

# Classical Unification of Electromagnetism & Gravity

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The development of Physics has been distorted by the order in which history presents discoveries and the development of ideas. With hindsight, we are able to reconstruct the development of concepts correcting mistakes. We summarize here the results of 20 years work which has produced a unified theory of electromagnetism and gravity. The relativistic effects are derived from EM theory and shown to be real physical phenomena. From the assertion that the purpose of magnetism in nature is to give elementary charged particles the property of inertial mass, we derive the laws of electromagnetism. Our theory of gravity predicts the effects of gravitational potential, but differs from GR in having no singularities and uniform contraction in length. Knowing that magnetic flux is quantized, we derive the quantized energy levels of hydrogen. We derive the effect of magnetic coupling and show that the electron does not have an intrinsic magnetic moment. We look at the structure of the photon and investigate wave particle duality. Our unified theory lacks only an explanation of the strong force.

## 1. Introduction

In this paper, we are summarizing a large body of material in which everything is explained in detail with all the mathematical derivations set out in full. These are available on the author's website hosted at [www.bearsoft.co.uk](http://www.bearsoft.co.uk) [5], but we warn the reader that even with a sound knowledge of the calculus and of vector field theory it needs months of study to understand the work which we have summarized here.

We Use SI units and unless otherwise stated, all equations are in microscopic form. That is to say that we looking between and within the atoms and not at the bulk properties of matter.

The last 20 years of work by the author have been driven by a desire to understand how nature works. The Standard Model of Physics contains too many elements which are simply unbelievable. Feynman's explanation of the electric force as being transmitted by the exchange of virtual photons is farcical. The concept of point sized electron's with powerful magnetic moments is beyond belief. Its latest ventures into belief in the multiversity defy understanding as to how humans can be so daft.

It is our contention that nature cannot do mathematics. She can only work through simple physical processes. Mercury knows nothing except the action of gravity on her in the infinitesimal element of time altering her velocity. Nature does not do the integrals to establish the elliptical orbit and is not aware of the effects of gravitational potential contributing to the advance of its perihelion. Electrons know nothing of quantum mechanics or Feynman's fantasies about how the electric force is transmitted, but orbit within their atoms in accordance with the laws of Newton and Maxwell.

Einstein and the fathers of QM labored under the delusion that ultimate reality lay in the observation of the human scientist and took physics off the rails into the plunge towards belief in the multiverse.

By correcting some of the conceptual mistakes of Classical Physics, this body of work shows how simply the classical physics still taught to engineers can be extended to explain the phenomena claimed by Modern Physics. We start with the action of an electric current in forming a magnetic field risking instant

dismissal of this paper by those disciples of Einstein convinced that magnetism is simply an artifact of observation.

## 2. The Action of a Current in a Wire

Our first clue as to the nature of electric fields comes from the empirical Law of Biot-Savart:

$$\vec{B} = \mu_0 I \oint \frac{\hat{1} \times \hat{r}}{4\pi r^2} dl \quad (1)$$

Knowing that an electric current consists of the sum of the motions of the conduction band electrons and reducing the equation to its simplest form, it becomes:

$$\vec{H}_i = \vec{v}_i \times \vec{D}_i \quad (2)$$

Where  $\vec{v}_i$  is the velocity of the  $i^{\text{th}}$  electron and  $\vec{D}_i$  is its electric flux density. We assert that this is a fundamental equation of nature and that a magnetic field:

$$\vec{B} = \mu_0 \sum_i \vec{H}_i \quad (3)$$

will form subject to the limitations that magnetic flux is quantized and continuous. The  $\vec{v}_i$  are measured relative to the background and the summation is over all charged particles. This may be simplified for the magnetic field generated by a current in a circuit, taking the summation over the conduction band electrons using their velocities  $\vec{u}_i$  measured relative to the circuit.

In interpreting these equations, we depart from the concepts of Classical Physics introduced by Maxwell. We take Eq. (2) as prima facie evidence that the individual electric fields of all elementary charged particles coexist in space. Classical Physics takes  $\vec{D}$  to be singular, and then uses the mathematical artifact of Magnetic Vector Potential  $\vec{A}$  to sum the actions of the moving electrons and then use vector calculus function of *curl* to find the magnetic flux density  $\vec{B} = \nabla \times \vec{A}$ .

Nature cannot do this mathematics. She can only perform iterative local processes. We may use mathematics to model those processes, but can fall into the trap of producing beautiful equations which nature cannot enact.

Maxwell understood Faraday's electric and magnetic flux to have their seat in the aether. Thus he assumed that they were stationary in the aether and that when we observe a moving field, what is really happening is that the flux density is changing in much the same way as the sea level goes up and down as waves pass. We assert that this is not how nature works. The electric fields of the conduction band electrons move with them and the magnetic flux of the field formed by the current is stationary in relation to the circuit.

### 3. Flux is Quantized

It was not until 1961 that Deaver and Fairbank published their finding that magnetic flux is quantized [3]. With this knowledge, Classical Physics can easily derive the quantized energy level of the hydrogen atom.

Unfortunately, Faraday never had access to liquid helium and fuse wire, but he would be delighted to discover that his concept of tubes of flux is true to nature. He would however be somewhat surprised to discover how small her unit of magnetic flux is. But that would be nothing compared to discovering how small nature's unit of electric charge is. The quantum fluxoid  $\Phi_0$  as it is called is only  $2.067834610 \times 10^{-15}$  Weber.

In the light of Gell-Mann's conjecture that nucleons each consist of 3 quarks of charge  $1/3$  and  $2/3$  [2], that of the electron requires a smaller unit. The charges on the electron and the U and D quarks can best be explained if electric flux is quantized in units of  $\frac{e}{6}$ . The surfaces of the D quark is divided into two hemispheres, that of U into 4 resembling an inflated tetrahedron and the electron an inflated cube.

Further evidence comes when we consider the nature of photons. A photon of 8 half phases each consisting of a quanta of magnetic flux and a quanta of electric flux will have an energy content of  $2e\Phi_0\nu$  or  $h\nu$ .

When we come to consider the mechanics of orbiting electrons, the quantization of magnetic flux has profound effects on our application of the laws of electromagnetism.

### 4. The Electric Force

Maxwell identified displacement charge and stated that electric flux terminates in displacement charge. One interpretation of electrostatics is that an electric charge induces an electric field polarizing space and that an equal and opposite displacement charge is attracted to the surface of the charge. While this seems quite feasible for a charge on a metal surface, it is harder to imagine it applying to an electron because the total charge of electron plus displacement charge would be zero. We therefore proposed that the electron consisted just of energy stored in an electric field and the displacement charge at its inner surface. Electric flux, then, has energy content stored in a polarization of space. An electron sitting within the electric field of another electron experiences a force because its surface sits with the polarization of the other's electric field.

The problem of how force can be exerted at a distance is solved because it is the electric field which extends outward through space. The action of the force is local to the electron experiencing the force. We see the electric field as possessing the

property of electric potential by virtue of the potential energy resulting from the proximity of elementary charged particles.

### 5. Lorentz's Theory of Electromagnetic Mass

Very few physicists know that around 1900, Lorentz developed a theory that the inertial mass of an electron was due to the motion of its electric field generating a magnetic field which contained its kinetic energy. He believed matter to be made of positive and negative electrons held in equilibrium by electric forces. This theory formed part of his derivation of the Lorentz transforms and explained the phenomena of SR as real physical effects. The discovery of the neutron put an end this theory and Lorentz's claim to be the founder of SR. However, the general acceptance of Gell-Mann's model of the nucleon removes any objection to Lorentz's theory. We have had to make one or two corrections to put it on a rigorous footing. In particular, showing that the Lorentz contraction is of the  $\vec{D}$  and  $\phi$  fields rotating  $\vec{E}$  towards the direction of motion and thus making the energy content of the electric field invariant.

The Lorentz theory gives the electron radius of  $1.879 \times 10^{-15}$  m which gives it a self energy of  $\frac{3}{4}mc^2$ . We can account for the whole energy of  $mc^2$  released in electron positron annihilation by assuming that this occurs when their centers are 3 electron radii apart.

Lorentz only used energy considerations in his theory. He did not describe the motor action by which the inertial force is generated. In our analysis, we find it necessary to postulate that:

- the surface element performs a motor action turning magnetic energy into work done by a force and work done by a force into magnetic energy
- magnetic energy moves within the charge's electric field parallel to  $\vec{D}$ .

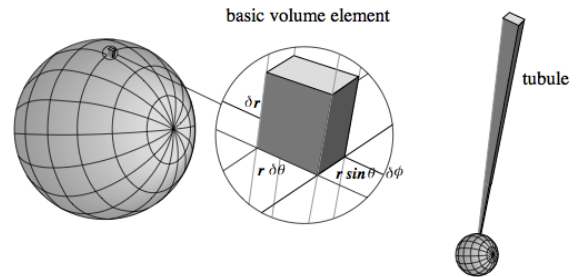


Fig. 1. The Faraday tube subtended by the surface element of solid angle  $\delta\omega = r^2 \sin\theta \delta\theta \delta\phi$ .

We then equate the work done with the changing energy content of a conic volume element subtended by the surface element of solid angle  $\delta\omega$  of the charge  $q$  of radius  $r_0$  in the direction  $\hat{r}$ :

$$\delta\vec{F} \cdot \vec{v} = \frac{\mu_0 q^2}{16\pi r_0} \delta\omega [\hat{r} \times (\vec{a} \times \hat{r}) \cdot \vec{v}] \quad (4)$$

From which can be derived the force by integration over the surface of the charge:

$$\vec{F} = \frac{\mu_0 q^2}{6\pi r_0} \vec{a} \quad (5)$$

which is the non-relativistic case. We repeat this calculation in our theory of relativity taking into account the contraction in length and derive the relativist form:

$$\vec{F} = \frac{\mu_0 q^2}{6\pi r_0} \gamma \begin{pmatrix} \gamma^2 a_x \\ a_y \\ a_z \end{pmatrix} \quad (6)$$

From these equations, we can derive Newton's laws of motion in both their original and relativistic forms.

## 6. Special Relativity

Lorentz identified Maxwell's wave equation in electric potential and Poisson's equations as being special cases of the same equation:

$$\nabla^2 \phi - \frac{1}{c^2} \frac{\partial^2 \phi}{\partial t^2} = -\frac{\rho}{\epsilon_0} \quad (7)$$

giving Maxwell's equation in the absence of charge and Poisson's equation for a stationary charge. He was able to show that this reduced to Poisson's equation when the substitution was made to contract the co-ordinate system by a factor of  $\sqrt{1-v^2/c^2}$  thus

proving that Fitzgerald Contraction was a real physical effect predicted by EM theory. He also proved that this results in a real increase in inertial mass which in turn results in a slowing of times dependant processes. He proved the validity of the Lorentz Transforms from the stationary system to the moving system and that any attempt to measure the speed of light would result in the same answer. Poincaré demonstrated that they were also universally valid.

Einstein then produced an alternative theory supposedly based on the fact that the speed of light was the same in every reference frame. But his derivation was a mathematical fudge using light from the stationary system to synchronize clocks in the moving system. This in effect means that he was using the concept of an aether in which light travels at  $c$  and explicitly using velocities of  $c+v$  and  $c-v$  in his calculations. But then ended up by claiming that it is  $c$  in every system and saying that the concept of an aether is superfluous.

The result has been an ongoing debate as to the validity of Einstein's theory which has been grossly distorted by the lack of availability of knowledge of the work of Lorentz and Poincaré. It must be emphasized that the two theories while possessing exactly the same equations are very different in physical interpretation. Einstein's contraction in length, increase in mass and time dilation are artifacts of observation. In Lorentz Poincaré relativity, they are real physical effects.

## 7. Gravity

There have been many attempts to explain the force of gravity in terms of the nature of matter as consisting of elementary charged particles. These were all fruitless because Classical Electromagnetic Theory regarded the electric field as described by  $\vec{D}$  and  $\vec{E}$  to be singular. If however, the electric fields of every elementary charged particle coexist in space, the way is open to a solution.

The author started by asking where the energy released when a mass falling through a gravitational field comes from. He proposed that it came from the  $mc^2$  energy of the mass. This results in a loss of mass  $\delta mc^2$  to release  $m\delta\Phi$  of energy where  $\delta\Phi$  is the change in gravitational potential. This gives a differential equation:

$$\frac{dm}{m} = \frac{d\Phi}{c^2} \quad (8)$$

which has a solution:

$$m_\Phi = m_0 e^{\Phi/c^2} \quad (9)$$

We explain the force of gravity as resulting from the effect of gravitational potential in releasing energy from the mass. We postulate the mechanism is an effect of the presence of the coexisting electric fields of elementary particles having a very very small effect on each other reducing their ability to contain energy. The properties involved would have to be the absolute value of electric potential and the energy content of each elementary charged particle.

Since we are unable to detect the effects of gravitational potential in any local experiment, we conclude that other physical quantities and in particular the units of measurement must be affected in a consistent fashion. We know from the planetary ranging experiments that the speed of light is reduced and by use of Dimensional Analysis, we can identify the effects of gravitational potential on all physical quantities.

We find that the contraction in length is independent of direction and in this depart from Einstein's General Relativity which holds that the contraction is only in the horizontal plane. We further depart from Einstein in that our function describing the effects is an exponential function  $e^{\Phi/c^2}$  which does not give singularities.

Gravitational potential causes ruler to contract and clocks to slow by the same factor of  $e^{\Phi/c^2}$ . Einstein's singularities result from using a factor equal to the first two terms of the expansion of this function.

We understand space to have no fabric and are able to describe it using Euclidian geometry and Newtonian time against which can describe the physical universe taking into account the effects of gravitational potential.

We have correctly derived the advance of the perihelion of Mercury and the bending of light by gravity.

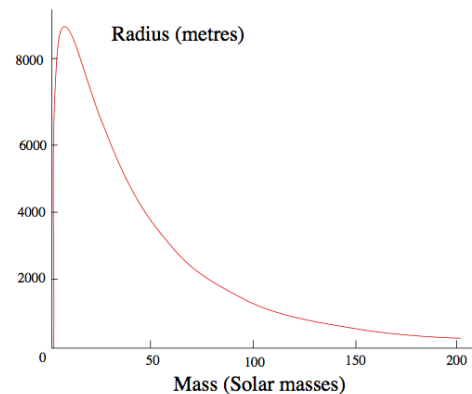


Fig 2. Euclidean Radius of a Neutron Star

We have been able to model a massive neutron star and show that its radius as measured against Euclidian space is given by:

$$R = \sqrt[3]{\frac{3M}{4\pi\rho}} \exp\left(-\frac{G}{c^2} \sqrt[3]{\frac{4\pi M^2 \rho}{3}}\right) \quad (10)$$

where  $M$  is the mass and  $\rho$  the density. See results in Fig. 2.

If it were possible to burrow around inside the neutron star local geometry and the measurements of physical quantities would appear unaffected.

When applied to the massive black hole at the centre of our universe, we find it may well have an incredibly small radius of the order of  $4 \times 10^{-1711}$  m.

## 8. Gravity and Photons

When a mass free falls through a gravitational field, its energy content remains constant. That is to say that it loses mass releasing  $\delta mc^2$  energy which is turned into kinetic energy stored in the magnetic fields of its electrons and quarks. When its fall is arrested, the kinetic energy is released and the mass has less total  $(KE + mc^2)$  energy. This loss of energy happens because the matter consists of elementary charged particles.

A photon simply consists of energy stored in its electric and magnetic fields. It does not suffer any loss of energy because it is all kinetic energy and the action of gravity is simply to cycle the energy between its electric and magnetic fields. Photons do not feel the force of gravity. The phenomena of gravitational red shift does not result from the photon doing work against gravity. It results from the difference in gravitational potential and the effect of gravitational potential on the energy levels within the atom. Photons carry with them a record of the gravitational potential in the region of the emitting atom.

Gravitational potential reduces the speed of light by a factor of  $e^{2\Phi/c^2}$ . This cannot be measured locally because the ruler used to measure distance has contracted by a factor of  $e^{\Phi/c^2}$  and the clock slowed by the same factor.

When the photon is moving in a horizontal direction, the effect of gravitational potential is to produce a velocity gradient across the width of the photon causing its path to bend. This is exactly the same effect that we see where light passes through a medium with varying refractive index.

## 9. Electromagnetism

The empirical laws of EM led Lorentz to develop the Electromagnetic Theory of Mass. We go further and postulate that the electromagnetic properties we observe in macroscopic system are a side effect of the properties of nature required to give an elementary charged particle the property of inertial mass.

We have described the fundamental action of the motion of the electric field of an electron in Eq. (2) and of the resulting magnetic field in Eq. (3). From these and the assumption that the energy contained in the magnetic field generated by a charge's motion moves parallel to its  $\vec{D}$  field and is generated or used by a motor action within the surface of the charge, we are able to show that it exhibits the property of inertial mass.

By substituting  $\vec{D}_i = \frac{q_i \vec{v}_i \times \hat{r}_i}{4\pi r_i^2}$  in Eq. (3), we can perform the

closed integral around a circuit and then sum over all conduction band electrons to derive Ampere's Law.

Classical Physics sometimes attributes two different mechanisms to explain a single effect. The self energy of the electron is good example where it can be found by integration of the energy density over the volume of the field, or from the work done in assembling the electron against the internal stresses. We assert that only one of the two can be correct and in the case of the electron show that its energy is contained in its electric field and that its surface elements do not repel each other. A similar situation exists in the interaction between magnetic fields and moving charges.

Einstein identified this in his 1905 introduction to special relativity [2], where he says that one law applies if a conductor is moved through a magnetic field and another when the magnetic field is moved past the conductor. As magnetic flux moves through the background, it generates an electric intensity:

$$\vec{E} = \vec{v} \times \vec{B} \quad (11)$$

It would seem obvious that we may use this to make a speedometer to measure our velocity through the aether, but no electric field has ever been measured. We would suggest that this electric intensity is never experienced because it is the physical cause of the Lorentz Contraction. We only see it in electromagnetic radiation where there are no spherically symmetric electric fields of charged particles which could suffer the contraction. Here it forms driving force to maintain the existence of the electric fields of the photons and waves.

However, when a charged particle moves through a magnetic field we observe a force  $\vec{F} = q\vec{v} \times \vec{B}$  acting on it and when the strength of a magnetic field is changing, we find an emf generated in any circuit it threads. We can derive both these effects in terms of the mechanism which gives charged particles the property of inertial mass. Electromagnetic induction and the property of inertial mass both result from this same fundamental action of nature.

## 10. Induction

Now that we have established how changes in the velocity of an electron result in an inertial force, we can apply these principles to a magnetic field generated by the combined motions of a number of electrons. The energy density is given by:

$$Q = \frac{\mu_0}{2} \left( \sum_i \vec{u}_i \times \vec{D}_i \right)^2 \quad (12)$$

We can identify the contribution of the action of the  $j^{\text{th}}$  electron by writing this as:

$$Q = \frac{\mu_0}{2} \left( \vec{H}_0 + \vec{u}_j \times \vec{D}_j \right)^2 \quad (13)$$

where  $\vec{B}_0 = \mu_0 \sum_{i \neq j} \vec{u}_i \times \vec{D}_i$  may be regarded as the flux density of

the background magnetic field through which the  $j^{\text{th}}$  electron is moving.

By expanding Eq. (13) and forming an equation similar to (8), we get:

$$\frac{d}{dt} \delta E_m = \frac{q}{4\pi} \delta \omega \int_{r_0}^{\infty} \frac{d}{dt} (\vec{B}_0 \cdot \vec{u}_j \times \hat{r}) dr \quad (14)$$

This is then integrated over  $r$  and then over the surface of the electron and simplified to give the force on the electron:

$$\vec{F} = q \vec{v} \times \vec{B} \quad (15)$$

In this action, the symmetry of the vectors involved in the triple scalar product divides the surface of the electron into 4 quadrants with equal energy flowing into one pair and out of the other. The forces involved are summed over the surface resulting in a force perpendicular to  $\vec{B}$  and  $\vec{v}$  and having no effect on the energy.

If on the other hand, we vary the strength of the magnetic field, we break this symmetry and now when we sum the force over the surface of the electron, we find a component in the direction of motion. Summing over all the conduction band electron gives the induced emf. It is to be noted that this action involves all the elementary charged particles of the circuit generating an equal and opposite force on the lattice of the conductor.

The laws of Electromagnetic Induction may result from these fundamental actions of nature, but they are laws relating to manufactured objects and are conditioned by the design of those objects. We have derived the laws for induction between two circuits in terms of their self and mutual inductances. We have also derived the energy content of the magnetic field generated by a current in circuit as:

$$\frac{1}{2} I \Phi \quad (16)$$

## 11. The Hydrogen Atom

With the laws of electromagnetism derived, we may now consider the case of the simple orbital system of the hydrogen atom. The motion of the electron generates a magnetic intensity, but formation of a magnetic field is conditioned by the quantized nature of magnetic flux. We postulate that two distinct fields are formed; one closely surrounding the electron and moving with it and a second surrounding the orbital path. The kinetic energy of the electron is shared equally between these in accordance with the principle of equipartitioning of energy.

However, as an orbital system, it must obey the laws of orbital mechanics. The Virial theorem states that the average potential energy is minus twice the average kinetic energy. These factors give us two equations:

$$\frac{-Ze^2}{4\pi\epsilon_0 r} = -4m_r \pi^2 r^2 \nu^2 \quad (17)$$

$$\frac{1}{2} \nu e n \Phi_0 = \frac{1}{2} m_r \pi^2 r^2 \nu^2 \quad (18)$$

where  $\nu$  ("nu") is the orbital frequency and  $m_r$  the reduced mass and  $n$  the number of quanta of flux threading the orbit. These may be solved to give:

$$r = \frac{4n^2 \Phi_0^2 \epsilon_0}{\pi m r} \quad (19)$$

$$\nu = \frac{em_r}{32n^3 \Phi_0^3 \epsilon_0^2} \quad (20)$$

From this, we can calculate the energy level  $ne\Phi_0\nu$  and angular momentum  $L = \frac{ne\Phi_0}{\pi}$ . These are the same as the values Bohr obtained, his being in different units and using Planck's constant  $h = 2e\Phi_0$ .

We extend this analysis to the case of an atom in a background magnetic field and obtain the accepted result that the coupling energy equals the product of magnetic moment and the flux density. However, the orbital mechanics reveal the actual mechanism for this as being different from that proposed in QM.

There can be no inductive effect because the flux threading the orbit cannot change. The only effect is the Bev force on the the electron increasing or decreasing the orbital radius depending on its orientation. Because the Virial theorem applies, increasing the energy content of the the magnetic field decreases the energy of the orbital system and decreasing the energy in the magnetic field increases the energy of the orbital system. The result is that there is no preference for the orbit to flip either parallel or antiparallel to the field. This effect is precisely that observed in the Stern-Gerlach experiment.

Furthermore, an electron moving in a strong magnetic field will display cyclotron action. If the orbit is small enough, the magnetic field it generates will only contain a small number of quanta of flux and we can apply Eq. (18) and solve it for the orbital frequency  $\nu = \frac{qn\Phi_0}{2m\pi^2 r^2}$  and then substitute into the expression

for the angular momentum  $L = 2\pi r^2 \nu m$  to give:

$$L = n \frac{h}{2\pi} \quad (21)$$

Thus we show that an electron in cyclotron motion can exhibit quantised behavior. This is precisely the result observed in a Penning Trap. This and the new interpretation of the Stern-Gerlach experiment shatter the myth of the electron's spin.

The atom and the nucleus are complex systems. Chaos theory shows that complex system obeying deterministic laws can never the less generate pseudo random behaviour. The author believes that one day a future generations of physicists will add this element in a full classical theory of atomic and nuclear structure.

## 12. Wave Particle Duality

We have considered how quantized electric flux and quantized magnetic flux might form a photon. The general solution of the wave equation is any function  $f(x-ct)$  defined over a domain in  $x$  and moving in the  $x$  direction with velocity  $c$  which is single valued and twice differentiable over that domain. This is satisfied by  $f = 1 - \cos(x-ct)$  over a domain of  $0 \rightarrow 2n\pi$ . This has the same differentials at  $f = \sin(x-ct)$  and has nice integrals. We can thus determine the energy content of one phase as:

$$= \frac{3}{2} \Phi_0 \frac{e}{6} \nu = \frac{1}{8} h \nu \quad (22)$$

So it is a simple matter to conclude that a photon 8 phases in length and containing 8 quanta each of magnetic and electric flux

has an energy content of  $h\nu$ . The important thing to understand is that the electric and magnetic flux are moving with the photon at the speed of light.

We postulate without evidence that there is a second solution which exists as a perturbation of existing electromagnetic fields and that this is more in keeping with Maxwell's understanding of the flux being stationary and varying in flux density as the wave passes. It is our conjecture that the phenomena of diffraction is caused by an interaction between these two solutions of the wave equation and that in the close proximity of matter, energy is drained from the moving flux into the perturbation wave and that it is the perturbation wave which suffers diffraction. And then as the photon passes on, energy is transferred back guiding the photon along the path of the diffracted perturbation wave.

We note that a charged particle moving at near light speed resembles a single phase of a photon and we suggest that in close proximity to atoms, the same mechanism of diffraction is at work.

### 13. Future Development

We have had some success modelling the structure of the proton and neutron with U and D quarks. Both take the form of the two similar quarks orbiting at opposite points in the same orbit. (Fig. 4) This is the only configuration which will give a magnetic moment. The necessary force of attraction is many orders of magnitude greater than the Coulomb force and we suggest that the bond is formed by a quanta of electric flux with the displacement charge at its ends stuck to the surfaces of the quarks. Energy levels would be determined by the number of quanta of magnetic flux wrapping the orbit. Orbital velocities would be such as to produce significant relativistic mass increases and the exact analysis to predict a magnetic moment remains to be done.

We have achieved a large part of deriving a Grand Unification Theory. We have not been able to predict the magnetic moments of the proton and neutron nor find an electromagnetic explanation for the strong force.

We have looked at possible alternative model for the neutron. (Fig. 3) Lorentz's theory of electromagnetic mass gives a radius for the electron of about 2.5 times the radius of the proton. If a proton managed to penetrate an electron, the surface of the electron would sit in its electric field. If this resulted in a reduction in the radius of the electron, the increase in energy stored in its electric field would account for the excess energy released in neutron decay. The trapped proton feels no force from the electron because its electric field extends outward from its face and is absent within. Such a neutron would exhibit strong Van der Waals force,

but we have not been able to model even the simplest nuclei to predict a binding energy.

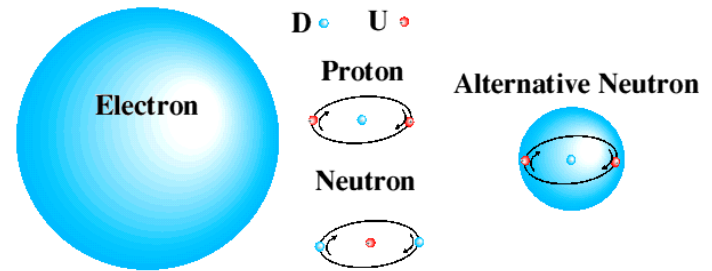


Fig. 3. Possible models of the Proton and Neutron

### 14. Conclusion

The history of the development of physics has been a very slow and faltering process involving vast numbers of man-years of work. On the other hand, we see here the work of one physicist reworking that history and correcting the mistakes of the past. This vast achievement could only have been possible because of the correctness of the basic concepts.

We are left to decide which is less unbelievable. The author's assertion that the electric field of an electron (or U or D quark) exists in its own right and that the electric fields of all elementary charged particles coexist in space, or whether electrons spend their lives hovering around in uncertainty waiting for a human observer to make an observation causing nature to work out endless probability calculations to determine its position. That the coexisting electric fields of all elementary charged particles forms a background against which the motion of  $\vec{B}$  generates  $\vec{E}$ , and the motion of  $\vec{D}$  generates  $\vec{H}$ , or that magnetic fields are merely an artifact of observation.

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