Storrs Connecticut 2018 Proceedings of the CNPS 1 (with few small 'typo' errors corrected)

Models giving the Xi Double-charm Baryon and Higgs Masses

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This article shows a drawing of a platonic-related pattern of spheres that generates a sphere volume Ratio nearly equaling the mass Ratio of the empirical Higgs boson to proton. (My older NPA article just included a precise word description of that drawing.) I also give the updated value for the empirically estimated Higgs boson mass, still quite near my drawing's estimate. And I also discuss the mass of a more recently discovered particle by the super-collider group, called the "Xi double-charm baryon". I note that its mass is near the average mass of two already known particles. And midway between two others, too. That 'Averaging Method' also worked well in my older journal articles. Further comments are made about all of the above.

1. The Main Introduction

Part 1 of this article is devoted to the Higgs boson. I give an updated empirical estimate of the Higgs boson mass based on additional analysis by the super-collider specialists, which likely reduces slightly the previous small un- certainty in their earlier estimates. I also provide a helpful drawing showing a pattern of spheres, based on a 'Platonically constructed' layout, which remarkably exhibits a sphere Volume Ratio that nearly equals the Mass Ratio of the Higgs boson to the proton. (I showed that drawing, previously, in an old NPA talk, but only included a precise word description of it in an old NPA proceedings book.)

In Part 2 of this article, we discuss the estimated mass of a more recently discovered particle by that super-collider group. They named the particle, the "Xi double-charm baryon", denoted: Ξcc^{++}.

Interestingly, we note that its mass is nearly the same as we get by averaging together the masses of one pair of already existing and known particle masses. And we also note the existence of yet a different pair of empirically known particle masses. And that averaging that other pair also gives a mass nearly the same as the mass of that newly discovered particle, too. And we note that we have often used that 'averaging method' or "paradigm" before. And that, even then, it often remarkably resulted in an average mass value that nearly matched another major particle mass.

Additional interesting comments are made about the subject of Part 1 and Part 2, above.

2. Part 1, More Discussion of the Higgs Boson

We will now discuss the Higgs Boson mass. And some history regarding scientists' attempts to understand why the various particles, in the vast physics 'particle zoo', have the major mass ratios that they have.

2.1. Scientists' Quest to Understand Why the various Particle Mass Ratios exist

First, we will discuss the importance of knowing why prominent particles, especially those historically termed Elementary Particles, exhibit the particular mass ratios they do. I.e., the different ratios noted when comparing one particle mass with another.

That is – we and some top scientists have aimed to theoretically predict, calculate, and understand each empirically exhibited major mass ratio and with considerable accuracy. And, hopefully, far better than the common present method. I.e., "adding up the supposed new elementary particles and etc., the quarks' and etc.'s approximate masses – theorized to comprise the most prominent particles". Such as the prominent Proton, Neutron, major Pion class, and Kaon class.

One present problem is that those prominent particles have masses of hundreds of MeV/c^2, but very often the quarks, that are supposed to compose them, have typical masses of only several MeV/c^2.[1] Therefore, the main bulk or mass of many prominent particles, like the proton and neutron, is very poorly accounted for.

That problem has persisted, even though the quark treatment may help account for very small mass differences between particles which have almost the same high bulk mass. For example, like the proton and neutron, having only a slight difference between their bulk mass. So, I think that problem has been like winning a lot of little battles, but losing the war!

And, strangely, as of 2-19-2018, the following frank, but likely true, statement was found in a seemingly professionally-written Wikipedia article entitled, Higgs Boson: *"The Standard Model does not predict the mass of the Higgs boson."* That Wikipedia article gave a reference number, 92, to support that statement.2.2.

2.2 My Paradigm and Sketch, and other Scientists wishing to understand Mass Ratios

SEE NEXT PAGE for my important FIG. 1. I think many Nobel Prize laureates have bemoaned, frankly, the great shortcoming in estimating and under- standing particle mass ratios.

Einstein, for example, apparently looked forward to theoretically solving the mass ratio problem quite well, but he never did.

In an speech in 1930, Einstein clearly expressed his aim, as summarized and translated by a science reporter, as described below [2]: "This does not finish the program by a long way. It has been solved for what he calls 'quasistatical motions,' but he also wants to derive elements of matter (electrons and protons) out of the metric structure of space. No doubt much work will have to be done before this is achieved."

And John A Wheeler, an admirer of Einstein, wrote, in a thousand-plus page book, the following, "**What else is there out of which to build a particle except geometry itself**?"[3]

(Although my handling of that geometry issue is different from Wheeler's and Einstein's, I have, remarkably, been quite closely estimating the major particle mass ratios for 25 years.[4-6]) And at least I agree with where they advocated starting at: "Build a particle out of geometry itself".

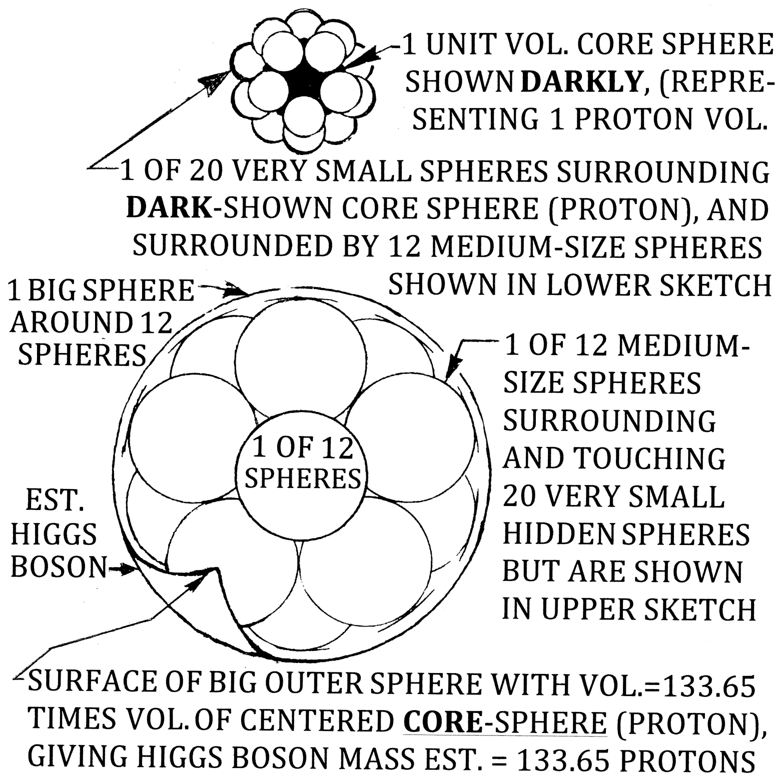


Figure 1. Higgs Mass Dwg.

Isn't that what I've done in Fig. 1, above? I.e., used a geometric drawing ratio to almost exactly match the mass ratio of the Higgs boson to proton! And the geometric volume ratio that my drawing generated is 133.65 to 1, very close to the most recent empirical estimate of the Higgs boson to proton mass ratio: 133.32 to 1.

And the success involves the most basic sphere patterns – many being quite analogous to patterns exhibited by the five Platonic Solids, themselves, and thus "without bending Euclid (or Euclidean Space)"!

In fact, even if the above very near match with the 'Higgs' was 'just coincidence'– which I doubt, still consider this: The use of such super-symmetrical, advanced, platonic pattern to achieve even a coincidental near match with such advanced and unique particle as the 'Higgs' — would be noteworthy!

Quite a number of other scientists have also frankly expressed the need to understand particle mass ratios:

Feynman, in an interview shortly before his death in early 1988, was quoted as saying, "Why is it that the mass of the muon compared with the electron is exactly 206 or whatever it is, why are the masses of the various particles such as quarks what they are? Etc., etc. There's **not an idea at the present time**, in any of the theoretical structures that I have heard of, which will give a clue as to why those masses are what they are."[7]

And **Steven Weinberg**, in a more recent book, wrote: "the standard model involves many features that are not dictated by fundamental principles but instead simply have to be taken from experiment. These apparently arbitrary features include a menu of particles, a number of constants such as **ratios of masses**, and even symmetries themselves. We can easily imagine that any or all of these features of the standard model might have been different".[8]

Thus, even up to fairly recently, very prominent Physicists have expressed the strong wish to understand and be able to estimate more accurately - the prominent particle mass ratios existing in Nature. But I think most of the mainstream has sort of ignored or obfuscated the issue. So I think, frankly, the situation has been much like the poet Schiller bemoaned, "Against ignorance, even the gods con- tend in vein."

Now, returning to my important Figure 1, and the sketches shown there: The main sketch, near the lower center of the drawing, shows one very large sphere surrounding and touching 12 fairly large equal spheres. And those 12 are surrounding and touching 20 very small equal spheres, in a manner illustrating "close packing of spheres".

But those 20 surrounded spheres have to be indicated in a smaller sketch above the main sketch because so many of those spheres would otherwise be hidden. And, even still, the position of some spheres is still blocked by others, but now their places are more clearly inferred using symmetries associated with platonic solids and close packing of spheres.

And, as shown, those 20 spheres surround and touch one centered core sphere that is shown darkly. And we note the main sphere volume ratio that results, i.e., the very big outer sphere to the dark centered core sphere - is: **133.65/1 volume Ratio**. And that is remarkably close to the most recent empirically based estimate by the super- collider specialists: **133.32/1 mass Ratio** for the Higgs Boson to proton [9].

(Note, when readers encounter particle masses ex- pressed in 'GeV' units worth of equivalent energy, i.e., mc^2; they should just make sure they are taking the ratio of one particle's energy, expressed in GeV units, to the other particle's energy, also expressed in GeV units.)

2.3. Other Interesting Facts relating to my "Higgs Drawing" and Platonic Structures

Some other points of interest are as follows: Regarding Figure 1, if we instead showed 1big sphere around 20 others, and those 20 around 12, and those 12 around 1 core sphere; the volume ratio, outer sphere to centered core sphere, would not change. The 133.65/1 volume ratio resulting would still be the same as we previously noted in Figure 1, with 1 big sphere around 12 others, and those 12 around 20 and those 20 around 1 centered core sphere. We thus say that we can employ those sets of spheres, 12 around 20, vs. 20 around 12, in two different or **'DUAL'** patterns. (And without changing the volume ratio of the outer-most sphere to the centered core sphere.)

And we borrowed that term, **'DUAL'**, from the old term, dual, used in solid geometry. There it is used to denote an aspect of the icosahedron and dodecahedron platonic solids, i.e., one solid has the same number of 'vertices' as the 'other' has 'faces', and that latter 'other' has as many 'vertices' as that first mentioned solid has 'faces'.

So either of those two solids can be imagined positioned inside or outside the other, with the center of each face of one solid touching each vertex of the other solid. And regardless of which of the 'duals' is inside or outside the other, a very special and impressive symmetry is manifested!

(The 'cube', with 8 vertices and 6 faces, and the 'octahedron', with 8 faces and 6 vertices – are also 'platonic duals'. And the dual aspect, there, is very important in generating super-prominent 'resonances' in physics, and helping to produce important particles, also. And helping us also model the resonance energy ratios or particle mass ratios that arise! But I cover that in other papers, not here.)

So, when we try to connect ancient history with modern times, we can conclude, in a sense, the following: "The Platonic structure that was the goal of the first 8 books of Euclid, and which Plato thought **god** used to help lay out the universe [10] – also helped us here to estimate the mass of the so-called '**god**' particle, the Higgs mass". And the discovery of that Higgs boson, including the success of the designed powerful accelerators needed to produce such high energy and mass particle – was a major goal of the mainstream's Standard Model of Particle Physics.

We might also note that the upper sphere pattern shown in Figure 1 (which helped us construct our Higgs mass estimate) also appears on an old tablet in an old Japanese Buddhist temple. That sketch, and others, appear in a book, *Sacred Mathematics – Japanese Temple Geometry*, with a forward written by Freeman Dyson [11]. Unfortunately, many other such old tablets (with other sketches and discourses on them) - have long been lost, no longer to be found on old Japanese temples and shrines anymore.

3. Part 2, Now we discuss the newly discovered Xi double-charm Baryon, Ξcc^{++}

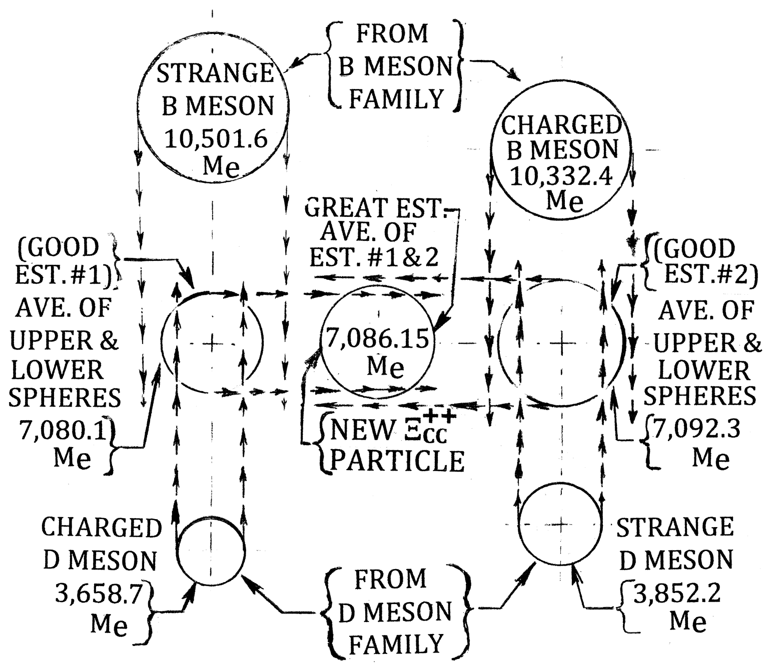
Instead of further discussing the Higgs boson, we now discuss a more recently discovered particle, the Xi double- charm Baryon.

There are <u>**Two** basically different methods</u>, that we use to derive a good particle mass ratio, i.e., a more favored 'candidate', for nature to create particles to match. Or to very nearly match.

The first method, previous illustrated, was to study a major sphere pattern, for example, incorporating platonic- related symmetries and close-packing of spheres. And note the sphere volume ratios generated by that pattern. And then noting that that sphere volume ratio does, in fact, very nearly match an empirical major particle mass ratio, like the Higgs boson to proton mass ratio, as previously illustrated. (That first method, involving major geometric patterns, is the more reliable method.)

But there is **ANOTHER METHOD** of deriving a good mass ratio 'candidate' for nature to create particles to match. And it involves **AVERAGING** together the particle masses of TWO already existing major particle masses. I.e., one of which might be a mass equivalent of a very major 'energy resonance'.

And we'll next do **THAT** to derive the mass of the Xi double-charm Baryon, which equals almost exactly **7,086.1** electron masses [12]. (And we'll temporarily postpone related discourse about it and related issues.)



NOTES: (Me) DENOTES THE MASS OF 1 ELECTRON.
(Me) = 0.511 MILLION ELEC. VOLTS (MeV) OF ENERGY.

FIG. 2; METHOD OF "AVERAGING TWO KNOWN PARTICLE MASSES" OFTEN PREDICTS WELL A "THIRD PARTICLE'S MASS", LIKE THE NEW Ξ_{cc}^{++}

Figure 2. Xi Double-charm Baryon Dwg.

3.1. Specific Average of two Particle Masses nearly equaling the Xi double-charmed Baryon mass

We will now give our first example illustrating our averaging method, by averaging together two rather accurately known masses of existing particles, as follows:

We average the mass of the *strange B meson (10,501.6* electron masses) with the mass of the *charged D meson (3,658.7* electron masses): That gives us an *average of 7,080.1* electron masses. That result is about 6 electron masses low of the new **particle's 7,086.1** ref. electron masses, but still noteworthy.

(Miscellaneous Comment: That miss, an estimate about 6 electrons too low, is a miss that is somewhat greater than desirable. But still quite close enough to merit attention, especially when trying to estimate the mass of a particle of rather high mass. And that estimate becomes even more respectable and meritorious if the averaging of two different other particle masses also gives a mass close to that targeted empirical-estimated mass, 7,086.1 electron masses. And that referenced second independently averaging-based example will now be given below.)

As our second example, we now average the mass of the *charged B meson (almost exactly 10,332.4* electron masses) with the mass of the *strange D meson (3,852.2* electron masses): That gives us an *average of 7092.3* electron masses. That result is about 6 electrons masses high of the new particle's **7,086.1** ref. electron masses, the empirically estimated mass.

(Miscellaneous Comment: This time our estimate is about 6 electrons too high, instead of about 6 electrons too low. So, again, our miss is somewhat greater than desirable, but still quite close enough to merit attention, and, again, especially worthy when trying to estimate the mass of a particle of rather high mass. And our second estimate is even better than otherwise, because it was calculated using data quite different and independent from the data used in our first example of averaging.)

(Incidentally, in our second example, we could have used the neutral B meson instead of using the charged B meson, in our averaging, because the neutral B meson has almost exactly the same mass as the charged B meson, almost exactly 10,332.4 electron masses.)

VERY IMPORTANT: We have demonstrated, above, that the averaging of two independent, different pairs of particles gave us close, noteworthy estimates to the new particle's empirical mass, our target. I.e., one estimate coming out about 6 electrons too low, and the other about 6 electrons too high. Since, AND ONLY SINCE, both estimates are respectfully close to the same target - can we AGAIN average both estimates together, the *7,080.1* and the *7,092.3*, to get ***7.086.15*** electron masses.

Thus, we deem that final, refined estimate, ***7.086.15*** electron masses, to be a good mass candidate or value for Nature to choose as a mass for a pretty important particle to nearly match. And, yes, we find that in Nature that a **real** particle exists with almost exactly that mass, i.e., that **Xi double-charm baryon** with **7,086.1** electron masses.

And thus our averaging method for use in estimating – has extremely closely matched that empirical-based target estimate – within the small experimental error expected, in that important particle case.

And, for our two different averages, nearly hitting the same target, note this: Each set used for the higher mass – a difference member of one ’particle family’; and each set used for the lower mass – a different member of another ’particle family’— an interesting, but not unusual ’entanglement’.

3.2. Other Cases where the Averaging Method Predicts Real Particle Masses Quite Well

There are actually too many other important examples to give here, where the simple averaging together of two already known important particle masses predicts the existence of another important known particle mass. And with quite respectable accuracy.

(Of course, that good result doesn’t always occur. And sometimes there are ultra-short life, less prominent particles that my methods do not simply derive. In fact, if my ’averaging method’ always ’created’ a new particle, there would be an infinite number of different mass values in- stead of finite number. And a corresponding infinite number of important and prominent particles in the physics ’particle zoo’.)

So, apparently for our averaging method to work, a ’necessary condition’ for predicting a particular good particle mass candidate is not, alone, a ’sufficient condition’. And I don’t understand, in detail, all the ’sufficient conditions’ also involved. But I believe Don Briddell’s Loop approach, or something like it, might involved a good place to start.[13]

(Incidentally, it is interesting that Linus Pauling noted, for benzene, the empirically determined bond length be- tween carbon atoms – which exhibited resonance between a single and double bond. And he noted that that benzene carbon-to-carbon bond length was shorter than that between carbon atoms associated with a single bond, but longer than that of carbon atoms associated with a double bond [14]. In a very rough way, that is a sort of averaging, too.)

We now give just a few more examples, among many, where the simple particle mass averaging method in this paper, works well. And sometimes we will merely mention names of the particles in our examples, without listing the masses. And without ’special highlighting’, but sometimes we will add a special comment:

Example 1: The average mass of the particles in the very closely knit major ’kaon family’ of particles is 970.0 electron masses. Let us average that average kaon family’s mass value, 970.0 electron masses, with the mass equivalent, 2706 electron masses, of a super-prominent ’resonance’ energy. (That latter value, 2706 electron masses, was historically termed, "the equivalent mass of lowest of three Sigma Hyperon resonance energies".) (Incidentally, that ratio, 2706 to 1, also nearly matches a sphere volume ratio, 2702 to 1, appearing in a very basic sphere pattern.)

That averaging, 970.0 and 2706, gives **1838 electron masses**, which is between the mass values of the proton and neutron, two particles with almost equal masses.

Historically, the proton and neutron have been regarded as the most important particle masses, except for, perhaps the electron mass, itself.

(Special comment: Using another method, the 'sphere pattern ratios method', we can predict quite closely the two major mass equivalences of two most prominent energy resonances. I.e., indeed, those major mass equivalences are often regarded as particles, themselves. Although those two pattern-based predictions hit very slightly lower than the empirically based calculations of the mid-point of each of those resonances - yet I think the following is clearly true: The prediction made by our pattern method captures something even more basic and important than the empirical-based mid-point method, although both method's predictions give almost the same values.)

When I note our pattern-based mass estimates, and then further use those values in my averaging method – I get very good results. I.e., I generally obtain even better predictions that way – than I get by using the pretty similar mass values based on empirical-based mid-point of each resonance for the estimates.

IMPORTANT: But to keep things simple in this paper, when I average two existing particle masses together to predict a third particle; I will use the 'empirical-based' mass values found in the conventional scientific literature. Including values found in some good articles in Wikipedia.

(But I reaffirm that I think our 'sphere-pattern ratios method' captures truths that are more basic to Nature and Physics than grabbing even empirically measured values. In fact, successful prediction of 'the third' particle mass often occurs, even if I use a good mass candidate in my 'averaging' solely based on a pretty basic sphere-pattern. I.e., that is – even if that mass candidate, that 'second particle' helping us to 'average', does not correspond with any significant empirically detected particle. Nor super- major resonance energy equivalent mass!)

Example 2. We now, again, use that the mass equivalent of the super-prominent 'resonance' energy, discussed in example 1, that 2706 electron masses value. We aver- age that 2706 electron masses with the empirical mass of the Strange D meson, 3852.19 electron masses – a me- son which we've used before. That gives us an average, 3279.1 electron masses, about 6 electrons high of the empirical value of the major Omega Hyperon, 3272.9 electron masses. (That is a respectable estimate, considering the large mass of particle we're trying to estimate. But had we used, instead of that 2706 empirical resonance value, the 2702 value, based on our sphere volume pattern method, our averaging outcome would have come out closer.)

Example 3: We now use a different super-prominent res- onance equivalent mass in our next averaging example. It was historically termed, the equivalent mass of "the lowest of two Xi Hyperon particle resonance energies", and its empirical value is equal to 2997.7 electron masses. We average that with the empirical value of the major Lambda Hyperon, 2183.34 electron masses. That averaging gives 2590.5 electron masses, about 5 electrons high of the empirical value of the major heaviest Xi Hyperon, 2586.74 electron masses. (That is a respectable estimate, but had we used resonance and mass values based on our sphere volume pattern method, our averaging outcome would have come out even closer, **as usual**.)

Example 4: We now use the average of the empirically determined mass values in the close knit major Pion class (or 'family of particles'): 270.1 electron masses. We av- erage that with the empirical mass of the Tauon particle, 3477.19 electron masses. That averaging gives 1873.6 electron masses, which is less than 1 electron mass away from the empirical mass of the important Eta Prime meson, 1874.1 electron masses. (That's pretty remarkable.)

Example 5: We now use that average Pion particle mass value, again, that we used in example 4, that 270.1 electron masses. We average that with the empirical mass of the Eta Prime meson, 1874.1 electron masses – which we estimated well, also in example 4. That averaging, '270.1' and 1874.1, gives 1072.1 electron masses, which seems **exactly** the empirical mass of the important Eta meson, 1072.1 electron masses!

(We note the related particle names, "Eta Prime" meson and "Eta" meson, whose masses we estimated in examples 4 and 5, above. And also the common particle value, the average major Pion, which we used, in our averaging method, in both example 4 and 5 averaging processes – to estimate very well both the mass of the Eta prime and Eta mesons. We also note that we used the Eta Prime meson to help estimate extremely well the mass of the Eta meson. I think all that is frankly awesome, super-remarkable!)

((Incidentally, it seems like some particle masses, or mass equivalents of very major resonance energies, are used more successfully than others – in our averaging process (method) to predict other particles' masses. And I don't understand, very well, why?))

Example 6: We now use, again, the empirical mass of the Eta Prime meson, 1874.1 electron masses, i.e., the particle mass we estimated in example 4 and used in example 5. We average that '1874.1' value with the empirical mass of the major Omega Hyperon, 3272.9 electron masses, the particle we also estimated in example 2. That averaging, 1894.1 and 3272.9, gives 2573.5 electron masses, which is remarkably within 1 electron mass of the empirical mass of the important and prominent lightest Xi Hyperon, 2573.1 electron masses.

There are other examples of averaging the mass of one particle with another that effectively 'land' very near an- other empirically known particle's mass, but we only illustrated the more simple and interesting cases above. There are subtleties and additional aspects about our method and procedure of selecting particles for averaging and the results to expect, but mostly beyond the scope of this article.

But I will give one such example:

If the mass of a Charmed B Meson (12,283.8 electron masses) is averaged with the mass of a Eta Prime meson (1,874.1 electron masses), that gives 7079.0 electron masses, a mass 'candidate'. We find that the new Xi double-charm Baryon (7,086.1 ref. electron masses) is about 7 electron masses higher than that (7079.0 electron masses) 'candidate'.

Thus, that 'third set' of averaging outcomes missed the target by 7 electron masses – compared to each of the two previous averaging outcomes, where 'each set' missed the target by only 6 electron masses. I.e., relative to that target empirical 7,086.1 electron masses.

But my experience is that going from an error of 6 to an error of 7 electron masses, in such cases, is more problematically than it may appear.

That miss, by 7 electron masses, is disappointing, but not so great when estimating high mass particles, that it should be ignored. And it might even help slightly to prompt a particle candidate into actual existence. Yet, when I consider that one of the earlier estimates was better, but low; and the other earlier estimate was equally good, but high and offsetting the low; my experience is this: When trying to estimate the target empirical mass in such cases, it is better to just include the two best sets in our averaging, and put aside the least good averaging set, i.e., that third set.

3.3. More Detailed Discussion of the Xi double-charm Baryon

The "Xi double-charm baryon" was empirically found to have the 'mass equivalent' of 3621.4 MeV of energy. And thus its mass is calculated to be 7,086.1 electron masses, since the energy of an electron is almost exactly 0.511 MeV. I.e., it is customary, since Einstein, to just say that a particle with mass (or equivalent mass), 'm', has an energy of mc^2, an energy often expressed in MeV units.

The new particle's half-life seems much longer than many relatively short-life particles, but somewhat less time than several lighter and relatively long-life particles. (Particle masses of not greater than the neutron seem generally to have longer half-lives than particles masses much greater than the neutron.)

My experience also dictates this: When averaging the masses of one pair of already known particles gives a value that is also nearly the same as that obtained by averaging the masses of a different pair of already known particles - the following often results: There is a greater chance of finding a real particle in Nature existing, and with a mass value near those alike average outcomes, and with longer half-life than otherwise. I.e., a less promising situation would exist if only averaging one pair together hit near the proposed candidate value.

Important: One rule that seems to apply to both my particle predictions methods is likely related to the "Heisenberg Uncertainty Principle". Suppose a compact mass particle initially seems to be a good candidate based on my methods? But suppose such candidate begins to try to spin at the speed a light, c? Consider the proposed compact mass, "m", of that particle, times its velocity, "c", times its radius "r"? I.e., that product is the angular momentum of the particle candidate, "mvr". Suppose that 'mvr' value is less than the "Planck Bar constant", also expressible in angular momentum units? That makes it unlikely that such compact particle candidate will arise even with a short life. So that makes such existence more "Uncertain", i.e., more difficult.

(Note, however, that the free electron likely has a relatively large diameter, and thus is not a compact particle. And thus can generate much more angular momentum when it spins, than otherwise, and thus not violating Heisenberg Uncertainty Principle. But for **compact** particle candidates less than 200 electron masses, they cannot even potentially develop enough angular momentum for them to materialize - according to this interpretation of Heisenberg's principle.)

4. Conclusions

We gave the latest more refined empirical estimate of the Higgs Boson mass, compared to the proton mass. And it remains remarkably close to the volume of an outer sphere compared to the core sphere in a fundamental platonic sphere pattern shown in this paper and in an old NPA presentation. That supports our method of using platonic patterns in our estimating, and that such patterns likely relates to what is really going on.

(And this time, we have included such drawing in the CNPS proceedings book, instead of just a precise word description.)

We have also mentioned the latest important new particle discovered by the super-collider group, called the "Xi double-charm baryon", with a mass of 7,086.1 electron masses.

We found that empirical mass to be close to the aver- age mass value of two already known important particles in physics, but that gave us a slightly high estimate. And close to another average mass value of yet two different important already known particles in physics, but that second average gave us a slightly low estimate.

BUT when those slightly high and low estimates were averaged together, our final estimate remarkably hit the new particle mass extremely accurately!

We have often used that "averaging of existing particles" method very effectively before, and we have revisited many historical examples of that, here.

And our averaging method also works well, when we use certain pattern ratios or a certain super-major resonance ratio given by such patterns. That is – when we use such values in place of one of the empirically-estimated particle masses or resonance equivalent masses, used in averaging procedure. And we gave a few examples of that, too.

But our averaging method, described above, does, in- deed, have limitations, as we further described in the article.

That averaging method is just another tool, in additional to a still more elementary and effective tool, the use of a simple sphere volume ratio in a major platonic symmetrical pattern. That latter tool was used very effectively to nearly match the mass ratio of the Higgs Boson compared to the proton, as shown in our Fig. 1.

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