A Call for Reformation in Modern Science

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ABSTRACT
A call for the reformation of modern science is issued. The necessity for reformation is based on the scientific community's disregard of certain logical criteria and principles in science designed to keep scientific theories logically self-consistent and progressing toward truth. By disregarding these logical criteria and principles, the scientific community has claimed credibility for many new theories comprising much of modern science that can not logically qualify as science. These theories include the theory of relativity, the theory of quantum mechanics, the Dirac theory of the atom, and the universal theory of evolution. New unified theories of classical electrodynamics are being developed to replace the Dirac theory of the atom, relativity theory, and quantum mechanics. These new theories are logically self-consistent and point the way to a better science based on truth and reality.

INTRODUCTION
Throughout history as men have explored the realms of mathematics and natural philosophy, they have recognized the usefulness of employing logic to obtain more rigor in their investigations and to show the correspondence of their developed theories to the real world. This use of logic is still well known to us from the teaching of plane geometry.

In the course of developing or proving new propositions in plane geometry, one starts from previously proved propositions and by application of logic proves the new one. No propositions may be used that have not been proved in the real world by straight-edge and compass construction, etc., or deduced from them. No false propositions may be employed as part of any proof. In this way geometry is kept free of many false propositions and remains internally self-consistent. To the extent that the fundamental propositions of plane geometry have been properly verified in the real world, we may say the conclusions of geometry are true.

The purpose of this paper is to point out that modern science, as currently practiced, no longer properly employs logic to keep scientific theories rigorous, self-consistent, and in good correspondence with the real world.

IS THERE ANY TRUTH IN SCIENCE?
What is truth? Is there any truth in science? Some philosophers say there is no truth in science which is based upon observation and experiment, because science relies on logical induction to generalize from the particular observation to the universal rule. Put bluntly, induction is a logical fallacy. Just because one observes a thousand white swans, one can not conclude that all swans are white. Number 1001 may be black.

Other philosophers of science, such as Karl Popper(1), say that all theories in science have the same probability of being true, namely zero. Their argument is simple. A scientist, after he has performed a number of experiments and made a number of measurements, plots a graph. How many lines (or theories) can pass through the points on a graph? An infinite number of course. The nice smooth lines found in science textbooks are but one line out of an infinite number that might have been drawn. The scientist has chosen the line he draws, he has not discovered it. But if it is possible that there is an infinite number of lines, it follows that the probability of any particular line that is chosen (and the equation it represents) being the true one is one out of infinity, or zero. Therefore all theories, even the best, have the same probability of being true, namely zero.
The above analyses of science are too simple. Science employs many forms of logic including induction and deduction. General theories, developed by induction from particular observations, are checked by deducing additional data that should be observable. Subsequent failures in the laboratory to obtain agreement with the deduced observations causes modifications or abandonment of the original theory developed by induction.

The type of argument by Karl Popper and others is also too simple. It assumes that there are only a few data points. As the number of data points becomes infinite, the probability of having more than one acceptable line going through them becomes zero. Where do these other data points come from? They come from all other experiments in science. In order for science to be logically self-consistent, no theory invented to explain a phenomenon can incorporate ideas or notions disproved by data in experiments involving other phenomena. Thus as more data is collected in more varied phenomena in nature, the restrictions of logical self-consistency drive science to limit itself eventually to the one true theory.

THE NEED FOR REFORMATION

With the rise of modern science in this century the emphasis on gaining philosophical truth through science has waned. This came about in a rather curious way. When the modern theory of the atom was being developed, it was considered desirable to combine the physics of the atom with geometry, special relativity, and quantum mechanics, even though it seemed unintelligible to build a theory from false theories.

The traditional straight-edge and compass proofs of geometry were obviously inadequate for the verification of geometry on the atomic scale. At the time no one had any idea about how to verify that geometry described the real world on the atomic scale.

The theory of special relativity explicitly assumed a point particle geometry. This is fundamentally incorporated in the Pythagorean theorem in four dimensions, i.e.

\[ ds^2 = dx^2 + dy^2 + dz^2 - c^2 dt^2 \]  

employed by relativity theory to show space-time relationships. Furthermore special relativity explicitly assumed that all particles are inherently point-like. All their intrinsic properties such as spin, magnetic moment, and shape were inherent, fixed and independent of interactions with the rest of the universe. Now most elementary particles have been found experimentally to have finite size with internal structure involving multiple charges which produce the particle's spin, magnetic moment, and shape. These particles are known to be interacting with the rest of the universe and deforming their shape as they are exposed to external forces. Scientists such as Hofstadter have received Nobel prizes for proving this experimentally. In his Nobel lecture he said,

The history of physics shows that, whenever experimental techniques advance to an extent that matter, as then known, can be analyzed, by reliable an proved methods, into its elementary parts, newer and more powerful studies subsequently show that the "elementary particles" have a structure themselves. Indeed this structure may be quite complex so that the elegant idea of elementary (point particles) must be abandoned.

The theory of special relativity is also based on Hamiltonian mechanics. Hamiltonian mechanics is based on the assumption that all forces in nature are of the action-at-a-distance type derivable from a potential energy such as the gravitational force. In nature there are also forces of a nonlocal or nonpotential type. These are the friction or drag type forces that practically every observable system normally has. These forces do not occur at a point but rather at a surface or volume as in the case of a satellite during re-entry into the earth's atmosphere. Relativity theory is unable to describe such systems as satellites during re-entry, the damped pendulum, the damped gyroscope, or a ball rolling with friction, because they are of generally non-Hamiltonian type. The inability of Hamilton's equations of motion to represent the real world equations of motion in their entirety implies the inapplicability of the analytic foundations of special relativity to describe the real world.

The theory of relativity is applicable to only absolutely rigid bodies. No relativistic formulation of the entire branch of engineering known as the theory of elasticity has ever been achieved. Perfectly rigid objects are an idealization. In the real world, all material objects are elastic.
Relativity theory is based on the assumption of the constancy of the speed of light. However, the speed of light is not a constant in the real world, but only in a vacuum. The speed of light has a complicated dependence on a number of physical characteristics such as the frequency of the light itself and the density of the medium in which propagation occurs. Relativity theory fails to satisfactorily describe the speed of light as it actually occurs in nature, i.e., with a complex functional dependence on the local characteristics, because the Lorentz transformations of relativity theory are generally unable to preserve the value of such a locally varying speed, contrary to the very fundamental postulate of relativity itself.

Finally, the theory of quantum mechanics had its problems too. The theory of the quantum began originally as an empirical packaging scheme for energy or light in order to explain certain observed phenomena such as black body radiation, the photoelectric effect, the line spectra emitted by excited atoms, and the temperature dependence of specific heats of materials. The original packaging approach was quite successful in describing these phenomena. In the course of developing the theory of quanta, it became necessary to decide whether the quantum or package of energy resided in the incident light or in the molecule. Einstein put the quantum in the incident light or photon, but standing wave and interference experiments in optics indicated that it belonged in the atom and molecule(4,5).

After the development of relativity theory, a scientist named Dirac developed the empirical theory of quanta into the full theory of quantum mechanics, when he combined electrodynamics, relativity theory, and quantum theory to produce the current theory of the atom as embodied in the Dirac equation. At that point the empirical quantum packaging scheme was developed into quantum mechanics and became intimately tied to Hamiltonian mechanics and the theory of relativity. As a result it also employs the same basic idealizations as these theories, i.e., the point particle idealization. Since there are no known point particles in nature, quantum mechanics is an unintelligible illogical theory.

The point particle idealization was absolutely necessary in quantum mechanics in order for it to properly mesh with Hamiltonian mechanics and the theory of special relativity in producing the Dirac theory of the atom. However, with the development of the Pauli Exclusion principle to limit the number of electrons in the atom for each particular energy level, it became necessary to ascribe a unique property to electrons called spin. The spin is exactly like a magnetic moment. Since all particles must be point particles in quantum mechanics, it was not possible to give a physical explanation for the spin of electrons, neutrons, protons, etc.

The normal physical explanation for a magnetic moment of an extended particle is that one or more of the charges making up the particle is rotating in orbit about the center of the particle producing a circular electric current which produces the magnetic moment fields. This explanation was not possible for quantum mechanics with only point particles, so spin had to be made an inherent fixed or quantized characteristic of point particles with no known physical explanation(6). High energy proton experiments(7) at the Argonne National Research Laboratory have shown that the spin of the proton is not an inherent quantized characteristic. On the contrary spin becomes more important as the collision of protons becomes more violent. This is further evidence that the theory of quantum mechanics is unintelligible and illogical.

Due to the point particle idealization quantum mechanical models are intrinsically unable to represent the extended character of the nucleus and its constituents. Thus quantum mechanics can not handle the possible deformation of the nucleus and its constituents with consequential alteration of their magnetic moments. Whereas quantum mechanics works reasonably well for electronic atoms where the point particle idealization is well approximated, it fails with pionic and kaonic atoms where the nucleus and meson overlap each other in the lowest energy levels(8).

As a result of the success of the false Dirac theory of the electronic atom, a majority of the leaders in the physics community decided to relax the rules of logic employed in science for hundreds of years. Thus the false theories of quantum mechanics, relativity, and the atom were given credibility in science. Also many other theories like them, such as the theory of evolution, which contain some false notions have been accepted in science.

LOGIC IS THE SOLUTION

What should society and/or scientists do to rectify the situation so that science can be put back on track zeroing in on the truth and reality? The answer is that all members of society as well as the scientists should insist that science return to the logical self-consistency basis that it once had in order that science be able to describe the "real" world and progress toward truth. The defense of our nation is in jeopardy when we rely upon a science describing an imaginary world.
There are two logical criteria or principles that need to be incorporated back into science. They are known as Mach's logical criterion for scientific propositions and Mach's principle for all scientific propositions.

Mach's criteria for scientific propositions states that only those propositions should be employed in physical scientific theories which can be directly verified experimentally or from which statements about observable phenomena can be induced and verified. This criterion is analogous to the rules of logic used in plane geometry in proving a proposition. Without this sort of self-consistent logical rigor the propositions proved in plane geometry or the theories fashioned in science would bear no relationship to the "real" world or truth.

One of the principles that undergird science is known as Mach's principle. The purpose of this principle is to ensure that scientific theories correspond to the real physical universe that is observed, at least, some very gross ways. Mach's principle is based on the observation that the electromagnetic and gravitational forces have infinite range such that all parts of the universe interact with all other parts all the time in a coordinated way. On the microscopic scale the electromagnetic force is seen to control the structure of atoms and molecules. On the macroscopic scale astronomers observe that the force of gravity controls the structure of all astronomical systems observed in nature including the largest nebula which are 500 million light years across in size. Mach's principle states that only those physical theories that take into account the unifying effects of the electromagnetic and gravitational forces throughout the universe in a self-consistent way should be included in science.

SUMMARY AND CONCLUSIONS

In retrospect it appears that the desire of scientists to obtain useful practical scientific models for the atom and other phenomena as quickly as possible in the publish or perish environment of modern scientific research has made it impractical for modern scientists to be concerned with the question of truth. For fast paced modern societies answering such questions properly is thought to hinder "progress".

In reality this point of view is a cancer or defect of modern science. It has hindered true knowledge and progress. It has propagated a very distorted picture of reality. Finally it has jeopardized the defense of our nation which is largely based on the technology we have gained through scientific research.

The principal task that confronts our society and scientists is to reform our industry, government, and university supported system of developing science to be logically self-consistent and to label all known false theories as false until a suitable replacement is found. Along these lines it is interesting to note that promising work is already in progress to develop new unified theories of classical electrodynamics to replace the Dirac theory of the atom, relativity theory, and quantum mechanics(9,10). These new theories are logically self-consistent and satisfy Mach's criteria and Mach's principle. They point the way to better science based on truth and reality.

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