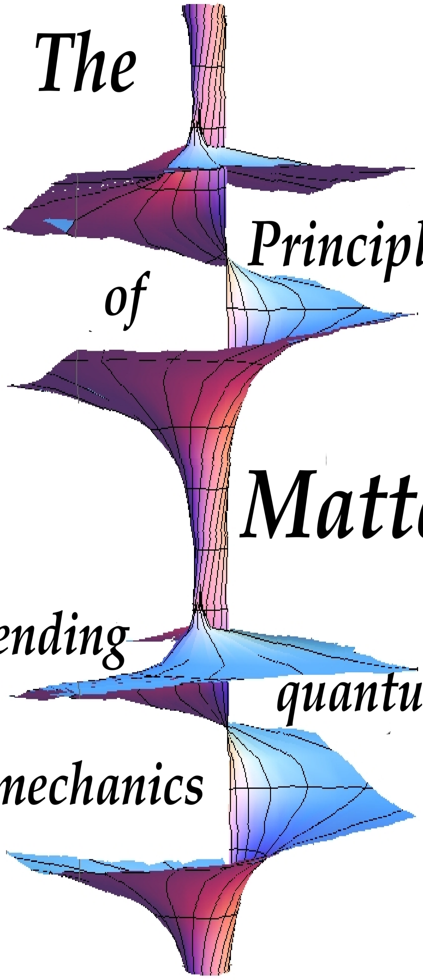
The Principles of Matter

amending quantum mechanics



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Take a look under the hood of quantum mechanics and see what it takes to build a particle and a field. Find out the real reason why there are two families of particles: boson and fermion. Learn where charge comes from and why the weak charge is so weak with parity problems. Take a look at the neutrino's structure and you begin to understand its properties.

This peak under the hood started with Michael Faraday on the 29 of August 1831 who did the first experiment exploring the large scale quantum behavior of iron when a 6" diameter forged ring of iron was used as a transformer core to measure an induced electromagnetic impulse. Faraday's experiment and Faraday-Maxwell equation for the description of induction is fine in free space, but when well annealed iron is used as a coupling agent the problem becomes one of the more interesting large scale quantum mechanical problems that exist. Toroidal iron core transformers were used starting with Henry Roland in the late 1870s to measure ferromagnetic dynamic magnetic permeability and this continued for the next 40 years by different people with improved purity and measuring properties at elevated temperatures. There were problems because the measurements made no sense as the permeability measured would often be much greater than 100,000 approaching 1,000,000 and bore no relation to the much smaller quasi-static permeability measurements.

We discovered this problem as an

inability to characterize the dynamic electromagnetic properties of steels using Maxwell's equations independent of any form of the B~H relation at modest field levels. In addition simple applications of quantum mechanics were not able to untangle the processes that were taking place.

Like all good problems that persist for nearly two centuries it implied our view of physics is deficient. We know a great deal more about iron metallurgy than quantum mechanics, which has been studied for a much shorter time. The problem we encountered in understanding originates with the foundation of quantum mechanics and the poor way in which relativity is integrated into quantum mechanics.

The source of this ignorance is history itself. Faraday enjoyed a period of tranquil political activity for half a century from the end of the Napoleonic era when commercial priorities dominated his research allowing him to make great progress working as a principal metallurgist in Britain as well as doing research in electromagnetism, chemistry, and acoustics. His broad view of experimental sciences allowed him to lay the experimental and philosophical basis that Maxwell codified. Quantum mechanics and relativity really did not have a Faraday, who had as broad an understanding of the experimental sciences. Einstein came the closest with his family's electrical business and his work in the patent office. He expended a major effort on trying to understand quantum mechanics and failed. The failure was only partial, because he did define what must be done in the future by his own long term efforts on the problem. His principal difficulty was finding good experimental data.

Einstein and his contemporaries were interrupted by two world wars and the depression of the 1930s. So the result was that quantum mechanics' union with relativity was damaged goods when delivered to the people who took up these subjects following the second world war.

There were small pockets of good experimental work done after the war by people that followed Faraday's experimental example: I.I. Rabi, P. Kusch, W. Lamb, N. Ramsey and C. Towens. They extended our understanding of the electromagnetism of materials and showed how quantum mechanics is integrated into this description. Unfortunately theorist who interpreted this data used non-unique methods of analysis *with numerous assumptions appearing to solve any problem, but providing little understanding.*

Unlike Faraday the experimental efforts were now concentrated in a area of sub-atomic and the atomically small while neglecting large scale behavior. What was missed is there are no scale limits to quantum mechanics and quantum mechanics when properly done is the basic mechanics of nature.

Annealed iron and alloy steels represent a class of material where large scale longitudinal magnetic excitations can exist in significant numbers. The characteristic dimension of these excitations in iron is 14 cm which is not an atomic dimension and a mass one billionth of that of an electron. Over the years this exciton had been explored by many researchers under different names, but never comprehending the scale of the effect.

We identified this exciton by altering Faraday's original experiment by replacing the toroidal ring with a long straight bar then placing a small primary at one end with a sliding secondary to detect the response along the bar. Using frequencies from 1 kHz to 3 MHz it was discovered that there were three fields. One of these fields was a low frequency magneto-elastic wave that moves with the speed of sound. The other two fields were large scale quantum fields with a propagating mode exceeded the speed of sound and relativistic characteristics. To properly describe this exciton required a significant addition to relativistic quantum mechanics, which could now be tested.

The analysis that result describes the quantum particle and more importantly the spaces in which the particle is first generated and then sampled. This new space which we refer to as the self-reference frame endows the wave-particle duality encountered in measurements in the laboratory frame. The origin of this new space is required by relativity itself in a very basic way so that a particle with a minimum of mathematical resources can be self-defining with a set of physical properties that are realized in the laboratory frame.

The limitation imposed on this frame in order to encode information are severe. That severity is reflected in the restricted dimensional conditions to generate the information that defines the particle and coded into a set of differential equations. The net result of this experimental investigation is a book that lifts some of the statistical veil obscuring the origins of quantum mechanics.

Some Chapters

Residual Problems with Quantum Mechanics

Selective History

Basics: Symmetry as a Trap for Quantum Field Theories

Amending Quantum Mechanics

Defining a Particle

Characteristics of a Particle

Origin of Charge & Weak Charge

Gravity's Structural Source

Zero Charge & Quantization of the Photon & Neutrino

Longitudinal Relativistic Spin Wave: a Spin Zero Boson

Large Scale Quantum Effects

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