Dipole Lattice Mechanics

Michael Gunning, Uragh, Belturbet, Co. Cavan, Ireland. H14XE79. mgunning@uragh.com

Abstract

In this paper I introduce the concept of Dipole Lattice mechanics to explain the structure of space and the origins of matter. It explains the properties of fundamental particles such as mass, charge, spin, magnetic moment etc. It describes what light is and it predicts the existence of what I call a dark photon which readily explains the results of all single photon Mach-Zender type interferometry experiments. It also predicts the existence of Dark energy and Dark matter and explains what they are. It provides an alternative and simple explanation for Stern-Gerlach and Bell Inequality type experiments which are the pillars of Quantum Mechanics. It also proposes explanations for Quantum Tunnelling, Gravity, Superfluidity, Superconductivity, the Casimir effect and many more.

1. Introduction

I have always been intrigued by the fact that the proton and the electron have the exact same magnitude of charge but have totally different masses. To me they must at least have something fundamentally in common. This is one reason why I have never been convinced of the validity of the standard model of particle physics. It describes the proton being composed of quarks with fractional charges even though the electron, which is considered a fundamental particle, has only unit charge. This feels physically wrong and in my view is nothing more than a mathematical abstraction. The Standard Model also, does not explain Dark Matter, Dark Energy, Gravity or why neutrinos have mass and change spontaneously between types. There are other short comings as well, but it is safe to say that the Standard Model is woefully inadequate. The principal of Occam's razor states that the simplest solution is probably the more correct one. I would add to that the more beautiful solution is probably the more correct one. The standard model lacks beauty and is definitely not simple. I am also uncomfortable with the explanations put forward by Quantum Mechanics to explain many, so called, weird observations. Interpretations such as "Many Worlds" and "Superposition of States" just make no physical sense to me and are again only mathematical abstractions. While I appreciate that it has great predictive power it has no clue as to what is actually happening as demonstrated by Richard Feynman in his "*shut up and calculate*" comment. The great 19th century physicist, Lord Kelvin, said,

"It seems to me that the test of "Do we or not understand a particular subject in physics?" is, "Can we make a mechanical model of it?" I have an immense admiration for Maxwell's model of electromagnetic induction. He makes a model that does all the wonderful things that electricity does in inducting currents, etc., and

there can be no doubt that a mechanical model of that kind is immensely instructive and is a step towards a definite mechanical theory of electromagnetism".

I would share Einstein's instinct that *"God does not play dice with the Universe"* and that there is no *"Spooky action at a distance".* The reason, I think, that science has failed to unify Special Relativity and Quantum Mechanics is because the interpretation of the real world by Quantum Mechanics is largely incorrect and that by Relativity is largely correct. My model is a mechanical model as desired by Lord Kelvin which is both powerful in its simplicity and elegant in its beauty.

2. The Fundamental Building Block

The idea for this fundamental building block came to me while reading explanations for the Casimir Effect[1]. The Casimir Effect is the attraction experienced between two parallel conducting plates placed very close together. It proposed that fluctuations of different wavelengths of the vacuum energy were being excluded from the gap between the plates, thereby reducing the pressure inside the gap and causing the plates to move towards each other. These fluctuations consisted of virtual particle-antiparticle pairs of different wavelengths. I couldn't visualise any structure ever coming from such a haphazard and chaotic environment, so I thought about regularising and ordering it. Instead of having an infinite number of virtual particle-antiparticle pairs of different wavelengths, I replaced them with a dipole of fixed charge and length (Figure 1). I am not putting forward a detailed explanation of what a dipole actually is other than to speculate that the positive monopole is a source of energy from the vacuum and that the negative monopole is a sink for

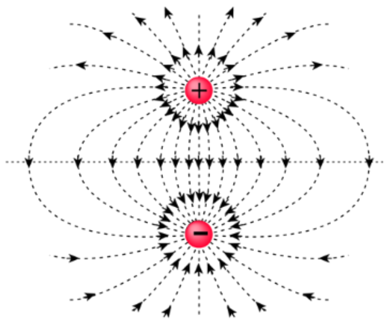


Figure 1

energy back to the vacuum. The two monopoles thus always come in pairs and act as a unit. Like poles on different dipoles will repel each other and unlike poles will attract as per the Electrostatic Coulomb force. This dipole is thus the single building block of everything, and the only force is the Electrostatic Coulomb force.

3. Chirality and Handedness

As demonstrated by the Wu Experiment[2] conducted in 1956, beta particles emitted by Cobalt 60 violated the conservation of parity (p-violation). This showed that particles can tell the difference between left and right with one direction taking precedence over the other. To account for this, I propose that the dipole itself is not symmetrical in some respects. Its behaviour is such that If the dipole were a physical dumbbell, then one end would be much heavier than the other. The lighter end moves more quickly in response to an impulse. When the centre of rotation of a clockwise rotating dipole is oscillated by a wave travelling in a particular direction the dipole will orientate itself at right angles to this direction, but the “lighter” monopole will always end up on the right-hand side with respect to the direction of the wave. This is exactly what would happen if you did the same thing with a physical dumbbell with asymmetric ends. The right-hand rule for the Lorentz force has its origins in this asymmetry of the dipole and it is also responsible for many other phenomena which will be expanded on later.

4. The Fabric of Space

The fabric of space is made up of many dipoles arranged in a structure similar to that of a sodium chloride crystal. Each of the two monopole types forms a separate face-centered cubic lattice, with the two lattices interpenetrating so as to form a 3D checkerboard pattern as shown in figure 4a. The negative monopole in the figure (coloured purple) is depicted as smaller than the positive monopole to indicate the asymmetry as described earlier. Each monopole's nearest neighbours consist of six monopoles of the opposite type, positioned like the six vertices of a regular octahedron. The direction of the dipoles in adjacent parallel rows alternate so there is no charge bias in any particular direction. The face centered cubic lattice structure is the most compact arrangement that the monopoles can arrange themselves into and as can be seen from figure 4a this leads to the formation of three mutually perpendicular axes. The diagram shows links between the monopoles but this is just for visual clarity. There are no permanent links between the monopoles of any dipole so any negative monopole can pair up with any of the six positive monopoles surrounding it and vice versa. All the dipoles can however oscillate and do so at the natural frequency of the lattice structure. Each can oscillate transversely around their centre in any plane and they can also oscillate longitudinally, parallel to a line joining the two monopoles. The fabric of space is therefore a continuously quivering three-dimensional lattice of dipoles. I will refer to this structure in the rest of this paper as the space lattice.

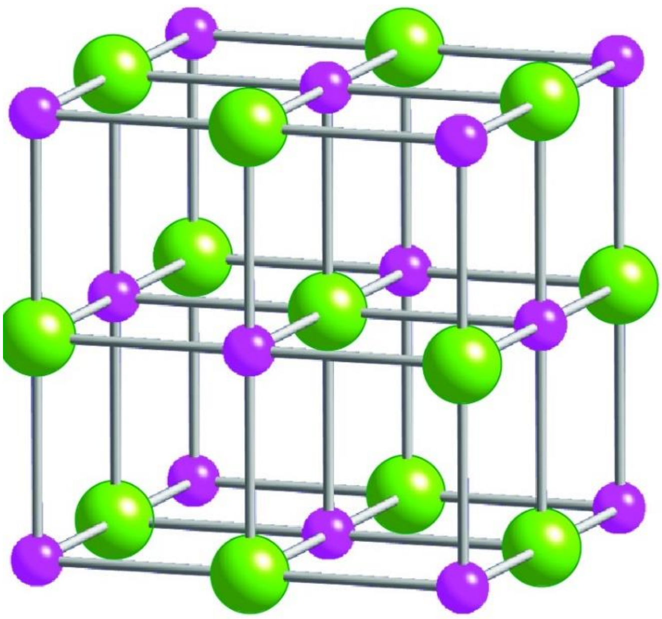


Figure 4a

5. The four basic particles

There are only four basic particles, the electron, proton, positron, and antiproton. I will deal with neutrinos later.

Particles are formed in pairs as follows. When the monopoles of a dipole somehow get separated from each other they become unstable, but they can be stabilised by other dipoles surrounding it. A positive monopole will be surrounded by dipoles with their positive ends pointing outwards and a negative monopole will be surrounded by dipoles with their negative ends pointing outwards. There are three different outcomes after a dipole breaks in two.

1. If the monopoles separate by just a small distance, then they will just be attracted back to each other to reform.
2. If the dipoles get separated by a relatively large distance, then each monopole is surrounded very quickly by a small number of dipoles with the same charge facing outwards as the charge of the monopole. The exposed end of the dipoles in this shell will be close together and therefore still unstable. More dipoles will be attracted to them and will build up another shell around the first one. This process will continue until the repulsive lateral forces between dipoles is greater than the attractive radial forces. These two particles are the proton and antiproton. Because they have opposite charge, they will be attracted to each other and because they are the same size will interact in a way which will annihilate each other as described later on.
3. If the monopoles separate by a distance between case 1 and 2 then one of the particles will by chance start to get surrounded by dipoles before the other. The structure will continue to form as in case 2 but the second monopole gets trapped within it and cannot now be stabilised in a similar manner. This structure is what I call a primordial neutron as it was only formed during the big bang and is different from the neutrons present today, which will be described later. The trapped monopole eventually makes its way to just beneath the last shell of dipoles to form around the structure. It then starts to flip the dipoles in the outer shell as the inward facing monopoles are repelled outwards. If we imagine the structure as a solid sphere inside a thin spherical shell it will be easier to visualise what happens next. When sufficient dipoles are flipped on a small area of the outer shell, they will start to repel the solid sphere away. This will allow the monopole to flip more dipoles on the outer shell which will increase the repulsive force until the entire solid sphere breaks through the shell on the opposite side. As the solid sphere emerges the opening in the shell will close behind it and the monopole will flip any remaining dipoles. As there is no longer a radial force holding the dipoles in the shell together the repulsive lateral forces will cause the shell to expand until the lateral forces are balanced by the lattice tension. The monopole is therefore trapped inside a large shell of dipoles while its companion has been tightly surrounded by a dense cluster of dipoles. The monopoles are now well separated from each other and cannot recombine as in case 2 as the radii are very different, which leaves two very stable particles. If the positive monopole becomes the small particle, then it is a Proton, and the large particle is an Electron. If the negative monopole becomes the small particle, then it is an Antiproton, and the other particle is a Positron.

By this mechanism Protons and Electrons (Matter) are always formed together as are Antiprotons and Positrons (Antimatter). One of the great mysteries of the Universe is why particles are almost all made of matter instead of antimatter. I can think of two possibilities to explain this. If by pure chance a tiny fraction more Matter is formed than Antimatter, then eventually all the Antimatter will annihilate with the same amount a Matter leaving just the Matter we see today. It is only a case of creating enough total matter so that the imbalance is what we see today. The second possibility is that because of the asymmetric nature of the dipole it is more likely that a positive monopole of a separated dipole gets surrounded first as the negative ends of the dipoles can move more quickly. This means that there will be a bias towards creating protons and electrons instead of positrons and antiprotons. After the annihilation of particles is complete there will only be Matter remaining. This mechanism requires that stable Matter can only be formed if

Protons and Electrons are very different in size and structure. I suggest that the period of inflation after the big bang was caused by the creation of Positrons and Electrons as the shells around them expanded outwards towards their equilibrium diameter pushing the space lattice apart. This description of matter is in keeping with our general understanding that the proton is a relatively dense and positively charged object with a measurable radius and the electron is a negatively charged point object because it is a monopole inside a shell that is so large in comparison and which is nearly as "open" as the space lattice. I should also add here that there is no lattice inside the electron so the usual concepts of distance and time, which are properties of the lattice, do not apply so the monopole can probably travel at speeds in excess of c. To an outside observer restricted by the confines of space and time by the lattice, the monopole inside the electron shell will appear to be almost everywhere at once. This may be why the electron's position appears so fuzzy.

6. Rest Mass of Particles

In the description above of how particles formed it is obvious that particles are spherical objects. The space lattice is however cubic so the lattice will have to stretch and twist in order for it to surround the spherical particles. This causes a tension to build up in the lattice. As two dipoles on opposite end of a lattice node are pulled apart a distance, d, they will experience a coulomb force which is inversely proportional to $\varepsilon_0 d^2$, where ε_0 is the permittivity of free space. These two dipoles may also be oscillating or rotating so the average distance between them will increase more. The coulomb force will therefore reduce further by a factor proportional to d. The mathematical relationship describing this effect is complicated, but it will have the form $C_\mu\ \mu_0 d$ where C_μ is a constant and μ_0 is the permeability of free space. The force is therefore also inversely proportional to this amount and the total force is proportional to the product of the two and we can write that the Force F is,

$$F \propto {}^{1}\!/_{\epsilon_0\,\mu_0\,d^3} \qquad (1)$$

If the lattice is stretching around a particle with radius r, then the total force for all dipoles will be inversely proportional to r^3 as d is linear function of r. As the Pressure P, is the force per unit area where the area is the surface area of the particle then we can write that,

$$P \propto {}^{1}\!/_{\epsilon_0\,\mu_0\,r^5} \qquad (2)$$

Pressure multiplied by volume gives the Energy and we know that the velocity of light c is,

$$c = {}^{1}\!/_{\sqrt{\epsilon_0}\sqrt{\mu_0}} \qquad (3)$$

Therefore

$$E = \frac{k}{r^2}c^2 \qquad (4)$$

This equation has the same form as between E and c as that from General Relativity[3] theory therefore k / r^2 is the rest mass of the particle.

The mass of a particle is therefore inversely proportional to it surface area.

The rest mass of a particle derives from the tension it creates in the space lattice when the particle is formed. As was stated earlier, the electron is larger than the proton so therefore it will be lighter than the proton which is what we observe. We know that the mass of the proton is 1836 times that of the electron therefore the electron has a diameter 42 times that of the proton.

7. Movement of particles at constant velocity

When a particle moves at a constant velocity v as measured by an observer it is effectively unzipping the space lattice immediately in front of it. As the grid separates the momentum of the particle carries it forward, stretching and tensioning the space lattice until it reaches a point that the particle has no momentum left and comes to a stop. The space lattice at the rear of the particle will be continuously zipping back together. As it does, this it will apply more tension to the space lattice behind the particle which will only be relieved by the particle moving forward again. The energy dissipated by the particle unzipping the space lattice in front of it is returned to the particle via the zipping of the lattice behind it. The process is then repeated, and the particle therefore continues moving in a straight line at an average velocity v. For a non-relativistic particle, the actual velocity will be anywhere between 0 and 2v and its momentum anywhere between 0 and 2mv. This maybe the origin of the Heisenberg Uncertainty Principal which states that we cannot know the position and momentum of a particle at the same time.

We know that the energy ΔE expended in moving a particle ΔX is the Force F by the distance ΔX.

$$\Delta E = F.\Delta X \qquad (5)$$

$$\Delta E = \Delta P.\Delta X/\Delta t \qquad \text{As Force F equals rate of change of momentum P} \qquad (6)$$

$$\Delta E.\Delta t = \Delta P.\Delta x \qquad (7)$$

$$\hbar = \Delta P.\Delta x \qquad \text{As per Heisenberg Uncertainty principal as } \Delta E.\Delta t = \hbar \qquad (8)$$

As the velocity went to zero therefore $\Delta P = P$ and $\Delta x = \hbar /P$ (9)

This is the formula for the de Broglie wavelength λ of a particle and therefore Δx is λ

As the lattice in front of the particle deforms and then relaxes it radiates a wave of wavelength λ in front of it. There is also a wave radiated from the rear of the particle, but its wavelength is about double that of the de Broglie wavelength. This is analogous to the wave produced by a subsonic bullet.

The most important new insight here is that a moving particle radiates a wave in all directions around it transmitted through the space lattice. As the lattice has no mass the wave will propagate indefinitely but will eventually become just part of the ripples of the space lattice.

In addition, as the moving particle tries to unzip the lattice it will increase the tension before the lattice gives way. The particle therefore experiences an increase in mass as it moves which is what is observed. As the particle reaches relativistic speeds the tension does not have sufficient time to release as it can only travel at c. The particle can never travel at c or greater because the lattice would not even unzip as the tension required to open it would not have reached it before the particle did. I will refer to this description of the motion of particles as lattice stepping and the waves produced as de Broglie waves in the rest of this paper.

8. Electric Fields

An electric field is a region of the space lattice where all the dipoles in a single direction are aligned in that same direction with respect to the polarity of the dipoles. The strength of the field will depend on the extent of the polarity alignment. A charged particle such as an electron will have all the negative ends of its surface dipoles facing outward. When placed in an electric field it will be forced to interact with the dipoles of the field. The electron will start to move in the direction of the field as there will be a greater net number of negative dipoles behind the electron than in front of it. In an extreme case, all the dipole ends behind the electron will be negative and all the dipole ends in front will be positive. As the electron moves forward lattice dipoles will align themselves with the electric field behind the electron and continue to push it in the direction of the field. The greater the field strength i.e. the alignment of the dipoles, the greater the force on the electron. This explains the Lorentz force F for an electric field E on a particle of charge e.

$$F = eE \tag{10}$$

9. Magnetic Fields

A magnetic field is a synchronous rotation of dipoles around one of the three axes of the space grid. If the rotation is around the z axis, then the dipoles in the x and y directions will rotate in the xy plane. Magnetic fields are generated by the moving dipoles in the shells of particles. As the oscillating motion of dipoles in the shells of particles couple with the spin or translational motion of the particle they will tend to rotate dipoles in the lattice. The strength of the field is determined by number of rotating dipoles and the direction of the field will be determined by whether the rotation is clockwise or anticlockwise.

When an electron at a velocity v enters the magnetic field along the x axis at right angles to the field direction z it will be radiating de Broglie waves in front of it. These de Broglie waves are longitudinal oscillations in the space grid, and these oscillations interfere with the rotation of the dipoles in the magnetic field causing them to stop rotating at right angles to the direction the electron is travelling. Because of the asymmetry of the dipole the negative monopole will always be on the right-hand side of the stopped dipoles as seen by the approaching electron. All the rotating dipoles in the xy plane will have lined up with all like poles facing one direction as determined by the direction of the electron. This is an electric field which then acts on the electron as described in the last section. The rotating dipoles do not have to fully stop but can oscillate around a particular direction. The de Broglie wave will cause some bias in the dipole charge distribution thereby creating an electric field of some magnitude. In this example if the electron enters along the x direction it will be deflected in the y direction which is the right-hand rule for charges in magnetic fields. If the particle is travelling faster, then the de Broglie wavelength is shorter and the frequency higher. The faster the magnetic field dipoles are oscillated by the longitudinal de Broglie wave the less they oscillate in the y direction and therefore the larger the electric field that is created and hence, force on the particle. If the particle enters along the z direction, then the de Broglie longitudinal waves cannot interfere with the oscillations of the magnetic field dipoles and no force is experienced by the particle. This agrees with the Lorentz force F in a magnetic field B

$$F = qv \times B \tag{11}$$

10. Magnetic Fields of particles

The dipoles making up the shell of an electron oscillate near the fundamental lattice frequency as they are spaced similarly to the lattice dipoles on the outside surface of the shell but taper slightly inwards at the inner surface. These oscillations are all synchronous which will naturally create a pattern over the surface where the amplitude of the oscillation is maximum for dipoles around the equator of the electron and reducing in amplitude the nearer the dipoles are to the poles. The electron will therefore have two poles by virtue of the oscillating dipoles in its shell. We can call the axis through the poles the spin axis as this is what it would be conventionally called. When an electron encounters the dipoles in the space lattice the oscillating dipoles in the electron shell will start rotating the dipoles in the lattice with the same frequency as the electron's. It is behaving like a forced harmonic oscillator where the driving force frequency is close to the natural frequency of whatever is been oscillated. There is therefore a strong coupling between the two. This effect will extend out into the lattice to form a magnetic field around the electron. As the magnitude of the oscillations of the electron's dipoles near the poles is near zero there will be near zero magnetic field at the poles. The magnetic field direction will be tangential to the electrons surface but since the largest field is at or near the equator, the overall field direction will be parallel to the spin axis. If the electron is spinning, then the oscillations of the dipoles in the shell will couple with the spin to rotate the dipoles in the lattice more quickly. The direction of rotation of the dipoles in the lattice will be opposite to that of the electron and this determines the direction of the magnetic field. The proton has a similar pattern of oscillating dipoles at its surface but because the radius of the proton is so small compared to that of the electron, the oscillating dipoles at its surface will be more restricted and will oscillate at a much higher frequency. It will not be able to oscillate the lattice dipoles with as big an amplitude as the electron as there will be very little coupling between them. This proposal for the structure of protons and electrons therefore predicts that the magnetic moment of the electron should be greater than that of the proton. That is in fact what measurements have shown. The magnetic moment of the electron has been measured as $-9.28 \times 10^{-24} JT^{-1}$ and that of the proton as $1.41 \times 10^{-26} JT^{-1}$.

11. Electric Fields of Particles

As stated earlier an electric field is just where all the dipoles align with similar poles facing the same direction. At the pole of the electron there is no magnetic field so any dipoles that line up above the pole will not oscillate in such a manner as to contribute to the electron's magnet field. It therefore constitutes the strongest electric field line emanating from the electron. In a magnetic field, when the dipoles rotate to the midpoint of the oscillation the dipoles are in effect lined up as in an electric field and, as the dipoles move away from the midpoint the electric field gradually disappears. At the equator of the electron where the magnetic field is strongest the oscillations of the lattice dipoles is greatest, and they therefore only line up as an electric field very briefly. There is therefore hardly any electric field emanating from the equator of the electron. The field progressively gets larger the nearer the oscillating dipole is to the poles. The electric field of the electron is therefore primarily concentrated around the poles falling off rapidly towards the equator. The electric field associated with the proton will have a similar structure with its strongest field around the poles but because it has such a small magnetic moment there is not much reduction in the electric field towards the equator. The electric field of the proton is therefore almost spherical. The total field strength from both particles will be the same but opposite in direction as they ultimately emanate from the monopoles inside. This is why the proton and the electron have the same magnitude of charge but different polarity.

12. The Neutron

The Neutron is simply a proton with a negative monopole orbiting the surface as it is attracted to the positive ends of the dipoles on the surface. The orbiting monopole interferes with the oscillation of the dipoles on the surface and therefore reduces the positive magnetic moment and instead contributes to the negative magnetic moment of -9.66 x $10^{-27}JT^{-1}$. As the magnetic moment is less in absolute magnitude than that of the proton the dipoles in the lattice around the neutron will be rotating slower and therefore the average force between the dipoles in the lattice surrounding the neutron will be greater. This will slightly compress the proton in the neutron and give it extra mass. The measured mass of the neutron is about 0.14% heavier than the proton. The total external charge of the neutron seen at a distance will be zero as there are now essentially a negative and positive monopole present. However, near the surface it will still appear as a proton most of the time.

13. Neutrinos

Neutrinos are generally accepted to be neutral particles that come in three "flavours" some of which are near massless and one which is possibly massless. They are produced mostly in nuclear reactions but interact very weakly with matter. During Beta decay for example a neutron is converted to a proton with the emission of an electron and a neutrino.

A neutrino is just a single dipole that is no longer part of either the lattice or a particle. It gets ejected with high velocity during particle interactions and travels through the lattice almost unhindered. Some neutrinos may consist of a pair of dipoles with unlike monopoles side by side. Each dipole is overall, electrically neutral but when a pair is arranged in this manner each end of the cluster will also be effectively neutral as well but at very close range to an individual monopole in the lattice it will be slightly attractive or repulsive depending on the situation. This is the structure of a neutrino.

This neutrino will have two distinct rotation modes, one parallel to the axis of the dipole and one perpendicular to it. If the neutrino is travelling in e.g. the +x direction with its axis parallel to the x axis and the dipole is rotating around the x axis, then the neutrino will have very little interaction with the lattice structure, and this corresponds to the lightest or perhaps massless neutrino. If the neutrino is rotating perpendicular to the dipole axis in the yz plane, then there is greater chance for interaction with the lattice which will slow the neutrino and thereby give this neutrino rotation mode the greatest mass. If the neutrino is rotating perpendicular to the dipole axis in the xz or xy planes then it will interact with the lattice somewhat less than the previous example and therefore have an intermediate mass. These rotation modes can all be active simultaneously but interactions with the lattice will cause some modes to dominate temporally which explains why neutrinos appear to oscillate between flavours. Whichever mode is dominating at the instant of a collision with a proton will determine the outcome of the collision. Neutrinos are also either left or right-handed which is just determined by the direction of spin relative to the chirality of the lattice

14. Pair Annihilation

The shape of the electron and positron are important to understand before discussing pair annihilation. As discussed earlier the majority of the magnetic field around an electron is produced at the equator. As with the neutron the tension in the lattice is affected by the magnetic field so there will be less tension in the lattice around the equator of the electron or positron. The poles of the electron will therefore be closer to the centre of the particle than the equator and so the dipoles at the poles will be more strongly attracted to the monopole inside. When an electron and a positron collide at speed their shells will touch and start to decelerate in an elastic collision. The monopoles inside them will continue moving towards each other and as the shells rebound the monopoles will exit the shells and combine to form a dipole. This dipole becomes a neutrino. The shells no longer have a monopole inside them and therefore will expand slightly as the small inward force is lost. The poles will expand more than the equator as they were previously more strongly attracted to the monopole. As the monopole is now gone there is nothing to keep the dipoles in the shell oscillating in sync and so the magnetic moment is lost. This will cause the lattice tension around the equator to increase slightly and therefore compress the equator back in. Overall, there is an increase in surface area and there is therefore a loss of mass as the lattice is stretched. As the lattice springs into its new position, dipoles in the lattice itself will be accelerated which will initiate two photon packets in opposite directions thus the mass energy of the two particles will be converted to two photon packets. A similar process takes place with a proton-antiproton annihilation. When the proton and antiproton meet the two particles merge and allow the two monopoles to recombine which becomes a neutrino. Without the monopoles present the previously dense arrangement of dipoles reorganises itself into a new less dense structure and therefore its surface area will be greater. This again corresponds to a loss of mass which is radiated away as photons as the lattice springs into its new position. This structure is electrically neutral and therefore has no electric field or magnetic field. This is a simple description of proton-antiproton annihilation because we know from particle collider observations that other particles are created in the process but that ultimately all these other particles eventually decay to photons, electrons, positrons and neutrinos. The key point here is that in both scenarios there is a decrease of the tension in the lattice which corresponds to a loss of mass which appears as the energy of photons or kinetic energy of electrons or positrons. The next section will explain where the electrons and positrons come from during proton antiproton annihilation.

15. Dark Matter and Gravity

Another big mystery in cosmology is the fact that most of the matter in the universe is dark. This matter reveals itself by its gravitational effects. For something to have a gravitational effect it just needs to distort the lattice. As I said earlier, most matter and antimatter were created during the inflation period just after the big bang. This enormously expanded the grid i.e. space, which contained the matter. As the antimatter started to annihilate with matter, positrons and electrons came together as described earlier and left empty shells while protons and antiprotons formed structures with no electric or magnetic fields. As the empty electron and positron shells have no monopole inside, they are electrically neutral and therefore have no electric field. The dipoles in the shells are not oscillated by an orbiting monopole inside anymore and therefore cannot produce a magnetic field either. These particles cannot absorb or emit photons and therefore are dark matter. They do however have mass and will behave gravitationally similar to normal visible electrons and positrons albeit slightly lighter. The same is the case for the structures left behind by proton antiproton annihilation.

There is a big difference between the gravitational effects of protons, neutrons, and their anti-particles and that of electrons and positrons. To date the gravitational effect of the electron has been ignored as it is insignificant compared to the gravitational effect of the proton and insignificant compared to the magnitude of the coulomb force. To understand the difference, we need to understand where the gravitational force comes from.

When a proton was formed during the big bang the dipoles that went into its construction arranged into a structure that was denser than the lattice from where they came so the volume they occupied was less. The lattice dipoles therefore had to come closer together than normal to shrink around the new particle. This increased the force of attraction between these dipoles, and this increased tension then propagated out from the particle in all directions. This is the gravitational field around a proton. Two protons close together will both be pulling on the lattice like pulling on an elastic band and will therefore feel an attractive gravitational force.

When the electrons formed initially, they formed from a shell that was originally around a “proton” but expanded to a radius over 40 times greater and therefore stretched the dipoles in the lattice to a length greater than in a normal lattice. Because the electron has pushed the lattice dipoles surrounding it further apart than they are in normal lattice, electrons and positrons will actually push each other apart gravitationally. They therefore experience negative or anti-gravity. As this force is so small compared to the coulomb force this has never been observed or even looked for. If the model of Lattice Mechanics is correct, then the potential energy gained by the lattice when a particle like a proton is formed is exactly the same as the potential energy lost by the lattice when an electron is formed. There was therefore no net energy required to cause the big bang. The thermal energy after the big bang came from pair annihilation.

Dark matter made from electrons and positrons have no net charge and will therefore repel each other gravitationally while dark matter made from protons and antiprotons will clump together by gravitational attraction. It is possible that light interacting with normal matter separated normal matter and dark matter and since the electron and positron shell dark matter, repels everything, it just went everywhere.

We know that a huge proportion of the total matter in the Universe is dark so there is a vast number of empty electron and positron shells everywhere. The existence of these empty shells explains a lot of phenomena which I will describe in the next few sections.

16. Quantum Tunnelling

In a typical quantum tunnelling event, an electron will appear to pass through a potential barrier for which it does not have sufficient energy to do so. We can model this as a moving electron trapped in a potential well. The moving electron will be confined between the two sides of the well, but this will not be the case for an empty electron shell. On occasion the electron will collide with an empty electron shell just at the barrier and if the monopole inside the electron has sufficient energy, it can leave the electron and penetrate the empty shell. As the newly activated electron shell is just outside the potential barrier it escapes from the potential well. The original electron is left behind as a shell but because it has no monopole inside it will be neutral. The dipoles in the shell will not oscillate in phase or to the same amplitude as an electron because there is no orbiting monopole to excite them so it will not have a magnetic moment either. The electron has therefore appeared to have penetrated the barrier almost instantaneously.

17. Neutron Decay

As described earlier, a neutron is just a proton with a negative monopole orbiting outside it. A free neutron has a half-life of about 10 minutes after which it decays into a proton and an electron. Because there are so many dead and empty electron shells everywhere it doesn’t take long for a neutron to collide with a dead shell with the negative monopole between them. During the collision the monopole gets injected into the shell where it reactivates it, and it becomes an electron. Now that the monopole is no longer orbiting the proton, the compressive force mentioned earlier is removed and the proton springs back to its normal size thus reducing in mass. This causes the lattice to spring back also and this action imparts all the energy to the newly activated electron as kinetic energy.

18. β⁻ Decay

In its most basic form β^- decay occurs when a neutron is converted to a proton within the nucleus with an electron and a neutrino being emitted. As described earlier a neutron is just a proton with a negative monopole orbiting its surface. In a nucleus this negative monopole binds the neutron to other protons. If this monopole gets struck by a neutrino with sufficient energy the dipole forming the neutrino can separate into its two monopoles. If the positive monopole then joins with the negative monopole of the neutron, it forms a new neutrino and the neutron becomes a proton. The remaining negative monopole, originally from the neutrino, will encounter a dead electron shell and reactivate it as a β^- particle.

19. β⁺ Decay

β^+ decay is very similar to β^- decay. Again, if a neutrino with sufficient energy collides with a proton in a nucleus it breaks into its two monopoles. The negative monopole will be attracted to the proton and convert it to a neutron. The positive monopole will be repelled away and will encounter a dead positron shell which it reactivates as a β^+ particle. If it encountered a dead electron shell first it would just be expelled by the positive dipole ends inside the shell.

20. Superconductivity

When a material transitions to being a superconductor it also displays a dramatic change in specific heat capacity and expels any external magnetic fields. The change in specific heat capacity can be explained by the condensing of empty electron and positron shells into the planes between the crystal structure of the material. Some materials only become superconducting at high pressures which would also support the idea of empty shells condensing into the material. When there are sufficient empty shells within the crystal structure just below the surface the materials own electrons can then tunnel from shell to shell which means that the negative monopole can move through the material without the need for the shells to move at all. The current therefore experiences zero resistance. When the monopole enters an empty electron shell it will temporarily reactivate it thus producing a magnetic field before it tunnels to the next empty shell. An external magnet field is expelled because empty shells are unable to transmit the rotating motion of the lattice dipoles internally. Since there is a very large number of these they act as a shield but when the current in the material exceeds a certain threshold then a significant number of the empty shells will be reactivated and will therefore be less able to shield against an external field. The reactivated electron shells will then experience a critical Lorentz force which interferes with the tunnelling process and the material stops superconducting. A similar thing happens with the external magnetic field exceeds a critical level.

21. Superfluidity

Superfluidity is very closely related to superconductivity and has only been observed in Helium 3 and 4. Again, I propose that it is caused by the condensing of empty electron and positron shells into the Helium. As the shells are neutral, they provide a frictionless sea for the He atoms to move around in. The thermal conductivity of superfluid helium is about one thousand times greater than the best metal heat conductors. A possible explanation for this is that the relatively large electron and positron shells allow for the efficient transfer of vibrational energy of the helium atoms throughout the mass of a liquid helium sample

22. Dark Energy

This is one of the biggest mysteries in cosmology today, but this model explains it very easily. At the edge of the universe the space grid finally comes to an end. The structure will not be as stable as in the interior as each dipole will not be surrounded symmetrically. Oscillations in the space lattice, caused by light and matter moving about everywhere in the interior, will propagate to the edge and then have nowhere to go. What happens is that some of the dipoles at the edge get slightly ejected into the void. They will be immediately attracted back to the lattice, but they will also attract the lattice towards them. The lattice therefore gradually expands. As this process is continually happening there will be a near constant force pulling the lattice and therefore the expansion will accelerate. Dark energy is just the lattices' way of dissipating all the energy of the oscillations in the lattice.

23. General Relativity

General Relativity[3] is often described as the theory of the very large and does not work at all at the atomic level. This is because for large objects i.e. large radii, the curvature of the lattice can be approximated to a continuously smooth curve but for protons and electrons there are discontinuities in the curvature due to the finite length of the lattice cells. There can thus be very abrupt changes in the curvature of the lattice around subatomic particles which is why General Relativity breaks down at these scales.

The stretching and tensioning of the space lattice by particles is ultimately what gives rise to the force of gravity. General Relativity beautifully describes the distortions in the space lattice in the presence of matter, but it does not describe what actually starts two bodies moving together. Two massive bodies like the sun and earth will produce a curvature/distortion in the space lattice like General Relativity describes but it will also cause an increased tension in the space lattice between them. As the lattice tries to reduce this tension it will pull the two bodies together.

Space contraction occurs when a moving body compresses the lattice in front of it and so the dipoles on opposite side of a lattice cell in the direction of motion are now closer together. Velocity is distance\time so if the velocity of light is to remain constant, the time interval elapsed will have to be less than in non-compressed lattice cells and therefore to an outside observer time will appear to have slowed down.

Gravitational waves are produced by massive objects such as black holes as they rotate each other at high speed. As they push and compress the space lattice, they will cause both longitudinal and transverse waves in the lattice which will travel away at the speed of light.

24. Light

If the de Broglie waves mentioned earlier are analogous to sound waves, then light is analogous to a shock wave. For example, when an electron and a positron annihilate, their shells expand suddenly and impart a step impulse to the lattice around it. As this longitudinal wave is transmitted through the lattice it interacts with the dipoles in such a way as to cause the alternating electric and magnetic fields that are associated with light.

The asymmetry of the dipole as described in section 4 is essential to understanding the interaction of the shock wave with the lattice dipoles in producing an electromagnetic wave.

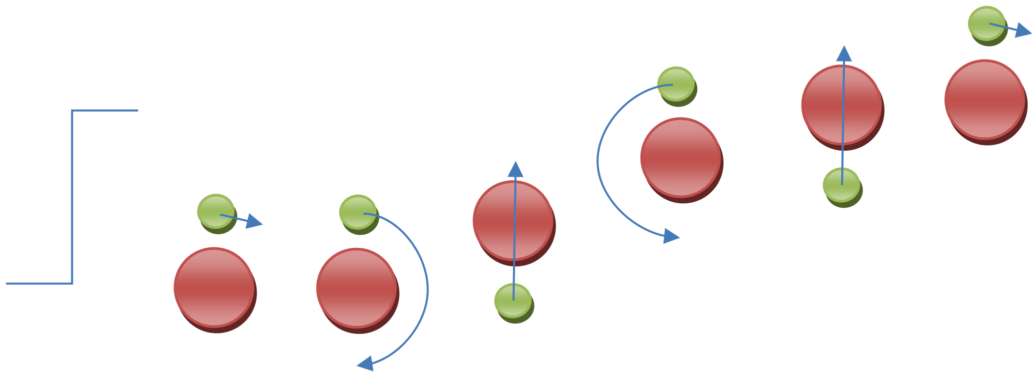


Figure 3

If we look at just a single dipole first it will be easier to understand. The dipole in Figure 3 in position 1 is part of a magnetic field and is rotating clockwise. The positive monopole is depicted larger than the negative monopole to convey that it is “heavier” and more difficult to move than the much “lighter” and nimble negative monopole. When the negative monopole is rotating clockwise just pass the 12 o’clock mark, the longitudinal wave approaches the positive monopole from the bottom of Figure 3 and begins to apply the step impulse to it via the nodes to which it is associated. This will have the effect of accelerating the positive monopole upwards. The positive monopole is slow to move, but the negative monopole is not, and it accelerates it the clockwise direction towards the 6 o’clock mark (position 2). At this point the positive monopole starts to decelerate. The negative monopole however reacts to the decelerating positive monopole by traversing across the top of it (position 3). As the deceleration continues the dipole will now continue rotating but this time in an anticlockwise direction towards the 6 o’clock mark (position 4) and when the positive dipole comes to a stop the negative monopole will this time traverse under the positive dipole to where it started originally (position 5). It will then continue rotating as it was before the step impulse (position 6). The dipole is effectively rotating around two mutually perpendicular axes and while in the description above the transitions are very sharp at the 12 and 6 o’ clock marks for explanatory purposes they are in reality much smoother and circular. As the longitudinal wave passes, we first get mutually perpendicular sinusoidal electric and magnetic fields in one direction as the dipole rotates clockwise and then we get mutually perpendicular sinusoidal electric and magnetic fields in the opposite direction as the dipole rotates anticlockwise. Therefore, at a point in the lattice there is an em field that varies sinusoidally in time.

The wavelength of the longitudinal wave can be any length depending on the duration of the step impulse therefore as the wave is transmitted through the lattice at the speed of light there will be dipoles just like in the description above all along the wavelength at various stages of the cycle which will generate mutually perpendicular sinusoidal electric and magnetic fields in space.

A single rotating dipole like in the description above does not constitute what we usually consider a photon. A photon packet will consist of vast numbers of adjacent dipoles rotating in sync with each other. These are capable of producing electric fields that we can detect. I should add here that when the dipole is flipping from the 6 o’ clock position to the 12 o' clock position there is an equal probability that it will go under or over the positive monopole. This means that in a photon packet the electric and magnetic fields of a collection of dipoles will cancel out in these directions during these phases of the cycle as half go under and half go over.

A photon has two spin axes as opposed to only one for the electron, proton, and neutron. It therefore takes two full revolutions of the dipole for it to return to its original orientation which is why the photon is considered a spin 1 particle. When “viewed” from the rear along the direction of travel, a photons plane of rotation will appear to oscillate from side to side by 45^0 for a total rotation of 90^0.

The description above describes the photon travelling along one of the axes of the lattice, but a photon can travel in any direction through the lattice. To follow its path is just a matter of getting the vector sum of the directions of all the dipoles involved in the x, y, and z directions. Unlike with a particle, such as an electron, there are no dipoles actually travelling through the lattice so the photon or photon packet will have no mass.

25. Dark Photon

For a photon to be formed it is essential that a magnetic field is present. As a photon enters a region of the lattice where no magnetic field is already present the leading dipoles of the photon will be generating a magnetic field just in front of itself which enables the progression of the photon. However, if the photon encounters a strong electric field, for example at right angles to its path, it will not be able to initiate a magnetic field in front of it and the photon will not be able to continue on the same path and will instead be reflected. When a photon of light enters a beam splitter at 45^0 the photon will encounter such an electric field which will reflect it through 90^0. When the longitudinal wave in the lattice that is producing the photon impinges on the lines of dipoles that make up the electric field it will be partially transmitted and partially reflected. The reflected part will continue as a regular photon, but the transmitted part will become a dark photon. It is dark because there are now no alternating electric and magnetic fields associated with it and therefore cannot be detected like a regular photon. The dark photon will travel in the same direction as the original photon would have if the beam splitter were not present and it will be of the same frequency. It is therefore capable of interfering with the original photon if their paths cross again. This dark photon is not detectable in its own right by any detectors currently, except and only when it interferes with its own originating photon. This process of creating a dark photon explains the outcomes of all single photon interference experiments using beam splitters. It dispenses with all the explanations requiring faster that light travel, backward causality and “many worlds” theories.

26. Atomic Structure of Hydrogen

The simplest atom is that of hydrogen ${}^1_1H$ which is just a proton attracted to the shell of an electron. They are held together by the electrostatic force. As both particles are spheres, the dipoles in the shells of the surfaces have their inner poles closer together than the outer poles. As the positive end of a dipole in the protons surface aligns with the negative end of a dipole in the electrons surface, they will attract each other but as they get closer there will be a repulsion by the inner more closely packed poles. There will therefore be a distance where these two forces balance and the electron will orbit the proton at this distance. As the proton has 1836 time more mass than the electron, the electron orbits around the proton. There is no net force on the electron therefore it is not accelerating and therefore does not emit electromagnetic radiation as required by Maxwell’s equations.

If a neutron gets sufficiently close to the proton in the hydrogen atom, then the negative monopole orbiting the neutron can get attracted to the proton and cause the two protons to join together. As the deuterium nucleus is very stable there must be no way for an empty electron shell to come into contact with the negative monopole and break the bond between the protons. The obvious way for this to occur is if the monopole is confined to a small area between the two protons. As the negative monopole is no longer orbiting the proton that was originally part of the neutron the compressive force is released and the mass energy difference between the neutron and the proton of 1.29 MeV/c^2 is released. However, about 2.23MeV of energy per nucleon is released when Deuterium is created in this way so the surface area of the two particles must have increased even further. Near the point of contact where the two protons are attached to the negative monopole the positive ends of the dipoles in the adjacent surfaces will repel the protons away from each other causing the area where the monopole is attached to bulge outwards. This extra increase in surface area accounts for the extra energy released. A second neutron can be added in the same way to create a Tritium ${}^{3}_{1}H$ nucleus.

There is no need for a strong nuclear force to explain the attraction between nucleons as the electrostatic coulomb force is sufficient to explain it. The so called strong nuclear force is about 100 time as strong as the electrostatic force but this is easy to explain because of the geometry of the proton and the electron. The electron radius is about 42 times that of the proton. When a proton is attached to an electron at a distance of 3 proton radii, the monopole inside the electron will be anywhere from 3 proton radii to 85 proton radii away from the centre of the proton. The average force on the electron will be the same as if the electron's monopole was just 10 proton radii away. When the proton is attached to a neutron the negative monopole is only 1 proton radius away. Since the force obeys an inverse square law the ratio in the two forces is about 100.

27. Nuclear Fusion

If two Deuterium nuclei collide with sufficient energy to overcome the repulsive coulomb force, then we get a structure that is effectively four protons joined by two negative monopoles. For the structure to be stable each monopole will have to bind to three of the protons. This will mean that the monopole will not be as close to the protons as it was in the deuterium nucleus and therefore it will have to bulge the surface of the protons much more. This will cause a much bigger increase in surface area and therefore a much larger decrease in mass. There is therefore a huge amount of the tension in the space lattice released and this energy appears as kinetic energy of the ${}^{4}_{2}He$ nucleus. 0.645% of the mass is converted into kinetic energy when two deuterium nuclei fuse so this corresponds to a 0.645% increase in the surface area of the proton.

There is another isotope of helium which is ${}^{3}_{2}He$ but only accounts for 0.000001%. This is formed in a similar manner to above, but the collision is between a proton and a Deuterium nucleus. In this case the single monopole joins all three protons together but because the proton surfaces do not have to bulge as much as with ${}^{4}_{2}He$ there is not as big an increase in the surface area and therefore less mass is lost.

Only one collision was required to create both of these two isotopes of Helium from Deuterium which is why an abundance of Helium was created just after the big bang. All the other elemental nuclei are built from Helium nuclei, protons, and neutrons in successive steps inside stars where the frequency and energy of collisions make it inevitable.

All the other natural elements are created by successively adding more and more deuterium and additional neutrons for stability to end up with Uranium ${}^{238}_{92}U$ which will have 92 protons and 146 neutrons.

28. Nuclear Fission

In large nuclei like $^{238}_{92}U$ some of the protons at the centre of the nucleus will have so many other tightly bound protons surrounding them that they will be compressed. They will therefore have a reduced surface area and increased mass. Nuclei above Iron in the periodic table will have their protons so tightly packed that some will start to be compressed in this manner. Elements such as Uranium 235 will have so many of its protons compressed such that it will release energy when the nucleus splits in two and releases the tension on the protons.

29. Electron Orbitals

When a nucleus is formed it will appear from a distance as positively charged and will attract electrons. As the first electron gets closer to the nucleus it will start to feel the repulsion from the surface in the same manner as described earlier in relation to the hydrogen atom. The electron will continue towards the nucleus until the attractive force from the outer ends of the dipoles in the shell of the electron is balanced by the repulsive force from inner ends of the dipoles. This surface of zero potential will be approximately spherical so the first electron will therefore primarily orbit the nucleus in a spherical shell. For stability the spin axis of the electron will be parallel to the spin axis of the orbit. This is what is referred to as the 1s orbital. A second electron can also occupy this orbital, and the pair will orbit together on opposite sides. The two electrons will align their electric fields parallel to each other and the magnetic fields will align opposite to each other to give the most energetically stable configuration.

The next electron that approaches will see a different surface of zero potential which will also be mostly spherical in shape overall but further away from the nucleus because of the two electrons below it. It wouldn't be stable for a third electron to occupy the 1s orbital as there would be collisions with the other two electrons as it can't pair its spin with both. There will be a raised ridge in the second surface of zero potential just above the orbit of the electrons in the 1s orbital so the third electron will therefore primarily occupy an orbit at right angles to the 1s orbit but further out from the nucleus. The fourth electron will pair up with the third electron and orbit as a pair with their spins opposite just as with the 1s orbital. This is known as the 2s orbital.

When a fifth electron is attracted to the nucleus it sees a complicated surface of zero potential because of the interactions of the 1s and 2s orbitals at right angles to each other. They produce dumbbell shaped regions of zero potential which are known as $2p_x$, $2p_y$ and $2p_z$. All the other orbitals fill this way with the zero potential surface for each orbit determined by the ones below it and the local magnetic fields ensuring that the spins of each pair are opposite.

As the electrons are all located at the zero potential for their orbital, they experience no net force and therefore are not accelerating. Accelerating electrons are known to lose energy so this solves the problem of why the electrons do not lose energy and fall into the nucleus.

The orbital angular momentum of the electrons is quantised because the orbital rotation of the electrons is coupled to the oscillations of the dipoles in its surface. The electron will have to make one revolution of the orbit for every one oscillation of the dipoles.

The quantisation of intrinsic spin direction comes about because the electric fields of both the proton and the electron are not radially symmetrical but are instead concentrated about the poles, more so for the electron than the proton. They therefore always align with an electric field but with the magnetic spin having a 50/50 chance about which direction it will align. Intrinsic and orbital momentum are therefore quantised because the rotation frequencies are coupled to the surface dipole oscillations.

30. Magnetic Field Around a Conducting Wire

When a potential difference is applied to a conducting wire aligned along e.g. the x axis of the lattice then the dipoles along the x axis that are not already aligned with this potential will be forcibly rotated 180^0 so that they do align. The alignment process will start at each end of the conductor and will proceed through the conductor at the speed of light, flipping dipoles as it goes. This has the effect of producing an electric field inside and parallel to the direction of the wire. Electrons inside the conductor will start to precess around this electric field and eventually align their spin axes with the field as their own electric fields are highly concentrated at their poles. Depending on their initial orientation, half will be spinning clockwise relative to the electric field direction and half will be spinning anticlockwise. Any rotation of the lattice dipoles near the wire by the clockwise spinning electrons will be cancelled out by the anticlockwise spinning electrons. The drift velocity of the electrons in the direction of the electric field will however impart an impulse to the lattice dipoles as the electrons lattice step through the conductor. The lattice dipoles will therefore rotate around an axis tangential to the wire but perpendicular to the current direction. This will produce a circular magnetic field around the wire and the direction will be determined by the direction the electrons are moving. The formula for the magnetic field strength, B at a distance r from a wire carrying a current I, is given as

$$B = \frac{\mu_0 I}{2\pi r} \tag{12}$$

where μ_0 is the permeability of free space. The current I is the charge per unit time passing a point which is directly proportional to the drift velocity which is in line with the description above.

31. Force Between Two Parallel Conductors

In the previous section it was shown that the dipoles in the lattice around a conducting wire rotate around an axis that is perpendicular to the current direction and tangential to the conductor. The spin direction will be such that the end of the dipole nearest the conductor when the dipole is at right angles to the conductor will be moving in the same direction as the current. Dipoles in the lattice on opposite sides of the wire will therefore be rotating in opposite directions and this is why the magnetic field around a conducting wire is circular. If a second conducting wire is placed parallel to this wire with the current flowing in the same direction, then in the space between the wires the dipoles in the two magnetic fields will be spinning in opposite directions and they will tend to cancel out causing a reduction in field strength between the wires. At the outer edges of the two conductors the field from one wire will tend to increase the field strength at the other as the dipoles from the two magnetic fields in these locations will be spinning in the same direction. The only difference is that at the outer edge of one wire the dipoles will be spinning clockwise and at the outer edge of the other they will be spinning anticlockwise. As the electrons in the conductors see a stronger magnetic field on the outer side of the conductor, they will experience a net Lorentz force and according to the Right Hand Rule the conductors will be pushed together as the currents are travelling in the same direction but the magnetic fields are opposite.

When the currents are travelling in the opposite direction the magnetic field between the wires increases in strength because now the dipoles contributing to the two magnetic fields are spinning in the same direction. The fields at the outer edge of the conductors will be reduced for a similar reason to above and the wires are forced apart by the Lorentz force as the current directions are opposite, but the field direction is the same.

32. Magnetic Field of a Solenoid

When the conducting wire from the last section is wound into a solenoid the magnetic field B, produced inside the solenoid is given by the formula,

$$B = \mu_0 N I l \tag{13}$$

where μ_0 is the permeability of free space, I is the current, N is the number of turns per unit length and *l* is the length. From the last section we seen that the dipoles in the lattice around the wire rotate around an axis perpendicular to the wire or current direction. If the wire is formed into a loop, then the dipoles in the plane confined by the loop will all be rotating in the same direction i.e. if the current is traveling clockwise around the wire loop then the dipoles in the space confined by the loop will also be spinning clockwise. As the magnetic field strength is proportional to the number of spinning dipoles then adding more loops to form a solenoid will increase the magnetic field. The magnetic field orientation will be parallel to the central axis of the coil and the direction will depend on the current direction.

33. Magnetic Field Around a Permanent Magnet

Ferromagnetic elements like nickel, cobalt and iron have two, three and four unpaired electrons respectively in their outer 3d electron orbitals which give rise to the magnetic properties of these elements. We know that within samples of these elements there are small crystals where these unpaired electrons have their spins aligned as this is the lowest energy configuration for them. These aligned unpaired electrons will cause dipoles in the lattice to rotate and therefore produce a magnetic field around each of the crystals with each crystal having a random magnetic field direction. These crystals are known as magnetic domains. An unmagnetized sample of iron will be composed of many domains. When placed in an external magnetic field, the rotating dipoles of the lattice which constitute the external field will interact with the rotating dipoles of the domains' magnetic fields and force them to align with the external field by rotating the iron crystal or domain within the sample. If enough domains are changed in this way, then when the external magnetic field is removed the iron remains magnetised permanently.

34. Magnetic Attraction and Repulsion

According to General Relativity space is curved by the presence of matter or energy. A magnetic field stores energy so it should affect the geometry of space. If we look at a volume of space where all the dipoles in all the lattice layers parallel to the xy plane are rotating, then there exist a magnetic field orientated in the z direction. As these dipoles are rotating in step with each other they will repel each other because like monopoles on adjacent dipoles will be close to each other for most of the revolution of the dipoles. The rotating dipoles will therefore move away from the nodes in the xy plane until they reach a new equilibrium position, causing space to expand in these directions. The dipoles in the z direction will move closer to the nodes until they reach their new equilibrium position causing space to contract in the z direction or along the magnetic field direction. As seen with the solenoid earlier, the dipoles of the magnetic field are all rotating in the same direction along the full length of the coil, as is also the case with a bar magnet. The magnetic field strength reduces with the distance from the magnet which just means less dipoles are rotating in the space lattice further away from the magnet. If a magnet's north pole is brought close to another magnet's south pole along the z axis then in the region of space between them the magnetic field strength will increase as the dipoles associated with the two poles are already rotating in the same direction and their number is increasing. This causes a contraction of space along the z direction which causes the two magnets to move towards each other. This further increases the magnetic field strength in the space between them and further contraction of the space occurs causing the two magnets to move even closer. This process continues and accelerates the two magnets together.

When two like poles are brought together the dipoles associated with each magnetic pole will be rotating in opposite directions. These rotations will tend to cancel each other out and the distorted lattice will return to its usual shape. These means that there will be an expansion of the space along the axis between the two magnets which will push them apart.

Evidence for this distortion of space by a magnetic field may already exist. Experiments to measure the half life of neutrons use either a beam method or a bottle method. The beam method uses a beam of free neutrons, but the bottle method uses cooled neutrons in a magnetic field. The two methods give two different values for the half-life. The bottle method gives 877.7 sec, and the beam method gives 887.7sec which is a 1.1% difference. Distorting the lattice also distorts time as per General Relativity, and this maybe affecting the neutron half-life measurements.

35. Electron Attraction

When two electrons are travelling parallel to each other with their spin axes parallel to the direction of motion and spinning in opposite direction the two electrons can be attracted to each other. This effect is similar to the force between two parallel conductors. The spinning dipoles in the lattice between the electrons will be spinning in opposite direction for each of the electrons and therefore reduce the magnetic field between them. The magnetic field at the outer edge of one electron will be enhanced by the other electron and when the de Broglie wave produced by the moving electrons interact with this magnetic field, it will produce a Lorentz force pushing the two electrons together. Because the spin axes are parallel, and the electrons electric field is very polarised the electrostatic force is at a minimum. If the spins of the two electrons were the same, then the Lorentz force would repel the two electrons.

.

36. Youngs Slits with single photons

In a Young's Slits experiment with single photons the original wave explanation is largely correct as the photon packet sends out a de Broglie wave of oscillation through the lattice. The wave will have the same frequency as the original photon and therefore after passing through the second slit will be able to interfere with the original photon and change its direction after which it will be detected on a screen as a single photon. Any attempt to detect the path of the photon before interference occurs will destroy the coherence of the waves.

37. Young's Slits with single particles

As described earlier a moving particle transmits what I will call a de Broglie longitudinal wave through the lattice in all directions. As this wave passes through the double slits it will interfere with itself. As the particle is continuously stopping and starting it is easy for its direction to be altered by the interfering waves. When two longitudinal waves interfere constructively, they will push the lattice in front of it in phase with the particles movement thereby making it easier for the particle to change direction to follow the peaks of the interference pattern. When two waves interfere destructively, they will tend to keep the lattice rigid, again forcing the particle to follow the peaks of the interference pattern.

38. Stern Gerlach Experiments

In the original Stern Gerlach experiment[5], silver atoms which have an unpaired electron were passed through an inhomogeneous magnetic field. It was originally expected that the atoms would be deflected by an amount that depended on the unpaired electrons magnetic moment direction. As this should be random, they expected to see an even spread from maximum deflection upwards to maximum deflection downward. What they got was two peaks at both extremes and nothing in between. This led them to conclude that spin was quantised. When they then passed one of the beams through another inhomogeneous magnetic field at right angles to the first, the beam was split in two again even though the spins were all in the same direction before entering the second device. There has been no explanation to date for this.

What is actually happening here is explained by referring back to the section on how the Lorentz force in a magnetic field comes about. As the electron travelling along the z axis enters the magnetic field along the y axis the de Broglie waves from the particle will create an electric field along the x axis. Stern and Gerlach modelled the unpaired electron as a tiny bar magnet only, but we cannot ignore its charge in this type of experiment. Because the electric field of the electron is mostly at the poles the electrons will align randomly with this electric field in the x direction with half having their magnetic spins pointing +x and half pointing -x. Because the electron is in a neutral atom there is no net electric force on the silver atom. At this point we have two sets of atoms with their unpaired electrons' spins aligned in the x direction but half spinning clockwise and the other half spinning anticlockwise. As the atoms proceed through the device in the z direction the de Broglie waves will interfere with the magnetic field around the unpaired electrons causing them to stop rotating and thereby create an electric field around the equator of the electron. The de Broglie wave in front of the electron has about twice the frequency of the de Broglie wave behind it so the field in front will be about twice as strong. The direction of the resultant field will depend on the electron spin so half will have an electric field in the +y direction and half in the -y direction. Because the magnetic field, in the y direction, is inhomogeneous there will be a gradient in the electric field produced in the lattice by the de Broglie waves which will interact with the electric fields around the equator of the electrons to deflects all the electrons to either maximum or minimum deflection which is what Stern and Gerlach observed. There is no quantisation of spin. The measuring device just creates it.

In the second device one of the beams still travelling in the z direction is sent into the device with the magnetic field pointing along the x axis. The electrons will all have their magnetic spins along the +x axis and the de Broglie waves from the particle will create an electric field in the lattice in the y direction. None of the electrons will always be pointing exactly in the +x direction as they will be precessing and therefore, depending on their orientation just as they encounter the electric field, they will either have their electric field and magnetic spins aligned in the +y or -y directions in a 50/50 split. The magnetic field will then just deflect them to the maximum deflections as before.

39. The Three Polariser Experiment

When two polarisers are placed at right angles to each other no photon can pass through but when a third polariser is placed at 45^0 between the two then 25% of the photons will pass through. To explain this, we need to refer back to the section on the photon packet where it describes how the plane of the spin of a single photon dipole appears to oscillate through an angle of 90^0, i.e. 45^0 left and right as viewed along its direction of travel. The polarisation direction of the photon or photon packet is the direction at right angles to both the dipole and the direction of travel at the midpoint of this oscillation. This direction is fixed for the photon or photon packet until such time as it interacts with something. A polariser is just a region of the lattice where there is an electric field i.e. where the dipoles are aligned in the same orientation with respect to the two monopoles. These lines of dipoles will be held more rigidly in place that those in the normal lattice and will not easily start to rotate. It is obvious from just this description that photons with dipoles rotating parallel to this field will not be able to pass through but photons rotating at right angles will pass through easily. Depictions of photons in this document so far have just shown the photon aligned with an axis of the lattice, but photons can obviously travel in any direction. To analyse a photon or a photon packet, whose spin is at an angle to the grid we just need to look at the component vectors in the x, y, and z directions. As the longitudinal wave causing the photon passes through the grid at an oblique angle it will interact with three or more dipoles such that the vector sum of their electric or magnetic fields add up to a resultant vector which equates to a photon travelling at the same oblique angle. When this oblique photon meets an electric field or polariser then the rotating dipoles interact with the electric field and each other such that

a) If the angle between the polarisation direction of the photon and the polarisation direction of the polariser is less than 45^0 then energy is transferred between the dipoles so that the resultant vector sum gives a photon with a polarisation direction parallel to that of the polariser. In this case the photon passes through the polariser and is aligned with it.
b) If the angle between the polarisation direction of the photon and the polarisation direction of the polariser is greater than 45^0 then energy is transferred between the dipoles so that the resultant vector sum gives no photon at all. In this case the energy of the photon is dissipated as heat and the photon is blocked from passing through the polariser.

When a photon packet passes through the first polariser with its polarisation at 90^0 to the table top the photon packet that emerges will have its polarisation at 90^0 to the table. As it approaches the second polariser at 45^0 the dipoles within it will be oscillating form side to side by 45^0. At the point in time when the longitudinal wave passes through the polariser there will therefore be a 50% chance that the rotating dipole's plane of rotation at that location will be at an angle less than 45^0 to the polarisation direction of the polariser and so only those photons that are oriented at 45^0 or less when they encounter it, will be able to pass. As they pass through, they will have their polarisation set at 45^0. This supports Malus' law which states that the percentage that get through is 50%. The same thing happens again at the third polariser which is at 0^0 so again 50% are able to pass. The total that pass is therefore 25%.

40. Lamb Shift

Lamb shift[6] refers to the difference between the energy levels of the 2s and 2p orbitals in a hydrogen atom. According to theories at the time the 2p should be at a higher level but this experiment apparently showed it to be lower. First of all, there is no 2p orbital in a hydrogen atom as its structure depends on the 1s and 2s orbitals been fully populated as explained earlier. In the experiment performed by Lamb the 1s electron is promoted to the 2s orbital and then it relaxes to two possible slightly lower levels before relaxing to the 1s orbital.

This effect is purely a result of the fact that the electric fields of the electron and proton are not radially symmetrical. The proton is fairly symmetrical with a dip around the equator while the electrons field varies from near zero at the equator to maximum at the poles. When the electron is orbiting the proton in the 1s orbital it will primarily be oriented such that the spin axes of both will be parallel and it will orbit primarily in the equatorial plane of the proton as this is the most stable configuration. This corresponds to the usual 1s orbital energy level. Lamb and Rutherford used microwaves in their 1947 experiment to stimulate transition to the 2s orbital and then waited for it to transition back to the 1s orbital. In some cases when the electron was transitioning back to its original orientation in the 1s orbital as described above it became oriented instead with one of its poles facing the proton at its equator. This is a very energetic and unstable orientation as the other pole will also be attracted to the proton. It eventually orients itself in the original orientation and emits a photon in the process with an energy less than that of the photon emitted during a direct transition from the 2s to the 1s orbital. In other cases when the electron transitions back to the 1s orbital it will encounter the proton away from the equator. This is also unstable and more energetic than its usual orientation as the poles of the electron will be attracted by different amounts due to the non-radially symmetric electric field of the proton. It won't be as energetic as the first case described and when it eventually transitions to the 1s orbital it will emit a photon with lower frequency that with the other case.

As both photons emitted during these two scenarios have frequencies a bit less than that emitted by a direct transition, Lamb and Rutherford[6] concluded that the electron first transitioned to the 2p orbital which was somehow lower than the 2s orbital and also split into two different energy levels before continuing the transition to the 1s orbital.

41. Bell Inequality Type Experiments

These types of experiments are supposed to be the definitive proof of Quantum Mechanics' validity. I think that John Bell's inequality formula[7] is incorrect because he made an incorrect assumption during its derivation. In his derivation he assumed that the results measured at detector B were independent of the settings of detector A. From my earlier description of how a photon packet passes through a polariser it is obvious that if the photon packet passes through detector A at whatever angle it is set at, then the probability of the entangled photon packet passing through detector B at whatever angle it is set at is just a variation of Malus' law, $I = I_0 \text{Cos}^2\theta$ where I is intensity and θ is the angle between the polariser's polarisation direction and the photon packet's polarisation direction.

It is absolutely the case that the coincidence results at detector B are dependent on the setting of detector A, so Bell's inequality formula is flawed. Coincidence counts are correlated with $\text{Cos}^2\theta$ which is exactly what these experiments show, and the extreme level of correlation is taken as iron clad proof of Quantum

Mechanics' validity. These experiments do nothing more that confirm Malus' law for photon packets. I find it amazing that in Bell's original paper[7] he proposed the use of Stern Gerlach devices for measuring electron spin to validate his proposition. Stern Gerlach device behaviour cannot even be explained by Quantum Mechanics, yet it was proposed to be used to validate Quantum Mechanics.

42. Aharonov Bohm Effect

The Aharonov Bohm effect[8] describes the deflection of an electron by a magnetic field even though the electron never actually entered the field. This was demonstrated by passing a beam of electrons very close to a solenoid and observing the deflections. The solenoid has no magnetic field outside the coils so should have had no effect on the electron. Mathematicians developed the field of vector potentials which can simplify the mathematics involved with changing electric and magnetic vectors but understood that it was just a mathematical abstraction and was not real in itself. The Aharonov Bohm effect changed this distinction because the mathematicians concluded that if the magnetic field could not affect the electron, then it must have been the vector potential, in this case the magnetic potential, that caused the effect. This led them to believe that the magnetic vector potential actually described reality and not the actual magnetic field itself[8]. This is a bit like saying that complex numbers are actually real things because they better describe some phenomenon. What is actually happening is that the de Broglie wave emitted by the particle interacts with the magnetic field and reflects off it. The reflected wave then interferes constructively and destructively with the original wave and changes the path of the electron.

43. Direction of Entropy

Entropy is often described as the measure of disorder in the universe, and it is always increasing. The direction of entropy is related to the expansion of the lattice by dark energy. At the beginning of the universe the lattice was very compact and highly ordered which is where the initial high entropy originates. As dark energy expands the lattice, the dipoles move further apart and can move more out of alignment with each other for longer which can be viewed as an increase in disorder or an increase in entropy. There will come a point when the dipoles are so far apart that they effectively behave independently of each other and thus achieve maximum disorder or entropy. The high entropy situation at the beginning of the universe corresponds to the high potential energy of the bonds between the dipoles which is gradually converted into kinetic energy of the dipoles as the energy of the big bang pulls the lattice apart via the mechanism of dark energy.

44. The Gravity of Black Holes

As stated earlier the force of gravity between objects such as the sun and the earth is due to the tension in the lattice pulling the two objects together as the lattice tries to reduce the tension. With a black hole the gravity is enhanced with an entirely different mechanism. As matter falls into a black hole the electrons are eventually crushed into anti protons. As the volume of an electron far exceeds the volume of lattice that the dipoles of an electron can create, the lattice itself also collapses inwards. At the very centre of the black hole the protons and anti-protons will also disintegrate and form into a very tightly spaced lattice just like what was probably present before the big bang. In effect a black hole is like a mini big bang in reverse, with the lattice and the matter within it being crushed into a tightly spaced lattice. If a black hole stops feeding, then it will remain as is but only temporarily. As Dark energy expands the lattice, the gravity holding the black hole together will reduce and the black hole will expand outwards again. It is conceivable that after all the matter in the universe is consumed by black holes that these black holes would eventually merge into one. This process of creating and merging black holes would counteract dark energy and so the entire lattice would also be consumed into a single massive black hole. This is what I think existed before the big bang. There is nothing inside the black hole except a very tightly packed lattice of dipoles and all that is required to initiate a big bang is for a pair on monopoles to get separated from each other.

45. James Webb Space Telescope Anomalies

In the short few years since the launch of the JWST so many anomalies have been discovered [9] that do not fit with current theories. Anomalies such as galaxies and black holes being much larger and more mature for the locations they are found in. In some cases, black holes have been discovered that are apparently older than the universe [9].

In this paper so far, I have described the structure of space as a cubic lattice of dipoles, and this is effectively the case in a local region of space. If the universe expanded from a single point, then the lattice will actually be spherical with one side of a lattice cell being a bit larger than the other, as one moves away from the centre. This will mean that as light travels towards the centre it will follow the path of least resistance i.e. high permeability. This means that light will not travel in straight lines and will be deflected by an amount that depends on how close to the centre it passes. An observer on earth, looking in one direction will therefore see light that could have originated from anywhere in the universe. This is why the universe looks much the same in all directions and the microwave background is almost uniform. This also explains many of the anomalies discovered by JWST. E.g. an observer may observe two galaxies side by side at the edge of the known universe and one may appear very young and small as expected but the other might be large and mature. This is because the second galaxy is not where the observer sees it but might be on the other side of the universe. It might even be the Milky Way a few hundred million years ago as we have no way of knowing what path the light took to reach the observer.

If space does consist of a spherical lattice of dipoles, then the Universe is probably much smaller than we think as light traverses curved paths to reach us. It also contains much less matter than we think as we are counting the same galaxies multiple times.

46. The Fine Structure Constant

The fine structure constant, α, is a dimensionless quantity given by the expression,

$$\alpha = \frac{e^2}{4\pi\varepsilon_0\, \hbar c} \quad = 0.0072973525693 \qquad (14)$$

where

- e is the elementary charge,
- ħ is the reduced Planck constant,
- c is the speed of light,
- ε_0 is the permittivity of free space,

If we assume that the length of a dipole is r and that the distance to the neighbouring dipole is also r then we can multiply the above equation by r/r and split into two fractions to give

$$\alpha = \frac{e^2}{4\pi\varepsilon_0\, r} \cdot \frac{r}{\hbar c} \qquad (15)$$

The first part of the expression is the potential energy of a charge e, a distance r, from another charge e, and has units of Joules or energy. In the case of a dipole in the lattice this expression would be doubled. The second term is the inverse of the rotational kinetic energy of a dipole rotating about its own centre at velocity c, with a radius of r/2, and is also in units of Joules or energy. If we write this second fraction using Planck's constant instead of the reduced Planck's constant, then the kinetic energy E is,

$$E = \frac{hc}{2\pi r} \quad = \text{hf} \qquad \text{as} \qquad \frac{c}{2\pi r} \text{ is the frequency of rotation.} \qquad (16)$$

This is the expression for the energy of a photon which as I stated earlier is just a rotating dipole.

The fine structure constant therefore represents the ratio of the potential energy of a dipole to its rotational kinetic energy. It is also a measure of how rigid the lattice is and with a value of 0.00729 it is therefore not very rigid as it is very easy to rotate the dipoles.

All the parameters in the Fine Structure Constant expression are intrinsic properties of the dipole so the ratio of potential energy to kinetic energy of the dipoles remains constant as the lattice expands but they each reduce at the same rate with the energy being dissipated as dark energy.

47. The Standard Model of Particle Physics

The Standard Model of Particle Physics (SM) is paraded as the most successful theory in physics, mainly because of its prediction of

a) Quarks
b) The Anomalous Magnetic Moment of the electron
c) The Higgs Boson

In what follows I will show that none of the three predictions are definitive proof of the validity of the Standard Model of Particle Physics.

Quarks

When Murray Gell-Mann and George Zweig in 1964 independently proposed the quark model with its fractional charges, the physics community was horrified and rightly so. Many years were spent looking for particles with fractional charges, but none were found. In the early 70's an experiment was carried out involving high energy annihilation of electrons and positrons. The annihilations produced muon-antimuon pairs and hadrons, i.e. protons and anti-protons. The results are shown below in figure 6.

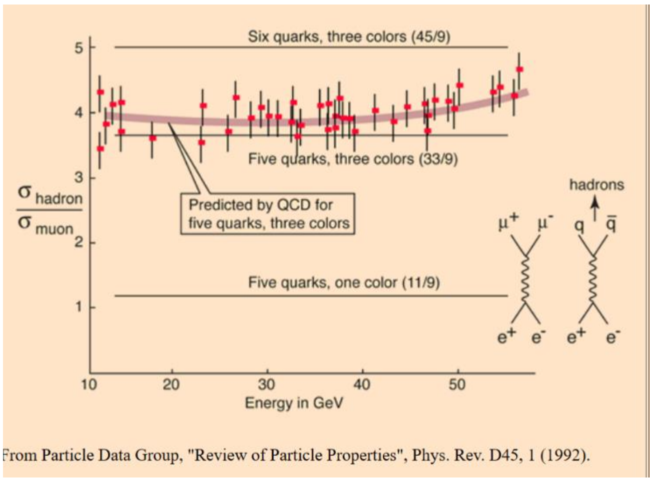


Figure 6

The Physics education website, HyperPhysics[10] explains very simply the quark model approach to explaining the results.

The models which are evoked to explain the experimental results in figure 6 involve the calculated cross-sections for the scattering events. It is helpful that the same type of scattering events, e.g., electron-positron scattering, can yield either two muons (leptons) or a variety of hadron products, any one of which suggests the creation of quarks. The experimental handle is then the relative frequency of the hadron events compared to the muon events. The calculated ratio of the products of the scattering process is the ratio of the cross-sections, and the cross-section σ for each product is proportional to the square of its charge. Therefore the ratio of the products R depends upon the ratio of the squares of the electric charges of the products. The calculated ratio then depends upon the number of types of quark-antiquark pairs which can be produced. So it has the form

$$R = \frac{\sigma_{hadrons}}{\sigma_{muons}} = \frac{\sum \sigma_{qq}}{\sigma_{muons}} = \sum \left(\frac{q_q}{e}\right)\left(\frac{q_q}{e}\right) \tag{18}$$

If we use the five quarks which would be available in this energy regime, the u, d, s, c and b quarks, then we get

$$R \approx \frac{4}{9} + \frac{1}{9} + \frac{1}{9} + \frac{4}{9} + \frac{1}{9} = \frac{11}{9} = 1.22 \tag{19}$$

The fractions come from the squares of the fractional charges of the proposed quarks i.e. 2/3 and -1/3. From the results of the experiment R is about 4 at low energies and increases with increasing energy so this predicted result was clearly wrong. To make the model fit the results better they proposed that each quark came in three different colours so now R = 33/9 or 3.66. A whole new property of matter was invented so as to make the original flawed hypothesis of fractional charged quarks fit the data.

In 1961, Ernest Sternglass, while working with Richard Feynman proposed a structure[11] for the Pion which consisted of an electron and a positron orbiting each other at relativistic speeds. He calculated its mass at 134.7MeV which compares well with the measured value of 134.97MeV. His model for the Muon was an electron in orbit around a Pion and that for the anti-muon was a positron in orbit around the Pion. His calculated mass for the muon and anti-muon was 105.8MeV which compared very favourably with the measured mass of 105.65MeV.

When a positron and an electron collide at high energy the monopoles get ejected from their shells but the two monopoles will be separated by large distances most of the time. Dipoles from the lattice will therefore surround the monopoles to form a proton and an antiproton. When a positron and an electron approach each other very closely without colliding then they will form a Pion. Another interaction like this will create a Muon or an Antimuon. As Muons are three body particles and require two separate interactions to form and two hadrons are created from each destructive collision of electrons and positrons, their will naturally be many more hadrons created than Muons. A very simplified analysis of the collision cross section of electrons, positrons and Muons in a beam give an R value of about 3.6 which increases with increasing energy as more of the Muons are destroyed again by the higher energy positrons and electrons. There is therefore no need for coloured quarks with their fractional charges to explain the above results in figure 6.

In the SM the electrons and Muons are elementary particles that are not made of quarks. The SM does not show how particles that are not made of quarks actually produce quarks in a collision which then form the hadrons. If it is just the energy of the electrons and the positrons that is supposed to create the quarks, then it does not explain either how energy actually gets converted into matter which then gains mass. In my model, supported by Sternglass' model, there are no such complications.

The Anomalous Magnetic Moment Of The Electron

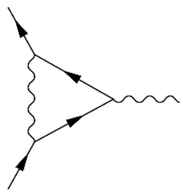
The prediction of the anomalous magnetic moment of the electron to more than 10 significant figures is paraded as one of the most accurately verified predictions in the history of physics.

From Wikipedia[12] , *In quantum electrodynamics, the anomalous magnetic moment of a particle is a contribution of effects of quantum mechanics, expressed by Feynman diagrams with loops, to the magnetic moment of that particle. The magnetic moment, also called magnetic dipole moment, is a measure of the strength of a magnetic source.*

The "Dirac" magnetic moment, corresponding to tree-level Feynman diagrams (which can be thought of as the classical result), can be calculated from the Dirac equation. It is usually expressed in terms of the g-factor; the Dirac equation predicts g=2. For particles such as the electron, this classical result differs from the observed value by a small fraction of a percent. The difference is the anomalous magnetic moment, denoted a_e and defined as

$$a_e \;=\; \frac{g-2}{g} \tag{20}$$

The one-loop contribution to the anomalous magnetic moment—corresponding to the first and largest quantum mechanical correction—of the electron is found by calculating the vertex function shown in the adjacent diagram. The calculation is relatively straightforward and the one-loop result is:



$$a_e \;=\; \frac{\alpha}{2\pi} \;\approx\; 0.0011614 \tag{21}$$

Where α is the fine-structure constant. This result was first found by Julian Schwinger in 1948.

Additional corrections have been made to this expression by adding terms which are successively higher in powers of α. To calculate these terms requires analysing many multiples of Feynman diagrams with thousands of calculations per diagram e.g. the α^4 term requires 891 Feynman diagrams with the number increasing exponentially with higher powers.

$$a_e \;=\; \frac{\alpha}{2\pi} + c_1\frac{\alpha^2}{2\pi} + c_2\frac{\alpha^3}{2\pi} + c_3\frac{\alpha^4}{2\pi} + \ldots. \tag{22}$$

The quantity a_e is an experimentally measured value which is dependent on the magnetic moment of the electron, which in turn is dependent on the magnetic moment of the dipoles in the electron shell. The fine structure constant, α, is a function of ħ which is the proportionality constant relating the energy of a rotating dipole to its rotation frequency. It therefore is also a function of the magnetic moment of the dipole, M_d. The expression in equation 22 is therefore self-referencing and equating M_d with itself. The above equation at 22 could be written,

$$f(M_d) = g(M_d) \tag{23}$$

All that is being done in evaluating the terms in equation 23 is confirming that the function f is equal to the function g. When the terms of equation 22 are being evaluated there are many couplings between the particles in the Feynman diagrams that have to be determined. Some come from the SM, some are measured, and some are estimated. There is therefore a huge scope to change the coupling values and goal seek the value of the terms in equation 22 to get them to agree with the latest measurement of a_e. This is not Physics but a pointless exercise in mathematics to reconcile a measured value with itself.

I should point out here that the value of the Muon's and other particle's anomalous magnetic moments do not agree with the measured values as well as the electron's anomalous magnetic moment does.

Muon	Predicted	a_μ =0.00116591804	Measured	a_μ = 0.0011659209
Tau	Predicted	a_τ =0.00117721	Measured bound	-0.052 < a_τ < +0.013
Neutron	Predicted	a_p = 0	Measured	a_p = -0.9

The predicted value of 0 for the Neutron is based on the original Dirac formula. It is only with the introduction of many multi coloured quarks that the standard model has been able to mathematically manufacture a magnetic moment for the neutron.

The Higgs Boson

The Higgs Field was first proposed in 1964 to solve another problem with the SM, namely that there was no mechanism to give mass to the particles. The Higgs field has an associated boson called the Higgs boson with a predicted mass of 125.18 GeV. A particle in the range 125-127GeV was eventually found in 2012 and in 2013 it was announced that the Higgs boson had eventually been found and the SM was vindicated.

Earlier I showed how Ernest Sternglass' model for the Muon did away with the need for quarks. His model can also be extended to use protons and antiprotons. In the book, Goodbye Quarks, by Ray Fleming he calculated that a proton in orbit around a negatively charged Pion would have a mass of approximately 123.52Gev. This is very close to that of the Higgs Boson. This maybe all that was discovered. Even if this is not the correct model for the Higgs boson there are a multitude of other orbiting systems that can be imagined just from the four fundamental particles.

48. Time and Direction of Time

In any two lattice cells of different size the maximum frequency of the oscillating dipoles will be greater in the smaller cell. The unit of Frequency is Hz or s^{-1} therefore the inverse of frequency is the rate at which time flows so the rate at which time flows at a location or at a point in the future is directly related to the inverse of the frequency of the oscillating dipoles at that location. Some of the properties of electrons and other particles are directly related to this frequency so our perception and measurement of time will be related to this frequency also. Before the big bang the dipoles were packed together as tightly as possible, so the rate of time flow was zero or near zero. As the universe expands and the lattice expands with it, the rate of time flow is constantly increasing so the direction of time is from a point where it was stationary towards increasing rate of flow.

49. The Casimir Effect

I started this paper by mentioning the Casimir Effect[1] and so will therefore complete it by explaining it. As I wrote earlier, the Casimir effect is the attraction experienced between two parallel conducting plates placed very close together. Casimir proposed that fluctuations of different wavelengths of the vacuum energy were being excluded from the gap between the plates, thereby reducing the pressure inside the gap and causing the plates to move towards each other. These fluctuations consisted of virtual particle-antiparticle pairs of different wavelengths.

His proposal was correct in some ways but the wavelengths that are being excluded from the space between the plates are of those waves of oscillation in the space lattice that cannot fit integer number of half wavelengths between the plates. As I have shown throughout this paper, waves in the lattice are caused by photons, electrons, protons, planets, stars, and black holes etc so there is a continuum of wavelengths of oscillations in the lattice, which eventually become dark energy. When some of these are excluded from the space between the plates the extra pressure outside pushes the plates together.

50. Suggestions for Further Study

Everything I have written in this paper is derived from my own intuition, logic, and knowledge of physics. I am not a mathematician and therefore do not have the necessary skills to provide rigorous mathematical proofs to back up the concepts put forward here. These simple concepts have been able to explain every phenomenon in physics that I have analysed, and I therefore am confident that any mathematical analysis will confirm the validity of these concepts. I accept that I may still have errors in the model and that there are things that I have missed but it is a starting point from where others can begin.

I suspect that a mathematical analysis will be able to identify the length of a dipole and the unit size of a lattice cell in our locality and others and with that knowledge be able to extend General Relativity to cover the full range of scales in the universe. It should also be possible then to compute the magnetic moments of the particles and their masses. In 2021 China's Large High Altitude Air Shower Observatory (LHAASO) reported the detection of a dozen ultra-high-energy gamma rays with energies exceeding 1 peta-electron-volt (quadrillion electron-volts or PeV), including one at 1.4 PeV, the highest energy photon ever observed [13] . This has a wavelength of approximately 1 $x10^{-21}$m. The shortest wavelength that light can have in this model is the length of the dipole so a dipole cannot be longer than this wavelength.

It may be possible for AI systems to analyse images of all the galaxies in the universe and identify which images are actually of the same galaxies and thereby give us a more accurate measure of the actual matter in the universe.

The longitudinal photon is a new concept which explains many of the optical experiments which have confounded physicists for several decades. I suggest that this could be detected by using the entangled partner of the photon that causes the longitudinal photon in the first place. At present it is only “detected” by interfering with its originating photon.

As for the origin of the dipole and its electric charge from which everything else naturally follows I will leave for others to discover.

51. References

1) Casimir HB. On the attraction between two perfectly conducting plates. InProc. Kon. Ned. Akad. Wet. 1948 (Vol. 51, p. 793).
2) Wu CS, Ambler E, Hayward RW, Hoppes DD, Hudson RP. Experimental test of parity conservation in beta decay. Physical review. 1957 Feb 15;105(4):1413.
3) Einstein A. The foundation of the general theory of relativity. Annalen Phys. 1916 May;49(7):769-822.
4) Meissner W, Ochsenfeld R. Ein neuer effekt bei eintritt der supraleitfähigkeit. Naturwissenschaften. 1933 Nov;21(44):787-8.
5) Gerlach W, Stern O. Der experimentelle nachweis der richtungsquantelung im magnetfeld. Zeitschrift für Physik. 1922 Dec;9(1):349-52.
6) Lamb Jr WE, Retherford RC. Fine structure of the hydrogen atom by a microwave method. Physical Review. 1947 Aug 1;72(3):241.
7) Bell JS. On the einstein podolsky rosen paradox. Physics Physique Fizika. 1964 Nov 1;1(3):195.
8) Aharonov Y, Bohm D. Significance of electromagnetic potentials in the quantum theory. Physical review. 1959 Aug 1;115(3):485.
9) https://www.livescience.com/space/8-stunning-james-webb-space-telescope-discoveries-made-in-2023
10) http://hyperphysics.phy-astr.gsu.edu/hbase/Particles/qevid.html
11) E.J. Sternglass. “Relativistic electron-pair systems and the structure of the natural meson”. Physical review. 1961; (123):391
12) https://en.wikipedia.org/wiki/Anomalous_magnetic_dipole_moment
13) https://en.wikipedia.org/wiki/Ultra-high-energy_gamma_ray#:~:text=Ultra%2Dhigh%2Denergy%20gamma%20rays,rays%20was%20confirmed%20in%202019.