10 The concept of charge

10.1 Spin configuration

The geometry of the teddy, (now the basis of both proton and neutron), is such that its *Stage 1* and *Stage 2* reconfiguration will produce both spin *and* charge. The spin is a product of its naturally occurring *face-spin bias* and its component of charge can be said to result from the *conservation of angular momentum* that will occur during this *Stage 2* reconfiguration in particular. The proton will comprise two sets of faces, each of which will provide a different characteristic as far as this charge component is concerned. The difference in the rotational speeds exhibited by what were originally its hexagonal and square components, will determine what will be the polarity of charge and this will be seen to be wholly dependent on the difference in these reconfigured face diameters and their number. Although still beyond the reach of our 3D detectors and therefore still a little speculative at this stage, even this tiny difference in size will have been enough to allow the universe to evolve in exactly the way that it has.

It was argued in the previous chapter, that the resultant configuration of the teddy's faces *already* provides *ALL* of the necessary characteristics that will naturally allow charge to occur - and this chapter will attempt to illustrate this further. It will also attempt to show (almost coincidentally), that these faces and their imposed face-spin bias are the reason *WHY* the proton appears to display two *different* kinds of charge in the first place, which have formerly been assigned to the existence of those sub-atomic particles – the *'quarks'*.

Although very real as far as this model is concerned, these separate components of charge (the positive and negative that would appear to result in the elemental), *DO NOT* now require the concept of these quarks as a descriptive part of the proton and neutron. The whole surviving tetrakaidecahedron that pinged into what would become our 3D part of the universe, has all the necessary attributes already, once its two-stage reconfiguration is accepted. The imposed charge exhibited by the *Stage 2* reconfigured teddy (or what can now be called the proton), will have everything to do with its ***spin ratios***.

Although these have already been defined in the previous chapter, they are an important concept in their own right and will be reiterated upon here. This definition is basically the difference between the overall surface areas of the hex and square faces (all of which are now circular after the *Stage 2* reconfiguration) and this ratio amounts to:

$$\frac{\text{Total square:}\quad 4.712 \times 10^{-28}\ cm^2}{\text{Total hex:}\quad 1.884 \times 10^{-27}\ cm^2} = \mathbf{0.25}$$

The total 'H' face area is obviously the larger of the two and could be deemed to reflect the positive component of charge - which up until now - has usually been associated with the proton's two 'up' quarks. If the *FOUR* 'H' face pairs are allowed to produce a charge of $+^1/_3$ each, the total 'H' face charge in this model will correspond to the required $+^4/_3$ previously contributed by these two ghostly sub-atomic particles. Using the spin ratio of 0.25, this allows the three 'S' face pairs an overall (counter) charge of:

$$1.33\ (\text{or } ^4/_3)\ (\uparrow\uparrow)\ \times\ 0.25 = \mathbf{0.33}\ (\text{or } ^1/_3)\ (\downarrow)$$

The problem at the moment is that this 'S' face component of charge needs to be *NEGATIVE*.

This *IS* achievable however, if one takes into account the rotation of the *de-gassed* 2D membranes (of both 'H' and 'S' faces) – and the consequential effects brought on by the necessary conservation of angular momentum. It may have already been noticed that the terms 'H' face and 'S' face are still being used - even though the teddy's reconfiguration has left both types as circular varieties. This will continue, as this provides both a logical link to the origin of these planes and is still the best way of differentiating between these two different sizes. The 'H' face is the larger and more numerous, with four pairs or a total of eight.

10.2 Membrane rotation and spin

Returning to the problem of this negativity, the key to *how* this can be achieved lies firmly with these 2D membranes that de-gas from the boundary chord material that forms the circumference of each of the teddy's faces. The proton becomes such *not* just because of charge, but also because of the apparent three-dimensional mass loss used by these membranes again, during *Stage 2* reconfiguration. It is these membranes that also provide the solution to the problem of *spin-conflict* caused by the inherent face-spin bias - carried over from the initial big-snap that separated whole surviving teddies and independent boundary chords out from the 8D lattice.

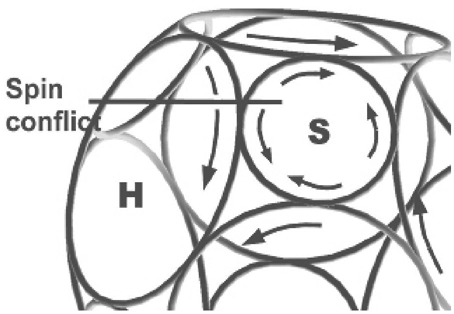

Figure 10.2.01 *The reconfiguration of the teddy occurs because of a spin conflict within the imposed face-spin bias components of its individual faces. This will later be solved as the spin is transferred to its 2D membranes.*

The neutron (or a *pre-Stage 2* teddy), has this *spin-conflict* within its structure and this comes about as its face-spin bias is transferred and therefore imposed upon each of the (six) 'S' faces by their four neighbouring (and now rotating) 'H' face *boundary chord values* that now surround them. It is this conflict, which helps bring about the *Stage 2* reconfiguration in the first place (see *Figure 10.2.01* above) and as the *de-gassing* of the teddy's 2D membranes occur, this face-spin bias is again transferred, causing these membranes to rotate *INSTEAD* of the induced spin (or potential) trapped within the boundary chords. The 'H' face membranes will retain the spin direction originally exhibited by the 'H' face chords; while the 'S' face membranes will actually be seen to have a choice. As it is the membranes that have now inherited the face-spin bias and *NOT* the adjoining chords, their rotation is now isolated from that of all other adjacent membranes. The spin conflict will disappear and each of the six 'S' faces can be allowed to rotate either clockwise or counter-clockwise – resulting in a fifty-fifty chance as to just which rotational direction this actually becomes.

Due to the configuration (and of course, reconfiguration) of the teddy in the first place; (where the rotation of its boundary chords because of face-spin bias ends up almost 'cog-like' in character); the 'H' faces will tend to rotate as pairs anyway (see *Figure 9.3.02* on page 77, Chapter Nine) and in order to conserve equilibrium, the 'S' faces will tend to follow suit. This means that whatever the choice of rotation in one particular 'S' face membrane, the other member of the pair will result in being of the opposite (or what will be referred to as *complimentary*) rotational direction.

As already hinted at above, the original face-spin bias carried over from the big-snap can be thought of as being more akin to a potential – as it would be the tendency for the boundary chords to rotate about the axis *normal* to any particular face. There would quite naturally be a relationship between the surface area of these membranes and therefore, the circumference of the face itself. As each component of face-spin bias is transferred to its corresponding 2D membrane, this potential will translate into rotational energy and it would thus be possible to assign this *rotational component* a definitive value.

The easiest way of illustrating this phenomenon in the first instance, may perhaps best be achieved by looking at what is basically the 2D membrane's ***moment of inertia*** *(I)*. The apparent 3D mass equivalence of the 'H' face membrane can be calculated from the resultant *Stage 1* dimensional boundary chord mass (M^{dbc}) and remembering from page 76 in Chapter Nine, the *area of influence* calculation where:

$$\text{'H' face chord 3D mass equivalence} = \frac{6 \times M^{dbc}}{10^3}$$

or,

$$6 \times \frac{2.325 \times 10^{-29}\ kg}{10^3} = \mathbf{1.395 \times 10^{-31}\ kg}$$

where '10^3' is the appropriate '1D' conversion factor – which will be the same for both types of faces (see again Chapter Nine).

The above value becomes the 'H' face 2D membrane's ***3D mass equivalence***. As these membranes can in this example, be considered simply as rotating disks contained within the circular boundary of its parent 'H' face, their *moment of inertia* can be gleaned from the conventional expression:

$$I = \tfrac{1}{2}Mr^2$$

where the radius of the 'H' face in this instance, has already been calculated at $8.660 \times 10^{-15}\ cm$. Thus, the moment of inertia of each 'H' face 2D membrane becomes:

$$\frac{1.395 \times 10^{-31}\ kg}{2} \times (8.66 \times 10^{-17}\ m)^2$$

$$\text{Therefore, } \mathbf{I^H = 5.23 \times 10^{-64}\ kg\ m^2}$$

Similarly, the *moment of inertia* of the teddy's 'S' faces can also be calculated through similar methods, because the resultant masses of the 'S' face membranes are also known within this model. Therefore, (again referring back to Chapter Eight), the total *3D mass equivalence* of these particular 'S' face 2D membranes will have a value that equates to *circa* $9.300 \times 10^{-32}\ kg$ together with a corresponding radius of $5.000 \times 10^{-15}\ cm$ (remembering that these are the smaller of the two types of membrane). In this instance, the 'S' face membrane *moment of inertia* will in turn be equivalent to:

$$\frac{9.30 \times 10^{-32}\ kg}{2} \times (5.00 \times 10^{-17}\ m)^2$$

Therefore, for the 'S' face,

$$\mathbf{I^S = 1.16 \times 10^{-64}\ kg\ m^2}$$

It is 'rotational symmetry' that gives rise to angular momentum and its conservation - and it is the transfer of face-spin bias to the teddy's 2D membranes that results in an angular momentum about the membrane's centre of mass. This is all very well with a simple 'single' spin axis , but in this case - the angular momentum of a 'massive' particle like the teddy, will actually comprise four 'H' pair and three 'S' pair components. This means that the teddy (in reality) contains a total of seven ***rotational groups*** and each of these groups will occupy a specific axis location or ***axis coordinate***, which will be the same as the teddy's constant motion axes – already defined in Chapter Nine.

Each *rotational group* therefore comprises two 2D membranes with complimentary-rotating components, which produce a paired system with a combined angular momentum. These may (but certainly not yet) be equivalent or comparable to the *Lie Algebra* of rotational groups[1] such as O(3) or SO(3) – but this work has a long way to go before such comparisons can be properly made. The resemblance of these 'paired' rotational components to *Pauli matrices* is also a possibility[2] and this too will be explored at a somewhat later date (help!).

Before the effects of this angular momentum can be discussed more fully, the rotational characteristics of these 2D membranes need to be examined in a little more detail. It is also possible that this rotational aspect of the teddy can be described as a *wave function* and the value of these components could be referred to as *spinors* or ***spinorial objects***[3] and as such, the original face-spin bias of any particular 'H' face, must allow itself the ability of being described in terms of multiples of – or indeed divisibles of, a full

360° or 2π rotation. In other words, and for the purpose of this exercise, it would be handy if these 2D membranes could be provided with a value that corresponds to their ***angular velocity of rotation*** (ω).

At this moment in time, such a value for the original face-spin bias component would be pure conjecture but this is not important for an understanding of just how this concept of charge may work within the body of the proton (or *Stage 2* reconfigured teddy). What *is* important, is the relationship that can be afforded these 'H' and 'S' face membranes in terms of the production of elemental charge. In this respect, this 'H' face membrane's *angular velocity of rotation* (ω) can be given any value one wishes for the time being as long at it can also be shown that the corresponding 'S' face membrane's own *angular velocity of rotation* bears a direct and calculable relationship to it.

Therefore, for this exercise – and considering the character of the 'H' face to begin with – the *angular velocity of rotation* (ω) of 'one-sixth' an 'H' face circumference (a single boundary chord), can be given the basic value of $1.047\ rad.\ s^{-1}$ (based on an overall 'H' face rotation of 2π or $6.283\ rad.\ s^{-1}$ divided by six); which will have the advantage of providing the simplest of approaches to this question of comparison. This will also allow the angular momentum *(L)* to be calculated for each of these 'H' face 2D membranes; where:

$$\text{angular momentum } (L) = I\omega.$$

With a moment of inertia (I^H) already calculated on page 81 above as $5.23 \times 10^{-64}\ kg\ m^2$ and an angular velocity of rotation (ω) of $1.047\ rad.\ s^{-1}$, the angular momentum (L) of each 'H' face 2D membrane becomes:

$$5.23 \times 10^{-64}\ kg\ m^2 \times 1.047\ rad.\ s^{-1}$$

$$\mathbf{L^H = 5.47 \times 10^{-65}\ kg\ m^2\ s^{-1}}$$

As the teddy's boundary chords are split in two during *Stage 2* reconfiguration, part of the original angular momentum that was face-spin bias - would be transferred to the newly configured circular 'S' chords that now replace these (formerly) square faces. With its total of seven rotational groups, the teddy at this stage can be thought of as a tiny set of inter-locking 'cog-wheels' and the points of convergence *(POCs)* are the areas where these cogs mesh. Putting the spin-conflict to one side for the moment, the rotation of a larger 'H' face cog will directly influence the rotation of a smaller 'S' face cog and both must therefore exhibit *the same* linear speed at the *POC*. As linear speed is constant and is determined by the angular velocity multiplied by the radius, or:

$$\mathbf{v = \omega r}$$

then for the 'H' face, this will equate to:

$$v = 1.047\ rad.\ s^{-1} \times 8.66 \times 10^{-17}\ m.$$

So therefore, in this particular exercise:

$$v^H = 9.06 \times 10^{-18}\ m\ s^{-1}$$

Similarly - the same can be said for the 'S' face and assuming the same linear speed at the POC, one will need to define its angular velocity in terms of that of the 'H' face so:

$$\frac{v}{r} = \omega \text{ or } \frac{9.06 \times 10^{-17}\ m\ s^{-1}}{5.00 \times 10^{-17}\ m} = \mathbf{1.81\ s^{-1}}$$

The angular velocity (w) of the 'S' face thus becomes $\mathbf{1.81\ rad.\ s^{-1}}$ as a consequence of having the same linear speed as that of the 'H' face (measured at the mutual POC) and the angular momentum of the 'S' face 2D membrane can now be calculated in a similar way - and this in turn will equate to:

$$I\omega, \text{ or } 1.16 \times 10^{-64}\ kg\ m^2 \times 1.81\ rad.\ s^{-1}$$

and therefore:

$$\mathbf{L^S = 2.10 \times 10^{-65}\ kg\ m^2\ s^{-1}}$$

The apparent difference in rotational speed between the 'H' face membrane and the 'S' face membrane at the POC can now be compared thus:

$$\text{'H'} = 1.04\ rad.\ s^{-1}\ x\ 6 = 2\pi \text{ and,}$$

$$\text{'S'} = 1.81\ rad.\ s^{-1}\ x\ 6 = 1.74\ x\ 2\pi = \mathbf{3.48\pi}$$

This will also give an estimated figure for the total original angular momentum of the teddy that would have been carried over from the big-snap as face-spin bias and within this particular exercise, this will amount to:

total 'H' face (L^H) = $5.47\ x\ 10^{-65}\ kg\ m^2\ s^{-1}\ x\ 8$,

plus:

total 'S' face (L^S) = $2.10\ x\ 10^{-65}\ kg\ m^2\ s^{-1}\ x\ 6$

and this gives an original (hypothetical) angular momentum of:

$$\mathbf{L^O = 5.63\ x\ 10^{-64}\ kg\ m^2\ s^{-1}}$$

This is of course, all based on the assumption that the original *angular velocity of rotation* for the 'H' face membrane can be given a value of 2π (or a rotation of $6.283\ rad.\ s^{-1}$).

10.3 Achieving negativity

The difference between the two angular velocities of rotation (ω) of the 'H' and 'S' face membranes, can be used to provide a visual representation of these characteristics and this has been included as *Figure 10.3.01* in the following column.

A direct comparison of the two linear speeds will show that any particular point on the circumference of the 'S' face membrane, will cover *1.74* times the distance of a comparable point on the circumference of the 'H' face membrane in the same unit of time, because:

$$\frac{\omega^S}{\omega^H} = \frac{1.81\ radians\ s^{-1}}{1.04\ radians\ s^{-1}} = \mathbf{1.74}$$

This ratio will not change, regardless of the value applied to one or other of the membranes and this also helps when considering the possibility that these membranes may act like spinorial objects.

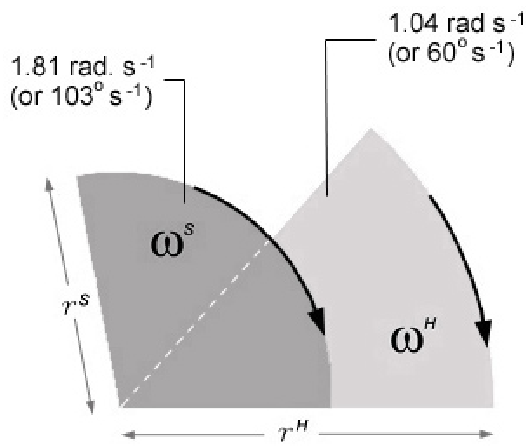

Figure 10.3.01 *A graphic comparison between the angular velocity of the 'S' face and 'H' face 2D membranes.*

The intriguing thing about these abstract entities is of course, their ability to change their sign from positive to negative when they undergo a complete rotation (through 2π). There may also be a vague theoretical connection between spinors and this model's 2D membranes in terms of their ***quaternion axes*** which in the case of this spinorial function, would seem to increase from two, to four dimensions (and not from two to *three* as one might expect). A spinor would also seem to require a 'real-time' attachment to some fixed object (for it to work) and in the case of these membranes, this may be provided by their origin as two-dimensional condensate from three-dimensional boundary chords. One is therefore presented then, with a two-dimensional object, rotating in four-dimensional space - but attached to a three-dimensional object (this being the membrane's parent boundary chords around its circumference).

The ***angular velocity ratio*** defined above, actually becomes perfectly suitable for describing the function of this 'H' and 'S' face difference in terms of spinors. If a (base) 2π rotation - such as that of the 'H' face 2D membrane - produces a positive value, a comparable measure of rotation for the 'S' face membrane (during the same period of time); will produce a *negative* value, because the speed of rotation must be *1.74* times greater. The sign change however, is only supposed to occur in (complete) multiples of 2π, but in this case, the 'S' face membrane will actually result in a comparable rotation of 2π x 1.74, which amounts to circa 3.5π in this exercise.

This may seem like a strange value for the rotational characteristics of these 'S' face membranes and this would be true if not for something that has been noticed while playing about with the implications of these spinors. Suffice to say that for the moment, this value seems to be acceptable in the sense that it actually seems to work fine. This will be explored further in what will be called the spinor's ***zone of tolerance*** in a later chapter.

The very fact that these rotational groups seem to behave like spinorial objects, will have important consequences when the subject of proton-proton bonding is discussed also in a later chapter. For the time being, these 'S' face membranes, with a rotation of just under 4π would seem to be 'teetering on the edge' so to speak - and one could imagine an input of energy being introduced that would push these components once again into an area of *positive value* - relatively easily. This too, will have consequences during the bonding process that will ultimately provide the first elements proper within this 3D/4D universe.

Returning to the question of charge itself, the surface areas of the (now) circular 'H' and 'S' faces can be provided with the (approximate) values:

$$2.356 \times 10^{-28}\ cm^2\ (H) \quad \text{and}$$

$$7.854 \times 10^{-29}\ cm^2\ (S)$$

which each relate to a radius of:

$$8.660 \times 10^{-15}\ cm\ (H) \quad and \quad 5.000 \times 10^{-15}\ cm\ (S)$$

respectively - and the physical relationship between face size, actually corresponds quite closely to the difference in rotational speed.

10.4 Calculation of charge

The *area of influence* (Δ) however (from which these surface areas are derived), has been shown to have a direct bearing on the calculation of angular momentum and thus rotation. It is this action of rotation of the 2D membranes *against* the face's specific boundary chords, that would in this model, seem to produces the teddy's (or now technically the proton's) element of charge and because of the conservation of angular momentum, the faster spin of the 'S' face membranes - produce *negative* charge because of the spinorial implications.

The elemental charge - or the unit of charge produced by a single proton, would in this model, now seem to be provided by a total of *seven* distinct components - or seven distinct *rotational groups*. This becomes another one of this model's somewhat bold statements, in that the position of the quark within the scheme of things now becomes redundant.

These integral groups would correspond to the 'H' face pairs *(4No.)* and the 'S' face pairs *(3No.)* mentioned earlier - and the rotation of each of these components would need to produce its own specific (coulomb) value thus:

'H' pair component ($\uparrow$) = $+\ 5.340 \times 10^{-20}\ C$

'S' pair component ($\downarrow$) = $-\ 1.780 \times 10^{-19}\ C$

As explored in Chapter Nine, these values would seem to have a direct relationship to the *surface areas* of each of the faces (the 'H' pair component is three times greater than that for the 'S') *and* this relationship also extends to their *spin ratios*. These ratios and the 'S' and 'H' charge values indicated above - are all proportional to each other and there *IS* a common relationship that would seem to link the two together. This is best illustrated by dividing each of the above coulomb values by two - in order to arrive at a charge component that can be applied to *each* individual face - and this results in a *single face* coulomb value of:

$$\boldsymbol{2.670 \times 10^{-20}\ C\ (H)} \quad \text{and} \quad \boldsymbol{8.900 \times 10^{-21}\ C\ (S)}$$

Each of these values can then be divided into the appropriate (overall) 'H' or 'S' face 2D membrane surface area (already provided on page 79 above). The value for each 'H' face and 'S' face is an approximation at the moment and does not take into account any possible concavity or convexity in its structure, but does seem to be heading in the right direction. This common relationship can therefore be found thus:

$$\frac{2.356 \times 10^{-28}}{2.670 \times 10^{-20}} = \mathbf{8.824 \times 10^{-09}}$$

for the 'H' face 2D membranes - and similarly,

$$\frac{7.854 \times 10^{-29}}{8.900 \times 10^{-21}} = \mathbf{8.824 \times 10^{-09}}$$

for the 'S' face membranes.

Before this apparent coincidence can be properly explored any further, a final (possible) characteristic of the *Stage 2* reconfigured teddy should be considered. This has to do with the

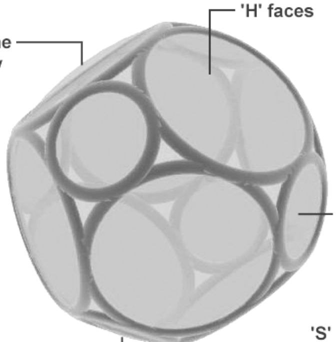

Figure 10.4.01 *Because of the centripetal effect of rotation and/or the influence of a resultant electric field, the teddy's 2D membranes may take on a characteristic very similar to convexity.*

shape of the rotating 2D membranes themselves (hinted at above) and what may be the result of both a centripetal effect because of rotation - and a distortion caused by the possible presence of an electric field; in turn, produced by these moving 2D membranes against their parent boundary chords. This will be called ***membrane convexity*** and is illustrated within Figure 10.4.01 in the previous column.

Apart from the obvious effects on shape, the major consequence of this would be an increase in the membrane's surface area due to this additional convexity. Considering the scale of the teddy, this would not amount to much, but may be sufficient however to change the value of the 'common relationship' described on the previous page. A change of just a very small percentage in this figure for both the (now slightly convex) 'H' and 'S' face 2D membranes will increase the apparent 'strangeness' of this coincidence.

This would almost (but not quite yet); allow this common relationship the ability to correspond to the numerical value already attributed in the 'real-world' to the ***permittivity of free space*** (ε_o) where originally, the Greek letter 'ε' represented the ratio of electric displacement in a medium : to the electric field intensity producing it.

However, for this parameter to work properly within this model and in the context described here, it would require a magnitude adjustment in order to take into account the fact that most of the linear measurements used here, are in *centimetres* and *NOT* in meters as is usually prescribed for this particular value (i.e. usually defined as $8.854 \times 10^{-12}\ F\ m^{-1}$). This will not solve this difference completely, but, considering the fact that one is also dealing with a *two-dimensional* phenomenon; the inclusion of a 2D conversion factor *MAY* be seen to remedy this situation.

It is of course, early days and a more detailed examination of this coincidence will be discussed further in Chapter 12 and especially within Chapter 15 of this submission.