A Complementary Geometric Explanation of the 3 Flavours

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Abstract

An alternative/complementary geometric explanation for the 3 flavours of matter is put forward and then examined with a critical eye. The conclusion is that the 3 flavours of matter arise from the external structure of the W and Z bosons.

The Three Flavours of Matter

Why are there 3 flavours of matter? This question has been on the 'to do list' of particle physicists since the Standard Model was first worked out in the early 1970s. Back then, Anthony Zee and Stephen Barr believed that the answer to this question lay in the relatively large mass of the top quark. In 2008, Fox and Bogdan Dobrescu revived this opinion. The average energy of the Higgs field is roughly the same as the top quark's mass, suggesting that the two might be intrinsically linked. The rest of the masses of the particles are like 'rounding errors', by comparison, according to this line of thinking.[1]

Elsewhere, particle physicists are wary of attempting to learn anything about particles based on the ratios their masses. Strassler commented on his website;

> *You can play lots of games with numerology; the top quark mass is closed to sqrt(2) * the Higgs mass, the Z particle mass is close to the Higgs mass / sqrt(2). But when you try to calculate these things in real theories, such simple ratios do not generally emerge for particle masses; quantum corrections move things around a lot.*[2]

Obviously, the mass of the Higgs particle is different to the size of the Higgs field, but his meaning is still apparent. The average vacuum energy of the Higgs field is around 246 GeV, while the mass of the Higgs particles is only around 125-7 GeV. When we compare that to the mass of the top quark (173.2 GeV), it is clear that top quark is closer to the mass of the Higgs particle, than the value of the Higgs Field. But that is neither here-nor-there from the point of view of Fox and Dobrescu's theory, which is only concerned with the VeV of the Higgs Field, in any case.

From the perspective of the research I have done into Dimensional Gate Operators, I am inclined to agree with them that there is some significance between the mass of these particles and their relationships to the energies of the fields. In fact, if we look at the XNORed Higgs, we will recall that it had 126 unique data points, which is directly in between 125 and 127 GeV. The total number of points in the Higgs and Graviton is 59049. In another preprint, I played my own numerological games with this number. If you take $\sqrt{59049}$ it is equal to 243, which is very close to the value of the Higgs Field, but we noted that it was not close enough. [3]

However, later on, I noticed that the number of unique points in the XORed Higgs particle is equal to 373. Now, 373 - 126 = 247, which is very close to the actual value of 246.22. Now surely that can't be a coincidence.

Whether it is a coincidence or not, I'm not convinced that the answer to the 3 generations of matter does lie in the ratio of the top quark to the Higgs field energy value. It seems to me that this area of research is too narrow to produce good results for not only the quarks, but all of the leptons, as well. A far better explanation can be found — once again — in the physics of Dimensional Gate Operators (DGO).

Exponential Growth

XNOR is the rule set that governs imaginary numbers and XOR rules the real numbers.[4] We can add, subtract, multiply and divide — or do any other kind of arithmetic — with the imaginary and real numbers, if we first privilege the XNOR (!Δ) values over the XOR (Δ) values and then the reverse:

$$!\Delta(x)*\Delta(y) = !\Delta(z) \tag{1}$$
$$\Delta(x)*!\Delta(y) = \Delta(z) \tag{2}$$

Finally, we sum both values in XOR:

$$!\Delta(z)+\Delta(z) = (\Delta)w \tag{3}$$

Since, !Δ and Δ are non-commutative (Δ)w must equal 0. And we can do the same process again, this time with addition:

$$!\Delta(x)+\Delta(y) = !\Delta(z) \tag{4}$$
$$\Delta(x)+!\Delta(y) = \Delta(z) \tag{5}$$

Finally, we sum in XOR, and we have our result:

$$!\Delta(z)+\Delta(z) = (\Delta)w \tag{6}$$

But now we notice something really strange and seemingly inconsistent.

We can simply continue the process of addition seen in equation (4) and (5) when moving onto equation (6); see (7) and (8).

$$!\Delta(z)+\Delta(z) = !\Delta(w) \tag{7}$$
$$\Delta(z)+!\Delta(z) = \Delta(w) \tag{8}$$

Indeed, this process is neverending and each time the results of the equations are added together their sums necessarily grow bigger (See Fig 1-4).

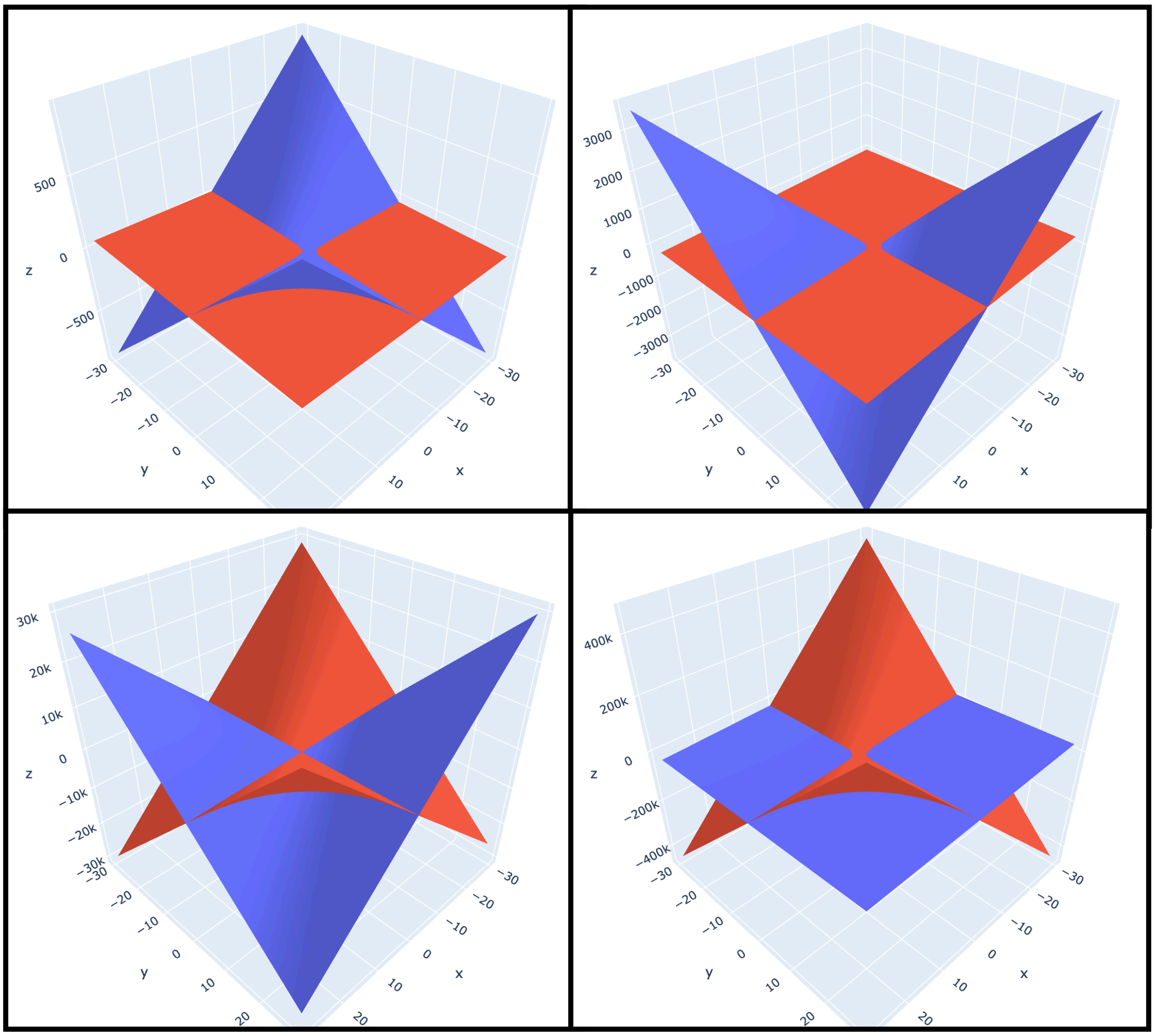

Fig 1 to 4 (Crosswise from top-left): The result of continuous !Δ and Δ multiplication over a range of -30 to 30.

But suppose we don't permit the process to be neverending. Suppose we restrict it merely to three iterations or 3 generations? Now, we can use this to build a convenient model of the 3 flavours of matter. And it is this exact model that we have been using to build the 3 generations of matter. [5, 6, 7]

Tables of Elementary Particles

So what is preventing us from going any higher than 3 generations? The typical answer to that can be found in another previous own preprint, this time detailing how the particles of the Standard Model fit in with the hyper-Complex numbers first discovered by Hamilton, also known as the Quaternions and Octonions. [8]

In that preprint, it wasn't difficult to show that the 3 generations of matter are themselves the result of the restrictive dimensions of the very matrix from which they emerge. (See Fig. 5)

g	*d*	*c*	*t*	H^1
u	*y*	*νe*	*μ*	H^2
s	*e*	*y*	*ντ*	H^3
b	*νμ*	*τ*	*y*	H^4
H^1	H^2	H^3	H^4	*G*

g	*d*	*WZ*	*c*	*WZ*	*t*
u	*y*	*νe*	*μ*	H^1	G_1
WZ	*e*	*y*	*ντ*	G_4	H^2
s	*νμ*	*τ*	*y*	H^3	G_5
WZ	H^1	G_6	H^3	G_3	H^4
b	G_2	H^2	G_7	H^4	G_8

Fig 5: The Quaternion and Quinternion Matrices

It is especially easy to see this feature in the Quaternion matrix (Fig 5: LEFT), prior to its expansion to the Quinternion matrix (RIGHT). As we can see, the three quarks (d, c, t) are all collected together at the top of the matrix along the x-axis, and the lighter quarks (u, s, b) are arranged down the y-axis. Even after the matrix is expanded and later broken up, this feature remains. As does the tripartite groups of the leptons in yellow, at the centre of the Quaternion matrix.

Now, that we have spent time looking at the problem and how it was solved prior, I would like to examine it from an alternative geometric approach.

The New Geometric Approach

This new geometric approach actually occurred to me prior to the matrix method explored in the last section, but I neglected to mention it much earlier, as I did not think it was as strong or convincing an answer. Since writing this paper, however, I have begun to change my mind and I am now fairly confident that part of the answer can be found in the stellated geometric forms of the rhombic dodecahedron (RD).

Recall that the RD was the first geometric solid that we encountered out of the DGO Quaternion Multiplication. This 4-dimensional figure stood to represent both the gluon and the W and Z bosons, by way of differing logic gates. [9] One of the interesting geometric properties of the RD is that it has exactly three stellations, not including the base stellation. Some sources include the base stellation in this count, [10] but the first one I encountered did not. [11] In a way, this makes sense to me, as the base form is not really a stellation. Another way is to have the RD at index 0 and the others at indices; 1, 2, and 3 respectively.

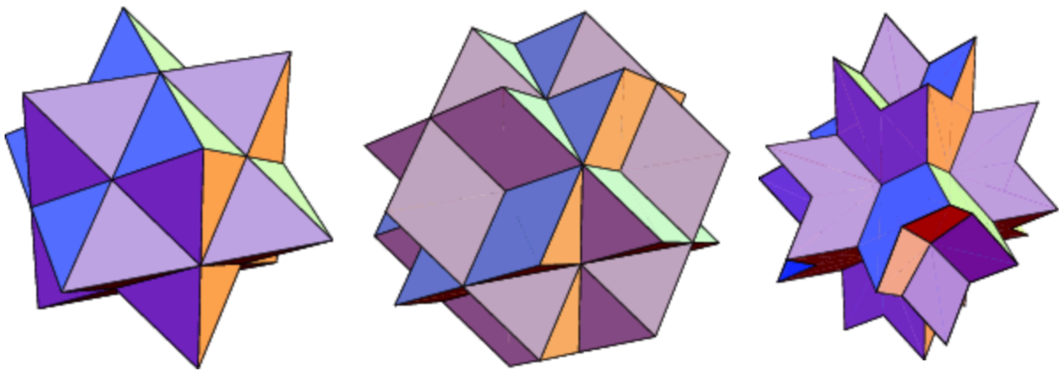

Fig 6: The 3 stellations of the rhombi dodecahedron

While it is true that no more regular stellations of the RD exist past index '3', the reason for this is less easy to ascertain. One explanation I've found indicates there are no more 'regular stellations' beyond the final stellation. [15] If the analogy to the particles holds, this implies that the bosons — and by extension all of the other matter flavours — must be entirely geometrically regular, otherwise they either cease to exist or cease to be effective.

Deep Questions

You may be wondering, as I was, why these stellations apply only to the bosons of the electro-weak or strong family and not to the quarks and leptons themselves. After all, aren't we concerned with the 3 generations of matter and not with the 3 generations of bosons, which — to my knowledge, at least — isn't even a thing?

In my assessment, there aren't really 3 generations of W boson or gluon, but there can be differing energy levels of them. If these different energy levels mean they have different effective masses, then that might lead some to call them a new particle, but I don't think that is really think this is the case.

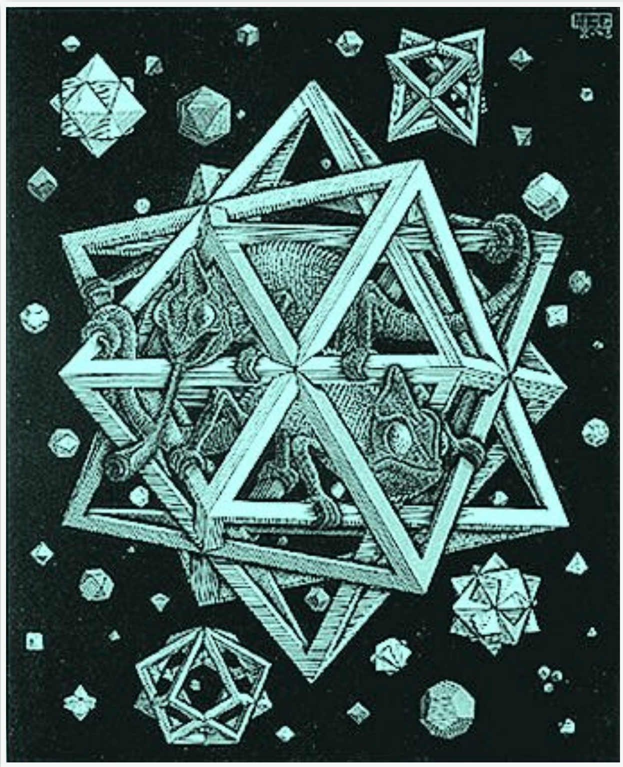

Fig 7: 'Stars' by M. C. Escher. Wood engraving, 1948. Fair use. [12, 13, 14]

Another issue we face is in trying to find a similar limit on stellations for the rhombicuboctahedron (RCO) and cuboctahedron, which — as we know — represent both the photons and the W and Z bosons and also line-up with the charged leptons. As far as I can tell, however, no such limit exists on these forms. Or if it does, it is not strictly limited to only three stellations… But, as it turns out, the solution to this problem is really rather simple and bears very much in the way of similarity to the solution first mentioned at the start of this preprint and first proposed by Stephen Weinberg.

According to Weinberg's theory, it was the mass of the top quark, which was the most important or 'real' result and the rest of the masses of the matter particles were no more than mere rounding errors. If you recall, it was this observation that was leading Fox et al. to believe that the Higgs Field was the cause of the 3 flavours. [1]

But, it is rather the geometry of the W and Z bosons which are responsible for this restriction. This makes sense, because in the DGO model, the W and Z bosons create the quarks, but they also create the weakly interacting leptons. And since that includes the charged leptons, like the electron and muons, and their associated force mediator (the photon), then it stands to reason that they would be restricted in the same manner.

Or said another way, it is stellated polytopes all the way down…

And so, we see that all of the particles below the W and Z bosons share this tripartite nature, but none of those above it do. In fact, the Higgs and Gravitons only have one generation, and they don't have a RD structure, so they are a perfect example of what I mean. It is therefore reasonable to assume that the 3 generations of matter, do not stem from the Higgs field or top quark, but rather from the electro-weak sector of the bosons.

Testability?

If we were able to probe into the field of the Weak Force, we might to able to see some of the geometry exhibited by the 3 stellations of the rhombic dodecahedron. But, given that the Weak Force is such a short ranged force, I think this measure would be unlikely. However, since the quarks, the photons and the leptons all appear to inherit something of their structure from these stellations, it might then be possible to discover its fingerprint in that location instead.

Therefore, it would be interesting to see if the angles and lengths of these three stellations have been produced prior in some kind plasma or electrical experimentation. The RD has octahedral symmetry, as does the cube, RCO, CO, and all of the other polyhedra of the DGO Standard Model. Electromagnetism exhibits octahedral (and tetrahedral) symmetry at very small scales (see electron orbitals and Crystal Field Theory). [16, 17, 18] This is a good indication of the DGO being the correct theory to model the fundamental particles and forces of the Standard Model. We will talk about octahedral and tetrahedral symmetry in relation to DGO in a late paper.

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