The Troubles with Modern Physics and the Solution from Logic and Metatheory

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Abstract. Modern physics has many problems with infinities, dark matter, dark energy, black holes, and inconsistencies in logic. Since modern science poses as an authority more sure than the world's major religions, it seems appropriate to evaluate the truth of science from the perspective of logic and metatheory. Logic reveals that the assumptions or axioms of modern physics are based on idealizations known by experiment to be false. These idealizations lead to conclusions that are in disagreement with common sense. Metatheory (the theory of theories based on logic) indicates that the current theories of modern physics are conflicting, incomplete, and incompatible with each other. From additional arguments from the logic of metatheory the simplest solution that removes the conflicts and incompatibilities in modern science is to properly complete electrodynamics such that the theories of Maxwell's electrodynamics, the Copenhagen version of quantum mechanics, and Einstein's special and general relativity theories are replaced by a single more comprehensive theory. Improving modern science in this manner results in science fully supporting the Judeo-Christian scriptural views of the physical universe and its creation.

Introduction. The development of science from ancient times was based on some intuitively obvious assumptions about the universe. These are as follows:

1. Determinism – There are natural causes for everything that happens in the universe.

2. Objective Truth – Observations of the universe can be made independent of the observer.

3. Consistency – The same causes produce the same effects everywhere in the universe.

These assumptions have been challenged by the theories of modern science. For instance the Copenhagen version of quantum mechanics claims that the universe is governed 100% by random statistical processes and that there is no Law of Cause and Effect thereby denying Determinism and Consistency. Also this version of quantum mechanics, according to Heisenberg, claims that reality is in the "observation process" and so is not independent of the observer, and there is no Objective Truth.

The purpose of this paper is to uncover the fallacies of the main pillars of modern science, i.e. Maxwellian electrodynamics, Einstein's special and general relativity theories, and the Copenhagen version of quantum mechanics, and to show from logic and metatheory the path back to true science.

The Axiomatic Method. The axiomatic method was invented by the ancient Greeks as the proper way to organize and demonstrate inductive and deductive logical reasoning in the pursuit of natural philosophy. The axiomatic method is a logical procedure by which an entire system of natural philosophy (e.g. a branch of science or mathematics) is generated in accordance with specified rules of logical deduction from certain basic propositions (axioms or postulates), which in turn are constructed from a few terms (charge, mass, length, velocity, acceleration) taken as primitives. These axioms are to be defined and constructed by inductive logic from observed patterns in nature or intuition by which some warrant for their truth is felt to exist. One of the oldest examples of an axiomatic system is the ancient Greek Euclidean geometry.
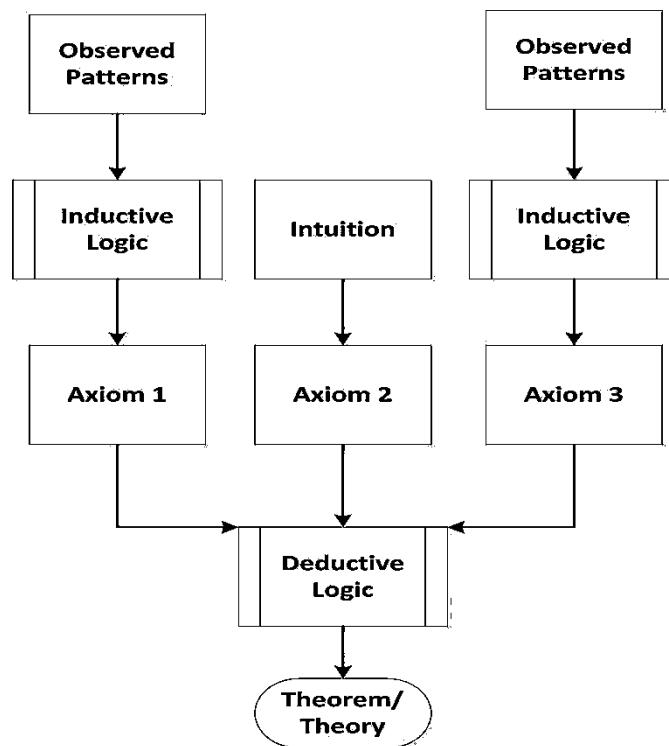

Figure 1. Axiomatic Scientific Method

Euclid, in the process of developing geometry, defined the axiomatic method of proof to be used in logically establishing theorems in geometry. To the extent that the axioms or postulates he chose were valid, his logically developed theorems would be valid.

The ancient Greeks were so impressed by the work of Euclid that they put the slogan "Let No One Ignorant of Geometry Enter Here" over the door of their academies of natural philosophy.

The modern world has also been impressed by Euclid to the extent that his book **Elements (of Geometry)** [1] has been published in more languages and editions than any other natural philosophy or scientific book in the history of the world. [2]

Euclid's approach worked well in geometry where the propositions could be imagined or justified by simple geometrical constructions using a straight edge and compass, but in physics and other areas of Natural Philosophy, the ancient Greek natural philosophers were not able to discover the appropriate axioms or postulates so easily. This is due to the fact that the axiomatic method was primarily a method of logical organization of abstract proofs of theorems or theories, but not a general method for postulate or axiom discovery of objective reality.

Newton's Empirical Method of Axiom Discovery. When Isaac Newton published his **Principia** [3] or **Mathematical Principles of Natural Philosophy**, he stated that he intended to illustrate a new way of doing natural philosophy that overcomes some of the limitations of the axiomatic method. This method is now called the empirical scientific method. The goal of Newton's method was to find empirically the axioms and appropriate terms from which the forces of nature could be derived by logic.

Newton claimed that in the past natural philosophers tried to understand nature in vain, because they did not use an empirical approach to find the axioms leading to the fundamental forces of nature based on experimentation. The empirical approach is more effective and efficient in discovering the causes and effects of nature. As a result he argued that the empirical approach combined with the logic of the axiomatic method was a more secure path toward truth in natural philosophy. The problem faced by the ancient Greek philosophers was that they could not guess or discover the relevant propositions and appropriate primitive terms for natural philosophy upon which to apply logic to derive the theorems or theories of natural philosophy outside of geometry and mathematics. These needed to be discovered by experiment.

Before Newton, Kepler discovered three empirical laws for the motions of the planets about the sun.

1. The planets orbit the Sun in ellipses with the Sun at one focus.

2. The line joining the Sun and a planet sweeps through equal areas in an equal amount of time.

3. The square of the period of a planet's orbit (P) is directly proportional to the cube of the semi-major axis (A) of its elliptical path, i.e. $P^2 = kA^3$.

Although these empirical laws were practical and useful, the fundamental cause of the motions of the planets was not revealed by them. Newton's emphasis on empirical forces turned out to be much more useful than Kepler's Laws and to give a better and simpler understanding of the mechanics of the solar system that could be applied even to processes on the Earth. From his empirical force laws of equations (1) and (2) below Newton was able to deduce Kepler's Laws.

However, in 1766, Titius Bode revealed his empirical law showing the quantum periodicity of the orbits of the planets. This indicated that Newton's empirical force laws were incomplete.
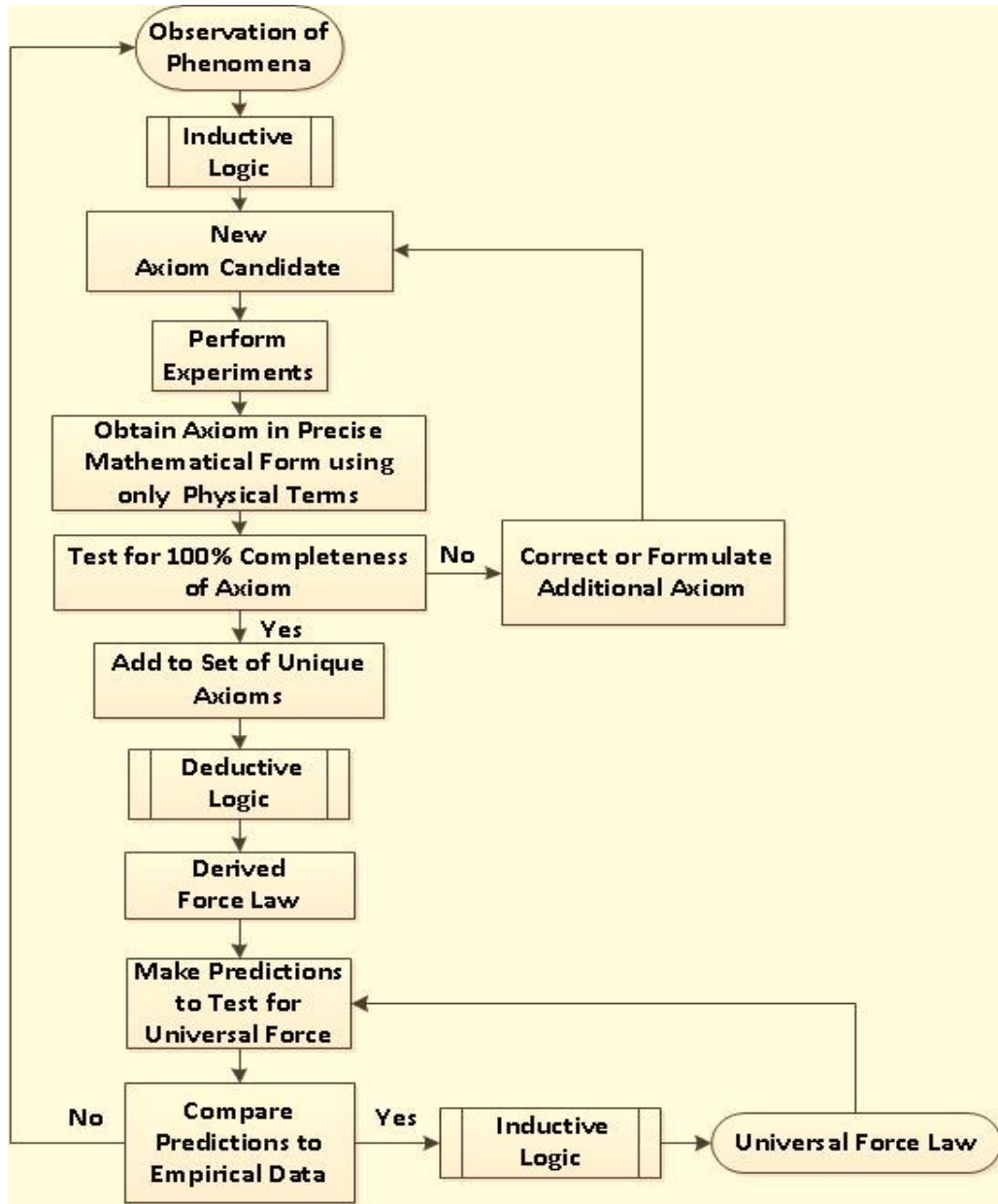
Figure 2. Newton's Empirical Scientific Method

Newton's empirical approach emphasizing forces does not lead to all truth at once, as Newton himself recognized with regard to his study of inertia and gravity. He never claimed to understand the causes and nature of inertia and gravity, even though he could define the empirical force of inertia and the empirical force of gravity as shown below.

$$Force\ of\ Inertia\ \vec{F}_I = m_I\vec{A} \quad (1)$$

$$Force\ of\ Gravity\ \ \vec{F}_G = G\,\frac{m_{G1}m_{G2}}{R_{12}{}^2}\,\hat{R}_{12} \quad (2)$$

When Newton was asked what inertial mass m_I was, he replied that inertial mass was a measure of some characteristic of matter that caused the force of inertia and that increased as the amount of matter increased. When Newton was asked what gravitational mass m_G was, he replied that gravitational mass was a measure of some characteristic of matter that caused the force of gravity between bodies of matter and increased as the amount of matter increased. When the ratio of the experimental inertial and gravitational masses were found to be equal in magnitude for the same two bodies, Newton realized that instead of the force of inertia and the force of gravity being different fundamental forces, they might have a common cause. Newton believed that scientists needed to continue doing additional experiments to discover more of the fundamental axioms of nature until one day, following his empirical scientific method of deriving more complete force laws using more complete sets of empirically discovered axioms, the universal force law would be discovered.

The Existential and Post-Modern Scientific Method. The scientific community was greatly impressed with the progress that Newton had made in science. He had expressed scientific laws in precise mathematical terms and equations that described many things not previously understood. Even though they knew that Newton claimed his work was incomplete, they established a new approach to science based on his experimental empirical approach and his use of precise mathematical equations to express scientific theories.

They modified the scientific method to de-emphasize the role of logic as shown in their diagram of the scientific method in Figure 3 and substituted the much weaker criterion of falsifiability of hypotheses. The reason that they de-emphasized the strict role of deductive logic and truth in science is that they did not believe in ultimate truth and purpose in the universe, but they were greatly impressed with what Newton had accomplished in science describing nature in precise mathematical terms without knowing (1) what inertial and gravitational mass was, (2) what was the cause of the inertial and gravitational forces, and (3) how the gravitational and inertial forces were transmitted between bodies.

This weaker version of the scientific method became known as the existential scientific method. It allowed idealizations to be freely used in scientific theories just as Newton had temporarily used the concepts of inertial and gravitational mass and action-at-a-distance forces. As modern science was developed the Maxwellian version of electrodynamics, the Copenhagen version of quantum mechanics, and Einstein's relativity theory were based on many similar idealizations including the point particle idealization. In 1957 Robert Hofstadter received the Nobel Prize for his scattering experiments that measured the finite size and three interior substructures of the proton and neutron. Since logic was no longer the criterion for falsification, the theories above, which are the pillars of modern science, were not falsified for the incorporation of the false point particle idealization.

Logical Arguments from Metatheory. Metatheory, the theory of theories, is a branch of metamathematics. It is the study of principles, conceptual elements, consistency and other

aspects of logical systems. From the days of the earliest natural philosophers science or natural philosophy has been developed as a logical system derived from postulates or axioms. Such scientific theories are subject to various logical principles based upon inductive and deductive logic and consistency.
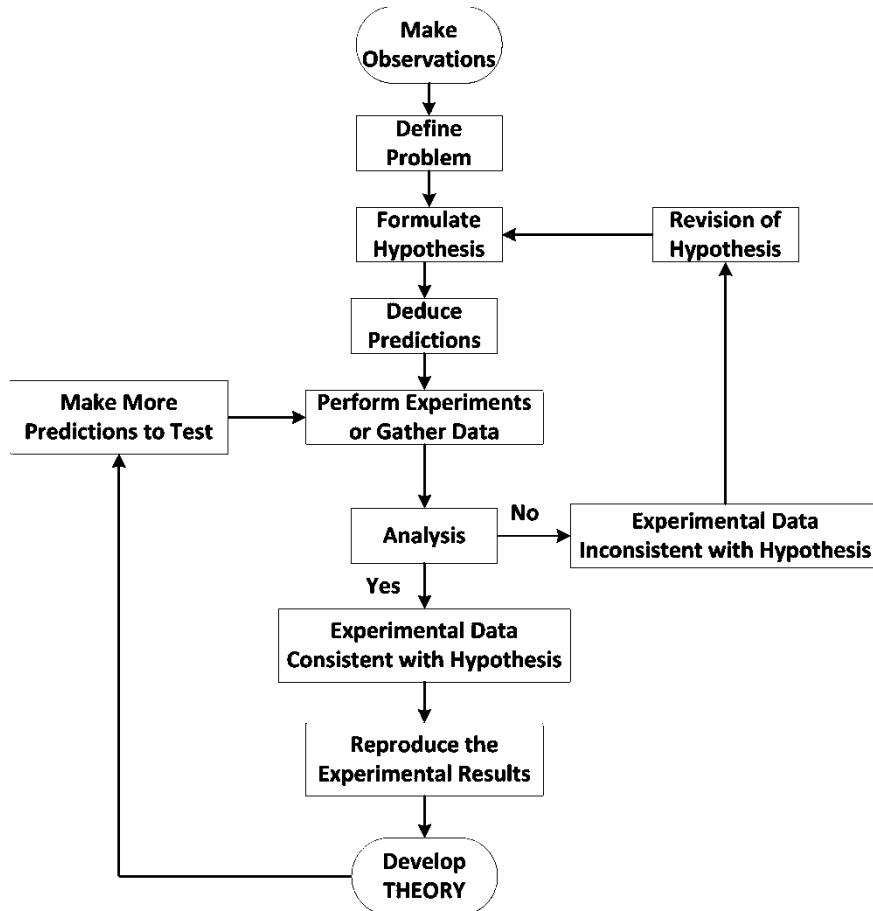
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Figure 3. Existential and Post-Modern Scientific Method

Henri Poincarè is generally credited as founding the field of metatheory or metamathematics. Being one of the last of the true natural philosophers, he was concerned about the logical structure of scientific theories and the logical basis of truth. Poincarè was the co-discoverer of relativity theory with Einstein, and he actually published one year before Einstein. However neither he nor Einstein ever received the Nobel Prize for this work, because of Poincarè's own arguments from metatheory below discrediting relativity theory.

Poincarè made logical arguments from metatheory [4] that no two fundamental theories in nature could employ the same fundamental constants, such as c the velocity of light. This was then combined with another logical argument that only fundamental theories could be true theories.

- **Electrodynamics uses c in wave equation**

$$\nabla^2 \Phi - \frac{1}{c^2}\frac{\partial^2 \Phi}{\partial t^2} = -\frac{\rho}{\epsilon_0} \quad (1)$$

$$\nabla^2 A - \frac{1}{c^2}\frac{\partial^2 A}{\partial t^2} = -\mu_0 J$$

- **Special Relativity uses c in space-time interval**

$$ds^2 = dx^2 + dy2 + dz^2 - c^2 dt^2 \quad (2)$$

- **Quantum Mechanics uses c in energy quantum**

$$E = h\nu = h(2Bc/8) \quad (3)$$

- **General Relativity uses c in Einstein's field equation**

$$G_{\mu\nu} + \Lambda g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu} \quad (4)$$

Poincare noticed that four "so-called" fundamental theories of modern science used the same fundamental constant c for the velocity of light, i.e. electrodynamics, special relativity, quantum mechanics, and general relativity. According to his logical criterion only one of these four theories could be fundamental or true. Poincare suggested that the fundamental theory was electrodynamics and that eventually it would explain all of the data explained by these other theories.

Poincarè also published another interesting logical argument from metatheory. [5] In this logical argument he showed that no two fundamental force laws could have the same mathematical form such as $1/R^2$. Now the electrodynamics force law and the force of gravity both have a $1/R^2$ form. Also since Einstein's General Theory of Relativity involves the fundamental constant c, Poincarè reasoned that gravity must also be of electrodynamics origin.

$$F_G = -G\frac{m_1 m_2}{R^2} \qquad F_{EM} = \frac{1}{4\pi\epsilon_0}\frac{q_1 q_2}{R^2} \quad (5)$$

The Superposition Principle [6] of metatheory describes the properties of linear systems needed for coherence and stability. Systems may be a collection of moving charges in electrodynamics and a combination of theories to describe these charges such as electrodynamics, relativity theory, and quantum mechanics.

A linear system is one that satisfies the homogeneity and additivity properties required by the Superposition Principle for coherence and stability shown below.

$$F(x_1+x_2+\ldots) = F(x_1) + F(x_2) + \ldots \qquad \textbf{Additivity (6)}$$

$$F(ax) = a\ F(x) \text{ for scalar } a \qquad \textbf{Homogeneity (7)}$$

If one wants to describe matter in the form of an elementary particle, an atom or a molecule by combining electrodynamics, relativity theory and quantum mechanics, each of these theories must satisfy the Superposition Principle.

$$F(x) = F_{EM}(x) + F_{SR}(x) + F_{QM}(x) \qquad \textbf{(8)}$$

Maxwellian electrodynamics cannot be combined with Special Relativity, because the electrodynamic field and force is nonlinear in r.

$$\vec{E}(\vec{r}) = \frac{q\hat{r}}{4\pi\epsilon_0 r^2} \quad \textbf{(9)}$$

Special Relativity is not a proper theory to add to electrodynamics, since it modifies electrodynamics further making it more nonlinear by giving rise to the expression for the electric field that is nonlinear in v due to the $\beta^2 = (v/c)^2$ terms.

$$\vec{E}(\vec{r},\vec{v}) = \frac{q}{4\pi\epsilon_0 r^2} \frac{\left(1 - \frac{v^2}{c^2}\right)\hat{r}}{\left[1 - \left(\frac{v}{c}\right)^2 \sin^2\varphi\right]^{3/2}} \quad \textbf{(10)}$$

$$\text{where} \quad \textbf{sin}\varphi = \hat{r} \times \hat{v} \qquad \textbf{(11)}$$

In quantum mechanics the principal task is to compute how a certain type of wave propagates. The wave is called a wave function. The equation governing the behavior of the wave is the Schrödinger wave equation. The primary approach to computing the behavior of a wave function is to write the wave function as a quantum superposition of special wave functions known as stationary states. Since the non-relativistic time-dependent Schrödinger's wave equation is *non-linear in the ∇^2 operator*, the wave equation of quantum mechanics is non-linear.

$$i\hbar\frac{\partial}{\partial t}\Psi(r,t) = \left[\frac{-\hbar^2}{2m}\nabla^2 + V(r,t)\right]\Psi(r,t) \quad \textbf{(12)}$$

Conclusions from Metatheory. From the perspective of metatheory we see that electrodynamics is a nonlinear theory, Special Relativity is a nonlinear theory and quantum mechanics is a nonlinear theory. According to the Superposition Principle no two of these theories may be combined to describe matter in the form of an elementary particle, atom or

molecule, because a nonlinear theory cannot be combined with another nonlinear or linear theory. Only linear theories can be combined. *Only one nonlinear theory is possible.* If a nonlinear theory is valid, it has to be the one and only theory, i.e. the universal theory. Of the four pillars of modern science, i.e. electrodynamics, quantum mechanics, special relativity, and general relativity, the only one capable of becoming the universal force according to metatheory is electrodynamics.

The newly published book, **The Universal Force Volume 1 – Derived from a More Perfect Union of the Axiomatic and Empirical Scientific Methods version 6,** [7] confirms all of these arguments from metatheory. It derives in a logically proper manner an improved version of the electrodynamic force from a complete set of the empirical equations of electrodynamics as axioms. This version of electrodynamics explains radiation and radiation reaction better than the relativistic version of Maxwell's equations and conserves energy and satisfies Newton's 3rd law which Maxwell's equations do not. Then it derives an improved version of the force of gravity and the force of inertia from the improved version of the electrodynamic force obtaining a new second term for each. These new terms explain the quantization of gravity as discovered by Bode and the unusual gyroscope experiments of Eric Laithwaite. The book shows how to derive the universal gravitation constant G from electrodynamics. It also shows how to derive the value of Planck's constant h from electrodynamics. Subsequent volumes in the series present improved electrodynamics models of elementary particles, atoms, nuclei, and molecules. Furthermore they explain the electrodynamic basis of life and the operation of the living cell. However the most significant contribution of this new book is in showing how to correct the scientific method to properly include logic and to make progress in the direction of truth. The results of this book have been incorporated in another new book **Fingerprints of the Creator – the Source of All Beauty in Nature**. [8] This book confirms all that the Bible has to say about the nature of the physical universe and its creation by God from the use of better science. It defines the symmetry of the fingerprint of God and identifies it in the structure of all elementary particles, atoms, nuclei, molecules, crystals, flowers, leaves, seed pods, animal bodies, orbits of the planets in our solar system, shape of the Milky Way galaxy, and the overall structure of the universe from redshift analysis.

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