical Electromagnetic Model of elementary particles which describes the spin, charge, and decay schemes for all the elementary particles. It needs to be expanded to describe the magnetic moment, mass, half-life, and excited states of each of the elementary particles. (Note the excited states of the electron in the presence of various atomic nuclei has already been calculated in agreement with all experimental data including spectral data in the extreme ultraviolet where Quantum theories predict nothing to observe [18]. Five of the simplest states of the electron are shown below in Figures 4-8.)

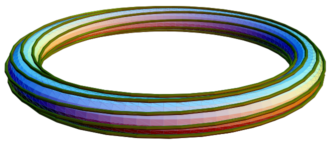

Figure 4. Electron
$e^{-}=(\downarrow,\downarrow,\downarrow)$
n = 1/3 (Sub-harmonic)

The classical model presented is different from the Standard Model and the Supersymmetric String Model in that the spin of an elementary particle is not a fixed quantum property of a point particle, but rather a dynamic quantity which can change when the particle is accelerated to high velocities or placed in various environments such as the nucleus. High energy scattering and reaction experiments with the proton have confirmed that the spin is a dynamical quantity, not a fixed quantum quantity [19]. This is also true of the magnetic moment, the mass, and the excited states of elementary particles.

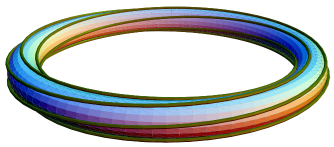

Figure 5. Electron
$e^{-}=(\downarrow,\downarrow,\downarrow)$
n = 1/2 (Sub-harmonic)

This new classical model is capable of explaining more properties of elementary particles than the Standard Model or the Supersymmetric String Model. The model does not have any of the inconsistencies in logic describing the various decay schemes of hadrons that plague the Standard Model. It is a simpler model in that the basic building block of all particles and matter is the stable closed charge-fiber loop. This work, in conjunction with previous work on the atom [3,5], the nucleus [3,6] and Weber's force law [16,20] completes an initial effort to show the way to remove the Special and General relativity theories plus Quantum Mechanics based on the Copenhagen Interpretation from all theories related to matter.

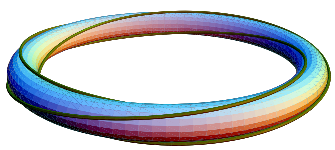

Figure 6. Electron
$e^{-}=(\downarrow,\downarrow,\downarrow)$
n = 1 (Fundamental)

Democritus was very close to this new electrodynamics model when he defined the "atom" to be the smallest piece of matter with hooks on it to hold things together. If he had only closed the hook to form a loop, he would have gotten it right. The tiny closed charge-fiber loop is the real "atom" of matter. Although Democritus (born in 460 BC) is commonly credited with introducing the concept of the atom, there was some one even earlier who appears to have gotten it right. The ancient Hebrew prophet Ezekiel writing in 595 BC describes in Ezekiel 1:16 the model of a "wheel within a wheel", depicting how God created all matter in the universe. The living creatures described in Ezekiel 1 are the Cherubim who guarded the gate to the Garden of Eden after man sinned (Genesis 3:24), who were depicted upon the cover of the Hebrew Ark of the Covenant (Exodus 25:18-20), and who lead the 24 elders in worship at the throne of God in Heaven (Revelation 4:6-11), telling them to respect and worship the holy, merciful, Creator-God. The "wheel within a wheel" that accompany the Cherubim are symbols of the structure of matter on all scales as shown in Figure 9 below. The larger wheel is the basic toroidal ring. The second wheel is the cross sectional ring or wheel

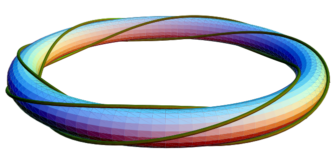

Figure 7. Electron
$e^{-}=(\downarrow,\downarrow,\downarrow)$
n = 2 (1st harmonic)

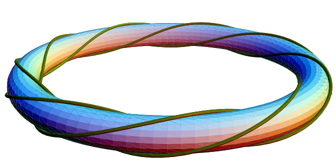

Figure 8. Electron
$e^{-}=(\downarrow,\downarrow,\downarrow)$
n = 3 (2nd harmonic)

inside the toroid that the charge-fiber goes around.

The perfect triune 3 x 3 x 3 intertwining symmetry of all elementary particles (and thus all matter that exists) appears to be the characteristic signature or fingerprint of the Creator. It provides some mystical insight into the Trinitarian relationship of God the Father, the Son, and the Holy Spirit by mimicking the intertwining of their forces and efforts.

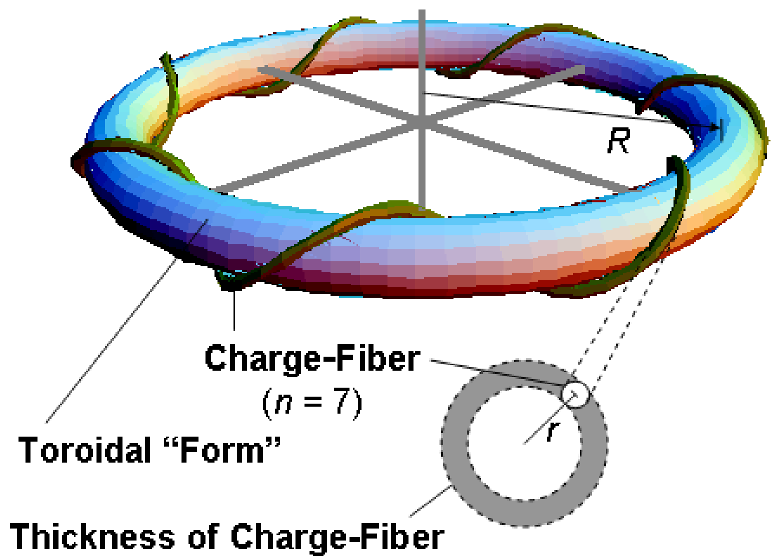

Figure 9. "Wheel Within A Wheel"

Implications of Charge-Fiber Model of Elementary Particles. The Charge-Fiber Model of Elementary particles introduces some new complexity into Classical Electrodynamics. The static elementary particle is no longer a point-like charge q. For stable matter consisting of electrons, protons and neutrons, the elementary charged particle consists of three complex internal currents. These internal current densities may be written in terms of chiral or helicity spinors for the right- and left-handed components of the current density. The interaction of each of these complex internal charge densities must be taken into account in a fundamental way.

Classical electrodynamics is normally expressed by means of Maxwell's equations. However, as shown in [8,16], Maxwell's equations are based on the point-particle approximation and miss the self-field effects of feedback that produce all the observed relativistic effects at high velocity. In [8,16,20] the fundamental laws of electrodynamics, *i.e.* Ampere's law, Faraday's law, Gauss's laws, and Lenz's law are found to be more fundamental that Maxwell's equations.

According to the Charge-Fiber Model of Elementary particles, the fundamental laws of electrodynamics need to be revised to take into account the newly discovered internal charge and current structure of real elementary particles. This can be done at the simplest level by recasting the laws of electrodynamics into an O(3) group symmetric form based on real unitary matrices which are orthogonal. In this approach there will be three charge densities, three current densities, three scalar potentials, three vector potentials, three types of electric fields, and three types of magnetic fields. (Note that Hooper [17] claimed to have measured and identified the unique characteristics of these three types of electric and magnetic fields by 1974.) The fundamental laws of electrodynamics change from a scalar form to a 3 x 3 matrix form with current densities reflecting the helicity of internal charge-fiber structure. Since the Charge-Fiber Model supports up to 27 charge-fiber loops in an elementary particle with three primary loops, and even more charge-fibers when additional primary fibers are added to an elementary particle, O(5), O(7) and higher orders of the orthogonal Group Theory are possible for interactions between the more complex elementary particles.

References.

1. Griffiths, David, Introduction to Elementary Particles, John Wiley and Sons, Inc., New York (1987) Table of Elementary Particles inside cover.

2. Fermi National Accelerator Laboratory web page at www.fnal.gov/pub/inquiring/matter/madeof/.

3. Lucas, Joseph C., "A Physical Model for Atoms and Nuclei," Galilean Electrodynamics, Vol. 7, No. 1, *pp.* 3-12 (1996).

4. Lucas, Charles W. Jr., "A New Foundation for Modern Physics," Foundations of Science (Common Sense Science), Vol. 4, No. 4, *pp.* 1-8 (2001).

5. Lucas, Joseph C. and Lucas, Charles W. Jr., "A Physical Model for Atoms and Nuclei—Part 1," Foundations of Science (Common Sense Science), Vol. 5, No. 1, *pp.* 1-7 (2002).

6. Lucas, Joseph C. and Lucas, Charles W. Jr., "A Physical Model for Atoms and Nuclei—Part 2," Foundations of Science (Common Sense Science), Vol. 5, No. 2, *pp.* 1-8 (2002) and Lucas, Joseph C. and Lucas, Charles W. Jr., "A Physical Model for Atoms and Nuclei—Part 3," Foundations of Science (Common Sense Science), Vol. 6, No. 1, *pp.* 1-8 (2003).

7. Lucas, Charles W. Jr., "A Physical Model for Atoms and Nuclei—Part 4," Foundations of Science (Common Sense Science), Vol. 6, No. 3, *pp.* 1-7 (2003).

8. Lucas, Charles W. Jr., and Lucas, Joseph C., "Weber's Force Law for Realistic Finite-Size Elastic Particles," Journal of New Energy, Vol. 5, No. 3, *pp.* 70-89 (2001).

9. Compton, Arthur H., American Physical Society address December 1917, Physical Review Series II, *p*. 330 (1918).

10. Compton, Arthur H., Physical Review Series II, Vol. XIV, No. 1, *pp.* 20-43 (1919).

11. Compton, Arthur H., Physical Review Series II, Vol. XIV, No. 3, *pp.* 247-259 (1919).

12. Bostick, Winston H., Physics of Fluids, Vol. 9, *p*. 2079 (1966).

13. Noether, E., "Invariante Variations-Probleme," Goett. Nachr, p. 235 (1918) and C. Lanczos, The Variational Principles of Mechanics (Toronto, 1966) Third Edition, Appendix II and Courant, R. and Hilbert, D., Mathematical Methods of Physics (Interscience 1953) Volume 1, *p*. 262.

14. Frank, Philipp, Philosophy of Science—The Link Between Science and Philosophy (Prentice Hall, Inc., Englewood Cliffs, NJ, 1957) *p*. 132.

15. Niels Bohr and the Development of Physics, W. Pauli editor (McGraw-Hill, New York, 1955).

16. Lucas, Jr. Charles W. and Lucas, Joseph C.,"Weber's Force Law for Finite-Size Elastic Particles" Galilean Electrodynamics, Vol 14, No. 1, *pp.* 3-10 (2003).

17. Hooper, W. J., New Horizons in Electric, Magnetic, and Gravitational Field Theory (Electrodynamic Gravity, Inc. 543 Broad Blvd., Cuyahoga Falls, OH 44221, 1974).

18. Lucas Jr., Charles W. and Joseph C. Lucas, "A Physical Model for Atoms and Nuclei—Part 3," Foundations of Science (Common Sense Science), Vol. 6, No.1 (2003).

19. Kirsch, Alan D., "The Spin of the Proton," Scientific American, May 1979, *p*. 68.

20. Lucas Jr., Charles W., "Derivation of a Universal Classical Electromagnetic Force Law for Finite-Size Elastic Charged Particles," submitted to the May 23-27, 2005 Natural Philosophy Alliance national meeting in Storrs, Connecticut for publication in the proceedings.

21. Lucas Jr., Charles W., "A Classical Electromagnetic Theory of Everything," submitted to the May 23-27, 2005 Natural Philosophy Alliance national meeting in Storrs, Connecticut for publication in the proceedings.