12 The evolution of the electron shell

12.1 The search for the electron

The atom can be considered as having two parts. It has a nucleus, where most of its mass is located and the electron (or electrons), which are responsible for its interactions with the outside world. The nucleus is unaffected by chemical reactions. Regardless of element, the nucleus takes up a tiny percentage of the total volume, which for the most part, is empty space. By the beginning of the twentieth century, the idea that all matter was composed of atoms was well established and it was already known that atoms contained negatively charged particles, even though the atom itself was neutral. No positively charged equivalent to the electron was known at the time and this prompted J. J. Thompson to propose his so-called ‘plumb-pudding’ model of the atom. In this model, the positive charge was supposed to have been evenly distributed throughout the spherical body of the atom, with the electrons embedded into it - indeed, rather like the plums in a pudding.

This model was however, unable to explain the results of Lord Rutherford's alpha-particle scattering experiments. Alpha particles are positively charged helium nuclei (they have two protons and two neutrons) and are the result of radioactive decay. In 1909, Geiger and Marsden, under the direction of Ernest Rutherford, investigated their scattering by thin foils of heavy metals, notably gold. A radon source enclosed within a metal block was positioned in front of a thin foil of gold and a narrow beam of α-particles would bombard this foil target. A glass screen coated with zinc sulphide was coupled to a microscope, both of which were mounted onto a stage that could be rotated around the gold foil (the target). As these particles only have a range of about 5 cm in air, the apparatus was enclosed in a vessel that could be evacuated, so the alpha particles would not be prevented from reaching the glass screen by air molecules. If one of these particles hit this screen, it would produce a tiny flash of light (called scintillation), so the experiment was conducted in a darkened room in order to be able to see these flashes should they occur. The stage could be rotated around the target, which would allow the scattering to be measured. The majority of the α-particles detected, were scattered through very small angles, but Rutherford found that about 1 in 8000 were deflected by more than 90°. These large deflections may have been caused by the successive scattering of these particles through much smaller angles (i.e. the particle's trajectory being 'bent' by more than one layer of atoms in the foil), but he was able to show that the number of these deflections greater than 90°, was far too high to be accounted for in this way. It seemed to suggest that this large angle scattering was due to a 'single encounter’ between the α-particle and an 'intense positive electric field'.

As a result of this famous experiment, in 1911, Rutherford proposed that *'an atom has a positively charged core* (now called the nucleus) *which contains most of the mass of the atom and which is surrounded by orbiting electrons'* [1].

There was however, opposition to Rutherford's model, as according to theories of electro-magnetic radiation, an electron orbiting the nucleus would continuously lose energy, as it is constantly changing direction and this would cause it to fall into the nucleus. As this obviously doesn't happen, Rutherford’s model had to be modified. This problem was resolved by Neils Bohr in who in 1913, suggested that electrons could revolve around the nucleus only in certain permitted orbits, each of which represented a certain energy level. While in these orbits, they do not emit radiation (they are in their 'ground' state), but when an electron moves from an orbit of higher energy, to one of lower energy, radiation is emitted as a 'packet' of energy - and this can be measured experimentally by determining the frequency of the emitted light and its wavelength. This tied in with Planck's theory that radiation is emitted and absorbed discontinuously, as multiples of a fundamental unit he called the 'quantum' or quanta in the plural.

Atomic hydrogen comprises one proton and one electron and it can acquire energy. This increase in energy according to the Bohr model, would raise the electron's orbit accordingly, but after a short time, the electron will return to its original level. It has been found that there are four possible routes that this return can take and this in turn can involve six different transitions from one energy level to another. Each of these transitions involves the release of an electro-magnetic wave, whose frequency is dependent on the two energy levels involved.

When there are a large number of atoms, say as in an energetic hydrogen cloud in one of the spiral arms of the Milky Way, these transitions are taking place all the time and therefore radiation of many different frequencies is emitted (within the energy range of the hydrogen's electron of course). This can be detected here on earth as an optical line spectrum and the line spectrum of atomic hydrogen is therefore composed of light of these frequencies. Bohr's theory provided a satisfactory explanation for the line spectrum of the hydrogen atom and he was able to calculate the expected wavelengths of the line and these predicted values were in agreement with those measured experimentally.

However, the Bohr theory does not account for the line spectrum of multi-electron atoms and was therefore superseded by a more mathematical theory based on wave mechanics that was devised by Schroedinger in 1926. In wave mechanics, *wave equations* are used to describe electrons in atoms and the solutions to the equations are called wave functions or *orbitals*. The result of this way of looking at the electron is to suggest a series of orbitals which differ from each other in their energy level and configuration in space and this theory provides a total of four orbitals which were given the following labels:

s = sharp p = principal d = diffuse
f = fundamental

These actually became sub-divisions of Bohr's original orbits and the first Bohr orbit becomes the *'1s orbital'*. According to the wave theory, an orbital may be occupied by a maximum of two electrons. The second Bohr orbit can have one 's' and three 'p' orbitals which, with a maximum of two electrons per orbital, will give a total of eight electrons. The third Bohr orbit can have a maximum of eighteen electrons and the fourth Bohr orbit can have a maximum of thirty two (see *Figure. 12.0.01* below).

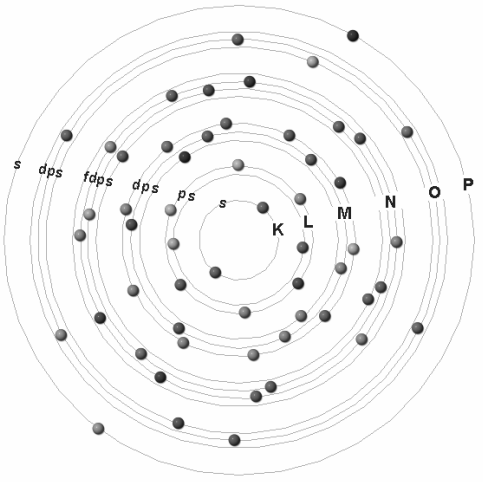

Figure 12.1.01 *The conventional electron shell (this example is lanthanum). Because of the difference in binding energies, the fourth orbital (or sub-shell) of the N-shell has been skipped and is empty.*

The wave theory also assumes that orbitals only represent the *probability* of finding an electron in a particular position at a given time and is based on what is called *'Heisenberg's Uncertainty Principle'*. This states that you can either measure the position of the electron *OR* its mass, *NOT* both at the same time. The wave theory also treats electrons as having particles as well as a wave nature, giving them too, dual characteristics or *duality*.

The experimental evidence for the number of electrons in the various electron *shells*, can be compared with theoretical predictions and there appeared to be a certain amount of disagreement between the two. The actual number in the first and second shells agree with these predictions, but begins to *disagree* after this. According to

theory, the third shell can hold up to eighteen electrons, distributed in sub-shells *3s, 3p* and *3d*, but by taking *ionization energies* into account, a large energy change occurs after only *eight* electrons have been added. Ionization energy, or more correctly the *first (or principal) ionization energy*, is the amount of energy required to ionize an atom that is in its ground state - or, to remove its most loosely bound electron (from its outermost shell).

The reason for this large energy change is that following the *3p* level (see again *Figure 12.1.01*), in order of increasing energy, it is the *4s* level that comes next and *NOT* the *3d* level as one would expect. Experimental evidence has shown that this *3d* level is in the *fourth shell* together with *4s* and *4p* levels, making a total of *eighteen* electrons and this overlap of energy levels between 'd' and 's' orbitals occurs repeatedly in the higher energy shells. This accounts for the discrepancy between the theoretical and the experimental values that would appear to occur in the real world.

12.2 Electron shell configuration

In the ways of science, speculation of any kind is to be avoided at all costs - and rightly so. It is probably safe to say however, that more than just a few researchers have quietly asked themselves the question *'why do these energy changes occur in this particular way?*'. Is this merely down to the ways in which we attempt to label and catalogue such phenomena; providing a simple and logical nomenclature to a system that we later find to be a touch more complicated than was originally thought? On the other hand, is this rather strange behaviour the result of a mechanism whose true nature *still* awaits discovery? Have we missed something along the way? *Figure 12.2.01* in the next column, shows the order in which the electron shell's energy levels appear to be filled and this certainly seems to illustrate the way in which the electron shell works in the real world, but there is still some confusion as to *why* this is the case. There seems to be little doubt that something rather subtle is going on within the outer layers of the atom, so can this particular model bring us any closer to grasping a better understanding of what may be the true nature of such interactions?

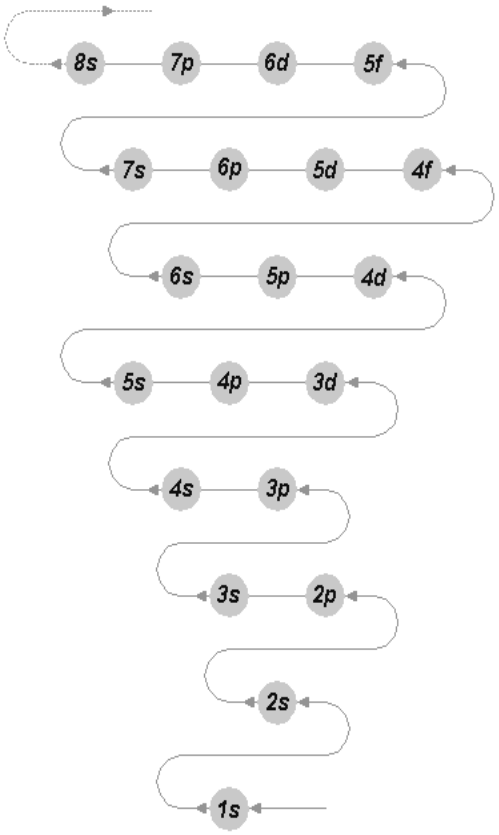

Figure 12.2.01 *The observed overlap of energy levels within the electron shell and the order in which the orbitals are seen to be filled.*

Returning to the dimensional boundary chord model; as whole surviving teddies and independent dimensional boundary chords ping into three-dimensional space, they will each take separate evolutionary paths because of their own very unique characteristics. Reconfiguration will result in the familiar proton, neutron and electron masses (the latter will not as yet, have inherited their charge); with the ever-present help of dimensional boundary surface wave phenomena that will all go hand in hand with this metamorphism. The still small, but highly energetic young cosmos will be awash with these

most fundamental of particles and the interactions between them, especially during proton/proton collisions, will herald the next evolutionary stage of the universe; or in other-words, the birth of the first true elements. This would involve the natural evolution of the electron shell, that will be indispensable in the process of stellar nucleosynthesis - and this will eventually result in the universe we observe and are part of today.

Travelling down their own evolutionary path, protons will have become the *direct* descendents of the neutrons, which in turn, would have been the product of *Stage 1* whole surviving teddy reconfiguration. As discussed in earlier chapters, the proton will also be endowed with very real components of spin and charge and these will play their own part in the later appearance of the elements. The *Stage 2* reconfiguration of the teddy (that by now is technically already the neutron), will produce the final 2D membrane *de-gassing event* within the circular chords that now make-up its 'faces' - and it is this characteristic that is paramount in the next evolutionary stage that will herald the appearance of the proton's electron shell.

This description of electrons being contained within a kind of 'shell' is not of course new - but it is perhaps the best available, because it does conjure up a mental picture of how the electron (or indeed electrons) seem to behave in any particular system. There always seems to be a limiting factor that defines just 'where' electrons can be found and they are usually pictured as orbiting the nucleus, as if like some scaled down planetary system. This old style view of the atom is changing of course, and these days the electron (or at least its position in space), may be better represented by wave motion and what is often referred to as a *probability-spike*, but this *'limiting factor'* does indeed seem to determine 'where' certain electrons appear to be in relationship to others that surround the same nucleus. What we can be sure of however, is that each of these 'elements' seem to become complete, *independent* systems in their own right, although there is little doubt that even though they are independent systems, they can still interact with one another.

Proton to proton contact (or collision) under certain conditions in the young, embryonic universe will in this model, induce a reaction that will ultimately lead to the synthesis of these very first elements. Just how and why this occurred, will have everything to do with the characteristics of spin and therefore of the charge exhibited by the newly evolved proton. The rotation of the 2D de-gassed membranes (which could perhaps be better described as a *sub* three-dimensional energy level), will produce an almost frictional type of effect, that will result in the vibration of the proton's boundary chords above that of their natural resonance levels or ground state. These vibrations will cause the emission of dimensional boundary surface waves (see again Chapter 10).

12.3 The proton's dim-waves

These 'dim-waves' will have a wavelength that will be determined partly by the frequency of the boundary chord vibration (and the mass involved therein) and, because there are *two* different types of *rotational groups* that make up the teddy in the first place, there will be *TWO* distinct types of emission; one from the 'H' face and one from the 'S' face. Each will have a different wavelength because of the difference in the effects produced by the rotation of their membranes. This will be dependent on the *area of influence* accorded to each individual boundary chord value.

To recap on this very important concept, the *area of influence* can be regarded as the membrane (or face) surface area, divided by the number of boundary chords that are bounding the area's circumference and for each of the 'H' and 'S' faces, this can be expressed as:

$$\frac{(H)\ 2.356 \times 10^{-28}\ cm^2}{6} \qquad \frac{(S)\ 7.854 \times 10^{-29}\ cm^2}{4}$$

which equates to:

$$\mathbf{3.926 \times 10^{-29}\ cm^2\ (H)} \text{ and } \mathbf{1.963 \times 10^{-29}\ cm^2\ (S)}$$

where '6' and '4' are the number of bounding chords. The *area of influence (AOI)*, produced by each of the 'H' face boundary chords is therefore

twice that of the ‘S’ face chords and this means that the frictional effect is greater at the 'H' face. This will create a chord vibration of a *higher* frequency and a corresponding dim-wave of *shorter* wavelength (see *Figure 12.3.01* below).

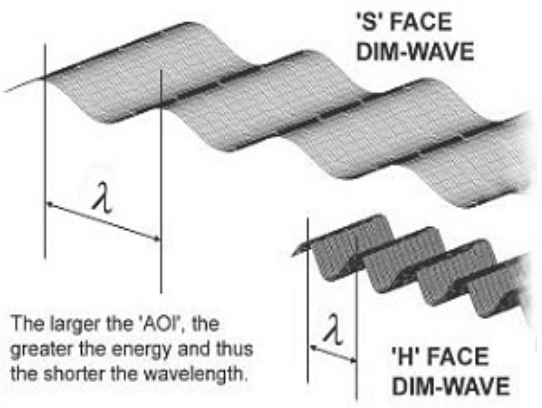

Figure 12.3.01 *The influence of rotating 2D membranes against their boundary chords will produce frictional energy that is translated into dim-waves that vary in intensity between 'S' and 'H' faces.*

The effects of charge also determine the propagation of these waves and, as pondered in Chapter 10 of this submission, the faces of the newly evolved proton should really be treated as *spinorial objects*. The 'H' and 'S' faces can each be assigned a different rotational component that allows the original face-spin bias to follow the laws of conservation as far as their angular momentum is concerned. With a resulting 2π and 3.5π component of rotation respectively, the 3.5π spin of the 'S' face will throw its value into the *negative* - which is exactly what we see when dealing with the phenomenon of charge within the proton. This will also coincide with the way that dim-waves of differing wavelength would naturally be expected to propagate. This becomes a matter of scale - as shorter and shorter wavelengths produce more energetic dimensional boundary surface waves.

Lower energy waves (such as light and heat) will tend to sit close to the 3D/4D boundary, while shorter wavelengths and higher frequencies will penetrate further.

Remembering that the fourth dimension is essentially the *expansion* of the universe (the element of scale), it just so happens (either coincidentally or otherwise), that this has so far corresponded with a *negative* value within this model. The fifth dimensional component of compression or contraction has been described as having an opposite effect to that of the scalar fourth, so this would appear to correspond to a *positive* value. This now allows us to look at the way in which we would expect such dim-waves to behave and it may be easier to look at each phenomenon in turn, starting with the lower energy waves produced by the vibrating chords of the 'S' face (see *Figure 12.3.02* below).

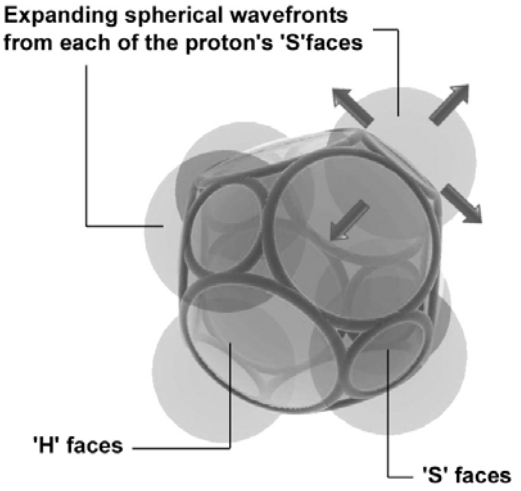

Figure 12.3.02 *Propagation of the 'S' face dim-wave will bathe the proton in six, off-centred, outwardly expanding spheres, as the vibrational energy from its boundary chords is dissipated.*

Travelling at the 3D/4D boundary, the lower energy (and thus lower frequency and longer wavelength) 'S' waves are 'negative' and are thus expansive anyway. Quite simply, they cannot be anything else. They will propagate outwardly away from their chord source - probably as *spherical* wave fronts. As there are a total of six 'S' faces, (the circular boundary chords of which are all vibrating due to the rotation of their membranes); one can imagine a total of six over-lapping spherical wave-fronts moving outwards

into space, continually moving away from the body of the proton.

Were it not for the fact that there will also be dim-waves emitted from the 'H' faces as well, these negative, expansive wave-fronts produced as a result the contact between 'S' face membranes and 'S' face boundary chords, would propagate outwards away from the proton, until the eventual attenuation of their energy. There occurs however, what would appear to be a fine balancing act between these two types of dimensional boundary surface waves. The dim-waves produced by the more energetically vibrating 'H' face boundary chords will have much shorter wavelengths and as a consequence, these will now propagate at what can effectively be described as the 4D-5D boundary.

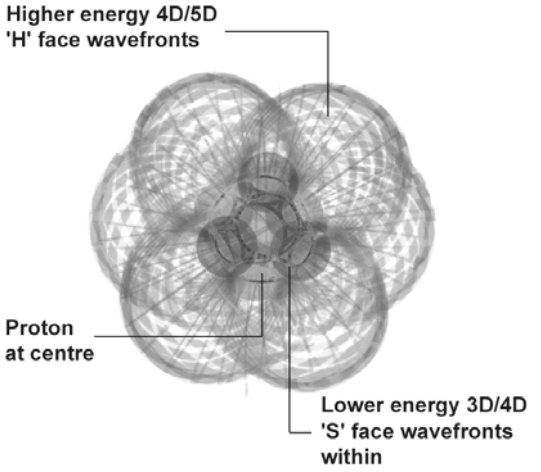

Figure 12.3.03 *Already bathed in 3D/4D dim-wave energy, the 'H' face boundary chords will also vibrate (at a higher frequency) and propagate as a higher energy dim-wave at the 4D/5D boundary. They will consequently possess a component of attraction.*

Apart from the obvious difference in the 'S' and 'H' face energy levels, the most noticeable effect here will be the *component of compression* (or attraction), that is naturally provided by the five-dimensional side of this higher energy boundary. The proton is also (already) bathed in 3D/4D dimensional boundary wave energy from the vibration of the 'S' face chords, which are expanding outwards as a series of wave fronts. Therefore, this higher frequency 'H' face dim - wave energy already has its own surrounding medium in which to propagate (see *Figure 12.3.03* in the previous column).

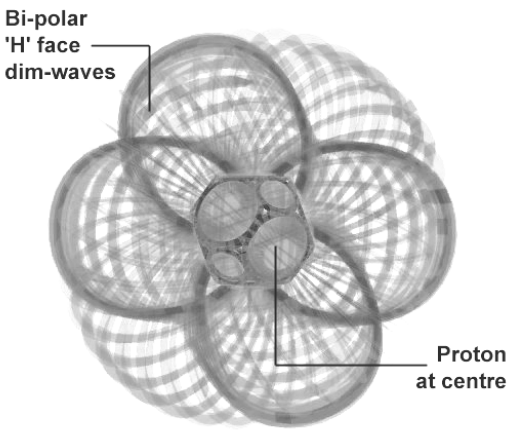

Figure 12.3.04 *Due to the higher frequency and thus energy of their dim-waves, the 'H' faces will act as pairs (rotational pairs) and provide these particular emissions with a north and south pole. The 'H' face dim-waves will effectively be bi-polar.*

This 5D characteristic of compression or attraction will fundamentally change the way that these 'H' face dim-waves behave. Each type of face is a member of a rotational group and as such, they will tend to work as pairs where these dim-wave emissions are concerned and any particular face will thus to be connected to its opposite by the same axis (see *Figure 12.3.04* above). Each pair will also tend to rotate in a *complimentary* manner (see *Figure 12.3.05* on the following page).

The 'S' face pairs are strictly negative however and only emit dim- waves at the 3D/4D boundary because of their scale and this energy has a single expansional component. These waves can only propagate outwards, regardless of the fact that they rotate as pairs. This produces the six over-lapping spherical wave-front configuration described above. The 'H' face pairs (of which there are a total of four), also include what is a contractive or *attractive* component - and these

will behave quite differently. These components will therefore comprise a two-part *duality* if you like - and as a consequence of these two very different (and opposite) characteristics, such dim-waves will require 'grounding'. The 'H' face component will basically comprise emitted dimensional boundary surface waves that are of much smaller wavelength than those produced by the 'S' face rotational groups and will include both expansive *AND* attractive elements.

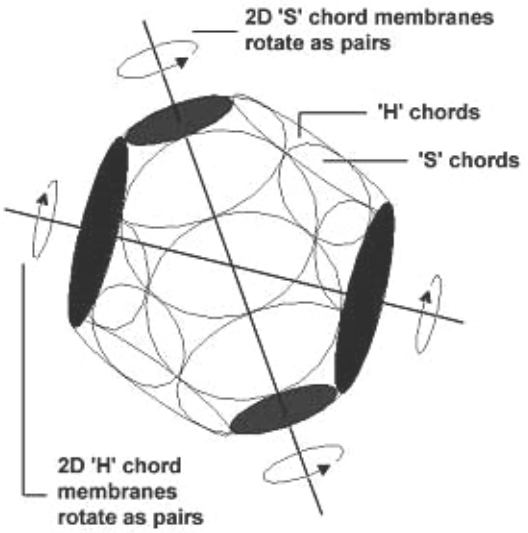

Figure 12.3.05 *2D membranes rotate as pairs within their chord structure and each type will contribute a specific characteristic to the teddy's charge. (Only one of each pair is shown for clarity).*

Each and every pair of these 'H' face rotational group components will therefore behave in a somewhat familiar manner, and will act as though they are north and south magnetic poles. This will occur as a result of the dim-waves' grounding requirement mentioned earlier (see *Figure 12.3.06* in the column opposite). The expansive (4D) component of these 'H' face rotational groups will propagate in an outward direction away from the nucleus, but the (5D) compressive element will produce what can only be described as 'field lines' as these dim-wave components must have the ability to ground themselves - and this can only occur in a direction towards what will become the rotational group's *opposite* pole.

These shorter wavelength, higher frequency dimensional boundary surface waves (that by their very nature must travel the higher energy 4D/5D boundary) will therefore exhibit both expansional and contractive characteristics at the same time. They will also endow the proton with an almost magnetic quality that will prove to be all-important when considering the physics of nucleosynthesis and the later appearance of the elements.

With a total of *four* rotational 'H' group components, the proton arrives at a configuration that will endow it with four north and four south polar faces, corresponding to opposing or *orthogonal* 'H' face members and this suggests what can only be visualised as a rather complicated set of over-lapping and probably interacting field lines that would now surround the nucleus (see again *Figures 12.3.03* & *4* on the previous page).

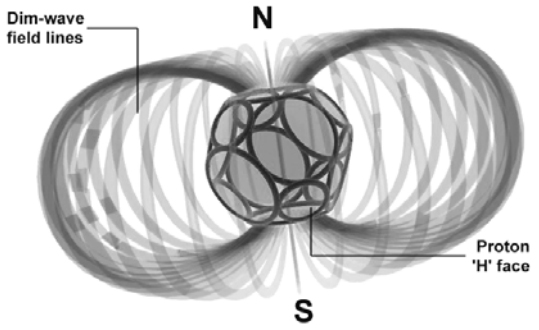

Figure 12.3.06 *'H' face dim-waves produce a 'field' effect between members of these rotational groups, effectively grounding themselves to one of the paired faces. They will exhibit what is effectively a north and a south pole.*

12.4 Monopoles

Before exploring these dimensional boundary surface wave emissions further, it may be worth mentioning that the 'S' face dim-waves can only by definition, be single or *mono-polar* in nature, in that they are purely expansive. This could be an interesting consequence in its own right because the search for ***monopoles*** has been

underway for decades and although their existence has always been deemed to be theoretically possible, they have never been found in nature until only recently. Researchers from Berlin, in association with others from Dresden, St, Andrews, La Plata and Oxford [2] claim to have observed magnetic monopoles in 2009, at the ends of what are known as ***Dirac strings***. Unlike those inferred here, most theoretical monopoles were always assumed to have been massive, although these recently observed varieties were actually claimed to have been found within a single crystal of *Dysprosium Titanate*.

A magnetic monopole can be described as a hypothetical particle that behaves like a magnet that only has a single north or indeed south magnetic pole (hence the name *mono*pole), but one that would still possess a net magnetic charge. The search for these entities has been on-going since 1931 and it has taken something like 78 years to find the first scant evidence of their possible existence. Some theorists have taken the stance that if monopoles do truly exist, they could be so massive that they would be almost impossible to observe any way.

We are all very accustomed to magnets, but they always seem to come with *two* poles, the north and the south. Even if we were to cut one in half, the result will *still* be two magnets, each of which still has its own north and south poles. A ***magnetic monopole*** on the other hand, would be a magnet with only one pole, but would this be an attractive force - or a repulsive one - as our common or garden magnets have both of course?

As already surmised above, magnetic monopoles have not yet been seen any where in the universe in any great number, although many theories like *GUT* and superstring tend to predict that the big-bang should have produced enough of them to drastically increase the energy density of the universe by perhaps a hundred billion times. Why have we not been able to detect them then?

As already mentioned above, they have always been believed to be very large but, what if the opposite is nearer to the truth and instead, they are an integral part of *ALL* matter within the universe - or more specifically, integral components of the nucleus itself. Could they better be defined as the dim-wave configuration of the proton's 'S' face rotational groups? We will have to wait and see.

12.5 The 4D(+) electron (e-) shell

Returning to the origin of the electron shell, as the 'H' face waves begin producing their field effect with (for the sake of argument) a 'north polar' *emission* - and a 'south polar' *attractive* component; the propagation of the lower energy 'S' face dim-waves that now flows outwards from these rotational groups will in essence, be trapped or ***caged*** within the higher energy 'H' face field lines. The proton therefore, ends up with what is basically a 'layered' system of propagating dimensional boundary surface waves comprising what becomes an 'inner' series of low energy, long wavelength 3D/4D emissions - and an 'outer' *caging* series of higher energy, shorter wavelength 4D/5D emissions. This produces an almost spherical volume of purely four-dimensional (expansional) space *between* these layers and it is this that forms what in this model, will be referred to as the electron shell or the ***e-shell***. The outer limit to this e-shell will be the 'field' produced by the two-component 'H' face dim-waves.

This phenomenon becomes an area where subtle interactions occur, involving the very fabric of the expansive fourth-dimensional level in which all of our three-dimensional material is suspended. It is not a ‘real shell’ as such, but is an area that creates an imbalance creates an imbalance within 4D space and at the 3D/4D boundary. This will more or less ADD 4D energy to what might be termed the background fabric of the expansive component of the universe, where this new volume is *trapped* between the 3D/4D and 4D/5D boundaries on either side of it (see *Figure 12.5.01* on the following page). The effect of this on the expansive medium that surrounds us, is that the proton now becomes surrounded in what can only be described as an 'anomalous bubble' that has the

property of *added* expansion (as the 4D energy within these bubbles can now be considered to be of a slightly *higher* dimensional energy than their surroundings).

This phenomenon will also have its effects on the 3D/4D boundary where low energy dim-waves propagate. This is also an area (which can be pictured as a continuous *linear-like* plane); that separates our own three-dimensional world from the expanding universe itself (or separates the energy equivalents). Each of these proton bubbles would take up three-dimensional space (they actually surround the three-dimensional proton).

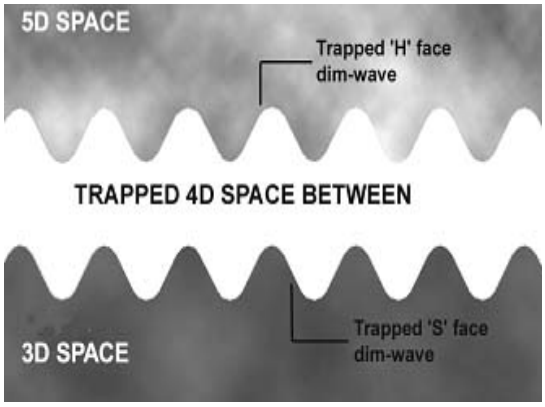

Figure 12.5.01 *A volume of 4D space is trapped between the proton's 'H' and 'S' face dim-waves and is thus added to the background as anomalous 4D+ bubbles.*

This volume does not however, contain any 3D mass - just 4D+ energy and it is this that creates an imbalance. There is a ***mass deficit***. This can best be described by looking graphically at what this does to the 3D/4D boundary. Any boundary between two dissimilar media has an almost two-dimensional characteristic. A discontinuity in the ground; caused say, by a difference in density or composition of the rock strata is a good example of this and the 3D/4D boundary can be pictured in the same way. In reality, this particular boundary is all around us, instead of spread out before us like the ground at our feet. In empty space, this analogy is good enough though. When we meet protons however, they will be surrounded by invisible bubbles of *higher* energy expansional space and each of these will form a kind of ***energy-spike*** that must penetrate deeper into the 4D medium so as to correspond with the increased (4D+) energy level (see *Figure 12.5.02* below).

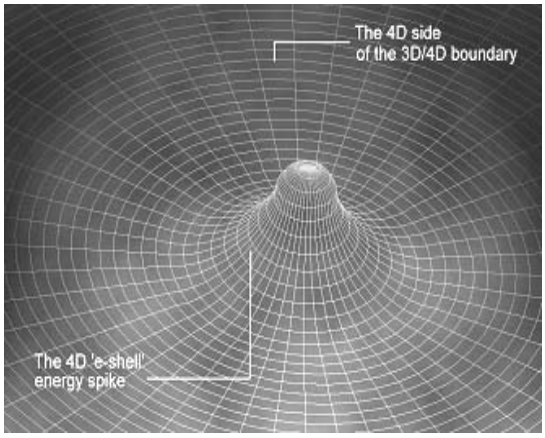

Figure 12.5.02 *Each and every proton 'bubble' would produce a 4D+ energy spike that pushes the 'e-shell' event further away from 3D energy levels and thus the 3D side of the boundary.*

Just like a plot on a graph, where the energy level (corresponding to the 'y' axis), would move further away from the abscissa, the higher this value becomes - the 4D+ energy-spike would have to move further away from the 3D part of the boundary that represented the energy level of the surrounding medium. If we could see all of this - every proton in every part of the universe would cause a similar fluctuation within this 3D/4D boundary. Having visualised what the *energy spike* would look like from a fourth-dimensional point of view, we can actually turn the boundary over and look at how its three-dimensional equivalent would appear to us (that is, if we could see this dimensionally abstract concept) and this view has been included as *Figure 12.5.03* on the following page.

Not un-coincidentally, this becomes visually analogous with the frequently depicted 'warping' of space-time, often illustrated as a representation of the effects of gravity on its surroundings.

Therefore, in this model, this particular effect of the proton's captured 4D+ bubble (its *e-shell*), on the four-dimensional side of the 3D/4D boundary has been called an ***energy-well***.

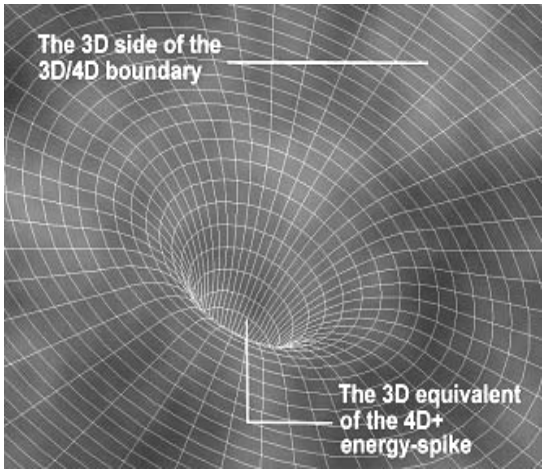

Figure 12.5.03 *Turning the 3D/4D boundary over to examine its three-dimensional side, reveals a disturbance in the boundary that has been called an 'energy-well' in this model.*

As mentioned above, this is purely abstract however and is not what we actually see. The *scale* of these 'proton bubbles' will lie somewhere between the size of the proton and that of the atom (here meaning the radius marked out by the orbit of hydrogen's single electron). The bubbles are also using-up three-dimensional space (basically volume in our terms) and this must relate to a ***mass equivalence***. This can be qualified by the way that these 4D+ bubbles can be imagined to react with their immediate surroundings. This *energy-well* is an area of *lower* 3D mass potential and as we know, the universe would seem to have an 'in-built' desire to strive towards equilibrium. This concept will need to be explored in a little more detail.

The 4D+ energy spike is the direct result of the proton's 'H' and 'S' dim-wave emissions and the surrounding bubble that these create as a consequence. These act on the existing four-dimensional medium by 'addition' and thus *increase* the rate of expansional potential within these particular areas. Unlike the analogous examples of atmospheric or even gas pressure differentials, where entropy dictates that the direction towards equilibrium is always towards lower overall pressure - the tendency in this case, will be for the lower background expansional energy to flow *towards* these higher energy spikes and this creates the well effect (also a little like the behaviour of the water in your bath when you remove the plug). Just like your bathwater, where the soap, sponge or even your rubber duck will be slowly carried towards the plug hole by the flow of water, three-dimensional matter with a mass *proportional* to that of the *mass-equivalence* mentioned in the previous column, will also be influenced by this four-dimensional expansional flow. What *is* this *mass equivalence* and its related *mass deficit* (see page 102) and more importantly, how can they both be calculated?

There will be an expansional 4D reaction as the *e-shell* is formed by the interaction of the proton's 'H' and 'S' face membranes against their boundary chords and the dim-waves that this event generates. Unlike the original 'creational' versions of this event; argued for in Chapter Three and Four of this series, *this* chain of events is all now occurring *within* our own three-dimensional world and *within* four-dimensional space in which we are suspended. As the reaction expands (in four dimensions; the fourth of which is scale), it is behaving like a *dimensional boundary surface wave* because the outside of the sphere is an area that lies between the higher energy four-dimensional bubble within AND our own lower energy 3D/4D space that now surrounds it. In a similar way to that described for the mass equivalents of the dimensional boundary surface waves produced during the *Stage 2* reconfiguration of the independent boundary chords (see Chapter 11), this 4D expansional event would use energy and this *MUST* involve the conversion of four-dimensional energy to an equivalent three-dimensional mass within the proton's bubble. These four-dimensional mass equivalents were given in the last chapter, as:

$$\frac{M^{dbc}\Delta}{(10^{-04})^{2}}$$

where M^{dbc} is the boundary chord's original starting mass (after the de-gassing phase); Δ is the 'H' or 'S' component's 'area of influence' in three-dimensional space and the $(10^{-04})^2$ represents the square of the 3D to 4D mass conversion factor (to represent exponential expansion). In other words, this 4D+ energy spike will have a three-dimensional influence that can be compared to a specific mass value - or a *mass equivalence*. The proton bubble itself, affects our own world only from the outside, where its boundary sits between third and fourth dimensional energy levels. The *inner* layer of the proton's two distinct sets of dim-waves is produced solely by its 'S' face reactions and is comprised of a total of three rotational groups.

As far as the *mass equivalence* is concerned, this is related to the three-dimensional volume that the proton bubbles takes up in 4D space - and this volume is being produced by these lower energy 'S' face reactions. Each of these 'S' face rotational groups has in turn, two paired faces and each of these will have a similar *area of influence* that in Chapter 10, was defined as:

$$\Delta^S = 1.963 \times 10^{-29}\ cm^2.$$

From the *mass equivalence* expression given above, each of the circular 'S' face boundary chords that produce, enclose and surround an 'S' face membrane (remembering that there are a total of 4No boundary chord values per circular 'S' chord) - each can in turn, be afforded what can be called an ***individual mass value*** (after the de-gassing phase), that will equate to:

$$2.325 \times 10^{-29}\ kg - 2.325 \times 10^{-32}\ kg$$

$$= \mathbf{2.322 \times 10^{-29}\ kg}$$

Therefore, the 3D to 4D mass conversion in this case, can be gained by using the resultant boundary chord mass, once the membrane de-gassing component has been removed. The expression thus becomes:

$$\frac{M^{dbc}\Delta^{S}_{e}}{(10^{-04})^2}$$

where **$'\Delta^{S}_{e}'$** becomes the *NEW* ***area of influence*** of the 2D membrane component, which would have now expanded to the increased scale of the e-shell itself. This would allow a solution to the above expression where the new *AOI* ($\mathbf{\Delta^{S}_{e}}$), now represents any *ONE* of the six expanding 'S' face dim-wave components thus:

$$\frac{2.322 \times 10^{-29}\ kg \times 1.963 \times 10^{-10}\ cm^2}{(10^{-04})^2}$$

$$= \mathbf{4.558 \times 10^{-31}\ kg} \text{ per 'S' face chord.}$$

These 'S' faces behave as *rotational pairs* however and any 'point' measurement of this mass equivalence would have to take this into account. In other words, any measurement must involve not just one of the six expanding spheres that make up the *e-shell*, but the complete pair of mass equivalence values. Therefore, any specific measurement of mass on the proton's bubble would need to take into account the 3D/4D reaction of an 'S' face boundary chord *AND* its paired partner thus:

$$4.558 \times 10^{-31}\ kg + 4.558 \times 10^{-31}\ kg$$

$$= \mathbf{9.116 \times 10^{-31}\ kg}$$

and this becomes the ***3D mass equivalence*** of the proton's expansive (dim-wave produced) electron shell at any particular point in space.

The configuration of the 'layered' *e-shell* is produced by the action of the 'S' face dimensional boundary surface wave emissions *AND* what is basically an expansive component of the dim-waves emitted by the 'H' faces too. Referring back to *Figure 12.3.03* on page 99, the *multi-pole* characteristics of the 'H' faces would infer the familiar concept of 'field-lines'. These would comprise paired north and south poles, one of which would emit expansional dimensional boundary surface waves - while the other - contractive or attractive dim-waves. They would be a phenomenon that included both an *emitter* and a *receptor*. The proton would therefore, emit *TWO* distinct magnitudes of expansive dimensional boundary surface waves.

Those with the *greater* energy, would be from the reaction of the 'H' face membranes against their boundary chords which, as can be seen from *Figure 12.3.03,* would involve one pole from each of these (four) rotational pairs. *HALF* the total 'H' face boundary chords would be emitting high-energy dim-waves that would lie *within* the energy spectrum of the expansive fourth dimension. The *lower* energy dim-waves from the 'S' face boundary chords, would be at or very close to the 3D/4D boundary and its corresponding energy level (see *Figure 12.5.04* below). This naturally provides the e-shell with an energy range or an ***energy depth***, which may go some way in helping to explain - and illustrate in this particular model at least - the behaviour and placement of the electrons in multi-nucleon elements.

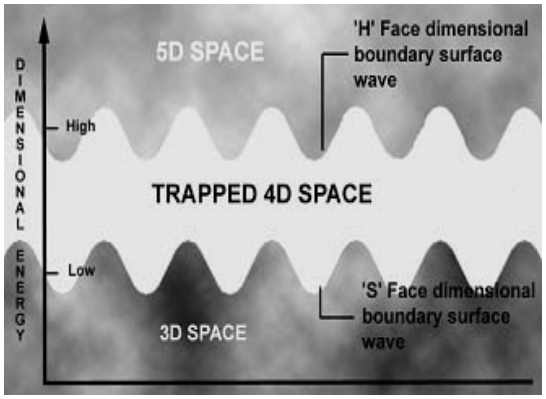

Figure 12.5.04 *The proton's E-shell will comprise a specific energy range determined by the 'H' and 'S' face dim-wave emissions.*

The 'H' face of the proton (or the whole surviving teddy) is the first to evolve - as this originally stores the inherited *face-spin bias* from the big-snap. This face is also the more energetic of the two, as far as its dimensional boundary surface wave energy is concerned and it would also be the first to propagate. It could be described as basically an *expansive* wave - but one that is bi-polar and is thus *grounded* at the other end of its rotational axis. Each field therefore, becomes *trapped* and cannot escape into space as would be expected from the less energetic 'S' face dimensional boundary surface wave. With the 'S-wave' propagating within, this may create a stretching effect that expands this cage outwards to form the e-shell itself because of the natural repulsive effects of like to like charges. The balance would logically occur when tension and repulsion become equal. The eventual repulsive distance between 'H-wave' and 'S-wave' would produce the *trapped 4D space* shown in *Figure 12.5.04* in the previous column.

The interplay of the expansive and *contractive* components of the proton's dim-wave emissions seem to be responsible for its charge (see again Chapter 10). As the electron (or the electron shell in this model) can therefore be allowed to possess a balancing charge of its own - these emissions should also be responsible for carrying a *proportional potential* of this charge into the electron shell itself - *via* either the 'H-waves', the 'S-waves', or both. Unlike the 'separated' membranes that produced it in the first place, the *e-shell* contains solely within its volume, *EXPANSIONAL* dim-waves, and these can by definition, only be *NEGATIVE*. This can be achieved either by isolating the *expansional* component of the 'H' face dim-waves (which will mean the expansive pole of each rotation group), or indeed by looking at their signs, where (+) x (+) = (+); (-) x (-) = (+) and where (+) x (-) = (-) etc., etc.. What is interesting, is that in so doing, half the total 'H' face value will amount to $^{2}/_{3}$ instead of the calculated $^{4}/_{3}$ attributed previously to these faces. Reversing sign as is required for this conjecture, the value of the electron shell becomes minus $^{2}/_{3}$ from the 'H' face dim-waves, *plus* minus 1/3 from the 'S' face waves; which equals *minus one*. Allowing this to occur, produces a balance between the overall *positive* charge of the proton - and the equal but *negative* charge of this (so far) abstract *e-shell*.

The energies of the electrons contained within the atom's electron shell, are known to have only certain values (not surprisingly, known as the ***energy levels*** of the atom). All the atoms of a given element have the same characteristic set of energy levels and each of the elements has a different energy level to any other. The actual

energies of these various levels are fairly well understood and can be calculated quite readily with the use of wave mechanics. Their values are usually presented in ***electron volts*** (eV), where 1ev = *1.602 x 10 $^{-19}$* joules *(J)*. These energy levels are usually represented by a series of lines in convention and they are logically called *energy level diagrams*. The diagram for the hydrogen atom is shown as *Figure 12.5.05* below.

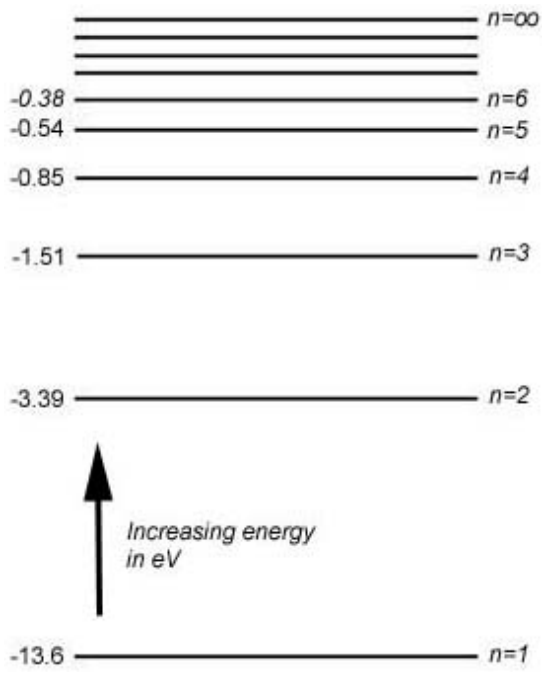

Figure 12.5.05 *The basic energy level diagram of the hydrogen atom.*

Hydrogen's single electron usually occupies the lowest level within the diagram and this corresponds to an energy value of (minus) *-13.6 eV*. The electron can absorb energy however and in so doing, it may *jump* to one of the higher energy levels. The lowest level is usually considered as the one nearest to the nucleus so, as the electron gains energy and reaches a higher level, (in the Bohr model at least), it can be pictured as moving into a higher orbit around the nucleus. This corresponds to what is called the electron's *excited state*. In conventional physics, the electron will usually lose energy by emission of an electro-magnetic wave and will fall back to its lowest *(-13.6 eV)* level, or its *ground state*. Each of these energy levels is also characterised by what is called a *quantum number* usually referred to as *'n'* where the lowest level (the *-13.6 eV* energy level or its ground state), is referred to as *n = 1*. For hydrogen, it can be seen from the figure that there are six of these quantum numbers (*n = 1 to n = 6*), with an additional 'top' quantum number of $n = \infty$ or zero. If the electron gains enough energy and reaches this level, it becomes free of the atom.

Coincidentally, the number of levels that exist between quantum numbers n = 6 and $n = \infty$ is four - and together with the first six or lower energy levels (i.e. n = 1 to n = 6), there is an uncanny resemblance to the configuration of the *e-shell* within this model. This too, contains a total of six distinct levels enclosed within what amounts to four outer layers; the outermost of which, in this model, will correspond with the $n = \infty$ level. This coincidence will be explored further within a later chapter.

Referring back to Chapter 10, an observation was made regarding the possibility of a connection between charge; an approximation to the value applied to the *permittivity of free space* and the surface area of the 'H' and 'S' faces. With two of these parameters known, it may be possible to play about with these to see if one can arrive at an approximation of an atomic radius, not a million miles away from that exhibited by say - hydrogen's single electron. If this can be the case, it may provide a starting point for the further examination of this characteristic in the future. Therefore, from Chapter Nine, the charge on any particular face would seem to approximately coincide with:

$$Q\varepsilon_0 = A$$

where *'Q'* is the charge in coulomb (C); *'ε_0'* represents the *permittivity of free space* (corrected here as commented upon within Chapter 10 to *8.854 x 10^{-09}*) and where *'A'* is the resultant surface area in cm^2. This particular scenario

would however, involve the emission of dimensional boundary surface waves and this would seem to indicate the need for the inclusion of the 4D mass conversion factor already brought into use on page 211. Therefore the above expression may need to be revised to accommodate this as follows:

$$\frac{Q\varepsilon_0}{(10^{-04})^2} = A$$

The negative charge on the electron, (i.e. the elementary charge) - is given as 1.602×10^{-19} C, so by multiplying this with the derived value of the permittivity of free space and dividing by the 4D conversion factor, one is presented with:

$$\frac{1.602 \times 10^{-19}\ C \times 8.854 \times 10^{-09}}{(10^{-04})^2}$$

$$= \mathbf{1.418 \times 10^{-19}\ cm^2}$$

and because at this stage it will be assumed that the electron shell will be spherical - this equates to a radius of:

$$\sqrt{\frac{1.418 \times 10^{-19}\ cm^2}{4\pi}} = \mathbf{1.062 \times 10^{-10}\ cm}$$

This coincides with the approximation of scale of the independent boundary chords as they 'ping' into 4D space; just prior to their own reconfiguration (see again Chapter Ten) and for the moment at least, this seems to corroborate the difference in perceived scale between atom and nucleus within the confines of this model.

The electron shell however, is supposed to house a particle under most conditions - the electron - and this is usually (?) assumed to be the carrier of the world's negative charge. While this charge now appears to originate within the 4D e-shell itself, this particle capture can also be accommodated within this model and will play a most important of roles in both the evolution of the elements and the behaviour of molecular bonding at a later date. This particle capture will be dealt with as part of the next Chapter within this submission.