The Proceedings of the International Conference on Creationism

Volume 6
Print Reference: Pages 7-30

Article 5

2008

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Gerald M. Brown
Cedarville University

In A. A. Snelling (Ed.) (2008). Proceedings of the Sixth International Conference on Creationism (pp. 7–30). Pittsburgh, PA: Creation Science Fellowship and Dallas, TX: Institute for Creation Research.

Introduction and Acceptance of a Classical Charge Fiber Model (CFM) of Elementary Particles Evaluated by Means of an Online Tutorial-Based Survey

Gerald M. Brown, Ph.D., 2660 Harbison Road, Cedarville, OH 45314

Abstract

The introduction of a new classical model of elementary particles by Lucas and Bergman is studied using an online survey instrument. The model is based on finite-size, elastic, charged particles that take the form of charge fibers. The Charge Fiber Model of Elementary Particles (CFM) constitutes a fundamental departure from the current paradigm of Quantum Mechanics (QM) and the Standard Model (SM) of elementary particles. The survey familiarizes respondents with the basic principles and claims of the new model by means of an online tutorial, and queries respondents to gage their knowledge and opinion of the model (http://www.commonsensescience.org/survey).

The analysis of the survey describes how experts in the field, or at least those who took the time to respond, regard the original and sweeping claims of the CFM. The response rate varied from a very low of 1.1% to a high of 29% among diverse scientific communities. This paper does not endorse the model, but considers the broader issue of how a theory representing a major departure from the status quo may be disseminated, perceived and accepted (or rejected) during its early stages. These issues are relevant to the ongoing development of a comprehensive young-earth creation model whose proponents, even with solid scientific and academic credentials, face a continuous struggle against the accepted scientific positions on origins, evolution and the age of the earth. Recognizing that scientific paradigms change over time provides incentive to evaluate models on the basis of their usefulness and to articulate our opinions of them in a manner that is both effective and non-offensive.

Keywords

Classical electrodynamics, Finite-size elastic charged particle, Ring model, Charge fiber model, CFM, Young-earth model, Creation science, Online tutorial survey

Introduction

Scientific revolution and creationism

The manner and process by which scientific theories make their way from initial ideas into accepted practice has been examined and described in detail by Kuhn (1972) in *The Structure of Scientific Revolutions*. Kuhn outlines how "normal science" is built upon the scientific achievements of its practitioners that supply, *for a time*, the foundation for further practice in the field. The relevant achievements and the framework by which everything in a particular field of scientific inquiry is understood constitute a paradigm. More than just models, paradigms govern how every fact is interpreted, how the body of knowledge relates to other fields of science, and how the world around us is modeled to conceptualize the materials and processes with which its practitioners deal. Within an established paradigm, normal science efficiently focuses research on unfinished details, and broad, initially unresolved issues give way to many small and relatively esoteric problems. Kuhn claims that normal science does a great job of "mopping up" with zest (in detail and depth) as its "expert puzzle-solvers" carry on the work and add to the scope and precision of the paradigm (Kuhn, 1972, p. 24).

At some point, even while resting on the shoulders and scientific achievements of those who have come before, there comes a point within a scientific discipline that a persistent failure to solve certain puzzles of normal science or a constant recurrence of certain anomalies eventually leads to a change in the dominant paradigm. Whether brought about by novelty of fact (the process of discovery) or by novelty of theory (the process of invention) the new ideas refuse to go away and force a sometimes painful reconstruction of the field from new fundamentals (Kuhn, 1972, p. 85). Not surprising, those who achieve the fundamental invention of a new paradigm are almost always either very young or very new to the field whose paradigm they change (Kuhn, 1972, p. 90). This is partly because such practitioners are less constrained to think in the manner of the existing model and partly because they have a smaller investment in time and reputation to set aside in taking up the new mantra.

What do we find if we apply Kuhn's model of scientific revolution to the emergence of the creation science movement over the last three decades of the twentieth century? First, the movement is extremely broad in scope. In place of researchers introducing new ideas and ways of doing things *within one or two specialized fields*, practitioners of creation science are introducing and pursuing ideas that run counter to well established scientific doctrines *across the entire spectrum of science*. Secondly, in place of several individuals or small groups of researchers at work in a fairly small number of institutions to account for the new developments, the creation science movement counts many hundreds of qualified scientific and technical experts from every discipline among its ranks. The movement also boasts tens of thousands of supporters who are non-technical members of the public. These people adhere to the concept that the world was created by a divine being, and despite the contrary opinion of the majority of science experts, believe that Darwinian evolution is not a credible explanation for the origin of life and the proliferation of species. In terms of Kuhn's analysis of scientific revolutions, such a broad movement that encompasses so many disciplines is nearly without precedent; the notable exception is the very introduction of old-earth geology and Darwinism over a century ago that has developed to become the dominant origins paradigm in the world's academic and scientific establishments.

Throughout creationism, and especially among those espousing young-earth models, creationists confront established paradigms on many fronts. Whether in geology, paleontology, anthropology, biology, or cosmology, their opinions and convictions as to what constitutes good science often run contrary to the prevailing scientific models. Since what biblical creationists believe and understand to be true is not accepted by the wider academic and scientific communities, including many Christian members of those communities, it behooves them to have a better understanding of the process by which non-traditional models can be introduced and gain acceptance within those communities. Understanding paradigm change within other fields may help creation scientists more effectively see progress within their spheres of expertise towards a more biblically correct world view.

The dynamics of paradigm change also occur on a smaller scale within the creation science movement. Whether one considers alternate models of plate tectonics, discussions on the location of the Flood/pre-Flood boundary in the sedimentary record, differences between the Septuagint and Masoretic chronologies recorded for the patriarchs in Genesis, or explanations for the seeming disparate size and age of the cosmos in a young-earth context, one finds competing viewpoints put forth by people seeking to understand the same created universe and the same world history. But "scientific truth" is not the same as objective reality, that which is true on the basis of God's omniscience and omnipotence. We strive to develop models that accurately represent the reality of the operative physical laws of the universe, the objective reality of the creation, but our models are only interpretations of that truth and we cannot know to what extent they are true. In fact, scientific models and the paradigms to which they belong are characterized by change, as our understanding increases and as particular scientific interpretations become popular. Which models are currently deemed most correct or which models will mature and prevail in the years ahead depends not just on their correlation to the objective reality of the creation, but on dynamics of paradigm change that include the model's usefulness, how and by whom the model was developed, and how it was presented and promoted among the scientific community (Kuhn, 1957, pp. 229–265).

With this process in mind, this paper examines the development and introduction of a new model of elementary particles based on classical electrodynamics. The model is a good candidate for such a discussion because its approach is fundamentally different from the current paradigm of Quantum Mechanics (QM) and the Standard Model (SM) of elementary particles. I will review the new model and its struggle to obtain a hearing among creation scientists as well as the wider scientific establishment. I will use an online tutorial-based survey instrument to evaluate awareness of the new model and to gage opinions of it among a large pool of experts in the high energy physics (HEP) community and among a much smaller pool of scientists known to have some interest in alternate physics models.

The Charge Fiber Model (CFM)

It is not possible on the basis of my research, nor is it the intent of this paper, to endorse the CFM. To appreciate, however, the complex issues related to the introduction and possible acceptance of the model I include a detailed description of its features and claims. As I describe a model that is very different and out-of-the-ordinary, consider how mainstream science also views our young-earth, six-day creation models; they are equally foreign and different in comparison to the established scientific models.

Historical development and publication history

The concept of a ring shaped elementary particle can be traced to the proposal by Parson (1915) that the electron might take the form of a *ring of spinning* *charge.* Pros and cons of Parson's electron were discussed by Allen (1919) during the early days of quantum theory. The ring structure accounts for the electron's spin and magnetic moment, explains the balance of forces that holds the electron together and accounts for why the electron *doesn't radiate energy* despite the flow of its annular current. Parson held that ring electrons maintained *static positions* within the atom but his atomic model had other difficulties, and never caught on. Even so, the potential role of annular circulating currents in the makeup of elementary charged particles is an important consideration.

In 1919, Compton (1919a, b) published results from X-ray scattering experiments and determined the size and shape of the electron to be consistent with a *flexible ring of charge* having a radius of approximately 1.85×10^{-12} m. In 1977, Barnes, Pemper and Armstrong (1977) claimed to have derived the *force of inertia* from the laws of electricity and magnetism and Barnes (1983) showed how effects predicted by the Special Theory of Relativity could also be predicted using classical electrodynamics applied to *finite-size elastically deformable elementary particles.* In 1990, Bergman published, with Wesley (Bergman & Wesley, 1990), a *ring model for the electron* that yielded the anomalous magnetic moment. More recent refinements of Bergman's ring model cover the fine-structure properties of the electron, proton and neutron (Bergman, 2001, 2006).

Joseph Lucas (1990), introduced a model for the *structure of the atom* based upon stationary ring electrons that provided a magnetic basis for the observed structure of the *Periodic Table of the Elements.* The model also proposed a *structure for the nucleus* that successfully predicted nuclide spins and other atomic properties. An updated version of this work is available in Lucas and Lucas (2002a, b, c, 2003b). Lucas and Lucas (2003a) introduced a *Classical Universal Force Law* for finite-size elastic particles. Refinements made by Charles Lucas were published in 2006–2007 (Lucas, 2006a, b, c, 2007) that include an *electromagnetic derivation of the force of gravity.* Charles Lucas (2004, 2005) introduced the *Charge Fiber Model of Elementary Particles* in order to explain the existence of the observed elementary particles of the Standard Model, including their symmetries, principal decay modes and interactions.

Lucas (C.W. Jr.) and Bergman's work has not generally been accepted for presentation at "mainstream physics conferences" or for publication in "recognized physics journals." In recent years their work has also been rejected by many creation science journals and publications (Bergman, personal communication, June 27, 2007). Typical venues for their presentations and publications are conferences held by the Natural Philosophy Alliance (publisher of Galilean Electrodynamics), Physics As A Science Workshop (1997 and 2000, Cologne), The Fifth International Conference on Problems of Space, Time and Motion (1998, St. Petersburg), Physical Interpretations of Relativity Theory (1998, London), The Journal of New Energy (Salt Lake City), The Cosmology Conference 2005 (Columbus), The International Conference(s) on Creationism (Creation Science Fellowship, Pittsburgh), and the Twin Cities Creation Conference (1992, Roseville). They have over 90 publications in these venues.

Current status of the Ring and Charge Fiber Models

Although the survey was conducted under the banner of *The Charge Fiber Model of Elementary Particles*, the work is actually moving along two distinct tracks. Bergman has developed a variation of the ring model of elementary particles that includes *helical perturbations* (Bergman, 2006). He is currently focusing on a simulation program to study the stability of a neutron consisting of a ring proton coplanar with and inside a larger diameter ring electron. He also produces and publishes a quarterly newsletter, *Foundations of Science*, under the auspices of an organization known as Common Sense Science (CSS). They adhere to a young-earth model of creation and strive to develop classical electrodynamic models that are consistent with their conservative interpretation of Scripture. CSS publishes a newsletter, *Foundations of Science*, four times a year and hosts a website at www.commonsensescience.org.

Lucas (C.W. Jr.) has developed the actual Charge Fiber Model with its detailed internal fiber structure to account for the existence and properties of the many recognized subatomic particles. He also derived a *Universal Force Law* (UFL) with which he recently succeeded in developing expressions for the *force of gravity* and the *inertial force.* He is currently working on the application of his UFL to the laws of *thermodynamics.* The salient features of the Ring and Charge Fiber Models are summarized in Tables 1 and 2, along with the accompanying Figures 1 through 9.

Compared to millions of man-years invested in standard physics models and tens of thousands of man-years in pursuit of various young-earth creation models, the CFM, with its hundreds of man-years, is a mere infant among theories. With only two principal researchers and a non-conventional publication history, it's reasonable to ask about the credibility of their work. In fact, without knowing the particulars of the situation, one survey respondent was very direct in stating:

> Physicists get emails like yours every few days: "I've got a theory which replaces every physics theory …," typically from a) retired engineers, or b) recent high-

Table 1. Salient features of the Charge Fiber Model. This information was presented through question statements and approximately 30 additional pages of text and figures using the embedded information links.

	Feature	Significance
1	Finite Size Elastic Charged Particles	Elementary particles can be modeled in physical terms. This facilitates the use of classical (empirical) electromagnetic laws to analytically derive their properties, internal and external forces and energy storage characteristics.
2	Ring Model (Figure 1)	Charge circulating in a thin ring is a stable, fundamental form of energy storage. This structure is able to account for, to a precision of four significant digits, the quantized interaction between electromagnetic (EM) radiation and materials.
3	Atomic Models & the Periodic Table (Figures 2 and 3)	From geometric considerations, the ring model dictates that electrons remain in stationary positions within the atom. From this, the model correctly predicts the properties of electron & nuclear shells, ultra-violet hydrogen spectra and nuclide spins.
4	Helicity in Ring Shape (Figure 4)	Helicity is the number of stationary corkscrew-like undulations along the circumference of the ring. The helicity accounts for higher energy states and improves the accuracy of the model to predict particle properties and interactions with EM radiation.
5	Universal Force Law, UFL (Figure 5)	Without the point particle assumption (Jackson, 1999, p. 179), simultaneous solution of classical electromagnetic laws yields a force law that works in all reference frames (stationary, moving or accelerating) and on all size scales (from subatomic to cosmic).
6	Relativistic Terms	The UFL accounts for relativistic effects including radiation and radiation reaction.
7	Non-Radial Forces (Figure 6)	The UFL has non-radial terms that can account for the curling of plasma currents and the tilting of the planetary orbits with respect to the plane of the sun's equator.
8	Charge Fiber Model (Figure 7)	Each ring shaped particle is modeled as three primary coupled rings of charge, called fibers. Each primary fiber can be comprised of up to 3 secondary fibers, each of which can be comprised of up to 3 tertiary charge fibers.
9	Charge Fiber Properties (Figure 8)	Fibers (primary, secondary and tertiary) have quantized properties: charge (±e), spin (angular momentum) and helicity.
10	Total Conservation	The number of fibers (charge) and spin/helicity are conserved in all particle reactions.
11	Electromagnetic Force of Gravity (Figure 9)	The universal force law applied to vibrating neutral dipoles (proton-electron pairs within the nucleus of atoms) reveals an attractive $(v/c)^4$ term that can account for the Newtonian gravitational force. A non-radial term explains the tilt of planetary orbits.
12	Gravitational Decay	Vibrating neutral dipoles must radiate energy. The strength of the gravitational force will decrease over time and lead to the expansion of planets.
13	CBR, Cosmic Background Radiation	An estimate of the wavelength of radiation emitted from oscillating neutral dipoles in hydrogen (the most abundant element in the universe) is consistent with the peak in the curve of the CBR data.
14	Gravitational Red Shift	A decay in the gravitational force means that in the past the stellar gravitational redshifts could have been much higher. This requires a reinterpretation of the redshift data and corresponding estimates for the size and age of the cosmos.

school graduates, whose knowledge of modern physics begins and ends with a vague sense that they don't like quantum mechanics.

One doesn't have to dig very deep into the CFM to find areas that have not been probed or places where answers don't exist. The work is "in progress" and Lucas and Bergman don't always agree on the details. Even some features presented in the survey are contradictory and ambiguous; but these are not bad things, given the circumstances. I liken the situation to that of Whitcomb and Morris in the period following their publication of *The Genesis Flood* (Whitcomb & Morris, 1961) as creation scientists began working through the development of the new flood model.

Investigating the model

I have followed Lucas and Bergman's work for more than ten years and closely examined their mathematical developments. A potential pitfall of any theory is apparent: A theory is only correct if both its equations and presuppositions are valid. The starting point of Lucas and Bergman's work is the assertion that the common expression of Maxwell's equations, the basis of classical electrodynamics, was derived using two assumptions that severely limit their applicability (Jackson, 1999). They claim it is not the empirical laws of electromagnetics that are limited, but that it is the consequences of those simplifying assumptions that render classical electrodynamics unsuitable for use at subatomic scales or at very high speeds. How can we know if Lucas and Bergman are right on this point? It seems both pretentious and improbable that Maxwell and those employing his work for more than a century have been wrong on such a fundamental point. A helpful position to take, though, is to ask not whether the theory is true or false, but to consider under what conditions and to what degree the model is useful. In this context, we should investigate to see if there are reasonable grounds for Lucas and Bergman's assertion, and to see if their approach might lead to new methods and models that are more accurate, simpler, or more useful than those

Table 2. Descriptions of information links found in the survey. Over a third of the links contain illustrations.

	Information Link	Principle Ideas Introduced through the Link
1	Cedarville	The Cedarville University website gives legitimacy to the survey by differentiating it from spam.
2	Charge Fiber Features	Combinations of primary, secondary & tertiary fibers can account for subatomic particle reactions and decays. (Figure 8)
3	Charge Fiber Model	The charge fiber model has three coupled fibers in place of a simple ring with helical undulations. (Figure 7)
4	Conservation	Total charge, spin and helicity are always conserved in particle interactions. Particle pair production/ annihilation is not allowed.
5	CB Radiation	The neutral dipole oscillation frequency of hydrogen is consistent with the observed cosmic background radiation (CBR), indicating its gravitational origin.
6	Coulomb's Law	For atomic size particles with inherent magnetic properties, Coulomb's law has limited usefulness.
7	Finite Elastic Particles	At subatomic scales and in the presence of magnetic forces, both finite size and feedback effects must be considered.
8	Force of Inertia	The UFL and the particle's self-fields yield an expression for $F = mA$, plus a non-radial term.
9	Gravitational Decay	Vibrating neutral dipoles must radiate energy, causing the gravitational force to decay over time.
10	Gravitational Force	Using the universal force law, the 4th-order velocity term between vibrating neutral dipoles gives rise to an attractive force. (Figure 9)
11	Gravitational Redshift	Gravitational redshifts would be larger in the past, skewing the interpretation of stellar redshift data.
12	Maxwell's Equations	Maxwell's equations are not universal because they incorporate the point particle approximation and combine the $\mathbf{E}_0$ and $\mathbf{E}_i$ fields.
13	Atomic Models	Contributions by Parson, Bergman and Lucas are included in addition to those of Rutherford, Bohr, Schrodinger, etc.
14	Neutral Dipoles	Pairs of oppositely charged elementary particles in fixed positions can vibrate with respect to each other, radiating (or absorbing) energy.
15	Non-Radial Forces	The universal force law contains non-radial terms. The non-radial gravitational term can account for the tilt of planetary orbits. (Figure 6)
16	Periodic Table	Geometric considerations of stationary particles within the atom account for electron shells, nuclear structure and the structure of the periodic table.
17	Planetary Expansion	Gravitational decay indicates the planets would be larger in the past and should show signs of past expansion.
18	Privacy	Survey respondents remain anonymous unless they want to provide contact information.
19	Quantum Mechanics	Quantum Mechanics (QM) is a very successful model. The same effects can be achieved using the charge fiber approach.
20	Radiate Energy	Particles in fixed locations radiate/absorb energy only when a particle (i) changes helicity state or (ii) experiences vibrational motion.
21	References	Links are provided to the most useful papers that describe the model. The papers include full mathematical derivations of most claims.
22	Relativity Theory	Special Relativity Theory (SRT) applies only in special circumstances. The universal force law can also explain these phenomena.
23	Ring Model Features	The absorption/radiation of energy is explained by changes in the ring's helicity, the corkscrew undulations in the ring's shape. (Figure 4)
24	Ring Model	The ring geometry and properties can be calculated. The ring's electric and magnetic fields are static and don't radiate energy. (Figure 1)
25	Scientific Models	Models should be judged by their *usefulness.* Finite size models facilitate a return to classical electrodynamics. “True” vs. “False” labels are not appropriate because models can change over time.
26	Stationary Locations	Electrons have fixed locations and orientations within the atom. This facilitates a new approach to understand chemical bonds. (Figures 2, 3).
27	String Theory	A set of mathematical models being developed towards obtaining a universal force law.
28	Survey Results	The survey results will be made public (in some form) as soon as practical.
29	Universal Force Law	The Universal Force Law (UFL) is valid on all scales and in all reference frames. Its non-radial terms provide new insight into many phenomena. (Figure 5)

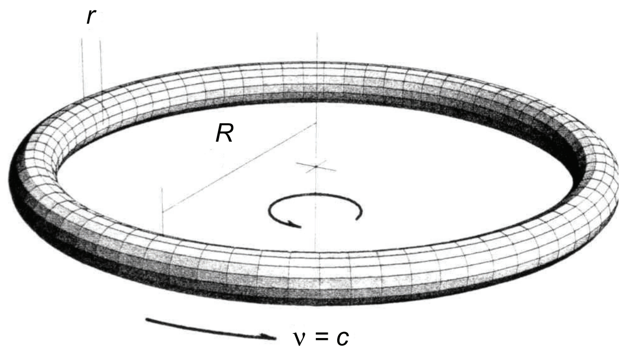


Figure 1. Ring model of an elementary particle with ring radius R, half thickness r, and annular charge velocity v = c.

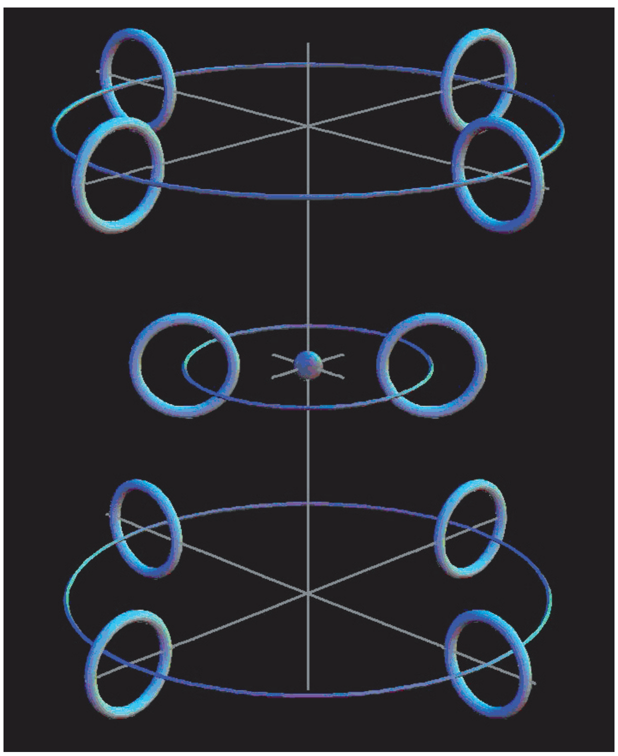


Figure 2. Neon atom showing the electrons in fixed positions. The magnetic flux lines strongly link the electrons and maintain the atom's stability.

developed within the QM/SM paradigm. By way of analogy, we could say that Lucas and Bergman's work is to mainstream physics as the six-day, young-earth creation model is to the prevalent billions-of-years, old-earth evolutionary model. The Charge Fiber Model of Elementary Particles looks equally strange to creationists as it does to evolutionists. It's worth examining though, because it may yield a more tangible, physical representation of the created universe than any other model to date. If the model turns out to be accurate and useful, it could change the way we do science in many fields.

Experimental work, often involving detailed and extensive number crunching that compares a model's predictions with observations or new types of calculations, is essential to confirm or deny the

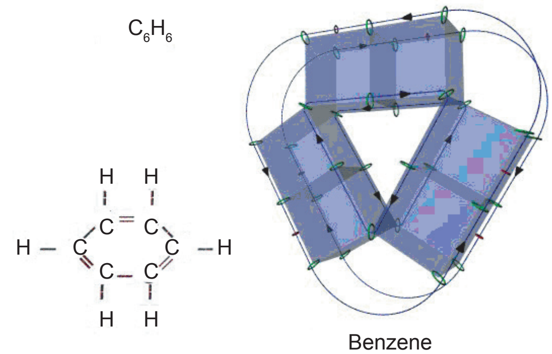


Figure 3. Benzene molecule. The cubes represent carbon atoms. The large rings are electrons and the small red rings midway along the edges of the carbon atoms are protons from the hydrogen atoms. Common edges reflect single bonds, common faces reflect double bonds, and blue lines represent magnetic flux lines that help bind the molecule together.

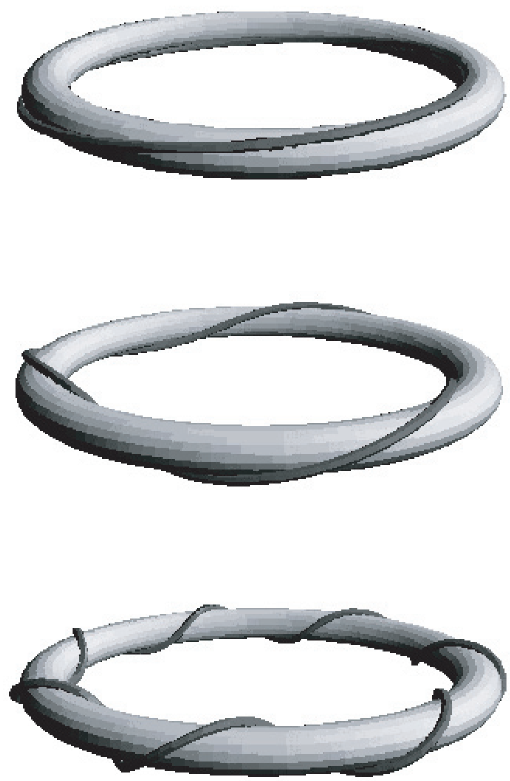


Figure 4. Ring particle at different energy levels and helicity. The large toroid is a visual placeholder. In the upper image, the fiber represents a ring in the ground state with a helicity of one. The lower images represent higher energy states with helicities of three and seven, respectively. (The toroid thickness is exaggerated for clarity.)

usefulness of a new model. Since very few people know about Lucas and Bergman's work there are few experts prepared to give an opinion on it. Some might take the position that since the new model has not been published in the established journals the matter

$$\vec{F} = \frac{qq'}{R^2}\left(\frac{\left(1-\frac{\vec{V}^2}{c^2}\right)\vec{R}+\frac{2\vec{R}^2\vec{A}}{c^2}}{\left[\vec{R}^2-\frac{\left[\vec{R}x\left(\vec{R}\times\vec{V}\right)\right]^2}{c^2\vec{R}^2}\right]^{1/2}}+\frac{\left(1-\frac{\vec{V}^2}{c^2}\right)\left[\left(\vec{R}\frac{\vec{V}}{c}\right)\vec{R}\times\left(\vec{R}\times\frac{\vec{V}}{c}\right)+\left(\vec{R}\bullet\vec{R}\right)\vec{R}\times\left(\frac{\vec{R}\times\vec{A}}{c^2}\right)\right]}{\left[\vec{R}^2-\frac{\left[\vec{R}\times\left(\vec{R}\times\vec{V}\right)\right]^2}{c^2\vec{R}^2}\right]^{3/2}}\right)$$

Figure 5. Expression for the universal force law, UFL, where q_1 and q_2 are the two charges, R is the distance between the charges, $\beta = V/c$ is the normalized relative velocity between the charges, and A is the relative acceleration between the charges. When $\beta=0$ and $A=0$, the force is the same as the Coulomb force (the magnetic force has not been considered). When β=constant and $A=0$, the first term yields the relativistic expression for constant velocity motion and the second term yields a heretofore unknown non-radial force component. When both and β and A are non-zero, the expression includes components for radiation and radiation reaction. The universal force law applies on all size scales and in all reference frames. (This equation is written in SI units although in the original references it appears in Gaussian units.)

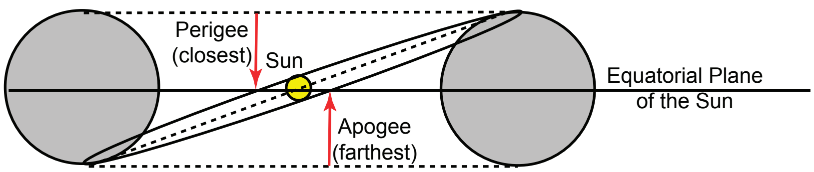


Figure 6. Evidence for the non-radial component of the gravitational force. The first term in the gravitational force causes a circular motion in the plane of the sun's equator. The second term superimposes a spiraling motion perpendicular to the direction of the first component. The result of exactly one corkscrew revolution during each equatorial circular revolution is an elliptical trajectory that is tilted at an angle with respect to the plane of the sun's equator. All the planets and moons in our solar system have orbits of this form. Note: The trajectory of the planet (the black ellipse crossing the sun) should appear as a single line directly on top of the dashed line but is shown as an ellipse for clarity.

In this work, therefore, I undertook a survey to find out what "experts in the field" know about the Charge Fiber Model and to find out what those same practitioners think about the model. I hoped to generate suggestions for applications that could experimentally confirm or refute the validity and usefulness of the model. In addition, the experience of CSS in the development and presentation of their model to others in the creation and wider scientific communities offers insight into how we should respond to new ideas and how we can more effectively present our work to others.

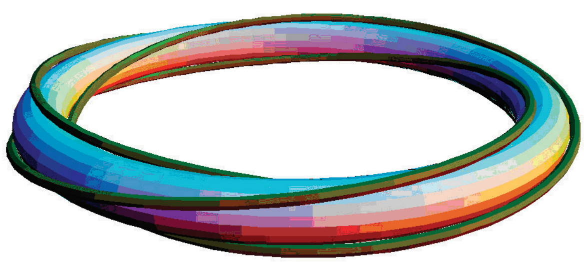


Figure 7. Basic charge fiber model. The basic ring is replaced by three primary charge fibers as shown here. Each primary fiber can consist of up to three secondary charge fibers, and each of those may consist of up to three tertiary charge fibers. (The large toroid is a visual placeholder.) The fibers are *not* linked or braided together. Without the visual toroid, the elliptical fiber rings could be visually slid in and out of position.

has already been settled; the work is not significant and should be ignored. But then very little about the young-earth model that creationists hold dear has ever been published in *Nature*, *Scientific American*, *Physics Today*, or hundreds of other established publications either. Being published in recognized journals is not a fair test of a model's validity or usefulness when the subject material falls outside the accepted paradigm of those journals.

Survey Design

The survey's stated purpose is fourfold: (1) Provide an overview of the Charge Fiber Model (CFM) for academics, researchers, scientists, and graduate students, (2) Contact people who are experts in the field and ask what they know about the model and their opinions of it, (3) Provide links to resources for further investigation of the model, and (4) Solicit practical ideas for experiments to validate or invalidate the model. To do this I implemented an online survey designed to simultaneously convey information about the CFM, assess practitioners' knowledge of the model, and solicit their opinions about it. I refer to the method as a tutorial-based survey because it facilitates information flow in both directions.

Survey Layout and Strategy

The survey had to convey a great deal of information while holding respondents' interest in material at which many would likely scoff. To accomplish this, many of the questions are actually statements that solicit an opinion. Appendices A and B contain the survey questions and response formats, respectively. The questions include links to 29 web pages containing images and salient information about the model.

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

Figure 8a. Combinations of primary charge fibers.

$\downarrow$ Represents an –e/3 charge fiber loop

$\uparrow$ Represents an +e/3 charge fiber loop

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

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

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

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

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

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

$e^- = (\downarrow,\downarrow,\downarrow)$ Represents one spiraling primary charge fiber with three –e/3 spiraling secondary charge fibers with left-handed helicity

$v_e = \overleftarrow{\Updownarrow} = \overleftarrow{\downarrow\uparrow}$ Represents one spiraling primary charge fiber with one –e/3 and one +e/3 spiraling secondary charge fibers with left-handed helicity

$\bar{v}_e = \overrightarrow{\Updownarrow} = \overrightarrow{\uparrow\downarrow}$ Represents one primary charge fiber with one +e/3 and one –e/3 spiraling secondary charge fibers with right-handed helicity to form the anti-particle

$\sum 0 = \overleftarrow{\Uparrow},\downarrow,(\uparrow,\overleftarrow{\Downarrow})$ Represents three spiraling primary charge fibers.
The first primary charge fiber consists of two spiraling secondary charge fibers with left-handed helicity.
The second primary charge fiber consists of a single –e/3 spiraling charge fiber.
The third primary charge fiber in ( ) consists of a single secondary charge fiber spiraling with two tighter spiraling tertiary charge fibers with left-handed helicity.

Note that there are two orientations of charge fiber loops, that is, parallel $\uparrow\uparrow$ and anti-parallel $\uparrow\downarrow$. 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 anti-parallel case the 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.

Figure 8b. Combinations of primary charge fibers. The adjacent key gives the notation to describe the various charge fiber combinations. The left two columns in the above table give the symbol and name of the particle according to the standard model. The third column gives the structure proposed by the charge fiber model and the next two columns list the net charge and spin. For example, the down quark, d, is comprised of a single primary fiber with charge $-e/3$. The electron $e-$ is comprised of three primary fibers, each with charge $-e/3$. The proton, p, is a compound particle with a single primary fiber of charge $-e/3$ and two secondary fibers each comprised of two inter-twined $+e/3$ secondary charge fibers with left hand helicity.

Table 2 summarizes the links and the principal ideas conveyed in each. Table 3 summarizes the design requirements for the survey tool and the features incorporated to accomplish them.

It was important for respondents not to feel that a certain response might imply their agreement with the model. The purpose of the survey was neither to solicit endorsement for the model nor to come up with numbers to validate it. I wanted to find out how much was known about the model and what was thought of its features and claims. Therefore, much of the survey is a guided tutorial that outlines the model and asks leading questions to confirm if the respondents are aware of the model's claims. For example, Question 13 states, "The classical approach taken by Lucas and Bergman envisions a universe comprised of finite-size elastic charged particles located at well-defined *stationary locations* within the atom. (**Y**es, **N**o, **U**ncertain, **C**omment)" The question statement communicates three significant facts that are very different from the standard paradigm: A universe filled with *finite-size elastic charged particles*, particles that are at *precisely known locations*, and particles that are at *stationary locations*. The link "*stationary locations*" contains Figures 2 and 3 and describes the model's features on the issue. In answer to question 13, "Yes" means, "That's what the model states", and confirms the respondent is aware of the model's claims about the stationary nature of atomic particles. A "Yes" response does not mean the respondent thinks the statement is true. The next question asks, "What do you think of the accuracy of this claim? (**A**gree, **D**isagree, **U**ncertain, **C**omment)" so that respondents may give their opinion of the model's value and validity regarding the claim. In this way, the survey endeavors to differentiate between what respondents know about the model and what they think about it.

When people first hear about creation science and start investigating its claims, they discover an extensive model that spans many aspects of science and requires a paradigm change in many aspects of their world view before it can be understood and accepted. In the same way, the CFM is extensive and hard to describe within a few short statements.

$$\underbrace{\vec{F}_G \approx -G\frac{m_1 m_2}{\left|\vec{r}_2-\vec{r}_1\right|^2}\hat{r}_{12}}_{\text{Linear Motion}}\;\underbrace{-\frac{45}{8}G\frac{m_1 m_2}{\left|\vec{r}_2-\vec{r}_1\right|^2}\left(\hat{r}_{12}\cdot\vec{\beta}\right)\hat{r}_{12}\times\left(\hat{r}_{12}\times\vec{\beta}\right)}_{\text{Corkscrew Spiral Motion}}$$

Figure 9. Expression for the Gravitational Force, where G is the universal gravitational constant, m_1 and m_2 are the gravitational masses of the two bodies, $\boldsymbol{r}$ is the distance between the bodies and $\boldsymbol{\beta}=\boldsymbol{V}/c$ is the normalized relative velocity between the charges. The first term represents the Newtonian gravitational term in the radial $\boldsymbol{r}$ direction. The $\boldsymbol{r}\times\boldsymbol{r}\times\boldsymbol{\beta}$ component in the second term gives rise to a spiraling corkscrew like motion that is *not* in the radial direction.

It's so different from mainstream physics that many of the question statements and information links found in the survey are of limited value *if taken individually and out of context.* On their own, they invite misunderstanding and ridicule. But, if one starts with the first statement, follows the reference link, and works sequentially through the questions and links of the survey, *the tutorial format builds a framework* from which the model can be appreciated and understood. It's an interactive process that encourages respondents to read, evaluate, and respond according to their current understanding. Comments and opinions are encouraged. Participants can go back and change their responses if their view or appreciation of the model changes. Unfortunately, it does take time to communicate this much information; more time than most people may want to invest. I offset this by breaking the survey into four relatively small sections, each one covering the material in increasing detail. The responses in each section are meaningful without knowledge of the subsequent material.

Potential respondents

I first approached people in the field of high energy physics (HEP) because of their extensive knowledge of the existing SM/QM paradigm. I used the now defunct

Table 3. Design requirements and features of the online tutorial-based survey tool. The survey facilitates a two-way flow of information supported by embedded information pages, figures, reference material and opportunities to submit comments, opinions, or even pose additional questions.

	Design Requirements	Features of the Online Tutorial-Based Survey
1	Convey confidentiality, integrity, and professionalism	Introduce myself and clearly reference Cedarville University. Provide an easy way to contact me. Be polite and direct. Identify this as a research project. Explain in the Privacy link what cookies are put on the user's machine. Keep the layout and design professional, grammatically correct and of high quality.
2	Allow the user full control to move through the survey	Provide a navigation window with links to each section of the survey, a scroll window with instructions and background information, links to contact me, links to technical references and Save, Reset and Submit buttons.
3	Get the user started	Keep the home page simple and direct (Figure 10). The title states it is a survey of "Academics and Science Professionals" and hopes to get them to the next page. The user can plan to use the Save button if they won't finish in one sitting.
4	Keep the user going	Include a description and image of the ring model in a link in the very first question. The link to a summary of atomic models in the same questions is long but contains jumps to contributions by Bergman and Lucas, hoping to catch people's interest.
5	Minimize the number of response choices	Use questions that are somewhat open-ended but with space for comments on every question. The ability to add comments is intended to offset the frustration and ambiguity some respondents may feel about some of the questions.
6	Convey detailed knowledge of the model	Include links on most questions to popup windows containing background information and new concepts. Include images to catch attention and better convey the novel ideas of the model.
7	Emphasize what is new about the model	Links that contains material the respondents are likely familiar with also highlight important distinctions and new interpretations. The links and many of the questions in Sections 3 and 4 present ideas that challenge the status quo.
8	Differentiate between prior knowledge and that gained from the information links	Each question allows the user to specify to what extent their answer is based on prior knowledge or on information acquired from the information links.
9	Respect respondents' opinions and experience	Ask questions about what the model "claims" (instead of about what "is true") and solicit respondents' opinion of the "scientific merit" of those claims. Provide a wide range of response choices and let the user clarify with comments if desired.
10	Promote deeper understanding of the model	The Technical References link provides information about the CSS website and the personnel involved with CSS. It also contains links to pdf versions of the most important papers concerning the model.
11	Ensure the usefulness of the respondents' data	Ask respondents about their occupation, experience and competency to evaluate the model. Users can enter a Group Code which is used to correlate responses with certain target audiences (such as HEP, CSS).
12	Estimate the time taken to complete the survey	The survey tracks the length of time each information link is open and the length of time respondents spend in each section. The survey also tracks how many times a given computer submits the survey.

HEPIC (High Energy Physics Information Center) website and randomly selected about one hundred of the physics departments and research centers from around the world that were listed there. I randomly picked about 50% of the names in each department and compiled a list of 2000 email addresses. I did not record any of the names associated with the email addresses.

I wrote a cover letter to introduce myself, describe the nature of the survey and ask recipients to help me in a research project by responding to the survey. The greatest risk of initial failure was that the email would be filtered out as spam or, more likely, be perceived as spam and trashed without the majority of recipients even looking at it. To minimize this risk I (i) used an interesting, accurate, and effective subject line that didn't resemble spam, (ii) identified myself and made reference to my university affiliation, (iii) stated the purpose of the survey, (iv) kept the text brief enough to fit in a typical email preview pane, and (v) asked for a response within a week. A link to the survey was included, http://www.commonsensescience.org/survey, (Figure 10) and the survey was sent to the 2000 HEP recipients.

I also sent the survey to a random subset of the Common Sense Science (CSS) mailing list. These 93 people had been notified to expect an email from me. I contacted them and used the same cover letter as with the HEP group. The CSS group was asked to enter a group code of 100 with their responses so I could distinguish them from the HEP group.

Before sending out the survey, I tested it on a dozen acquaintances and colleagues. Their feedback helped me clarify some of the more ambiguous questions and confirmed the technical aspects of the survey website functioned as intended.

Survey Results

The HEP email addresses were randomly sorted and emails were sent out in eight batches of 250 to avoid institutions receiving more than a couple of emails from the same sender at one time (Round 1). Table 4 lists the details of the mailings and the response rates. Surveys and bounce backs from invalid addresses started coming back immediately but the response was very small, and amounted to a mere 7 returned surveys on the first day and 2 more within four days. After a week, I sent a polite reminder to the same email list (Round 3), asking again for their support by submitting a survey. I pointed out that other groups had responded with a much higher response rate, and that I wanted the HEP community to be represented in the tally by more than just silence. This brought in

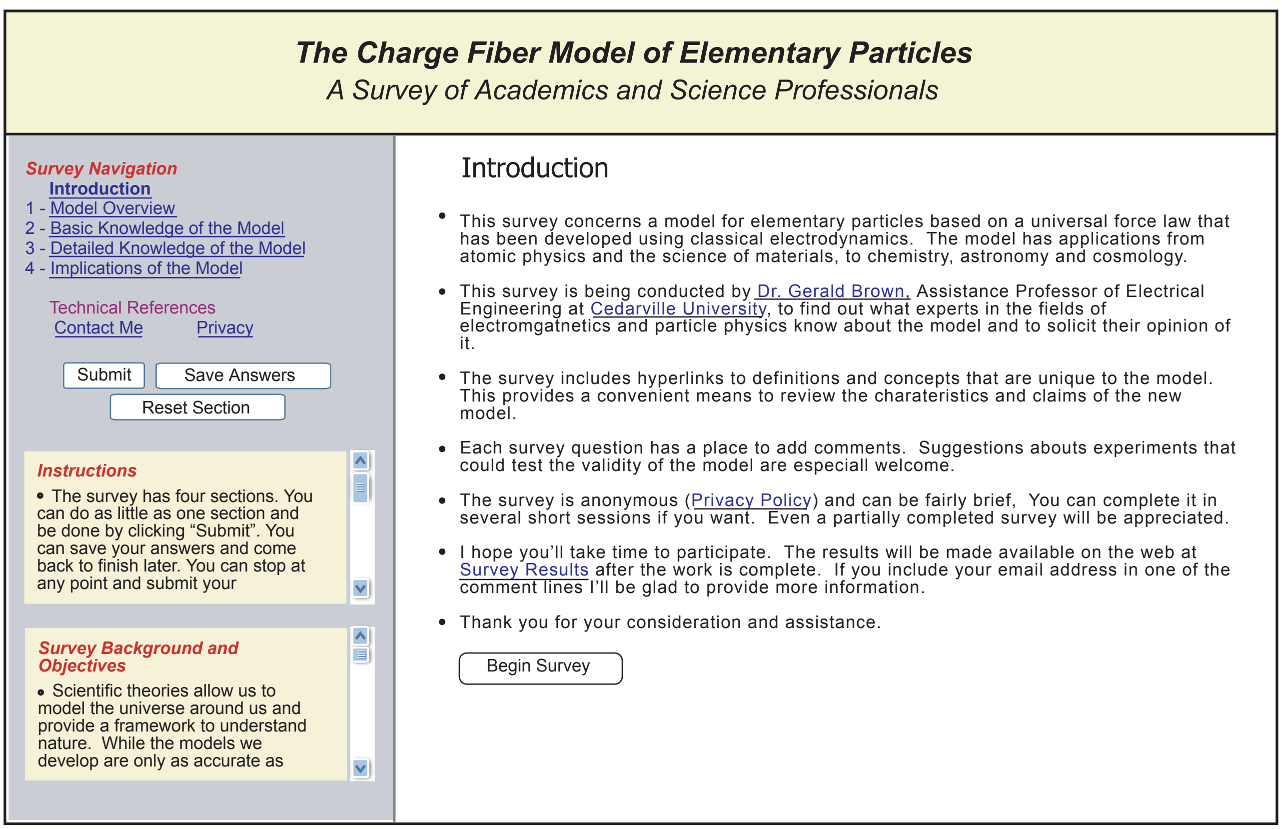


Figure 10. Survey home page. The navigation pane at the left facilitates quick movement through the entire survey. The layout is simple, uncluttered and designed to give the user full control. Detailed instructions and objectives are available for those who are interested without taking up much space.

Table 4. Survey sample size and response rate. The response rate from the High Energy Physics community (HEP) was very low compared to those who had some prior connection to the Charge Fiber Model or who were personally asked if they would review the survey. Responses from members of the Common Sense Science (CSS) email list who declared themselves unqualified to answer (9 respondents) were not considered in the analysis.

Round	Group	Sent	Bad Address	Effect.	Responses	Submitted	Final	Rate
1	HEP, initial	2000	160	1840	9	21 qualified	21	**1.1%**
3	HEP, resend	1998	160	1838	12			
2	CSS, partial list	93	17	76	27	18 qualified	24	**29 %**
						9 unqualified		
-	Test & Review	12	-	12	6	6 qualified		
	Total CSS & Reviewer Base			82[3]				-
	Total HEP, CSS & Reviewer Responses Submitted				54	Qualified Responses	**45**	-

Notes: 1. Responses peaked in two days and tapered off in about four days for the HEP group.
2. Two spam complaints were received by separate email. Two others mentioned spam in their survey comments.
3. Six of the tester/reviewers submitted their comments by separate email or through personal communication.

an additional 12 responses for a total of 21. The combined response rate from the HEP community was a marginal 1.1% out of a base of 1840 valid recipients. This raises legitimate concerns about extrapolating from those responses to the entire HEP community. Even so, the HEP responses I did receive were insightful.

The CSS emails were sent out in a single batch (Round 2) and responses came back immediately, 10 the first day and the rest over the course of a week. Nine of the responses from the CSS group were not considered in the analysis based on their own assessment that they lacked suitable qualifications to evaluate the model. I also considered the responses submitted by 6 of the 12 designated reviewers, 8 of whom had no familiarity with the model beforehand. The other 6 reviewers responded via email or in person. The combined email response rate from the CSS and reviewer group was a significant 29% out of a base of 82 valid recipients.

Unwanted and unsolicited email is a bane to everyone and I didn't want to add to the pile. At the same time, the survey represented a legitimate research endeavor and I hoped my cover letter and mailing technique would generate sufficient response to achieve my goal. I can't be sure, but I believe my emails made it past most spam filters and were simply deleted by uninterested recipients. On the second HEP mailing, I purposefully used the same sending address to respect people's privacy; if they blocked my email address they would not receive my second email. In total, I received less than a half dozen complaints about spam, whether by separate email or in a comment submitted in the survey. I consider such a small number to be very good.

Respondent profiles

The respondent profile information is found at the bottom of Table 6. The HEP group listed their occupations equally as **U**niversity professor, **R**esearcher, **G**raduate student, **P**ost doctoral work and ph**Y**sicist (all at 24%), or **O**ther (at 9.5%). The CSS group listed themselves as **U**niversity professor 25%, **R**esearcher 33%, **G**raduate student 4.2%, **P**ost doctoral work 8.3%, **E**ngineer 33%, ph**Y**sicist 21%, **D**irector 8.3%, and **O**ther 33%. The largest differences are the CSS group had a lower percentage of **G**raduate students, **P**ost doctorate workers, and ph**Y**sicists, but a larger percentage of **R**esearchers, **E**ngineers, and those who did **O**ther things. The CSS group represents a broader range of occupations. The percentages add to more than 100% because multiple responses were accepted.

Concerning work experience, the most prevalent experience in the HEP group was in the areas of physics, particle physics, quantum mechanics and relativity theory (between 50% and 67% each) and 29% had experience in electromagnetics. The CSS group was more diverse here as well, listing their experience as electrical engineer 21%, electromagnetics 25%, physics 59%, particle physics 21%, quantum mechanics 25%, relativity theory 17%, director/manager 29%, and other 38%.

When asked to rate their competency to evaluate the CFM, the HEP group evaluated themselves as **N**ot 33%, **S**omewhat 19%, **Y**es 33% and **V**ery 14%. The CSS participants evaluated their competency as **N**ot 4.2%, **S**omewhat 46%, **Y**es 33%, **V**ery 13%, and **O**ther 4.2%. The difference here was in the **N**ot and **S**omewhat categories.

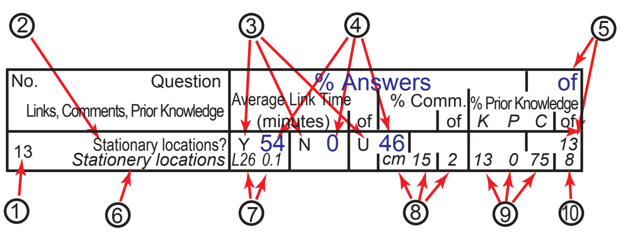
Section and information link times

The data was analyzed and the results are presented in Table 6; the HEP group of 21 responses and the CSS group of 24 responses. Figure 11 provides a key to reading Table 6. The survey web pages included timers to record the time respondents spent on each section and on each information link. Their response patterns were tracked (Table 5) and confirmed the reasonableness of the time information. The ratio of total link time to survey time was typically between 15% and 30% for respondents who looked at a lot of

Table 5. Survey time statistics. The amount of time invested by those who spent more than 20 minutes on the survey is about the same for both groups of respondents (bold), but CSS respondents submitted on average about three times as many comments.

Survey Time Statistics [minutes]		HEP	CSS
Number of Respondents in Group		21	24
Overall Response Rate from Group		1.1%	29%
Total Survey Time	Max	95	141
	Avg.	23	66
Those who spent <20 minutes	Avg.	8	14
Those who spent ≥20 minutes	Avg.	**46**	**48**
Section Time	Max	27	85
	Avg.	4.6	13.2
Number of Information Links Opened	Max.	23	22
	Avg.	5.6	7.0
Single Link Time	Max	8.7	8.7
	Avg.	0.5	0.9
Total Link Time	Max.	47	45
	Avg.	5	8
Those who spent > 20 minutes	Avg.	**28**	**25**
% Total Link Time / Survey Time	Avg.	14%	10%
Total Number of Comments (survey only)		91	272
Average No. of Comments per Respondent		4.3	11.3

links. One exception was a respondent in the CSS group whose ratio was only 5%, indicating the user probably left the survey active on the screen for an extended time while doing something else. That person's total time was adjusted downward from



1	Question number
2	Abbreviated question text
3	Answer key, that is, **Y N U** means **Y**es, **N**o, **U**ncertain
4	% answer for each response, that is, 54% **Y**es, 0% **N**o, 46% **U**ncertain
5	Total number of responses to this question, that is, 13
6	Name of information link(s) in the question
7	Information link number(s) and average time it was open, that is, Link 26 was open an average of .1 minutes (6 seconds)
8	% comments and total number of comments, that is, 15% (of 13 responses) is 2 comments
9	% answer for each prior knowledge response, **K P C** (see below)
10	Total number of responses for prior knowledge question, that is, 13%of 8 answered based on prior **K**nowledge; 0% of 8 answered based **P**artly on what they read on the link; 75% of 8 answered based **C**ompletely on what they read on the link

Figure 11. Key to survey results in Table 6.

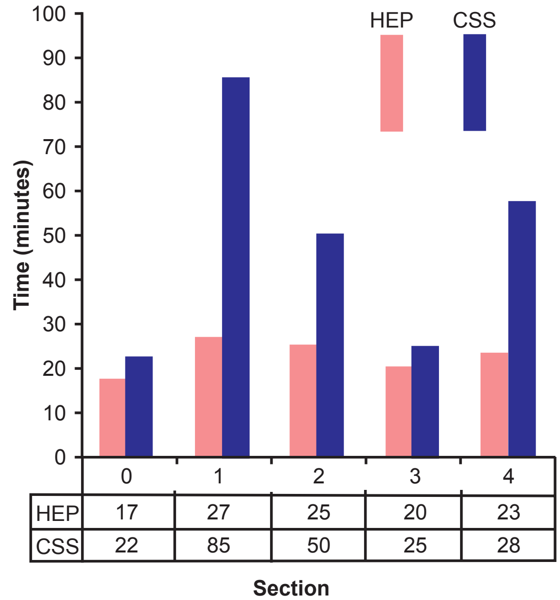


Figure 12. Maximum section times. The HEP group invested a max. of 27 minutes per section compared to the CSS max. of 85 minutes.

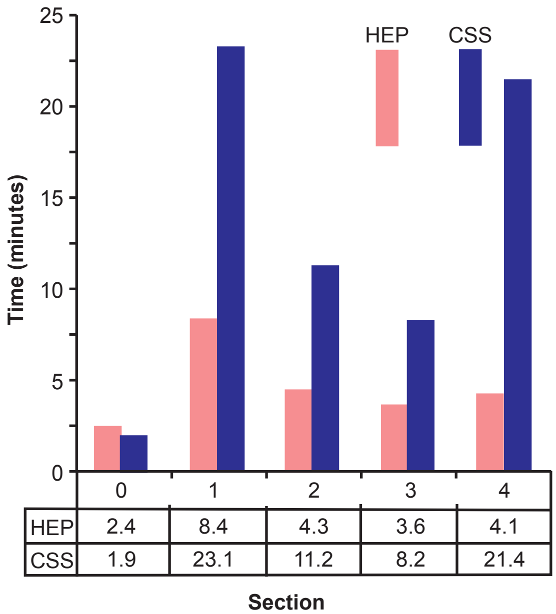
490 to 130 minutes to bring the average to a more reasonable value of 18%. All other data was left unaltered. It appears that no more than one response was sent from any computer.

The maximum time spent on the survey was 95 and 141 minutes for the HEP and CSS groups, respectively, and the average times were 23 and 66 minutes, respectively. The maximum time spent on any one section was 27 and 85 minutes, HEP and CSS, respectively, and the average times were 4.6 and 13.2 minutes per section (Figures 12 and 13). There were a total of 27 links in the survey that described the model (Table 2). Most respondents did not open many links. HEP participants opened an average of 5.6 links lasting 5 minutes total and CSS participants opened an average of 7.0 links lasting 8 minutes total (Table 5, Figures 14 to 16). The average time spent by all respondents looking at links was less than one minute per link.

In each response group, there were some who went quickly through the survey, the "quick lookers" that took less than 20 minutes in total, and others who took a significant amount of time, the "serious lookers" that invested 20 or more minutes in the survey. The quick lookers in the HEP group averaged only 8 minutes for the entire survey while the quick lookers in the CSS group averaged 14 minutes, a significant difference. On the other hand, the average times for the serious lookers in each group are very similar (46 and 48 minutes, total time). Most people in both groups did not spend much time reading the links. The total average time on information links for the serious lookers was 28 and 25 minutes for the HEP and CSS groups, respectively. Otherwise, total time

Table 6. Survey results. For each question the survey tool logged the question responses, the number of responses, prior knowledge responses, comments, section times and information link times. It also logged respondent information (occupation, experience, competency) and general comments.

No.	Question	HEP Participants (21 of 1840 = 1.1% response)												CSS & Rev. Participants (24 of 82 = 29% resp.)											
		% Answers											of	% Answers											of
	Links, Comments, Prior Know.	*Avg. Link Time [minutes]*				of	*% Comm.*		of	*% Prior Know.* K	P	C	of	*Avg. Link Time [minutes]*				of	*% Comm.*		of	*% Prior Know.* K	P	C	of
1	Heard of ring model?	Y	20	N	80	U	0						20	Y	96	N	4	U	0						24
	Atomic Models, Ring Model	L13	0.0	L24	0.0		Cm	0	0	69	13	19	16	L13	0.0	L24	0.0		Cm	33	8	91	0	8.7	23
2	Ring model's merit?	S	47	W	32	G	0	T	0	U	21		19	S	4	W	8	G	67	T	4	U	17		24
							Cm	32	6	50	13	38	16						Cm	46	11	86	9.5	0	21
3	Heard of charge fiber model?	Y	5	N	95	U	0						20	Y	71	N	17	U	13						24
	Charge Fiber Model	L3	0.5				Cm	0	0	46	7.7	46	13	L3	0.0				Cm	25	6	57	9.5	24	21
4	Charge fiber model's merit?	S	67	W	11	G	0	T	0	U	22		18	S	4	W	25	G	42	T	0	U	29		24
							Cm	28	5	29	14	57	14						Cm	38	9	63	16	11	19
5	Major dev.in physics? Which?	Y	70	N	10	U	20						20	Y	78	N	17	U	4						23
	Scientific Models	L25	0.1				Cm	55	11	81	6.3	0	16	L25	0.0				Cm	83	19	89	5.3	0	19
6	New models frequent?	S	55	F	10	C	15	H	5	U	15		20	S	58	F	17	C	17	H	4	U	4		24
							Cm	10	2	93	0	0	14						Cm	25	6	94	0	0	18
7	Estimate of QM and RT?	N	5	M	0	G	30	P	60	U	5		20	N	21	M	25	G	50	P	4	U	0		24
	Quantum Mech., Relativity Th.	L19	0.3	L22			Cm	20	4	100	0	0	15	L19	0.0	L22			Cm	46	11	100	0	0	20
8	String theory?	N	0	S	47	G	47	B	0	U	6		17	N	0	S	50	G	33	B	0	U	17		18
	String Theory	L27	0.5				Cm	6	1	94	6.3	0	16	L27	0.0				Cm	33	6	85	10	0	20
9	Comments on **overview**?						Cm	10	2										Cm	21	5				
10	Based on FEP's?	Y	38	N	0	U	62						13	Y	75	N	4	U	21						24
	Finite Elastic Particles	L7	0.3				Cm	0	0	2	0	78	9	L7	0.0				Cm	8	2	52	38	9.5	21
11	Coulomb's law different?	Y	36	N	29	U	36						14	Y	58	N	13	U	29						24
	Coulomb's Law	L6	0.1				Cm	29	4	50	30	20	10	L6	0.0				Cm	29	7	55	25	15	20
12	Rings explain quantization?	Y	29	N	7	U	64						14	Y	88	N	4	U	8						24
	Ring Model Features	L23	0.1				Cm	21	3	13	13	63	8	L23	0.0				Cm	21	5	73	9.1	14	22
13	Stationary locations?	Y	54	N	0	U	46						13	Y	88	N	0	U	13						24
	Stationary Locations	L26	0.1				Cm	15	2	13	0	75	8	L26	0.0				Cm	25	6	75	20	5	20
14	Accuracy of stationary claim?	A	0	D	54	U	46						13	A	63	D	8	U	29						24
							Cm	15	2	44	22	22	9						Cm	42	10	85	10	5	20
15	Periodic table structure claim?	Y	50	N	7	U	43						14	Y	83	N	0	U	17						24
	Periodic Table	L16	0.1				Cm	29	4	11	11	67	9	L16	0.0				Cm	25	6	77	14	4.5	22
16	Don't generally radiate energy?	Y	38	N	15	U	46						13	Y	83	N	4	U	13						24
	Radiate Energy	L20	0.0				Cm	31	4	25	13	50	8	L20	0.0				Cm	25	6	71	19	4.8	21
17	**Com. on basic knowledge?**						Cm	5	1										Cm	33	8				
18	Intertwined charge fibers?	Y	55	N	0	U	45						11	Y	52	N	17	U	30						23
	Charge Fiber Features	L2	0.3				Cm	18	2	13	0	75	8	L2	0.0				Cm	39	9	63	16	21	19
19	Conserve total charge?	Y	55	N	0	U	45						11	Y	65	N	0	U	35						23
	Conservation	L4	0.0				Cm	18	2	14	14	71	7	L4	0.0				Cm	26	6	56	22	17	18
20	Universal force law?	Y	56	N	11	U	33						9	Y	61	N	4	U	35						23
	Universal Force Law	L29	0.1				Cm	33	3	17	17	67	6	L29	0.0				Cm	48	11	72	5.6	17	18
21	Neutral dipoles?	Y	40	N	0	U	60						10	Y	39	N	4	U	57						23
	Neutral Diploes	L14	0.0				Cm	30	3	17	0	83	6	L14	0.0				Cm	35	8	53	12	29	17
22	Gravity/inertia claim merit?	S	60	W	10	G	10	T	0	U	20		10	S	9	W	30	G	30	T	0	U	30		23
	Grav. Force, Force of Inertia	L10	0.0	L8	0.2		Cm	30	3	33	0	67	6	L10	0.0	L8	0.0		Cm	39	9	63	25	13	16
23	Com. on **detailed knowledge**?						Cm	5	1										Cm	17	4				
24	Maxwell's approximations?	N	64	D	18	U	9	L	9				11	N	14	D	18	U	0	L	68				22
	Maxwell's Equations	L12	0.2				Cm	0	0	50	33	17	6	L12	0.0				Cm	0	0	81	9.5	4.8	21
25	Merit of Lucas UFL approach?	S	64	W	18	G	0	T	0	U	18		11	S	13	W	13	G	50	T	8.3	U	17		24
							Cm	36	4	50	33	17	6						Cm	42	10	74	21	0	19
26	Non-radial UFL term merit?	S	64	W	18	G	0	T	0	U	18		11	S	17	W	25	G	25	T	4.2	U	29		24
	Non-Radial Forces	L15	0.0				Cm	27	3	50	17	33	6	L15	0.0				Cm	50	12	50	22	22	18
27	Gravitational decay merit?	S	64	W	9	G	9	T	0	U	18		11	S	13	W	42	G	13	T	0	U	33		24
	Gravitational Decay	L9	0.0				Cm	18	2	33	17	50	6	L9	0.0				Cm	46	11	61	17	17	18
28	Gravity and CBR claims?	S	73	W	0	G	9	T	0	U	18		11	S	8	W	38	G	17	T	0	U	38		24
	CB Radiation	L5	0.0				Cm	18	2	50	0	50	6	L5	0.0				Cm	29	7	56	28	11	18
29	Gravitational redshift merits?	S	73	W	0	G	9	T	0	U	18		11	S	8	W	33	G	33	T	0	U	25		24
	Gravitational Redshift	L11	0.0				Cm	9	1	50	17	33	6	L11	0.0				Cm	38	9	61	33	5.6	18
30	Planetary expansion claims?	R	64	N	18	I	0	P	9	L	0		11	R	13	N	4	I	8	P	8	L	21		24
		B	0	D	0	U	18							B	0	D	0	U	17						
	Planetary Expansion	L17	0.5	B			Cm	0	0	50	17	33	6	L17	0.0	B			Cm	33	8	61	28	5.6	18
31	Non-tradtional models? Which?	Y	82	N	9	U	9						11	Y	71	N	21	U	8						24
							Cm	73	8	83	0	0	6						Cm	54	13	100	0	0	16
32	Merits of other models?	S	40	L	40	W	10	U	10				10	S	13	L	48	W	17	U	22				23
							Cm	10	1	100	0	0	5						Cm	35	8	94	5.9	0	17
33	Comments on **implications**?	Tot.	433		91		Cm	24	5					Tot.	1295		272		Cm	67	16				
1r	Occupation?	U	24	R	24	G	24	P	24	H	0		27	U	25	R	33	G	4.2	P	8.3	H	0		40
		E	0	Y	24	D	0	O	9.5		Cm	7.4	2	E	33	Y	21	D	8.3	O	33		Cm	25	10
2r	Experience?	a	0	b	4.8	c	4.8	d	29	e	4.8	f	60	a	21	b	8.3	c	4.2	d	25	e	8.3	f	59
		g	67	h	57	i	52	j	4.8	k	0	3.3	2	g	21	h	25	i	17	j	29	k	38	24	14
3r	Competency?	N	33	S	19	Y	33	V	14	O	0		21	N	4.2	S	46	Y	33	V	13	O	4.2		24
											Cm	19	4										Cm	79	19



	0	1	2	3	4
HEP	2.4	8.4	4.3	3.6	4.1
CSS	1.9	23.1	11.2	8.2	21.4

Figure 13. Average section times. The HEP group invested on average 4.6 minutes per section compared to the CSS average of 13.2 minutes.

for open links was only 2 or 3 minutes.

A major difference between the two groups was the number of comments submitted (Table 5). The HEP group submitted 91 comments (not counting the respondent information section), an average of 4.3 per person. The CSS group submitted 272 comments, an average of 11.3 per person. The maximum number of comments a person could submit was 33. A likely contributing factor for why CSS participants generally took longer to complete the survey than most HEP participants was that, in addition to contributing three times as many comments, the CSS respondents' comments were often much more extensive.

The most frequently viewed links on the survey by the HEP group were the Ring Model (24), the Charge Fiber Model (3) and the Scientific Model (25) links (Figure 16). This is probably because they were in the survey's first section. The CSS group viewed all the links about an equal number of times. The HEP group spent a fairly equal amount of time on each link (Figure 15), but the CSS group spent noticeably more time on three specific links in Sections 3 and 4, namely the Charge Fiber Features (2), Non-Radial Forces (15) and Cosmic Background Radiation (5) links. These links contained material that was quite likely new to most of the CSS respondents.

One of the arguments I faced conducting the survey was that it would be too long and that "nobody would take time to respond." The 1.1% response rate from the HEP community testifies to that lament. Even so, I hoped the material would prove interesting and professional enough that a small percentage of survey recipients would become intrigued enough to give me their opinions. In that regard, the survey was more successful. It appears people deleted the request immediately, glanced at it for a minute or two, or became intrigued (or considerate) enough to invest between 20 minutes and several hours on it. Even in the HEP group, where the percentage of responses was very low, 38% of the respondents spent more than twenty minutes on the survey.

Opinions on the Charge Fiber Model

One of the major differences between the two groups of respondents, not surprisingly, is that the majority of the HEP community (or at least those that responded to the survey) had little or no knowledge of the Ring and Charge Fiber Models beforehand. This can be seen, for example, in Table 6, questions 1 and 3, where the HEP responses were 80% and 95% "No", compared to 96% and 71% "Yes" for the CSS group. This is also indicated by the Prior Knowledge responses to the questions of Sections 2 and 3, where for most questions, between 67% and 78% of the HEP participants indicated that their answer was based **C**ompletely on knowledge gained from the link. For the same sections, less than 20% of the CSS group said their responses were based **C**ompletely on knowledge gained from the link.

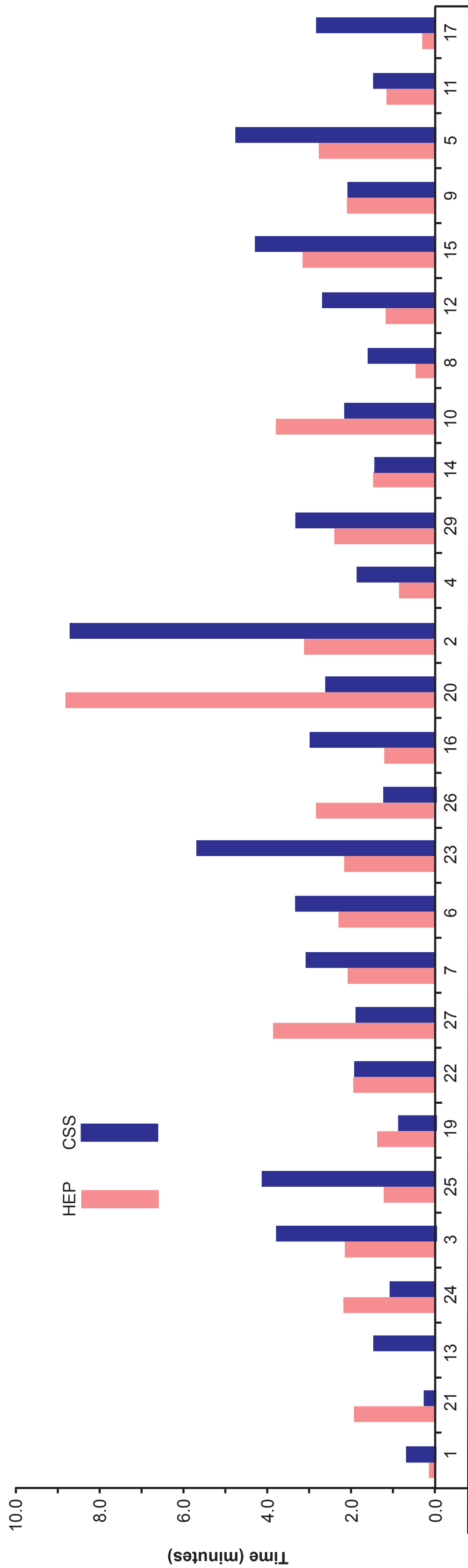
The overall percentage response from the HEP community was very small and their comments were usually short and often sarcastic in tone. Much of the sentiment was along the lines of, "Don't bother me with this. Don't you know any better? *Don't do surveys, do real physics and publish in real journals.*" (italics mine) Respondents in this category generally spent less than 5 minutes on the survey. The most extreme response of this type was possibly this one:

> You've tricked me into reading your links. I am offended by this waste of my time," followed by "hahahahahahahaha!" and "You should learn more real physics."

This person spent 16.5 minutes on the survey and looked at none of the information links. It seems the respondent's comments were based solely on the question statements and prior knowledge. One of the few more helpful responses was (italics mine),

> This theory here may have the possibility to explain a few physical effects but *it does not give any idea of the real basics*: Where does the universal force have its origin? What gives elementary particles their shape? *Point-like particles with quantum interactions provide, to my opinion, a much better [approach]* to find fundamental laws. (72 minutes, including 23 minutes on 23 links and 16 detailed comments)

The overall tone of responses from the small CSS community was much different. Their comments were much longer and none were sarcastic, but they were not necessarily supportive of the CFM either.



	1	21	13	24	3	25	19	22	27	7	6	23	26	16	20	2	4	29	14	10	8	12	15	9	5	11	17
HEP	0.1	1.9	0.0	2.1	2.1	1.2	1.4	1.9	3.9	2.1	2.3	2.1	2.8	1.2	8.7	3.1	0.9	2.4	1.4	3.8	0.5	1.1	3.1	2.1	2.8	1.1	0.3
CSS	1	0.2	1.5	1.0	3.8	4.1	0.8	1.9	1.9	3.1	3.3	5.6	1.2	3.0	2.6	8.7	1.9	3.3	1.5	2.2	1.6	2.7	4.3	2.1	4.8	1.4	2.8

Figure 14. Maximum information link times. The HEP and CSS groups each invested a max. of 8.7 minutes on one information link.

Some took strong sides in favor of Bergman, others in favor of Lucas. The length and detail of their comments indicate they have previously given a lot of consideration to some of the issues in modern physics raised by the survey. They recognized numerous problems exist and seemed to be earnestly looking for answers, turning over any reasonable stone, investigating what they found, and wanting to hold it up to the light of experimental scrutiny. They frequently disagreed with much of the material presented in the survey, but were engaged in an active dialog and were looking beyond the status quo for reasonable answers. The survey tapped into a wealth of information and opinions that were expressed in this group's comments.

The following excerpts are representative of the CSS feedback (italics mine):

If his proposal is true, then you should be able to measure the blackbody curve for different elements at the same temperature and get different parameters for the curve. (83 minutes total, including 45 minutes reading 22 links and making 15 comments)

New scientific models usually require old scientists to die and be replaced by younger ones. [And] Atomic models of Lucas/Bergman *provide reasonable explanations of chemical characteristics* and explain the stability of the atom. (75 minutes, including 2 minutes reading 3 links)

But *Lucas deserves a hearing despite preexisting preferences I currently hold.* [And] Lucas' model is *internally coherent* but this is a *hard sell/uphill battle.* (36 minutes, no links, 39 comments)

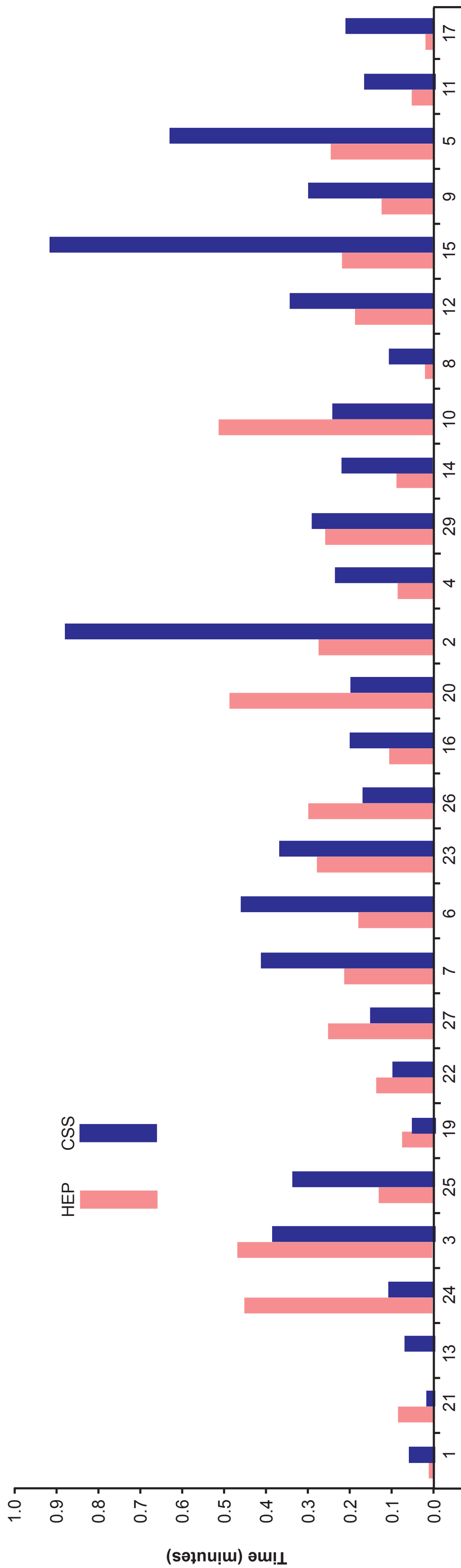
My concern would be to *solidify gains at a basic level by testing and discovery first*, saving the more speculative parts for later. (61 minutes, including 3 minutes reading 5 links)

I think *Bergman and especially Lucas are swerving away from their otherwise sound physical basis.* [And by the same person], "The ring model is the only model I've ever seen that is *even remotely on the right track.* (42 minutes, 1 link, 15 comments)

Lucas is *attempting to redo the base of what others consider a nearly finished pyramid of knowledge.* I follow the effort closely. [And] Here *we diverge but I listen carefully to what he says* for it attempts to link forces in matter. (66 minutes, no links, 30 comments)

The main problem science has had since WW2 has been *too much focus on approved lines of research and not enough "outside the box" research.* (49 minutes, 2 links, 28 comments)

The survey was not a technical critique or a



	1	21	13	24	3	25	19	22	27	7	6	23	26	16	20	2	4	29	14	10	8	12	15	9	5	11	17
HEP	0.0	0.1	0.0	2.1	0.5	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.1	0.5	0.3	0.1	0.3	0.1	0.5	0.0	0.2	0.2	0.1	0.3	0.1	0.0
CSS	0.1	0.0	0.1	1.0	0.4	0.3	0.1	0.1	0.2	0.4	0.5	0.4	0.2	0.2	0.2	0.9	0.2	0.3	0.2	0.2	0.1	0.3	0.9	0.3	0.6	0.2	0.2

Figure 15. Average information link times. The HEP and CSS groups averaged 0.5 and 0.9 minutes per information link.

peer review and it did not demonstrate the CFM to be either valid or invalid; it wasn't devised for those purposes. But it was a good vehicle for obtaining informal feedback about the model from those who responded. How much or little of the survey the non-responding 99% of the HEP group looked at before deciding not to submit the survey can't be known. Likewise, it's not known how the opinions of the responding 1% represent what the rest of the group would have said *had they responded*. It is clear from their comments though, the HEP respondents do not endorse fringe science. They seem eager to criticize an unconventional approach and do not appear to be searching for new models or methods.

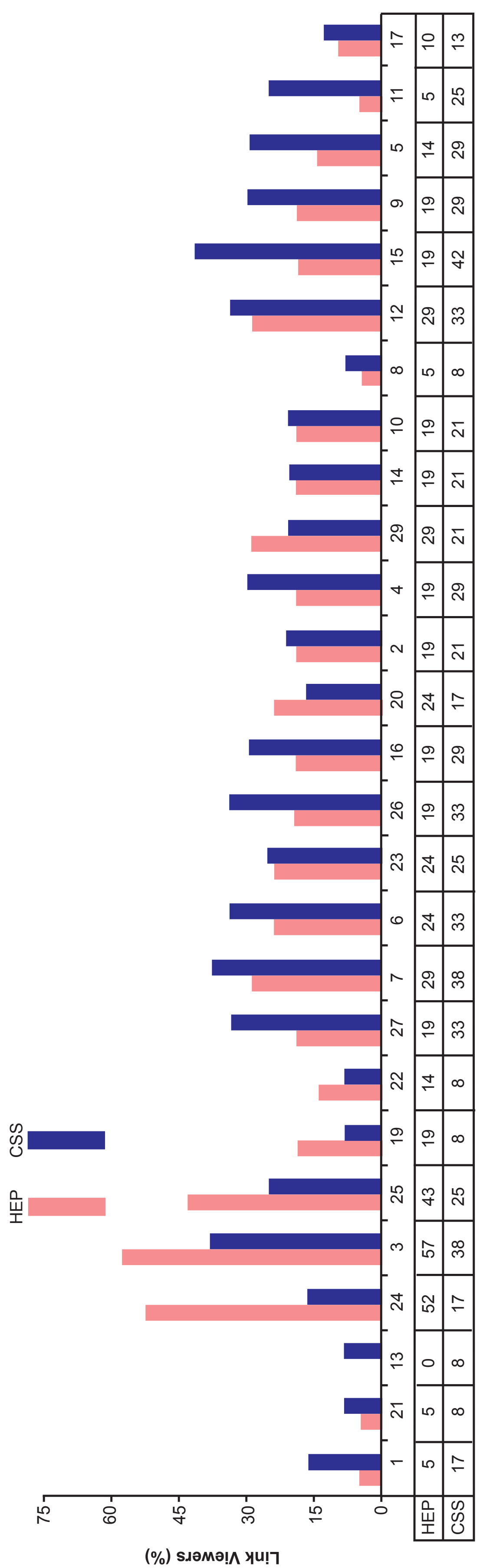
The physicists, engineers and researchers in the much smaller CSS community have very different views. They demonstrate mixed support for the model among a following of qualified practitioners who are observing its ongoing development. Their responses and comments confirm the model is complex and difficult to evaluate, and that it requires extensive experimental work before its ultimate usefulness can be determined.

Responses to questions about the CFM's scientific merit (questions 2, 4, 14, 22, 25, 26, 27, 28, 29, and 30) clearly reveal the difference in opinion the groups hold about the model. The HEP responses to these questions were typically "**S**peculation" (between 63% and 73%). The CSS responses were more accepting, typically lying between "**W**eak basis" (25% to 42%) and "Well **G**rounded" (25% to 50%).

When we combine the differences in respondent profiles with their overall assessment of the potential validity of the CFM, the results are consistent with the idea that the majority of HEP participants work within the established QM/SM paradigm and do not invest much time evaluating solutions beyond that model. The majority of CSS participants seem more willing to explore ideas outside the conventional paradigm and are therefore more willing to consider the CFM. Most of them do not endorse the CFM but many are waiting to see experimental work that could validate or invalidate its claims.

The Charge Fiber Model and the Creation Science Community

As some respondents have said, "Taking a survey doesn't prove anything and it's not the way science is done." Nor does a website establish a model's scientific merit just by presenting it to the public. There are tens of thousands of science websites and hundreds of creation sites. The



	1	21	13	24	3	25	19	22	27	7	6	23	26	16	20	2	4	29	14	10	8	12	15	9	5	11	17
HEP	5	5	0	52	57	43	19	14	19	29	24	24	19	19	24	19	19	29	19	19	5	29	19	19	14	5	10
CSS	17	8	8	17	38	25	8	8	33	38	33	25	33	29	17	21	29	21	21	21	8	33	42	29	29	25	13

Figure 16. Percentage of respondents viewing each information link. The HEP group opened an average of 5.6 information links and the CSS group opened an average of 7.0 links.

legitimacy of the latter might be measured by how closely they adhere to the latest models endorsed by major creation science organizations, but it's good to remember that models change and theories mature; every site is bound to contain material that at some time will eventually be replaced.

Common Sense Science (CSS) maintains a small website containing information about their model (www.commonsensescience.org). This author provides maintenance support for the site and is listed there as one of four scientists who are involved in their work. The site is plain in comparison with some websites that promote other models of "new physics", but the appearance of a website is not a reliable indicator of a model's scientific merit or technical viability. Websites make impressions and communicate ideas, but they don't convince experts that a model is valid; it's too easy to obscure critical details and unresolved problems with a well designed marketing spin and good graphics. Even the issuance of patents for a new technology doesn't establish a model as viable or useful science.

Experimental work can be prohibitively expensive in terms of time, space and money. Few practitioners have time to examine others' work in enough detail to determine its validity. Academics and researchers often struggle to find time for their own theories and projects and have little time or motivation to seriously investigate others' work. So it often falls to journal editors and reviewers to do the filtering and critiquing of new work; and this is not necessarily a bad thing. If a work passes muster and makes it into print, it attains an air of credibility. Over time the results can be followed by means of conferences and journals until, at some point, if the material gets close enough or helpful enough to one's area of specialization, additional effort can be made and one can start investigating the finer points of the theory. The CFM's publication history goes back nearly a century and some of its early proponents were prominent men in their fields (Compton, 1919a, b; Bostick, 1966). Although Charles Lucas' mathematical derivations are available for examination, it takes a good deal of time to work through them and verify their underlying assumptions. Until now, there has been no experimental validation of the CFM.

Although the CFM has not yet been established as a useful model, neither has it been disproven. In this regard, it's insightful to respond to a paper by Phillip Dennis published in the fourth ICC proceedings (Dennis, 1998) which took strong exception to Bergman's Ring Model and the philosophy espoused by CSS (Lucas & Lucas, 1998). After skillfully developing a philosophical and mathematical foundation for a particular interpretation of QM that is consistent with a young-earth creation framework, Dennis addresses the work of Common Sense Science. He meticulously examines the philosophical basis of their work and points out several serious weaknesses in their approach (Dennis, pp. 191–195). His presentation is not vindictive or inappropriate. In all fairness, it's the opinion of this author that if Lucas and Bergman publish such emphatic philosophical statements about the foundation of their work they must be prepared to face this level of critique. But while Dennis makes a strong philosophical case, his critique doesn't do justice to the fact that certain aspects of the CSS philosophy, even if poorly articulated by Bergman and Lucas, strike a strong chord with many creationists. I believe many people who follow the work of CSS choose to overlook how CSS justifies their approach because they are less concerned about the articulation of a philosophy than with finding a better approach to modern day physics. I'll come back to this point shortly.

Dennis goes on to seemingly disprove the Bergman Ring Model by showing it to be mathematically unstable (1998, pp. 195–196). He took his material from Bergman and Wesley's paper on the Spinning Charged Ring Model of the Electron (D.L. Bergman, personal communication, June 27, 2007). In this work, Bergman was constrained by space and as a result some points of his derivation were not as clearly expressed as they could have been. Bergman's paper is correct, but Dennis misinterpreted it. He failed to distinguish between the ring particle's magnetic and capacitive *self-energies* ($\boldsymbol{E}$), which are always positive, and the ring particle's magnetic and capacitive *potential* energies ($\boldsymbol{U}$), which can be positive or negative. Bergman uses a minus sign for the magnetic potential energy because the magnetic force in the ring is attractive and it takes energy to pull the ring apart against this force, making the magnetic potential energy $\boldsymbol{U}_m$ negative. But Dennis used a positive sign for $\boldsymbol{U}_m$ and wrongly concluded the particle was unstable. Bergman and Lucas have since developed more detailed and accurate models than the early version Dennis critiqued, but the clear denouncement of the model's mathematical merit in conjunction with Dennis' keen philosophical analysis seriously undermined the Ring Model's credibility and the entire CSS approach.

Lessons learned and further work

As one reviewer of this paper has insightfully pointed out,

> Conventional quantum mechanics has a long track record of success not only in physics, but also in virtually all applied fields it touches… Everyone in science today has been brought up to think of atoms in terms of energy levels, orbitals, and electron spin. On some mental level, most scientists probably want to think of these visualizations as real, concrete realities—as real matter was supposed to have been before the revolution in physics in the early twentieth century.

But the QM/SM paradigm of modern physics does not present a physical picture of the universe. It may be a very useful model, but it remains a mathematical model; it has no physical/visual basis. Much of the attraction behind the CFM and the approach taken by CSS is that their models are physical and based on empirical laws of physics that can be demonstrated at macroscopic scales. The young-earth creation model sets itself apart from the old-earth paradigm in that it consists of a universe purposely formed by God and designed to follow physical laws. Recourse is not made to immense periods of time and random events as the source of life and the development of intelligence and human traits such as creativity, personality and emotions. The CFM describes a universe that is predictable and knowable, consisting of elementary particles that have "an objective existence at a certain location in time in space", a universe that can be visualized and that follows the same laws of physics on all scales. The CFM does not invoke a quantum mechanical fluctuation as the origin of the cosmos, but describes a universe that is electromagnetic in nature and governed by an omnipotent God who interacts with the creation in tangible ways. The model has an inherent beauty and simplicity that appeal to many.

An important principle to apply in the development of non-traditional models is to use language that doesn't offend contemporary experts. The way theories and models are described should acknowledge the obvious possibility that even the latest and greatest developments of those model(s) are fallible, not likely complete, and definitely subject to revision at a future date. Like all scientific models, creation science models are subject to constant revision and improvement. It is, therefore, more effective to think of models in terms of "accuracy and usefulness" instead of whether they are "true or false". The way we articulate our opinions is not just semantics; it demonstrates respect for those who endorse other models. It even allows us to honestly work with the conventional QM/SM paradigm alongside the CFM and other unconventional models.

The importance of terminology can also be seen in what I consider to be the problematic aspect of the name "Common Sense Science". While the name may refer to the intuitive nature of their physically grounded models, it may also connote that other views and models are "less than sensible". Dennis points out that, "To the extent that "common sense" is intended to mean "rational", the view can be supported by Scripture" (Dennis, 1998, p. 192), but it can also be taken offensively and then becomes counterproductive in the promotion and understanding of their model.

The most important work to be done, though, before the Charge Fiber Model could be deemed useful, is that it must pass experimental muster. The survey was not effective in generating ideas for experimental confirmation of the model. Another opportunity to promote understanding of the CFM and its implications for science would be to solicit survey responses from additional scientific and academic communities. It would be insightful, for example, to obtain feedback from engineers working in specialized fields such as radio communications, MRI (Magnetic Resonance Imaging) technology, nanoengineering, or astrophysics and compare the results with the responses from the physicists in the HEP and CSS groups.

Conclusions

A tutorial-based survey about the Charge Fiber Model was prepared in an online format suitable for review by academics, researchers, scientists, and graduate students. The presentation provided an overview of the new model and offered up numerous novel ideas for further consideration. Approximately two thousand people in the world wide high energy physics (HEP) community had an opportunity to review the material and give their feedback on its scientific merit. The response rate was a very low 1.1% but the content of the responses was informative. The survey included links to technical papers for further investigation of the model, but based on the negligible amount of time respondents spent on the Technical Resources link (21), no one appears to have looked at that material while completing the survey. Further, very little time was spent by HEP respondents on links that provided background and details of the model. Therefore, the responses seem to be largely based on assumptions about what the links contained. The very low response rate among the HEP group must be kept in mind; the results may or may not be representative of a larger sample size.

The survey was also presented to about 75 people in the Common Sense Science (CSS) community. The response rate here was a strong 29%. Although this group was already familiar with the basics of the CSS approach, much of the material in the information links was new to them. These respondents spent more time than those in the HEP group on the background links, but most did not open many of the links or spend enough time on the links to cover the material in much depth. Their comments reflected a mixture of interest, concern, criticism, encouragement and personal experience.

The survey responses of the HEP and CSS groups showed a marked difference in their opinion of the scientific merits of various aspects of the Charge Fiber Model. About three quarters of the HEP respondents felt that most of what Lucas and Bergman are proposing is merely speculation and has almost no valid scientific basis. Among the CSS respondents, about one quarter thought the newer CFM material was well grounded and between a third and a half also thought the work had a weak scientific basis. This is clearly not an endorsement of the model. The numbers, in conjunction with the respondents' comments, indicate the HEP group is largely working within the QM/SM paradigm and is not looking for change. The CSS participants are casting around for other models and are willing to give the CFM a chance.

The CFM contains many ideas that are new and very different from the conventional way of looking at physics. Established paradigms are not dismantled and replaced overnight. The survey was not intended to change people's minds about QM or the SM in an hour, but to expose them to a new model and gage their opinion of it. Although the overall number of respondents was small, the amount of time individuals spent going through the survey indicates many of them are now quite familiar with its basic concepts and claims. How Lucas and Bergman's ideas fare against the conventional views of the current physics paradigm remains to be seen. The imperative thing at this point is for proponents of the CFM to embark on detailed experimental work to substantiate their model's fundamental claims and differentiate it from other approaches. An approach similar to ICR's RATE project (Vardiman, Snelling, & Chaffin, 2005) would likely be very effective if suitable sources of funding could be established. Until experimental work is undertaken, the model will remain in its present speculative state.

The developments that have taken place in the young-earth creation model over the last two decades show the type of progress that is possible when time and resources can be applied to specific scientific endeavors. The young-earth creation model is founded on ideas that diametrically oppose the tenets of mainstream science. Through much effort and perseverance many aspects of the model have attained a level of detail and maturity that were unheard of in years past. There has also been tremendous progress in the quantity and quality of resources that are available to continue developing the model.

The efforts of CSS to establish its ideas in the physics and creation science communities offers some lessons applicable to others promoting new ideas and looking for paradigm change in their field. The proponents of the Charge Fiber Model (CFM) currently have minimal resources with which to support their work and they face skepticism at every turn. The manner in which they have articulated their views in the past has sometimes made it difficult for qualified members of the scientific and academic communities to give them a fair and sincere hearing. The survey conducted in this work attempted to raise awareness of the Charge Fiber Model by presenting their newest material in a condensed and interactive survey format. The extent to which the CFM may become a useful model in our understanding of the created world around us remains to be seen. The application of a tutorial-based survey has been a first attempt to use the internet to simultaneously disseminate information about a new scientific model and to solicit qualified opinions about the model.

Acknowledgments

Particular thanks go to Dave Bergman and Charles Lucas for their untiring assistance as I strove to accurately represent their work on the Ring and Charge Fiber Models. I'm grateful for those who reviewed specific equations and details of their models with me. I appreciate too, those who contributed significantly through the peer review process. I'm thankful for the support of Cedarville University and Dr. Stan Baczek, Dean of the School of Natural and Applied Sciences, for the vision and support that enabled me to pursue this novel and open-ended topic. To those who took time to complete the survey and submit so many helpful comments, thank you for your time and contribution. I hope I accurately portrayed your understanding and sentiments about the model.

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APPENDIX A

Charge Fiber Model Survey Questions and Response Choices

Section 1—Model Overview

1. There has been remarkable progress over the past 100 years in our understanding of the structure of atoms. A recent development is the so-called ring model of the electron. Have you heard of the ring model? **Y/N/U/C**
2. What is your estimate of the ring model's scientific merit? **S/W/G/T/U/C**
3. A more recent development is the charge fiber model of elementary particles. Have you heard of the charge fiber model? **Y/N/U/C**
4. What is your estimate of the charge fiber model's scientific merit? **S/W/G/T/U/C**
5. Advances in scientific knowledge often go hand in hand with improvements in the corresponding scientific models. Are you aware of areas of modern physics where the underlying scientific models are undergoing major development? If yes, which developments would you say are the most significant? **Y/N/U/1/2/3/4/C**
6. How common is it for new scientific models to appear and become established? **S/F/C/H/U/C**
7. Two major theories in modern physics are quantum mechanics and relativity theory. What is your estimate of the merit of these theories? **N/M/G/P/U/C**
8. What do you think of the various new models that fall into the category of string theory? **N/S/G/P/U/C**
9. General comments regarding this section: **C**

Section 2—Basic Knowledge of the Model

10. Are the ring and charge fiber models based on finite-size elastic charged particles (FEP's)? **Y/N/U/C**
11. Can Coulomb's Law be seen in a different light when applied to finite-size charged particles with distinct geometry? **Y/N/U/C**
12. In the charge fiber model, electrons and protons are modeled as rings of spinning charge. The rings have distinct physical features that make them stable and give rise to a quantized interaction with light. **Y/N/U/C**
13. The classical approach taken by Lucas and Bergman envisions a universe comprised of finite-size elastic charged particles located at well-defined stationary locations within the atom. **Y/N/U/C**
14. What do you think of the accuracy of this claim? **A/D/U/C**
15. The charge fiber model claims to provide a physical, geometric basis for many atomic properties, including the structure of the periodic table of the elements. **Y/N/U/C**
16. The fibers (or rings) of spinning charge have static electric and magnetic fields. As a result, they do not radiate energy due to orbital motions or other large scale motions within the atom. **Y/N/U/C**
17. General comments regarding this section: **C**

Section 3 – Detailed Knowledge of the Model

18. The internal structure of a charge ring is more accurately modeled as three intertwined charged fibers. **Y/N/U/C**
19. Is the charge fiber model conservative through all particle reactions and interactions, always conserving i) charge, ii) spin and iii) fiber helicity? **Y/N/U/C**
20. Lucas has derived a universal force law based on finite-size elastic particles and claims that it is valid on all size scales and in all reference frames. **Y/N/U/C**
21. Lucas uses his universal force law to analyze vibratory oscillations of neutral dipoles at subatomic scales. **Y/N/U/C**
22. Lucas claims his universal force law provides an electromagnetic basis for gravitation and the force of inertia. How would you rate the scientific merit of these claims? **S/W/G/T/U/C**
23. General comments regarding this section: **C**

Section 4—Implications of the Model

24. Lucas claims that Maxwell's equations are limited in their scope, not due to shortcomings in the empirical

laws of classical electromagnetics, but because of two approximations made in the derivation. **N/D/U/L/C**

25. Lucas proposes that a universal force law based on finite-size elastic particles and a corresponding elementary particle model based on charge fibers can intuitively and accurately increase our understanding of the world around us, more so than Maxwell's equations, relativity theory, and quantum electrodynamics are currently able to. How would you rate the scientific merit of these claims? **S/W/G/T/U/C**
26. Lucas proposes that the tilted elliptical orbits of the planets and moons in our solar system are evidence for the non-radial term in his universal force law. How would you rate the scientific merit of this claim? **S/W/G/T/U/C**
27. Lucas points out that although vibrating neutral dipoles appear to offer a reasonable explanation of the gravitational force, the same mechanism inevitably gives rise to the loss of energy (through radiation) and a corresponding decay in the force of gravity over time. How would you rate the scientific merit of this claim? **S/W/G/T/U/C**
28. Lucas has calculated the wavelength of energy emitted by vibrating neutral dipoles within the hydrogen atom, the most common element in the universe. His conclusion is that the cosmic microwave background radiation is clear evidence for the electromagnetic origin of the force of gravity. How would you rate the scientific merit of this claim? **S/W/G/T/U/C**
29. A further repercussion of gravitational decay (if it actually exists) is the effect it would have on the gravitational red shift of light from distant stars. Instead of the redshift being predominantly a measure of local expansion rates and therefore distance from the earth, a new metric would need to be developed based on gravitational decay rates and distance. How would you rate the scientific merit of this statement? **S/W/G/T/U/C**
30. If the force of gravity were to decrease over time, it would result in the expansion of heavenly bodies throughout the universe. Lucas points to some of the data known from the study of plate tectonics and to satellite photos of planets and moons throughout the solar system as evidence that such an expansion has actually occurred. Lucas' claim that gravity is decaying and that heavenly bodies are expanding is: **R/N/I/P/L/R/D/U/C**
31. Are you aware of other non-traditional models in physics dealing with, for example, elementary particles, force laws, gravity, a theory of everything, and so on? If yes, please identify or describe them briefly: **Y/N/U/1/2/3/4/C**
32. What is your assessment of such models? **S/L/W/U/C**
33. General comments regarding this section and the entire survey: **C**

Respondent Profile

1. What is your occupation? (check all that apply) **U/R/G/P/H/E/Y/D/O/C**
2. What is your experience? (check all that apply) **a/b/c/d/e/f/g/h/i/j/k/C**
3. What is your competency to evaluate this model? Group Code: If you have a group code, please enter it in this comment box, along with any other comments you might have. **N/S/Y/V/O/C**

APPENDIX B

Survey Response Formats

	Response Code	Explanation
1.	**K/P/C/U**	Based on Prior **Knowledge**, Based in **Part** on what I read on this link, **Completely** based on what I've read on this link, **Unsure**
2.	**Y/N/U/C**	**Yes**, **No**, **Unsure**, **Comment**
3.	**S/W/G/T/U/C**	**Speculation**, **Weak** basis, Well **Grounded**, **Thoroughly** grounded, **Unsure**, **Comment**
4.	**Y/N/U/1/2/3/4/C**	**Yes**, **No**, **Unsure**, Answer**1**, Answer**2**, Answer**3**, Answer**4**, **Comment**
5.	**S/F/C/H/U/C**	**Seldom**, **Fairly** common, **Continuous** developments, **Happens** more than we know, **Unsure**, **Comment**
6.	**N/M/G/P/U/C**	**No** merit, **Mostly** speculation, **Generally** valid, No doubts - **Proven**, **Unsure**, **Comment**
7.	**N/S/G/B/U/C**	**No** merit, **Still** theoretical, **Good** preliminary results, Too **Broad** a topic, **Unsure**, **Comment**
8.	*****	**Comment**
9.	**A/D/U/C**	**Agree**, **Disagree**, **Unsure**, **Comment**
10.	**N/D/U/L/C**	Not heard and **Not** important, Not heard but could make a **Difference**, Heard before but it's **Unimportant**, Heard before and think it **Limits** Maxwell's equations, **Comment**
11.	**R/N/I/P/L/B/D/U/C**	**Ridiculous**, **Novel**, **Interesting**, **Possible**, **Likely**, Reasonable **But** not demonstrated, **Demonstrated**, **Unsure**, **Comment**
12.	**S/L/W/U/C**	**Speculation**, **Legitimate**, **Wide** range, **Unsure**, **Comment**
13.	**U/R/G/P/H/E/Y/D/O/C**	College/**University** Professor, **Researcher**, **Graduate** Student, **Post** Doctoral Work, **High** School Teacher, **Engineer**, **phYsicist**, **Director**/Manager, **Other**, **Comment**

14.

a	Electrical Engineering	**e**	Radio Transmission	**i**	Relativity Theory
b	Engineering Physics	**f**	Physics	**j**	Director/Manager
c	Power Electronics	**g**	Particle Physics	**k**	Other
d	Electromagnetics	**h**	Quantum Mechanics	**C**	**Comment**

15.	**N/S/Y/V/O/C**	**Not** Competent, **Somewhat** Competent, **Yes** Competent, **Very** Competent, **Other**, **Comment**