

STRUCTURALISM—Key to Reality and Meaning in Science

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Forward by Russel C. Moe

Many have said that the twentieth century science was dominated by Maxwellian electrodynamics, relativity theory, and quantum theory. Common Sense Science has raised two concerns about these theories.

First, CSS points out that Maxwellian electrodynamics, relativity theory and quantum theory stand upon an incorrect model of the atom or charged particle. Specifically, are electrons (and other charged particles) mathematical points or small spinning units of charge? It seems perplexing to think that physical properties can be modeled by such radically different (physical?) concepts, but perhaps that accounts for the enormous complexity and non-classical notions in relativity theory and quantum theory.

Quantum theory obviously is impacted by the difference between mathematical points and spinning units of charge. On the other hand relativity theory is concerned with electric and magnetic fields, where the high speed interactions of charges and fields are impacted by the difference between points and spinning units of charge.

Second, CSS points out that both relativity theory and quantum theory assume the “completeness” of Maxwellian electrodynamics as modified by Heaviside and Lorentz. Specifically, CSS points out that Maxwellian electrodynamics assumes that charge is a point-like object. However, if electrons (and other charged particles) are actually spinning charged rings, then high-speed motion will cause a self-inductance to occur between the moving charge and its fields. Maxwell could not conceive where field energy was stored as he “knew” they could not reside in the “inert” homogeneous atom. He thus opted to have energy reside as a “potential” in space. What if, prior to Maxwell’s work, the atom was known to be an assemblage of electrons, protons and neutrons? Would not the specific structure of that assemblage been sought after?

These two CSS concerns present a heavy challenge to the foundations of modern science, i.e. Maxwellian electrodynamics, relativity theory and quantum theory. The paper that follows summarizes a new attempt to help philosophers and thinkers understand a slightly modified electrodynamics of finite-size charges in the shape of a toroid without need of relativity theory and quantum theory.

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Abstract. The history of some philosophical ideas of science is reviewed showing how they led from natural philosophy based on finite-size indivisible atoms and the law of cause and effect to science based on existential philosophy, structural philosophy, and postmodern philosophy. A case is made that the philosophy of structuralism is better than the other recent philosophies of science above in that it allows the reality and meaning of science to be discovered. The similarities of the real structures of elementary particles, atoms, nuclei, organic molecules, the solar system, galaxies, and the universe as a whole appear to be explainable in terms of combinatorial geometry and a universal local contact electrodynamic force in an eloquent way with Platonic beauty. Credit is given to various scientists that made important contributions to this work.

Introduction. Atomism, one of the foundations of natural philosophy, was developed by Leucippus and his student Democritus in the fifth century BC. These atomists theorized that the natural world consists of atoms and void where *void* is mere nothing. Atoms are intrinsically unchangeable and move about the void combining into different clusters or substances. Atoms are reality's very small, indestructible building blocks [1]. The word atomism is derived from the ancient Greek adjective *atomos*, which literally means 'uncuttable' (*a - tomos (not cuttable) - tomos* a conjugate of the Greek verb *temnein (to cut)*).

Up until the twentieth century the law of cause and effect, a second foundation of natural philosophy, was a dominant part of natural philosophy or science. Causality denotes a necessary relationship between event A (called cause) and another event B (called effect) which is the direct consequence or result of event A. There are three assumptions normally associated with causality:

1. There are physical laws by which the occurrence of an event B depends on the occurrence of an event A.
2. The cause A must be prior to, or at least simultaneous with, the effect B.
3. The cause A and effect B must be in spatial contact.

The physical laws above are normally assumed to be force laws. The force must be applied before the effect is seen. The forces in nature must be local or contact forces in order to reach out and cause an effect.

Development of Existential Philosophy. In 1687 Isaac Newton published his famous book **Mathematical Principles of Natural Philosophy** [2,3]. In this work, Newton described universal gravitation and the three laws of motion, laying the groundwork for classical mechanics, which dominated the scientific view of the physical universe for the next three centuries. This book is considered by many as the most important contribution to science in the history of the world, because it was the first to show how to describe the physical world in terms of the

precise language and equations of mathematics which would become the laws of science.

Toward the end of the nineteenth century a number of natural philosophers became dissatisfied with Newton's approach, because they felt that it did not describe the real world. For instance Newton postulated the existence of gravitational and inertial mass, but nobody knew what mass was or could explain it. Newton, himself, admitted that he did not know what mass was. Why were gravitational and inertial masses equal for the same body? Presumably they were fundamentally different, since they were associated with fundamentally different forces. Newton's force of gravity was an action-at-a-distance type force with no known mechanism to produce spatial contact from the cause to the effect. Newton invented the ether as a medium to transmit the force from the cause to the effect, but the ether was not fully satisfactory in explaining attractive and repulsive forces and the force of inertia.

The descriptions of the universe in terms of fictitious quantities such as mass, the ether, and action-at-a-distance forces eventually led to the creation of existentialism to replace the approach of natural philosophy. The existentialist philosophers expressed the sense of the purposelessness and absurdity of the world that Newton described with fictitious forces and masses that did not exist.

During the time that existentialism was a dominant force in philosophy, many major developments of modern science occurred. These included the invention of quantum mechanics, especially the Copenhagen interpretation of quantum mechanics, in which the particles in nature are all point-like. The universal wave function of quantum mechanics describes point particles as governed 100% by random statistical processes. In the quantum realm it is not possible to determine that action A caused result B. The natural philosophers had believed, from experience with the real world that the universe is not totally random in nature, but has a certain degree of order, and the law of cause and effect is dominant. Also modern natural philosophers realized from scattering experiments that every particle in nature has a finite size and an internal structure contrary to the assumptions of quantum mechanics. (See Figure 1 below.)

Einstein's theory of relativity was also introduced during this time. It too was based on the point-particle notion combined with the idea that the spatial universe was homogeneous and isotropic. The lumpiness of stars and galaxies in space seemed to deny the latter assumption. Also relativity theory introduced the notion of four dimensional space, where time is the fourth dimension. No wonder the existentialist philosophers found the universe confusing without purpose and meaning. Their scientific theories described the universe using nonsensical notions that defied the reality of the ancient natural philosophers.

During this time the theory of evolution of life and the physical universe was introduced. The evolutionary process was one that led from disorder to order to more order. This was in disagreement with the experimentally based laws of thermodynamics that all systems tend to disorder over time and energy is

conserved. The nonsensical evolutionary process did not agree with common every day experience of the natural philosophers and the laws of thermodynamics.

Structuralism Philosophy. In the 1930s a new philosophy called structuralism [4,5] was developed by the Bourbaki (a secret society of French mathematicians) using some new ideas from linguistics. According to this new philosophy there are underlying structures in science and mathematics and the relationship of these structures is the source of meaning and reality that was missing in existential mathematics and science. The items making up any particular system exemplifying the structures are based on axioms which comprise the barest set of first principles. The theorems of mathematics or the theories of science are obtained by the rigorous application of logic to these axioms in a manner similar to the way proofs of theorems are done in Euclidean geometry.

The Bourbaki, in a series of 10 volumes, revolutionized most of mathematics by establishing an axiomatic basis for all of mathematics and showing its common structures. The Bourbaki believed that every fact in mathematics must have an explanation. Using set theory they attempted to show the unity and universality of mathematics in terms of axioms, logic, and structures. Structure was seen as the mathematically describable portion of reality that has meaning. This meaning can be expressed in terms of mathematical symbols and equations. Structuralism was perceived as the method of intellectual inquiry that provides a framework for organizing and understanding areas of human study that enables the discovery of meaning. Structuralism replaced existentialism which regarded human existence as unexplainable and without meaning, i.e. not in agreement with logic and common sense.

Members of the Bourbaki worked with researchers in many fields and applied structuralism to their studies. In the areas of linguistics [6], literature [7], psychology [8], anthropology [9,10], and economics [11] the Bourbaki were able to help researchers move their study from a descriptive phase to one based on mathematical symbols and mathematical equations with laws and theories derived by rigorous logic from a finite set of axioms. Many of these researchers won Nobel prizes for their work. One fundamental assumption of structuralism is that all of human behavior arises from the innate structures in the human brain. The ultimate goal in the social sciences is to discover and understand the cause and nature of the innate structures of the brain.

Postmodern Philosophy. The success of structuralism in the social sciences was not matched in the hard sciences of physics, astronomy, geology, chemistry and biology. The scientists in these fields were content with the previously developed existentialist type theories in their fields. As a result of their failure to participate in structuralism, the grand goal of structuralism was slowly abandoned and replaced by postmodernism [12,13,14]. Postmodernists hold that each field of study or body of knowledge has its own internally defined notion of truth or reality. As a consequence, the truth or validity of different fields of study cannot be compared. Each field is supervised by a group of experts in order to police the borders of that field with criteria for inclusion and exclusion. In the wake of Karl

Popper's 15] influential work, falsifiability is often put forward as the criterion for distinguishing between the truly scientific and the pseudoscientific in each field. Under postmodernism each field of human study now has experts that define their criteria for truth and meaning.

Universal Force Approach Supports Structuralism. The approach of the author and Common Sense Science builds on the ancient atomistic notions, the law of cause and effect, and on the Bourbaki notion of structuralism with the underlying structures in science being based on a derived universal electrodynamic contact force law, with the axioms of science being five independent empirical electrodynamic laws (Ampere's Circuital Law, Faraday's Law of Induction, Gauss's Electric Flux Law, Gauss's Law for Magnetism, and Lenz's Law which extends the law of conservation of energy to the non-conservative forces in electromagnetic induction) and the empirical fact that the smallest entities in nature (elementary particles) have finite size and internal structures which give rise to their properties. In order for the electrodynamic force to be a local contact force the electric and magnetic fields of charges must remain permanently attached to the charges. This was predicted by many and experimentally confirmed by Hooper [16]. In this view light is just a ripple in the electric and magnetic fields of charges.

Credits to Other Scientists. As with any major work in science, one must stand on the shoulders of others to achieve anything significant. At this point credit will be given to those who led the way earlier or influenced this work in some significant way.

After the end of the time that structuralism was a popular world view, Dr. Thomas Barnes, at the University of Texas at El Paso, published a rudimentary paper in 1978 [17], that is summarized in his book **Physics of the Future** [18], suggesting the possibility of describing relativistic effects as being due to the electrodynamic feedback effects of finite-size electrical particles of arbitrary shape. The author's attempt to solve the five fundamental laws of electrodynamics simultaneously using the Galilean transformation between reference frames in order to obtain a more universal electrodynamic force law was based on Barnes' suggestions. The five fundamental laws of electrodynamics represented electrodynamics in five different situations, i.e. the static forces between charges and magnets known as Gauss's laws, and the forces due to charges in constant motion such as Ampere's law for the force due to currents in a loop (the magnetic analogue to Gauss's law for magnets), Faraday's electromotive force of induction for changes in the magnetic flux through a circuit, and Lenz's law that any change made to an electrodynamic circuit results in an opposing force in the responding system (pushing a magnet into a coil not only produces a current in the coil but the coil exerts an opposing force back on the magnet).

When this work was presented at the Washington, DC meeting of the American Physical Society in 1978 [19, 20] and in 1979 [21], it was considered "politically incorrect" in the postmodern scientific world ruled by expert gatekeepers instead of axioms and logic. In that presentation the electron scattering data of Nobel

Prize winner Robert Hofstadter (see Figure 1) was used to show the finite size and internal structure of the neutron and proton. Even so, the scientists present were unwilling to consider the implications of the data. This data invalidated the point particle assumption of relativity theory causing its ideas to be false even if they led to formulas that agreed with experimental data. Agreement with data is only one of the necessary conditions for the acceptance of a theory. It is also necessary that its assumptions be reasonable and true. It is possible to make many theories that give rise to the same formula for totally different reasons, but they are not all true or valid scientific theories, because their assumptions are unreasonable or false.

HOFSTADTER ELECTRON SCATTERING DATA

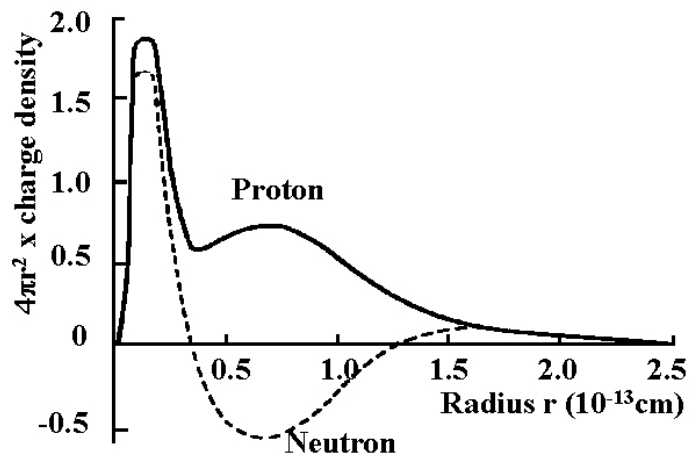


Figure 1. Measurement of finite size and interior structure of neutron and proton.

In 1978 Dr. Joseph Barredo went to the Smithsonian Science Information Exchange in Washington, DC looking for help in publishing some scientific papers and a book on triodynamics [55]. By chance the author was selected to help this professor from the University of Madrid who was invited by Enrico Fermi to work with him in his laboratory in Chicago just before his death. Barredo introduced the author to the possibilities of triune symmetry in explaining the internal structures of elementary particles and in explaining the process of formation and decay of many types of physical phenomena on various size scales in the universe.

For the next twenty years the author [22-30, 32-35,41,42,44] turned to the best known community interested in truth, i.e. the religious community, to rally support for a reformation in science. Groups of scientists were organized into research societies, such as the Creation Research Society and the Bible Science Association, that held conferences and conventions exploring the limitations of modern science, conflicts of modern science with religion, and identifying the areas of modern science suitable for revision or replacement.

In 1990 David Bergman, an electrical engineer, presented a paper on the “Spinning Charged Ring Model of the electron Yielding Anomalous Magnetic Moment” [61] at an international creationist scientific meeting in Pittsburgh, PA. Bergman had realized that the electron and proton could not be point-like spherical particles. He presented a paper showing that their charges must be distributed in a toroidal structure in order to be stable under the laws of electrodynamics. At that time Bergman and the author joined forces to begin the creation of a new science to replace modern science [43,46,49,50].

As promising work was completed by these scientists in the areas of geology, biology, physics, and astronomy, it began to be published outside these creation conventions in many types of venues [31,42,43,45,52,53,54] Secular scientific journals, such as Galilean Electrodynamics, were established to provide a place to publish papers that explored the limitations and defects of modern science. Secular scientific societies, such as the Natural Philosophy Association and the American Scientific Affiliation, were created to further promote this work.

In 1990 one of the author’s sons, John William Lucas, was attending Oxon Hill Science and Technology High School and needed a significant science fair project to work on for four years of high school. Following his father’s recommendation he chose to work on radiohalos. This work was presented to a 1992 creation conference contest for high school students and won a first place prize [36]. In 1994 it was submitted in the secular Westinghouse Science Talent Search and earned a semi-finalist ranking [37]. At the regional science fair that year, it won a major prize [38].

In 1992 another of the author’s sons, Joseph Charles Lucas, was also attending Oxon Hill Science and Technology High School and needed a significant science fair project to work on for four years of high school. The author recommended a new theory of the atom based on Bergman’s toroidal charge structure for electrons and combinatorial geometry. Mr. Bergman, who happened to move into the Washington, DC area at that time, agreed to be the official project advisor. In 1996 the project won first prize in Physics at the high school level, grand prize at the regional level and a grand prize at the International Science Fair in Hamilton, Ontario Canada over the objections of two Nobel Prize winner judges/postmodernist gatekeepers in physics [39,40,45]. Joseph received an academic scholarship to California Institute of Technology for graduating first in his class at the Science and Technology High School and winning a grand prize at the International Science Fair. Joseph later transferred to Harvard University and completed his B.S. degree in physics there.

About that same time the author and his son Joseph completed a new theory of the nucleus based on Bergman’s toroidal ring model for neutrons and protons using the same combinatorial geometry approach that was so successful for the atom. This simple model was not only able to explain the data previously explained by the quantum nuclear shell model but also the liquid drop model. The combination of internal structure with combinatorial geometry appeared to be very powerful [43].

During this time the papers of Andre Assis on “Gravitation as a Fourth Order Dipole-Dipole Electromagnetic Effect” were published in 1992 [47] and again in 1995 [48]. Assis started with Weber’s electrodynamic force law for his derivation. His derived gravitational force law was not fully satisfactory, but it was the right magnitude, showed the potential for an electrodynamic force of gravity between neutral electromagnetic dipoles, and a procedure for doing the derivation. The author’s derived universal electrodynamic force law proved more suitable for deriving the gravitational force than Weber’s force law [45]. However, the resulting derived force indicated that the force of gravity was decaying over time and it had a non-radial second term that was not in previous gravitational force laws. It took a number of years and help from astronomers and geologists of the Natural Philosophical Alliance (NPA) for the author to realize that there was data supporting these unexpected aspects of his derived force of gravitation.

Shortly after deriving the force of gravity, the author attempted to derive the force of inertia [50] from the universal force law in order to get a better handle on the definition of mass. The result obtained was similar to that for the force of gravity. The force of inertia was decaying over time and there was a non-radial second term not previously known. An exhaustive search of the literature on the internet discovered the unusual gyroscope experiments of Eric Laithwaite [51]. that revealed non-Newtonian effects in the force of inertia. These experiments confirmed the existence of the non-radial second term in the force of inertia. (The scientific community in Great Britain was not ready for Eric’s work, and he was the first scientist/engineer to be expelled from the Royal Society for demonstrating experiments that disagreed with the work of Newton. Eric is also the inventor of the lateral thrust electric motor that is used to power the high speed electric trains in Germany and Japan. Those trains were in use in Britain, until Eric was expelled from the Royal Society, and all his government contracts were cancelled.)

From the $F = ma$ term in the force of inertia, the definition of mass in terms of electromagnetic factors could be uniquely determined. This could now be compared with the mass term in the force of gravity. Fortunately they are found to be equal, as expected, **but mass is no longer a fundamental quantity in science.**

In 2002 the author’s first theoretical paper on elementary particles was presented at the Physics as a Science Workshop in the Canary Islands, Spain [52] In 2005 and 2006 it was presented again at the international NPA conferences in Storrs, CT [53] and Tulsa, OK [54]. This paper combined Barredo’s triodynamic notions with Bergman’s toroidal ring notions, combinatorial geometry and the chiral properties of the universal electrodynamic force. The resulting model seemed to be able to explain elementary particles in a simpler, more eloquent way than the Standard Model of Elementary Particles with no fictitious exchange particles and no action-at-a-distance strong and weak interaction forces needed. The atoms of Democritus had been reduced to the closed charge loops that comprised all elementary particles, which comprised all modern day nuclei and

atoms, which comprised all molecules, which comprised all the matter of the universe.

About this time the author began to notice that diagrams of the structures of elementary particles, atoms, nuclei, complex organic molecules like DNA, proteins, carbohydrates, orbits of the planets in our solar system, structures of galaxies, and the structure of the entire universe appeared to be very similar and to depend heavily on combinatorial geometry. See sample figures below.

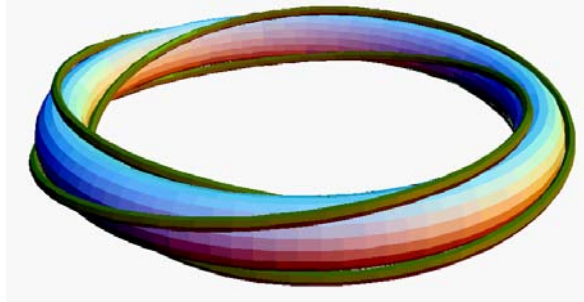


Figure 2. Chiral structure of elementary particles.



Figure 3 Chiral structure of DNA

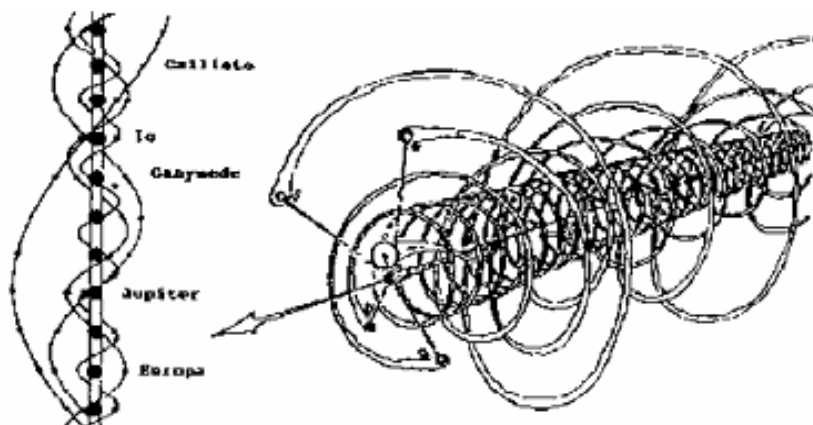


Figure 4 Chiral structure of orbits of the moons of Jupiter about Jupiter

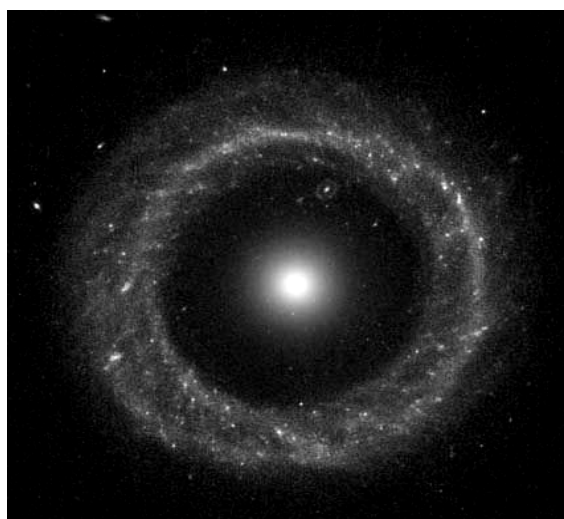


Figure 5 Chiral structure of Hoag's Object (ring galaxy)

This commonality of structures on all size scales led to work in biology where the interior structure of complex molecules is determined by the chiral properties of the universal electrodynamic force law [53,54]. The pulse of life at the molecular level was identified as a longitudinal vibration of organic molecules along the primary length of the molecule like longitudinal vibrations along a coiled spring. The vibrating molecules in living entities are continuously losing energy to longitudinal radiation which must be replaced from food and solar energy sources. The identification of the pulse of life opened the door for many different avenues of research. Electrical instruments were built to measure the vibrations of life at the molecular level in people, animals and food [60]. It was discovered that serious illnesses could be identified electrically. Processed foods and synthetic foods were found to be lacking in longitudinal vibrational energy leading to the breakdown of processes in the cell and degenerative diseases such as cancer.

A new paradigm for medicine was defined based on electrodynamics to aid in the destruction of viruses, bacteria, fungi, and parasites in the blood and specific organs. Dr. Robert C. Beck [56] created and designed various electrical instruments to exploit this new paradigm for health. A hospital in Mexico City is reputed to have nominated him for the Nobel Prize in Medicine for these devices. A French medical doctor, Antoine Priore, had earlier designed and built electrical devices to effectively “recharge” the longitudinal vibrations of molecules in the cells of the body when health is poor [57].

Finally, the local contact nature of the universal electrodynamic force provides mankind a new inexhaustible source of electrical energy. Since the universal force is local, some of the energy of every charge in the universe is present at every point in space. A magnetic energy pump that operates in a similar fashion to an electrical heat pump should be possible. Heat pumps have a SEER rating of up to 20, meaning that they can deliver up to 20 times the amount of heat for a certain expenditure of electrical energy that could have been produced using regular electrical heating. In a similar way a high efficiency magnetic field pump can produce much stronger magnetic fields which can then be used to generate more electrical energy than is required to run it. The excess energy can be used to power electrical devices in the home or even a car. Magnetic energy pumps with high efficiencies and kilowatts of excess power have been patented and advertised on the internet [58,59].

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