

# Why the Various Particles Have the Masses They Do

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## Abstract

In physics and in Nature, there exists prominent and important particles, such as the Proton, electron, and less stable Pions, Kaons, Muons, and about a dozen others. And even more minor particles with very short lives. This Article mainly addresses the 3 largest mass particles, the Higgs, the W, and the Z boson particles. And I think it largely explains “why they have the particular masses they do.” My previous articles did that for the case of lower-mass prominent particles. Links provided below. I do this by first noting the Mass Ratios of particles, i.e., their masses compared to basic electron, such as the “Proton to electron mass ratio, 1836.15 to 1.” And then by noting nearly matching Geometric volume Ratios arising when one or more large spheres are close-packed around, or surround, one or more small spheres – in the most simple, symmetrical pattern arrays. I.e., as sometimes seen in high-school geometry. And I comment on other matters relating to this article.

## Introduction, and examples of nearly Matching Ratios

Historically, at least 3 Nobel Laureates bemoaned, ‘Not knowing why particles have the mass they do?’ We will largely solve that on the pages that follow:

And, as said, this article nicely addresses very large mass particles. But in a sense my previous articles, that address lower-mass particles, are more impressive [1]. That is because, using still greater simplicity, their geometric ratios nearly match so many more particle mass ratios. Here are some links to those earlier articles:

<http://vixra.org/abs/1901.0299>

<http://vixra.org/abs/2106.0052>

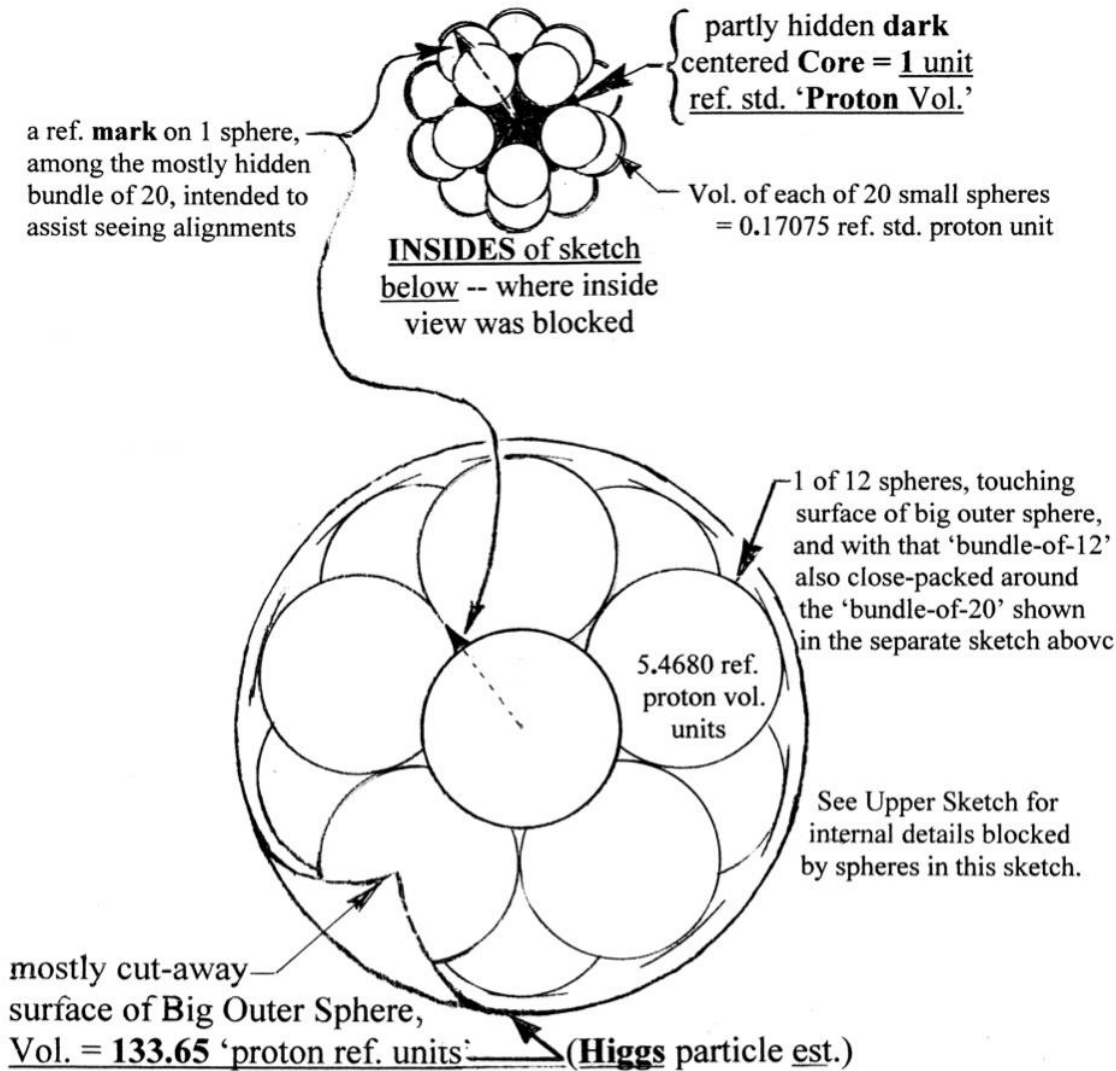
<http://www.causeeffect.org/articles/book.html>

<http://www.causeeffect.org/video/RatioTalk11-11-16.mp4> (for this link, allow 30 sec. to load)

Some sketches, below, may exaggerate some main features so they show up better. In some sketches, we use cross-sectional views or indicate partially ‘cut-away’ regions to hopefully clarify the view.

The first sketch below, as you scroll down, addresses the Higgs Boson particle. It was even shown and discussed in my previous articles (references above). But it is repeated here, again, because it is 1 of the 3 largest mass particles in physics -- all 3 of which are considered so important to the present ‘Standard Model of Particle Physics’.

Now please, **SCROLL DOWN** to view the sketches, displays, and relationships – key to this article:



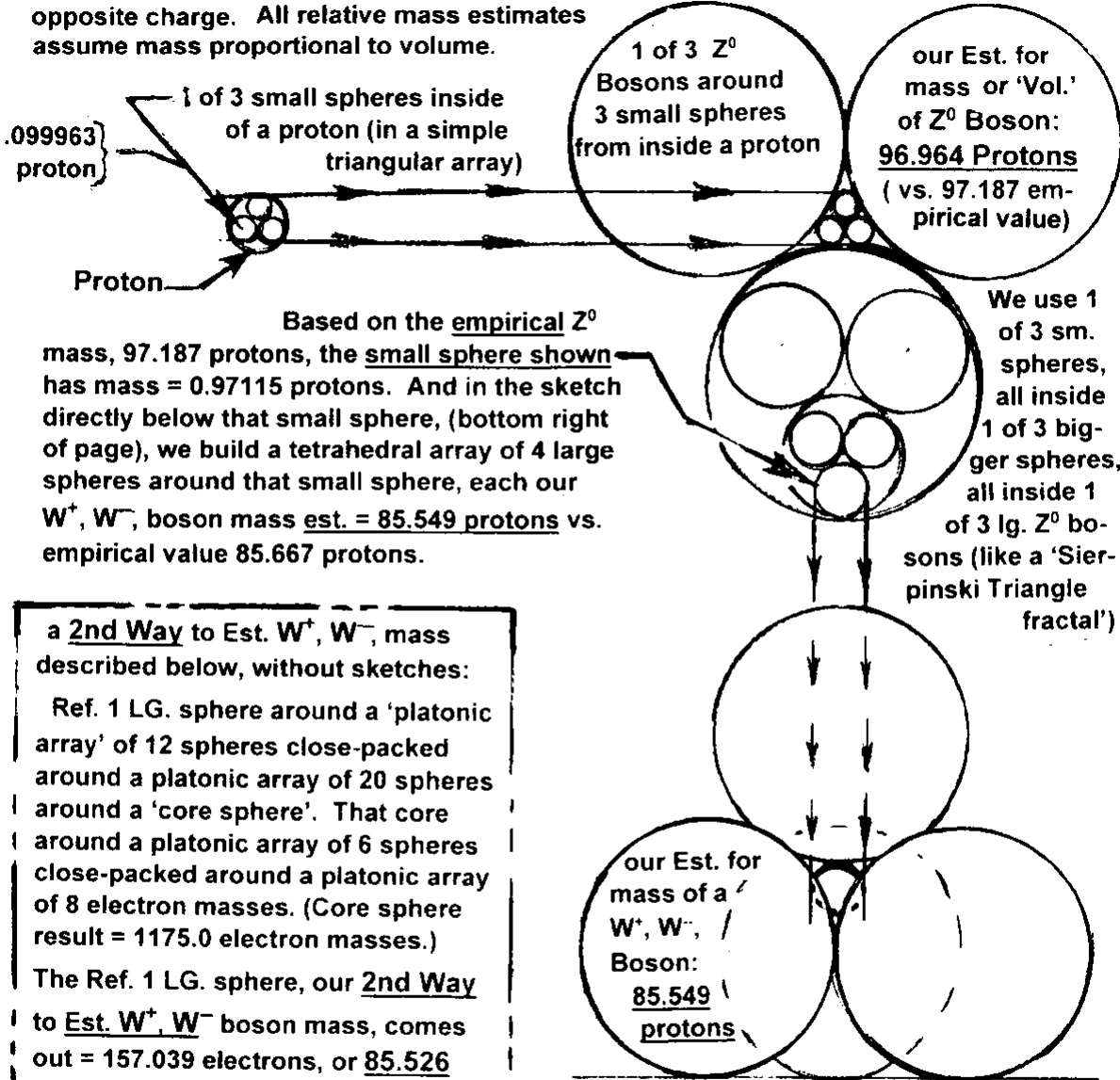
Note: Interchanging the '20-spheres' (Dodecahedron) position and the '12-spheres' (Icosahedron) position would **not** change the Vol. of the outer sphere.

## The Higgs Boson with *dwg*'s estimated Mass of 133.65 Protons

- . The above sphere patterns, using sphere packing based on 'platonic' arrayed symmetries, give a Volume **Ratio: 133.65/ 1**. I.e., Outer Sphere in lower sketch to dark core sphere in upper sketch).
- . That is remarkably near estimates by two independent groups of particle detection experts ranging from **132.90** to **133.72** protons.[2]
- . It is difficult and rare for 'Nature' to create very large particles that last beyond the shortest half-lives, and it is also difficult to measure them. But perhaps we can say, in a sense, "The final target of Euclid's 8 books, and the pattern that Plato thought *God* used to make the heavens – also helped us here to nearly match the so-called *God* particle's mass, the Higgs mass, a major target of the current mainstream's Standard Model of Particle Physics!"

Below, we again use 'close-packed spheres' to nearly match masses of other very large mass particles:

**Note:** All spheres shown below touch their adjacent neighbors, and all spheres belonging to the same 'set' are equal in size. The  $W^+$ ,  $W^-$  bosons have equal mass, but opposite charge. All relative mass estimates assume mass proportional to volume.



**a 2nd Way to Est.  $W^+$ ,  $W^-$ , mass** described below, without sketches:

Ref. 1 LG. sphere around a 'platonic array' of 12 spheres close-packed around a platonic array of 20 spheres around a 'core sphere'. That core around a platonic array of 6 spheres close-packed around a platonic array of 8 electron masses. (Core sphere result = 1175.0 electron masses.)

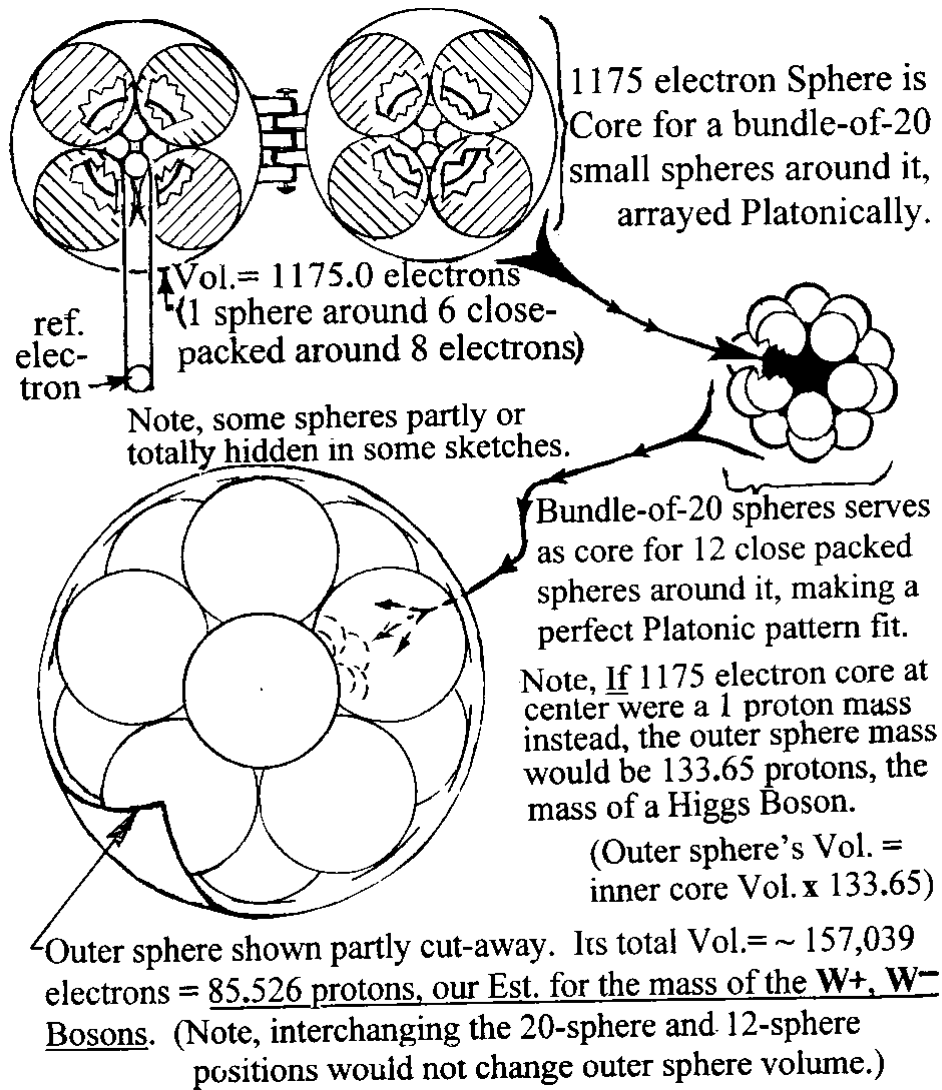
The Ref. 1 LG. sphere, our 2nd Way to Est.  $W^+$ ,  $W^-$  boson mass, comes out = 157.039 electrons, or **85.526 protons** vs. empirical value 85.667

**2nd Way to Est.  $W^+$ ,  $W^-$ , Boson Masses as Described above**

**1st Way, (main way), to Est.  $W^+$ ,  $W^-$ , boson masses giving 85.549 protons vs. an empirical value 85.667 protons**

**Dwg.: Ways to Construct and Est. Masses of  $Z^0$  &  $W^+$ ,  $W^-$ , Bosons**

Using upper sketches and a proton's substructure, we Est. the  $Z^0$  boson mass = **96.964 protons**, vs. 97.187 empirical value. At lower right sketch and just above it, we use an empirical  $Z^0$  boson's substructure to Est. the mass of  $W^+$ ,  $W^-$ , bosons = **85.549 protons**, vs. empirical 85.667 value. At lower left, we describe, without sketches, a 2nd Way to Est.  $W^+$ ,  $W^-$ , boson masses, giving 85.526 protons, (and on the next page, we show that with a sketch!)



### Dwg.: Another Way to Construct & Est. Masses of $W^+$ , $W^-$ , Bosons

Using the platonic arrayed sphere symmetries above, our est. for the W boson's mass is **85.526 protons** vs. empirical 85.667 value. We start with cross-sectional sketch at upper-left, by drawing 6 spheres close-packed around 8 electron spheres, and 1 medium-size 'Core' sphere around the 6 spheres. The resulting Core sphere Vol.=1175.0 electrons.

We next draw 20 spheres around that 'dark' Core (sketch at right); and then draw 12 spheres close-packed around the 20 (sketch at lower left). We lastly draw 1 large sphere around the 12, giving for our  $W^+$ ,  $W^-$ , boson mass Est. 85.526 protons (or 157,039 electrons).

(Note, the  $W^+$ ,  $W^-$ , bosons have opposite charge, but are equal in mass.)

Based on experience, generally, the more different drawings, using sphere patterns, that yet result in the same (or nearly the same) sphere volume ratios – the greater the chance of detecting actual particles with mass ratios nearly matching those geometric ratios. And the greater the particle's prominence and half-life.

## Optional -- Other Misc. Comments – perhaps for more ‘specialized’ readers

The links to my other articles (as provided earlier, above) contain other discussions and relevant information that should likely address most of the questions that readers of my present article may still have. But there may still be at least one important question, which I will now mention and try to address here, as follows:

In the above, I’ve often said that ‘this or that’ particle or boson is ‘this or that’ times more massive than a more basic ‘key’ particle, like the stable proton. But why does that key basic particle, (say the prominent Proton) – have its own particular mass, ‘to start with?’

I will try to be as brief as possible, giving more of an ‘outline’ than total justification, and omitting many details available in specialized textbooks, etc. All basic ‘small’ particles, like the proton, electron, and even so-called ‘photons’, have vastly different energies and masses. But have either the same ‘spin angular momentum’, for example, ‘1/2’, or a simple multiplier of that 1/2, (like  $2 \times \frac{1}{2} = 1$  unit). That unit is called ‘the reduced Planck constant’, or ‘the Planck Bar constant’, or the like. And more importantly the descriptive units or ‘dimensions’ of that Planck entity Can Be Expressed as ‘Spin Angular Momentum’!

Even long before Max Planck’s great work and his Planck Constant, many Scientists and Physicists considered even seemingly empty space to be pretty full of various Vortices, spinning ‘this way and that’, with ‘Spin Angular Momentums’, regardless of whether they were called ‘aether’, ‘fields’, ‘spinners’ or whatever. So, importantly, here, we will assume that all, or nearly all, of space (even rather small regions) -- have ‘spinning’ entities in them. And that there is an AVERAGE amount of ‘spin angular momentum’ over a short time period, around any randomly chosen small point in space. And if that region, or a nearby region, of space is occupied by a major particle ‘candidate’ globular amorphous mass, like a potential Proton, then the small region of space will try to impose upon that globular potential particle -- that average ‘quantum’ amount of spin angular momentum.

Now, suppose, as inferred from “Niels Bohr’s ‘Liquid Drop Model of the Nucleus’ – that there is a super-high maximum density that mass material, in this universe, can have, like liquid water, i.e., beyond which – no more increase in pressure can squeeze or reduce significantly such masses’ volume. (Democritus also had a rather similar concept and model.) Then, assume that ‘space’ is ‘pressurized’ to some high, rather constant ‘average’ pressure, as seems expected because of the ‘spinning entities’ in space. Then that pressure, together with that (Bohr’s) glob of rather uniform high-density matter -- will result in a particular (characteristic) maximum wave velocity through that globular mass. I.e., sort of like the velocity that a compressive sound wave has through water -- when the water is in a shallow tank, under atmospheric pressure.

Now, suppose that a small sphere, within that high-density glob, begins to spin, such that its material obtains that highest maximum (characteristic) spinning speed that it can have, (like the ‘speed of light’). And suppose that its spin angular momentum or ‘spin’ is also limited by that ‘Planck constant’ related average amount of spin that such small entity can have -- as outlined previously, above.

Then those ‘side conditions’ would determine a maximum amount of mass that a special particle candidate would have, as it is forming from that spinning glob of mass. And, therefore, a special advantage for that ‘quantum’ mass particle, with regard to stability, compared with other particle candidates. And likely ‘reinforced’ somewhat, by feedback, as likely other nearby regions of space tend to emulate or ‘get in step’ with that ‘quantum’ amount of angular momentum and energy. And thus, perhaps, the major factor determining a ‘favored’(supported) particular mass value for the ‘proton candidate’.

## References

[1] As of this paper's date, its author, Carl Littmann, still has his website showing examples, and more: See [www.causeeffect.org](http://www.causeeffect.org), [Home page](#), and article under it, "[Booklet of large & small Spheres in Patterns, and large & small Mass Particles](#)".

[2] Wikipedia, the free online encyclopedia, topic "*Higgs Boson*", as noted 3-22-2022 under sub-topic, History, '3.2, Experimental search', in the last sentence in the 2<sup>nd</sup> paragraph under subheading, 'Findings since 2013'.