The Quarks: A Beautiful Coordinate System

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A brief history, referenced from Wikipedia:

> *The quarks were proposed by physicists Murray Gell-Mann and George Zweig in 1964 shortly after Gell-Mann's 1961 formulation of a particle classification system known as the 'eight-fold way' in 1961.*
>
> *Quarks are a type of elementary particle called hadrons, the most stable of which are found as components of the nuclei of atoms (protons and neutrons). They are never found in isolation and are found only within hadrons, including baryons (protons and neutrons), mesons, or quark-gluon plasmas.*
>
> *Quarks have various intrinsic properties, including electric charge, mass, colour charge and spin. and are the only elementary particles in the standard model to experience all four fundamental interactions/forces — electromagnetism (EM), gravitation, the strong and weak interaction — and, are the only known particles whose electric charges are not integer multiples of the elementary charge.*

I propose that the quarks form a coordinate system of nine of the 10 dimensions of the Poincaré group's 3+3+(3+1) dimensions. They are spatial dimensions of length, height, and width, l/h/w, plus one time dimension. Where the first two sets of 3+3 represent a fixed set and a rotational set (superimposed) and can be used to model the early-era Planck scale universe, the third set in the (3+1) are introduced to transform a 3D space/object into a 4D space/object, and are offset to the 3 fixed + 3 rotational sets.

The 3x fixed set and the 3x rotational set are quaternionic in nature. With the 3x offset set plus the time dimension (3+1) they are octonionic in nature. However, I replace the quaternion terms $i/j/k$ for $L/H/W$.

I assign the colour charges of the quarks to the dimensions as, length = green, height = blue and width = red. With the quarks as hadrons, they become opposite partner pairs of the dimensions. The quarks, now coordinates of $L/H/W$ are forward (f/w), backwards (b/w), up, down, right and left.

Fig. 1 and Fig. 2 superimpose over each other. The fixed set of Fig. 1 measures the change/ difference of the spin/rotation of Fig. 2. Without the fixed set of Fig. 1, there would be nothing to measure Fig. 2 against, and spin/rotation would not exist.

The superimposed Fig. 1 and Fig. 2 emerged from a single point/source, where, together with expansion (lengthening of the dimensions) and, in an isotropic manner, create a potentially infinite field of positive electric energy: the electric field. The velocity of the expansion of this system is unknown to me.

The rotation of the expanding Fig. 2 creates enhancement when the system is at half spin/rotations, where the quarks have been rotated to their squared coordinates at Fig. 1

and, having been rotated through $90° \times 90°$, the system is now in an anti-position, with rotated up-quark carried around to the down fixed coordinate, and the down quark carried round to the up fixed coordinate. The same process applies for the other quarks, also.

New negative points are created at a distance equal to the lengths of the expanding dimensions, and form the shell of the nucleus. An anti-quark is a quark in its opposite coordinate of opposite charge and anti-colour. However, I do not know what the anti-colours are. I represent them as lighter shades of the green, blue and red colours listed in Fig. 1 and Fig. 2 (see Fig. 4).

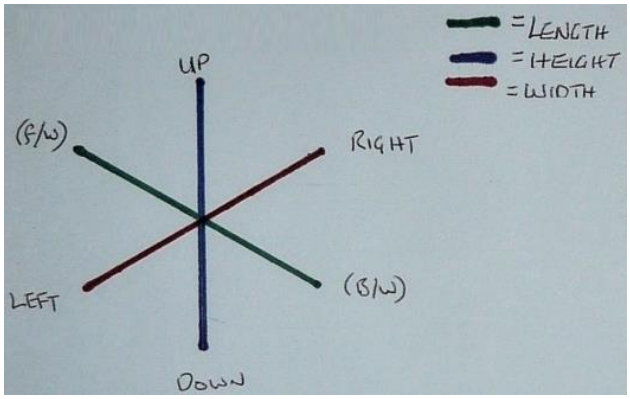

Fig. 1. Fixed Set.

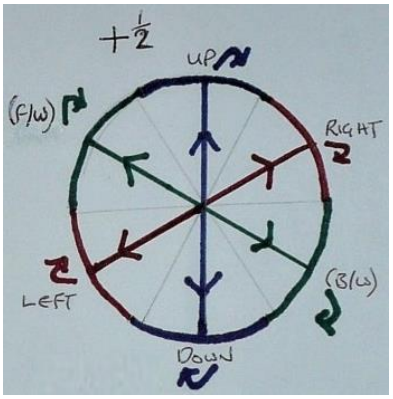

Fig. 2. Rotational.

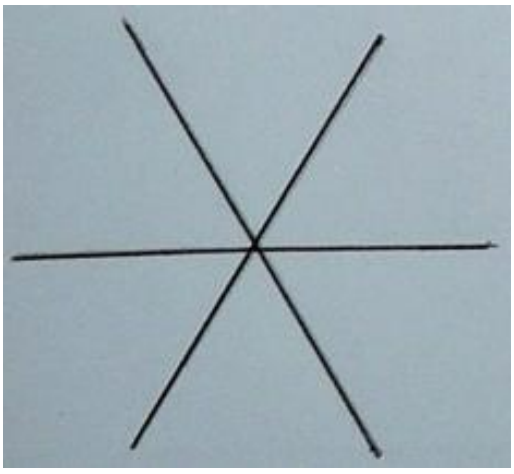

Fig. 3. Offset Set: Neutrons.

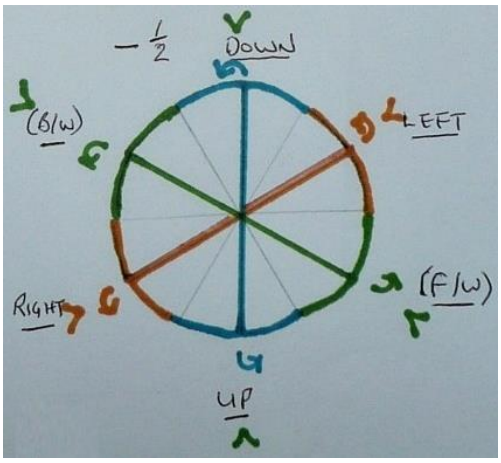

Fig. 4.

The negative charge creates the magnetic field effect, and the spin rotation is in the opposite direction.

Another half spin by rotation of $90° \times 90°$ shows the quark/anti-quark electromagnetic system. See Fig. 5.

Fig. 3 shows the set of 3 of the (3+1) spatial plus time dimensions (not coloured). They are border/boundaries where the colour charges meet and are neutral.

The time dimension (not shown) lies along the line of sight through the center/source 90° to the horizontal dimension.

Fig. 5 is the system after one complete rotation/spin. All coordinates of the 3x fixed set and the 3x rotational sets are again aligned.

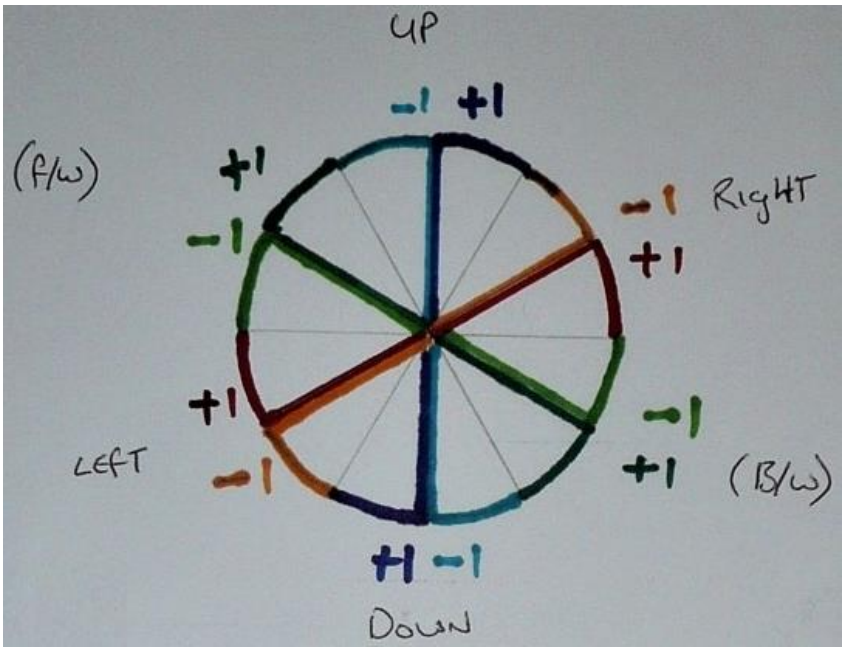

Fig. 5.

Here we can see examples of mesons in the forms of valence quarks. Each coordinate contains a quark/anti-quark pair (pion), e.g., the up coordinate contains an up quark and down antiquark pair, and the down coordinate contains a down-quark/anti-up quark pair (of height dimension). A more exotic meson (tetra-quark) can also be seen between the up and down coordinates in the form of an up quark/anti-up quark, and down quark/anti-down quark pairs. See Fig. 6.

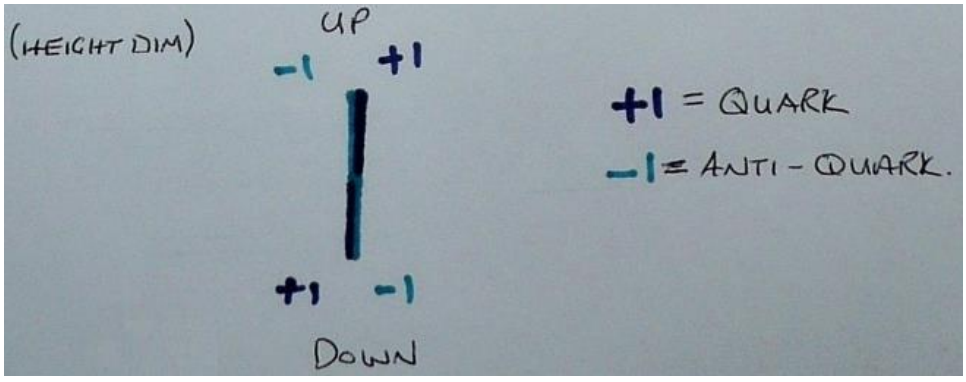

Fig. 6.

Examples of the strong and weak forces can be seen as interaction between quark pairs. For example, the strong force is the interaction between an up-quark/down-quark pair, where both up and down are repulsive and travelling away from each other from a source.

Also, the weak force is the interaction between the anti-down/anti-up quark pairs. They are attractive and travel back towards the source, and is electromagnetism. See Fig. 7.

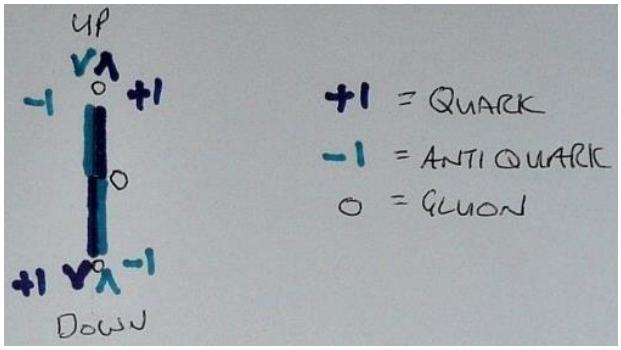

Fig. 7.

One complete rotation of the height dimension begins as up-down-up and down-up-down spin.

Fig. 8 is below. It is like Fig. 5, but labelled with appropriate particles.

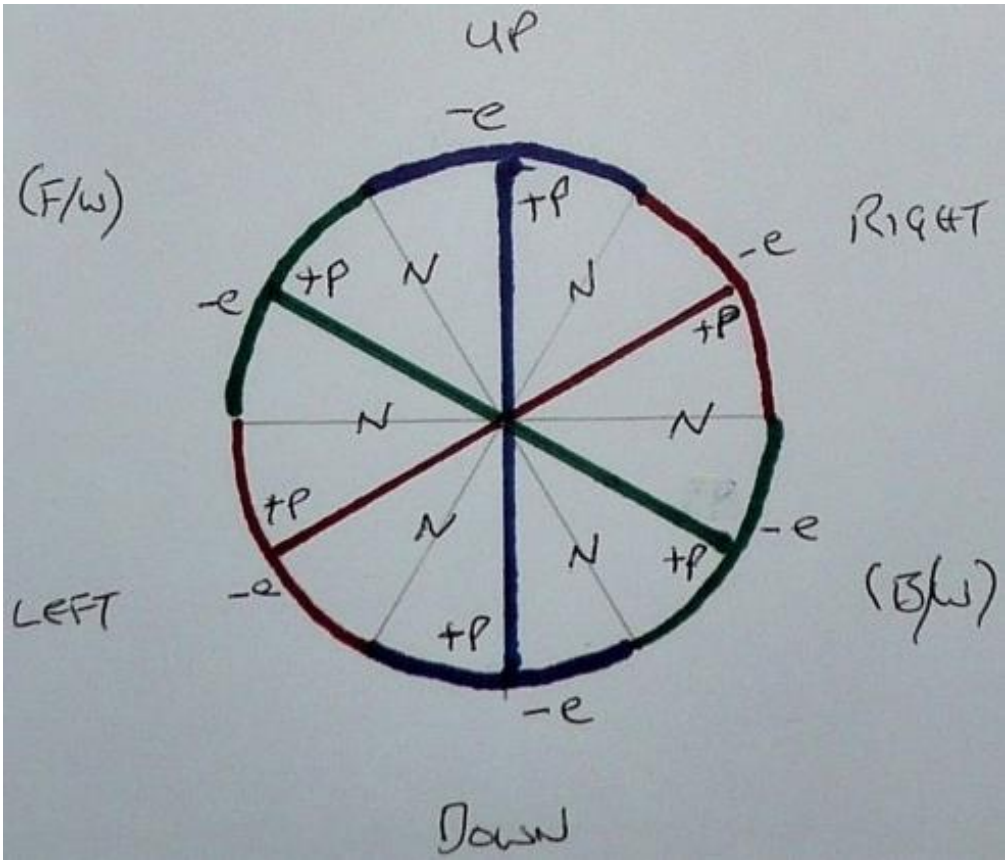

Fig. 8.

Expansion and rotation of the system continue at c, where the second rotation creates more new points by entanglement. Transforming the 3D spherical system into a 4D hyper-cubic system by introduction of the (3+1) spatial and spacetime dimensions. See Fig. 9.

Fig. 9 shows an underlying 4D hyper-cubic structure of the system, where the system has made two complete of rotations of four half spins represented by the four cubic orbitals.

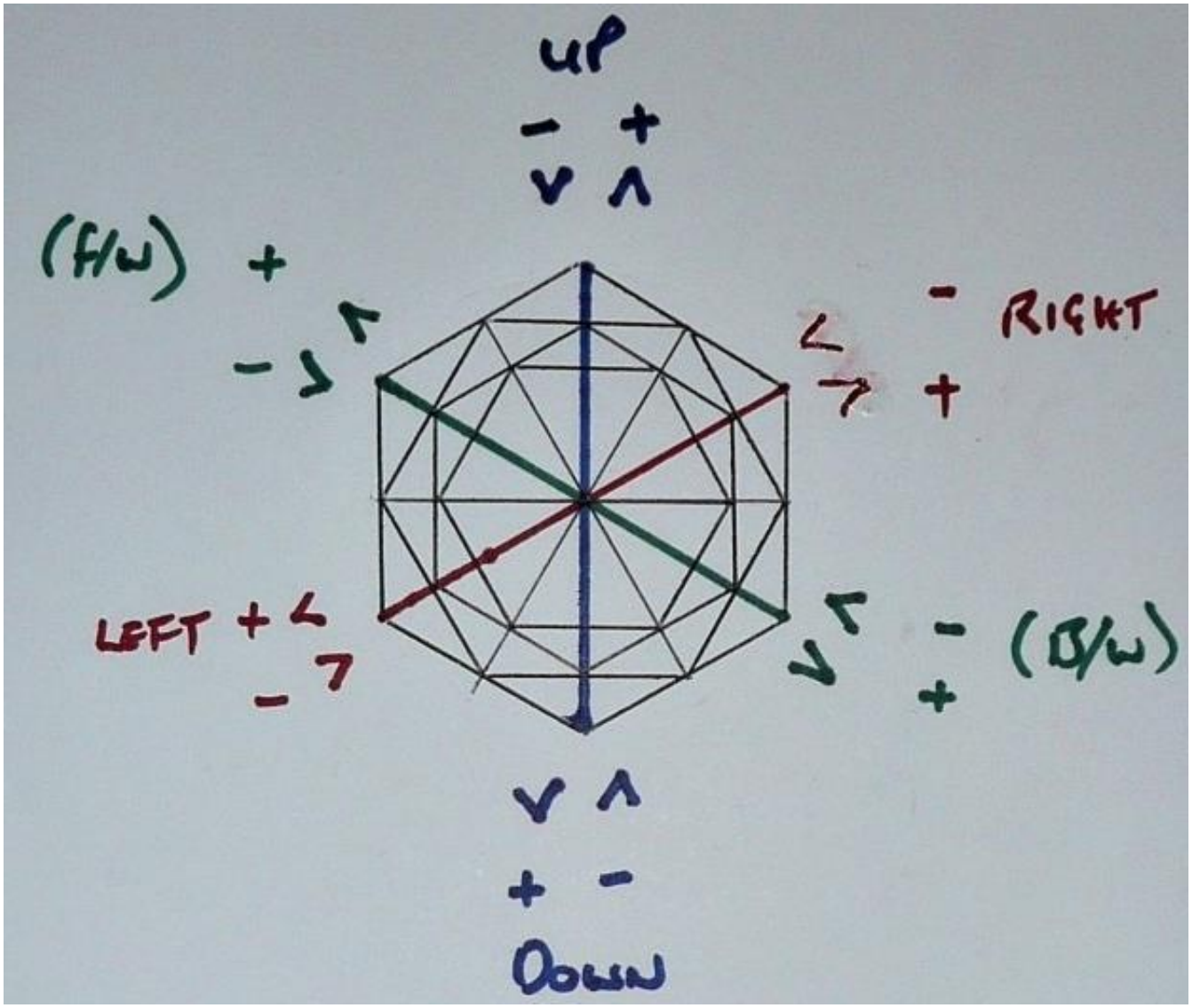

Fig. 9.

As my drawings can only be represented in 2D, they are representations of 3D and 4D space objects. And, to appreciate Fig. 9 more clearly, it should be viewed more akin to an optical illusion where you are not seeing the top near corner or the bottom far corner of the outer cube, the connecting spacetime dimension, or the positive and negative aspects of the dimension, which are all hidden by line-of-sight when looking through the center/source point.

This structure is very useful for the migration of energy to orbital shells via connecting suborbital shells.

The cubic structure can be removed and replaced with a spherical structure, as it is a rotating system, where any point on a rotating system would display curvature.

The cubic system is the result of the gravitational effect, where the negative aspects of the eight corners of the cube (six shown in Fig. 9 plus the two explained in the optical illusion analogy) and all connected through the center point/source are a set of nine tensor points. The positive aspects are scalars.

However, the gravitational effect as a set of negative tensors can only tend back towards zero/center/source as far as the nucleus/core of the system, the nucleus/core being all positive and neutral, hence why gravity is considered a weak force.

Fig. 10 shows the appropriate particles in the up coordinate. The same applies to all other coordinates.

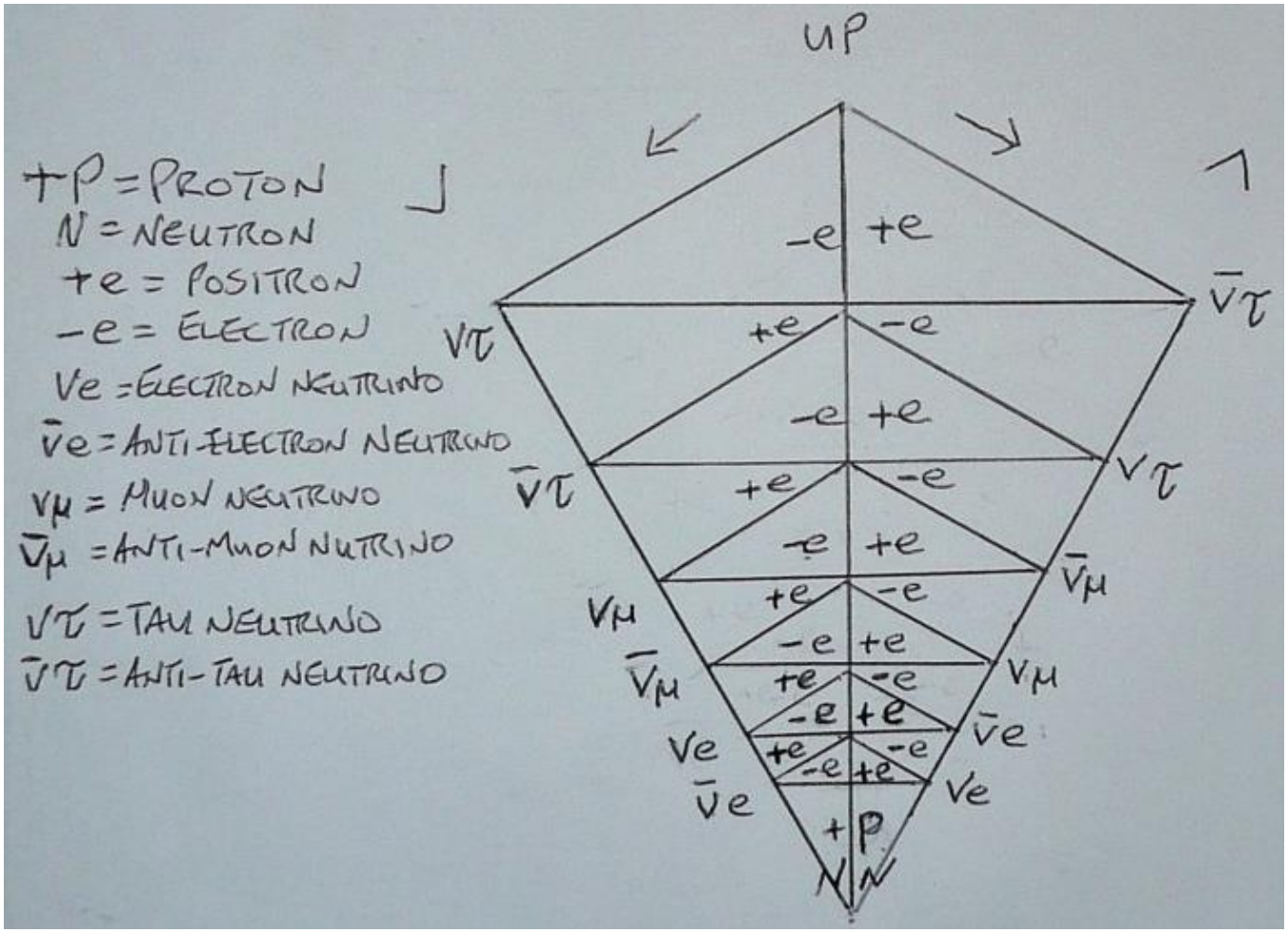

Fig. 10.

Fig. 9 shows the system at two complete rotations of the rotational set of dimensions. Fig. 10 shows the system at six complete rotations, where each half spin of the rotation produces a fine-structure/suborbital shell or an orbital shell of an energy level.

Fig. 10 shows neutrinos. They operate on the three spatial dimensions of the offset (3+1) set, and are the result of the decay of annihilated $-e$ (electron) and $+e$ (positron) pairs, the (3+1) dimensions being extensions of the neutrons in the nucleus/core.

Fig. 11 shows the underlying hyper-cubic structure at six complete rotations, each orbital and suborbital shell being an energy level n. It shows a spiral rotational graph of the inverted $n6$ to $n1$ levels. The unraveled spiral looks similar to the Lyman series.

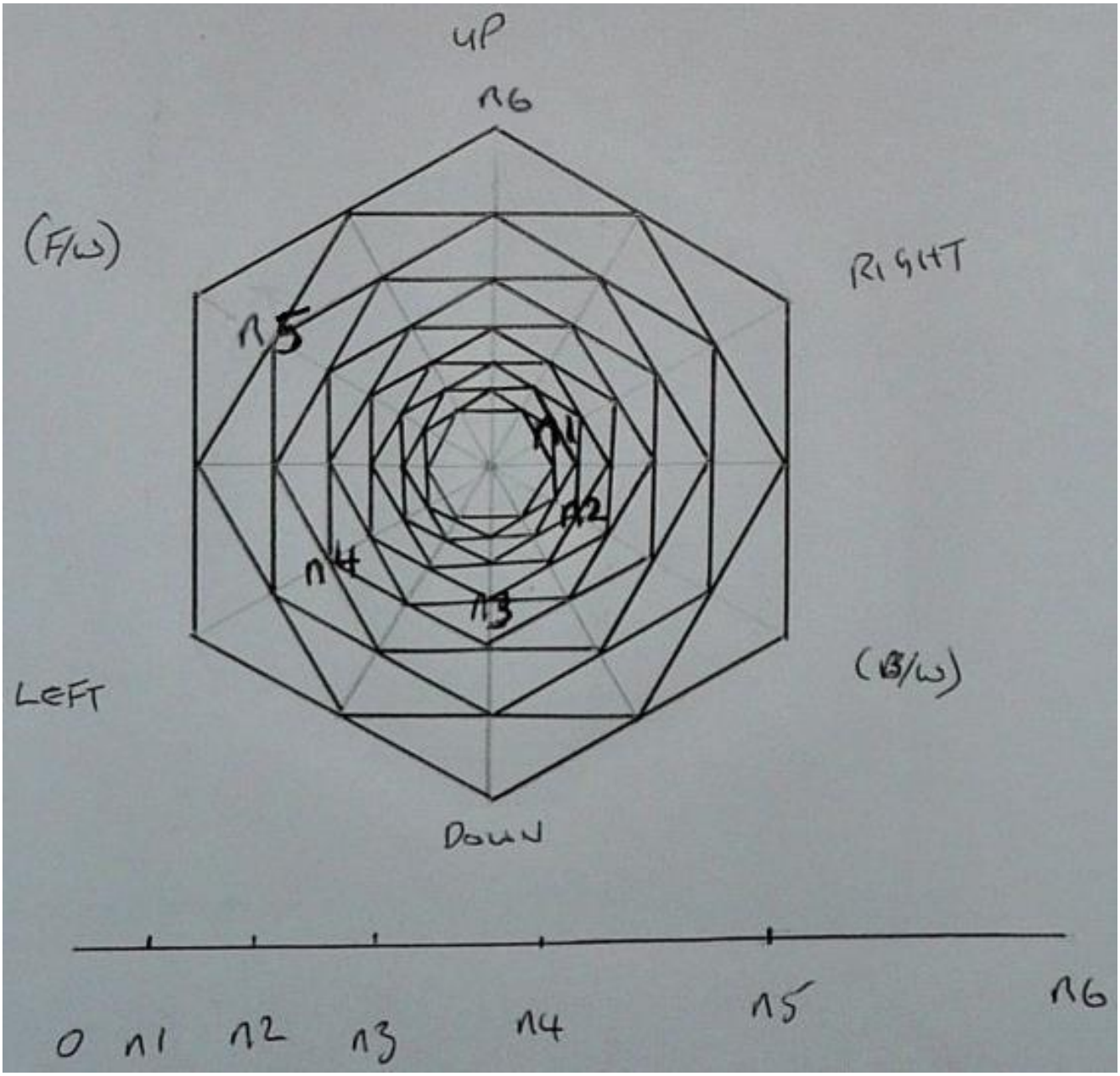

Fig. 11.

The underlying structure is useful for the migration of energy to and from energy levels/orbital shells.

When the structure is removed and replaced with a spherical structure, we are left to assume that "electrons can jump orbitals."

Fig. 12 shows the system after three rotations and, with the hyper-cubic structure and fine-structure/suborbitals removed and replaced with spheres. It looks much more like the popular representations of atoms.

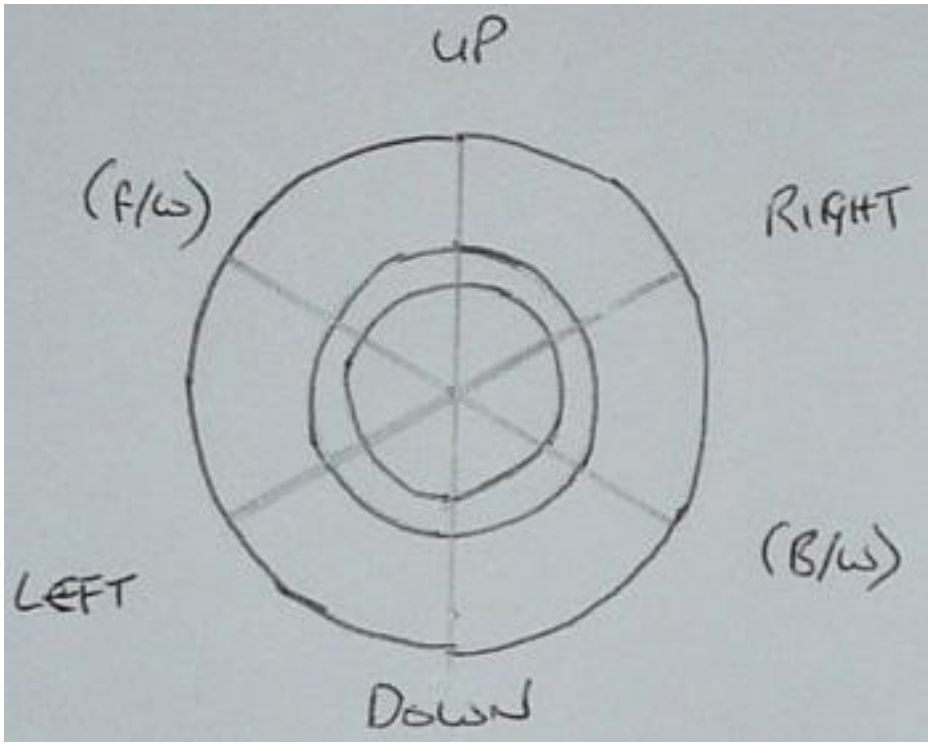

Fig. 12.

The intention of this exercise is to show how a quark coordinate system based on the ten dimensions of the Poincaré group, together with the quaternion and octonion forms, can produce a 3D and 4D space/object, with the use of drawings and explanations, but without math as such, although some early Figures clearly are quaternionic (labelled with ijk), having only suggested the math forms responsible for this model.

This is the quaternionic equation. I use terms $i/j/k$ replaced for $L/H/W$.

$$L = H = W = L/H/W^2 = -1$$
$$\text{where } \left(\sqrt{3} > 0 > \sqrt{2}^2\right) = (1 > 0 > -1)$$

This exercise began with refences from Wikipedia. And, although it is useful, it should not be relied upon as an accurate source of information, and, is subject to definition changes. One such change is that it now states there are six types, known as flavours, of quarks: up, down, charm, strange, top and bottom.

It used to state something along the lines of the quarks have three colour charges and three flavours associated to them! I prefer the older version, and would say that the three flavours represent the three sets of 3× fixed set, + 3× rotational set, + 3 of (3+1) offset spatial and spacetime dimensions of a beautiful quark coordinate system, with quarks (f/w), (b/w), up, down, right and left, being coordinates of an isotropic space/object of the three dimensions $L/H/W$.