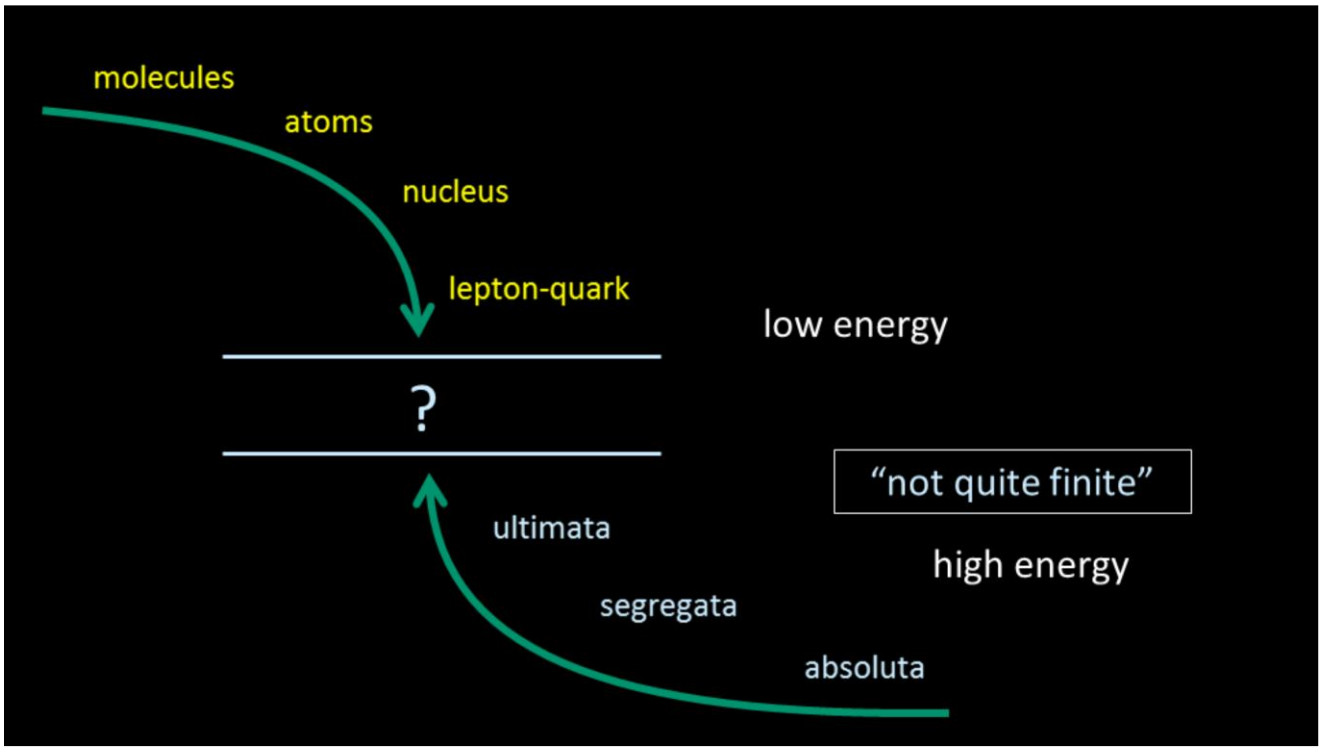
Ok, that's a quick look at the unique foundations on which the Urantia Book's scientific story sits.

Let's now see what this means for **mass** and **matter**.



As we know, everyday stuff is made from molecules, molecules are built from atoms, and atoms are complex things built from tiny parts. These tiny parts are called leptons and quarks, which are thought to be **elementary**, that is to say, not made from smaller parts.

This scheme, based on leptons and quarks, is called "the standard model of particle physics", and it describes most things we see really well. But in particle physics, all this is thought of as "**low energy**" stuff. Which implies another "**high energy**" domain…

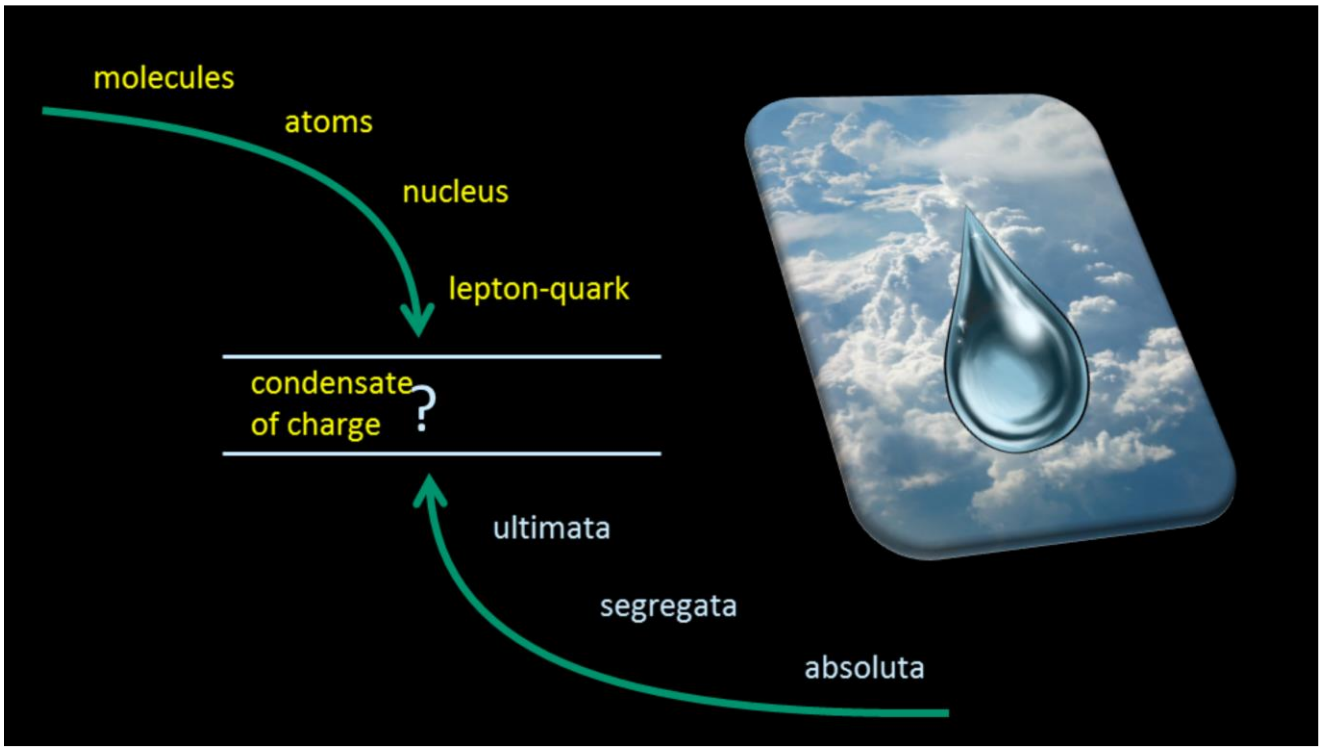
Which is where the Urantia Book comes in. The Urantia Book approaches this standard model from the other – **high energy** – side, introducing those **ancestral** levels of **not quite finite** stuff (which we just explored).

In the middle here, between what we can measure and what's been revealed, we have "**a region of interest**".

It's interesting to **scientists** – they want to know more about leptons and quarks.

It's interesting to UB readers – we want to know how **ultimatons** fit in.

Ok, so what do we know.



We know that for the standard model to work as advertised, this "**region of interest**" needs to be filled with something called

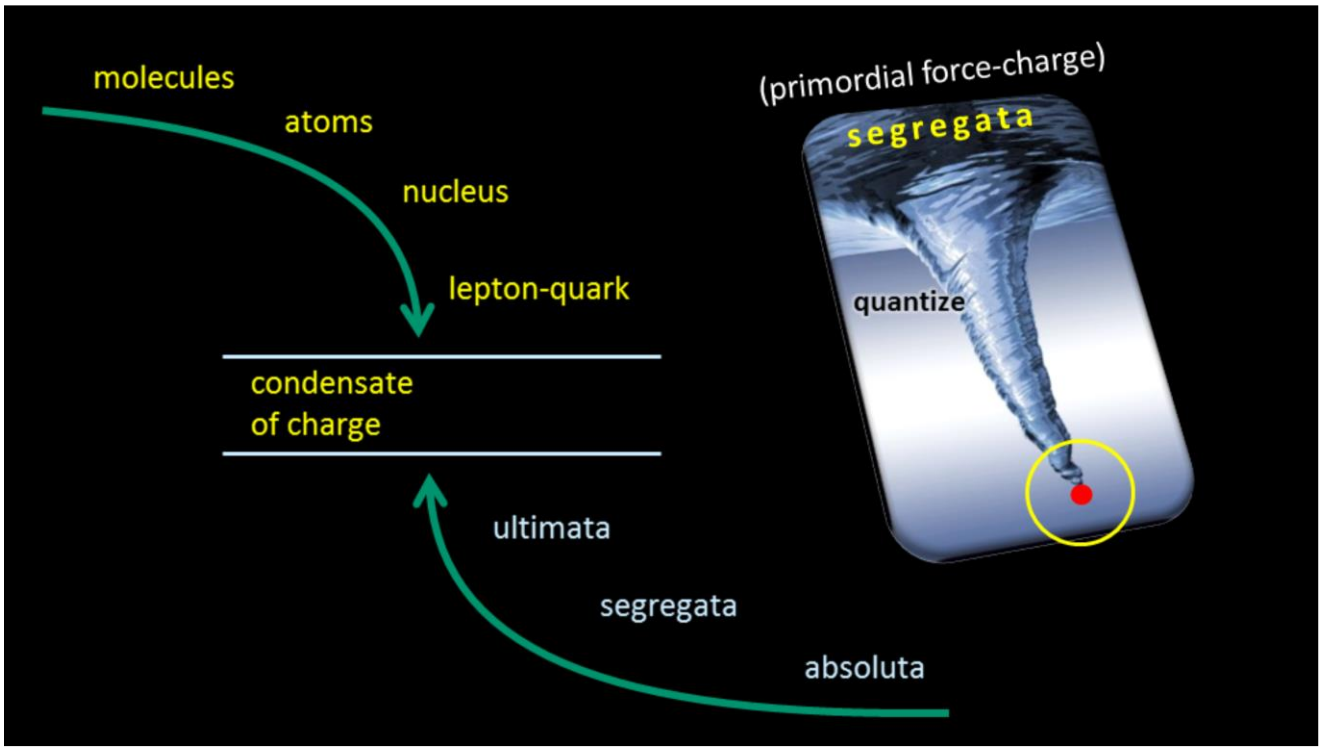
"**a condensate of charge**".

What's a condensate, and what kind of charge? We'll get to that. But first, let's introduce the **ultimaton**.

Think how a rain cloud can seem to condense out of thin air, and how a drop of rain can condense inside that cloud.

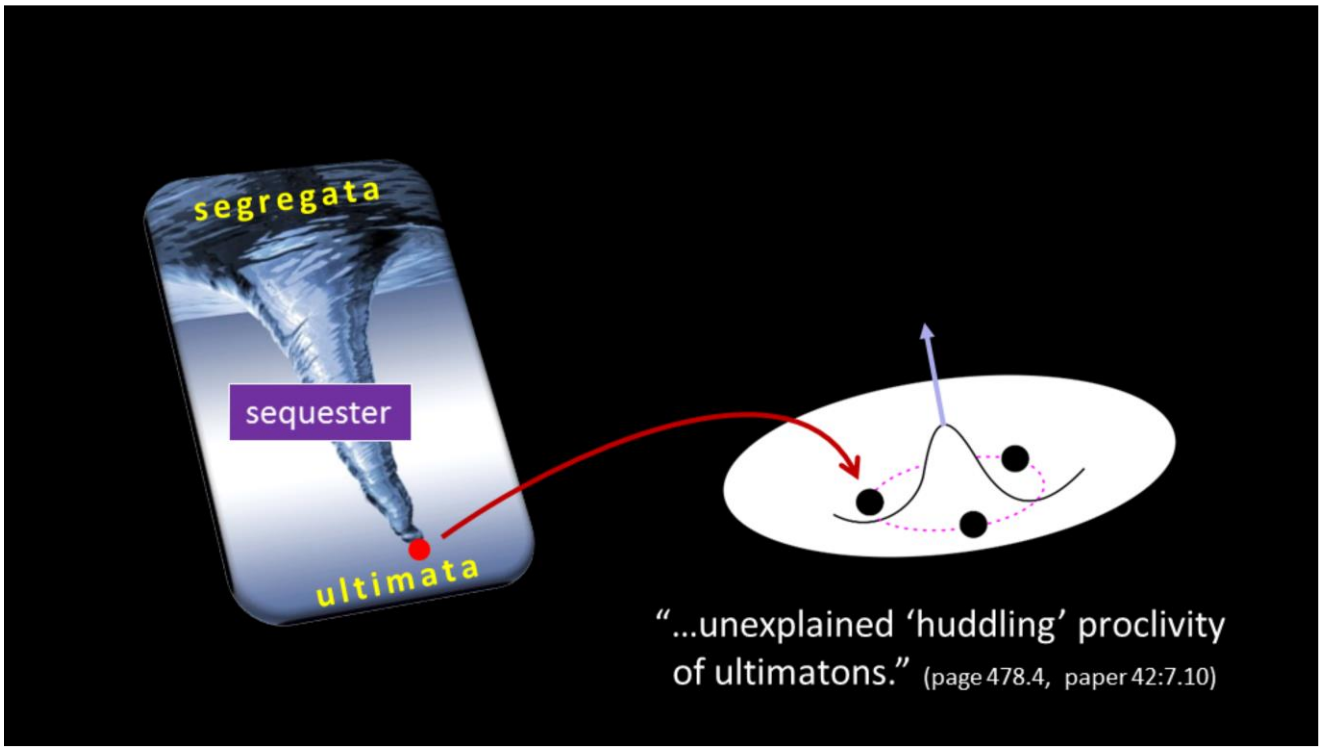
If we think of the cloud as **segregata**, then this tiny drop would be the **ultimaton**.

Can we put this in more mathematical terms?



Think of a tiny vortex in this "**not-quite-finite**" stuff.

Then this tip becomes discrete, a quantum of superfluid spin… an **ultimaton**.

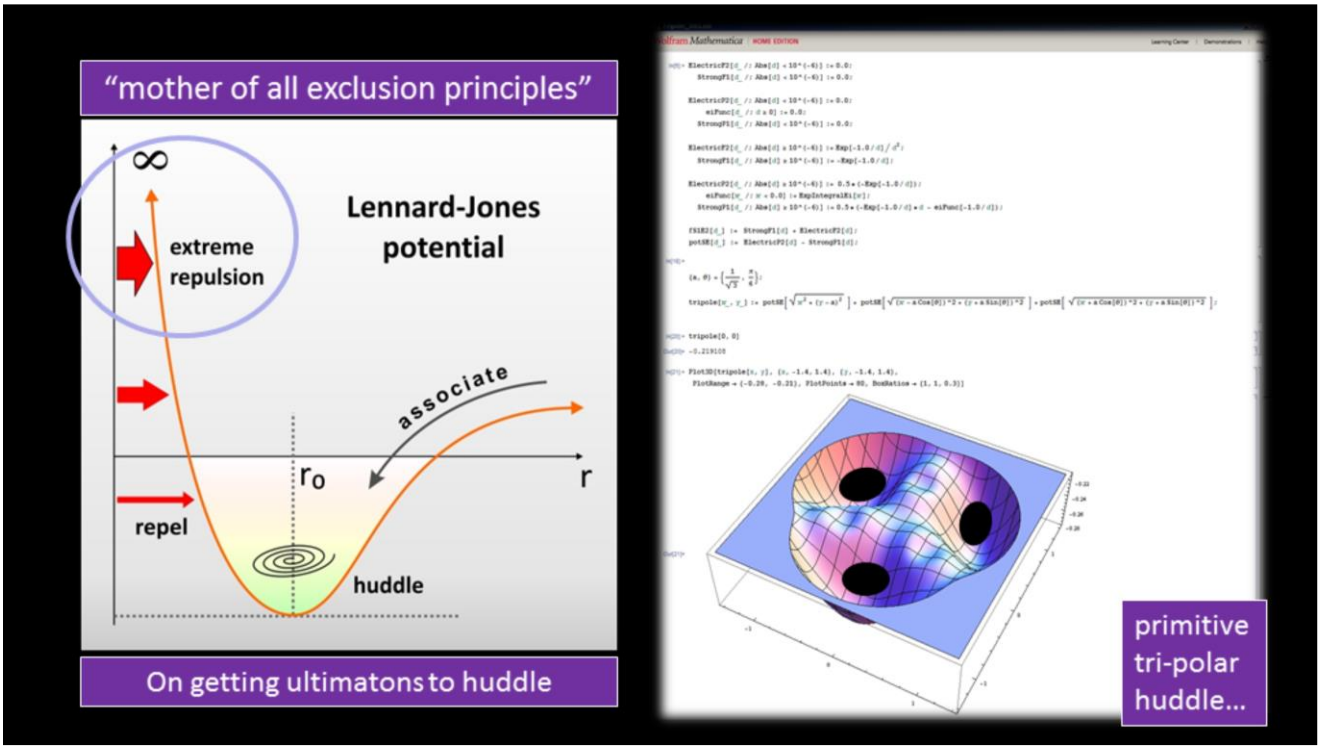


The idea is that segregata can be condensed into ultimatons.

Or as Lisa Randall might say: "**sequestered** onto our measureable manifold".

But before these ultimatons can be put to work, they need to "**huddle**".

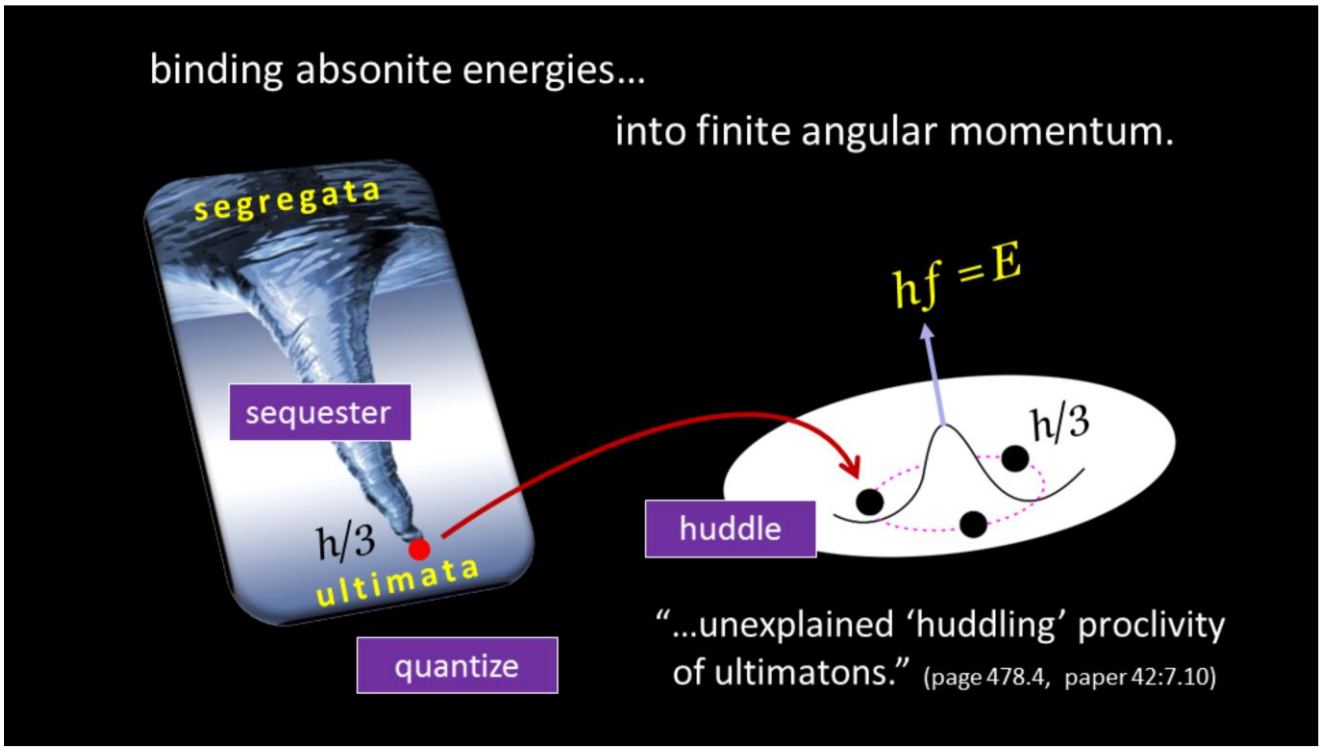
Now by "huddling", I imagine something like this: two or three ultimatons, locked very, very tight.



Mathematically, we'd have something like this: a balance of forces…

- "**mutual attraction**" drawing a few ultimatons together,
- while some **extreme repulsion** keeps them apart.

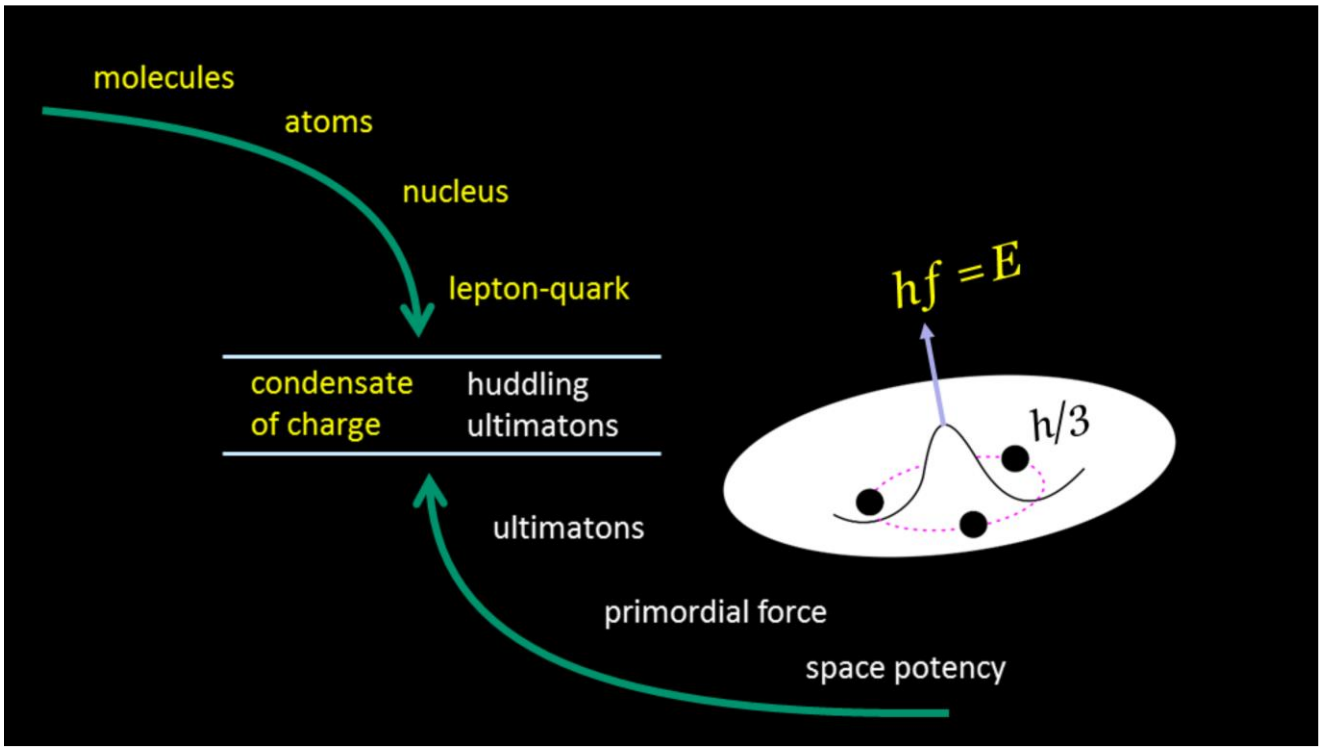
It's this sort of balance – between mutual attraction and extreme repulsion – that explains that [quote] "**proclivity to huddle**" (mentioned in paper 42 section 7).



It's these two characteristics of ultimatons – their quantized, superfluid spin, and their proclivity to **huddle** – that allow us to make contact with the standard model…

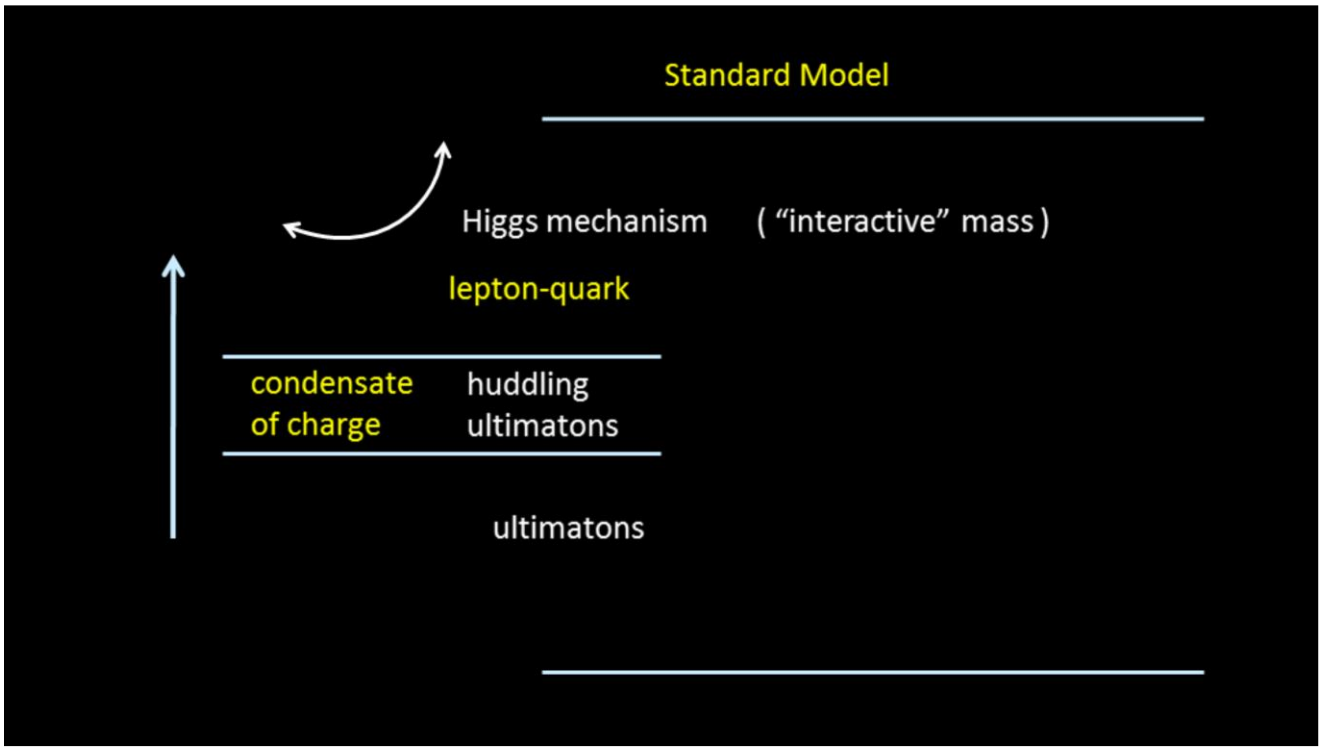
What we have here is the binding of **absonite** energies into **finite** angular momentum.

And angular momentum is something that science can measure.



So this “region-of-interest” will contain not isolated ultimatons, but **clusters** of them, huddling.

For me, this is where the Urantia Book story of matter begins…



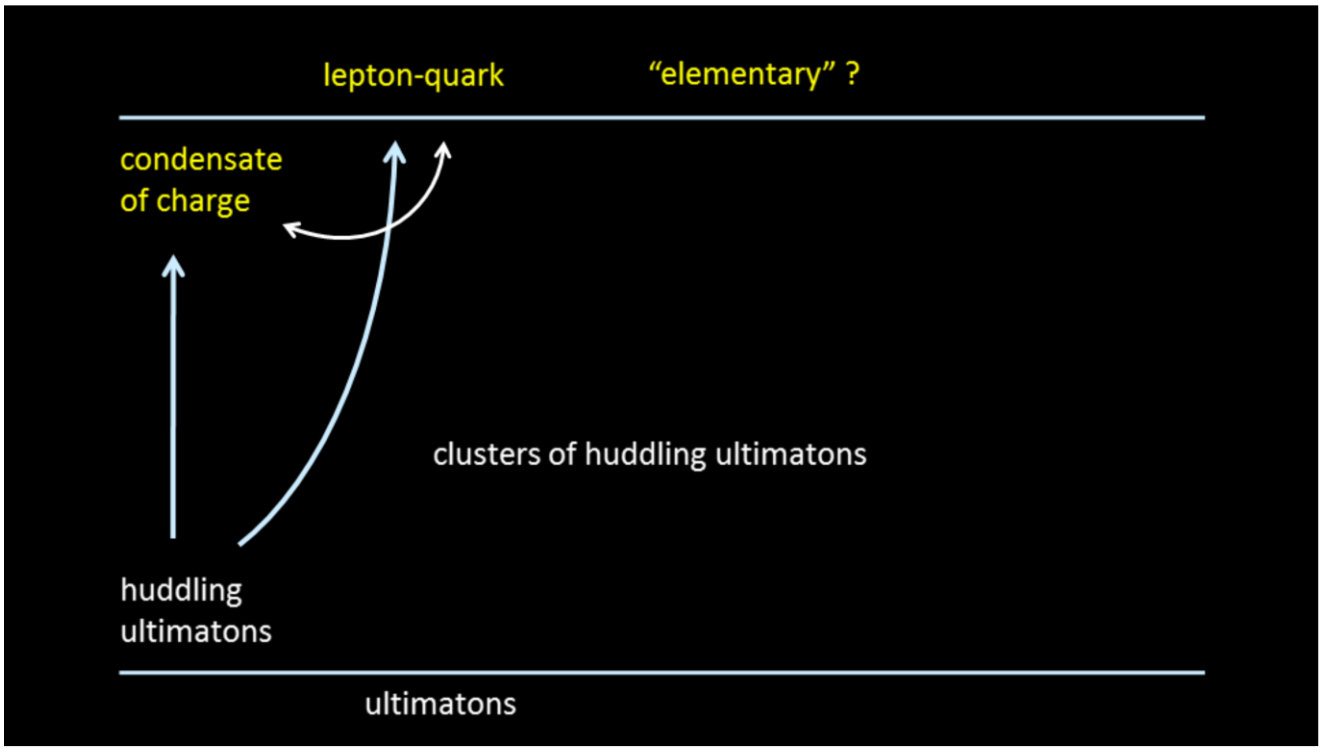
… with a condensate of charge driving the standard model,

and a condensate of ultimatons, huddling.

The thing to note here is that our "standard model" depends on an interaction between these [**leptons & quarks**], and this [**condensate of charge**].

This is the famous "**Higgs mechanism**", thought to induce an **interactive** type of mass.

So to allow us to hook up the Urantia Book's **ultimatonic** scheme with our current standard model, all we really need is, **first**, for these huddling ultimatons to interact with this [**condensate of charge**], …

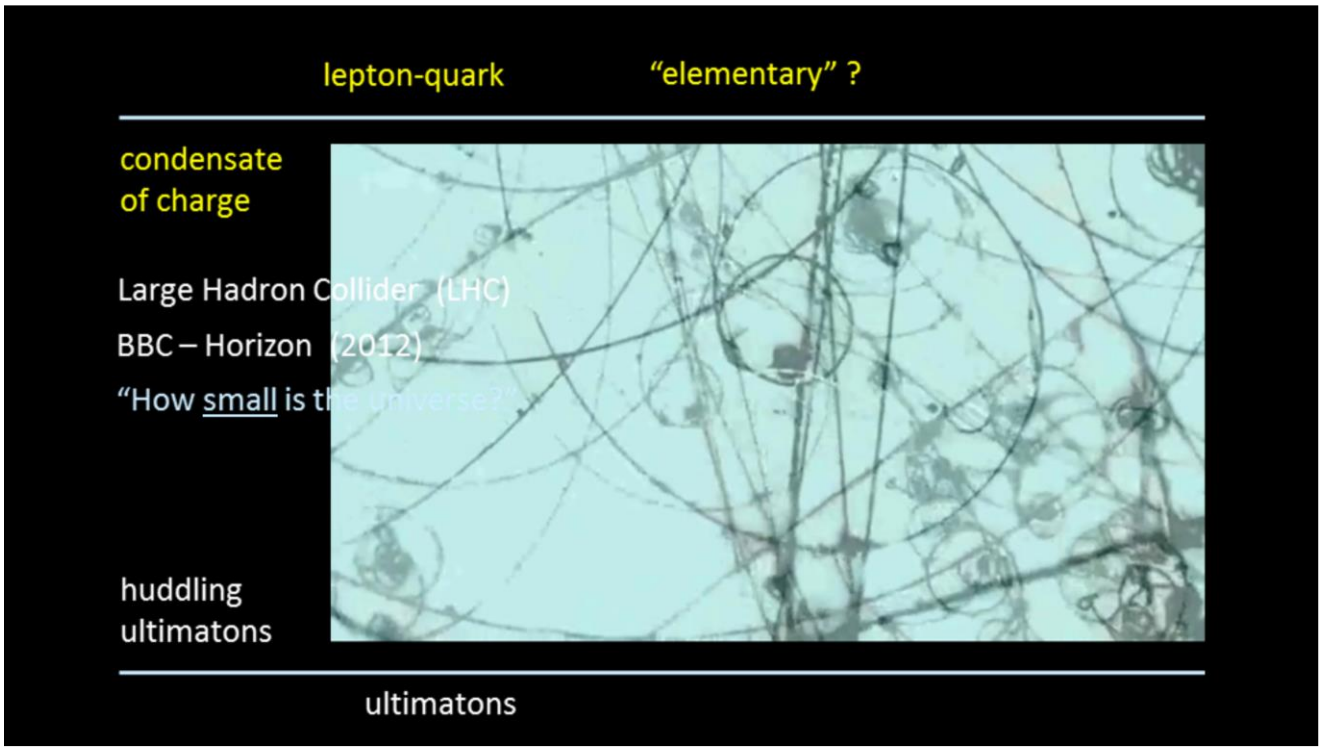


And **then** to show how leptons and quarks can be built up from clusters of these huddling ultimatons.

Of course, if electrons and neutrinos and quarks are built up in this way, from clusters of huddling ultimatons, then once again, our ideas about what's "**elementary**" will need to change.

As it turns out, scientists have been wondering about this for some time – how elementary are "elementary" particles?

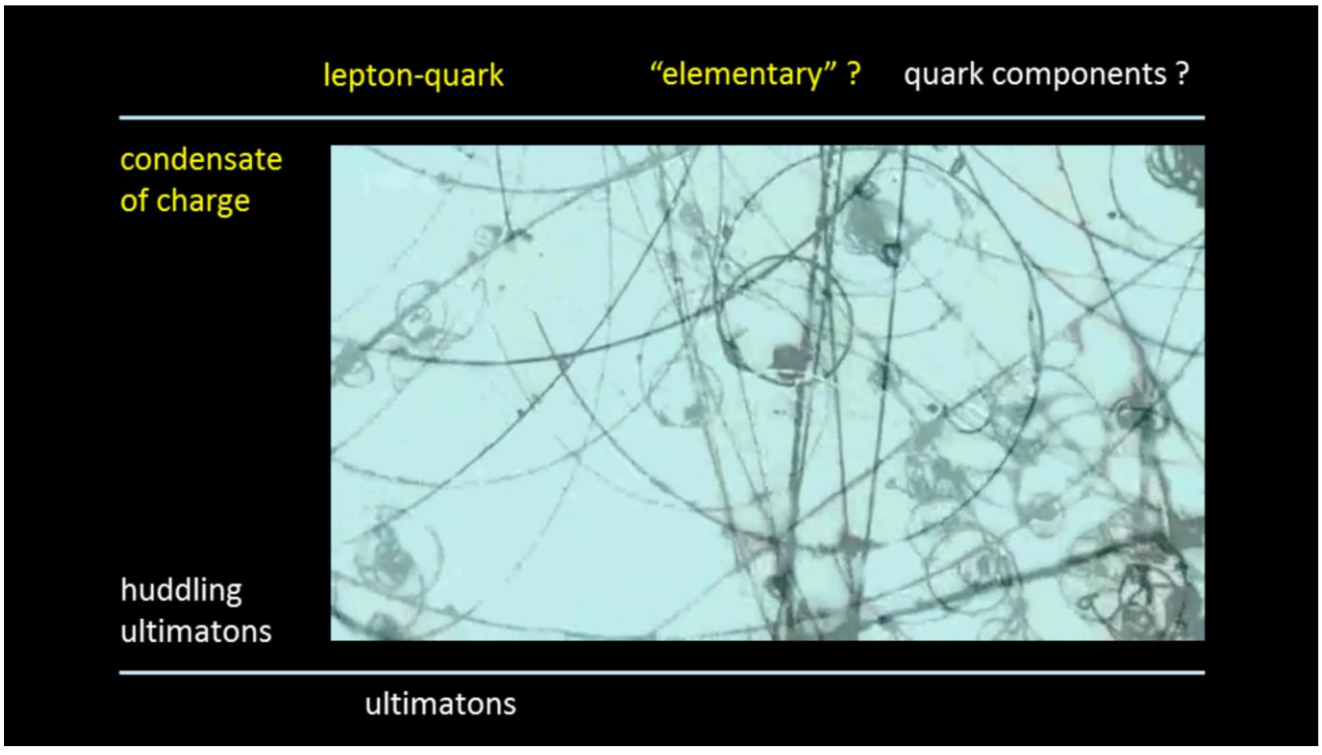
To find out, they built a really big machine…



… the Large Hadron Collider (or LHC).

In 2012 the **BBC** made a documentary about what scientists hope to achieve with this machine. Here's a 40 second clip:

[Movie: elementary particles?]



[Movie: elementary particles?]

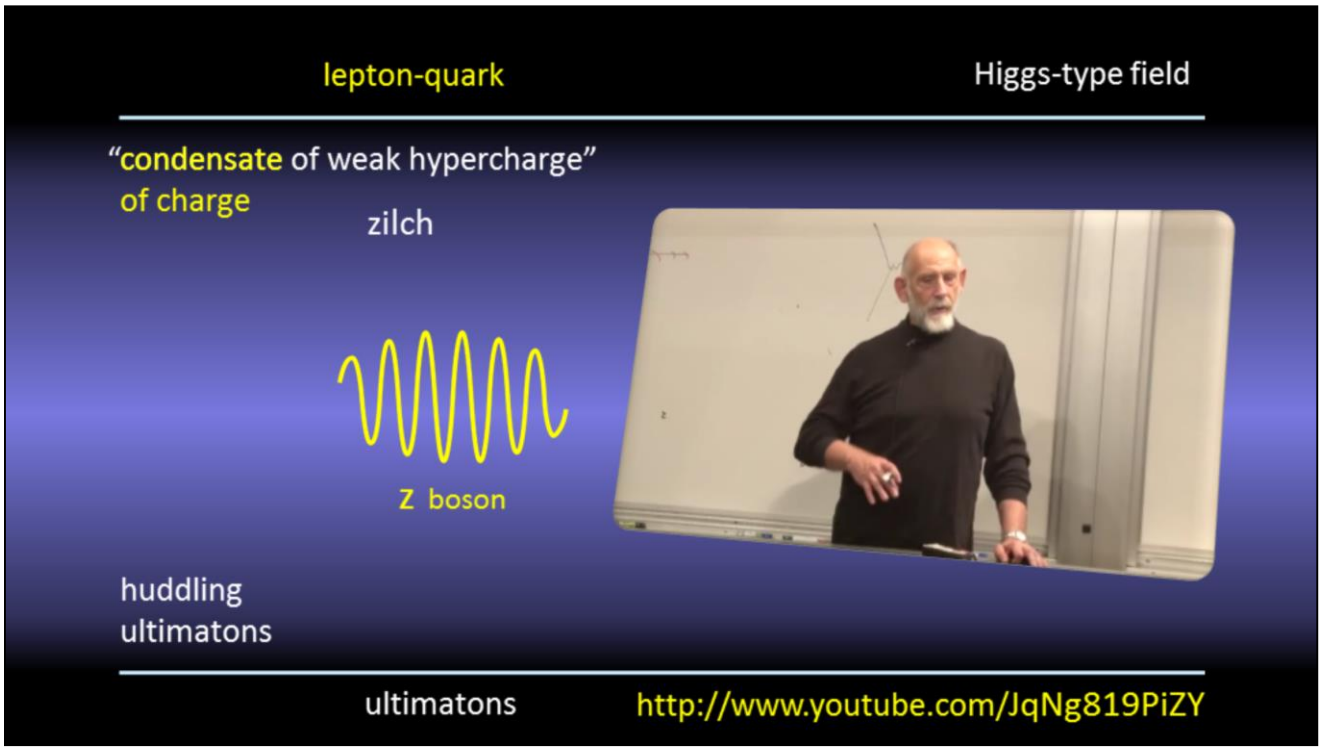
As you can see, scientists really **do wonder** about the internal structure of quarks. But there's a problem.

If leptons and quarks are made from smaller parts, then the next natural level down is the so-called **Planck scale**, which implies inaccessible energies and lengths. So any such internal "**sub**-structure" would seem to be forever beyond human capacity to prove.

But if something is **beyond human capacity** to prove, do those "**limitations of revelation**" (discussed in paper 101 section 4) still apply?

Is **this** why the authors were free to reveal **so much** about the ultimaton?

Now, about this "**condensate of charge**"…



This charge is called **weak hypercharge**, and this condensate is thought to fill all space. This is the famous "**Higgs-type** field".

Since the 1970's, our standard model (for particle physics) has **assumed** that this kind of condensate exists.

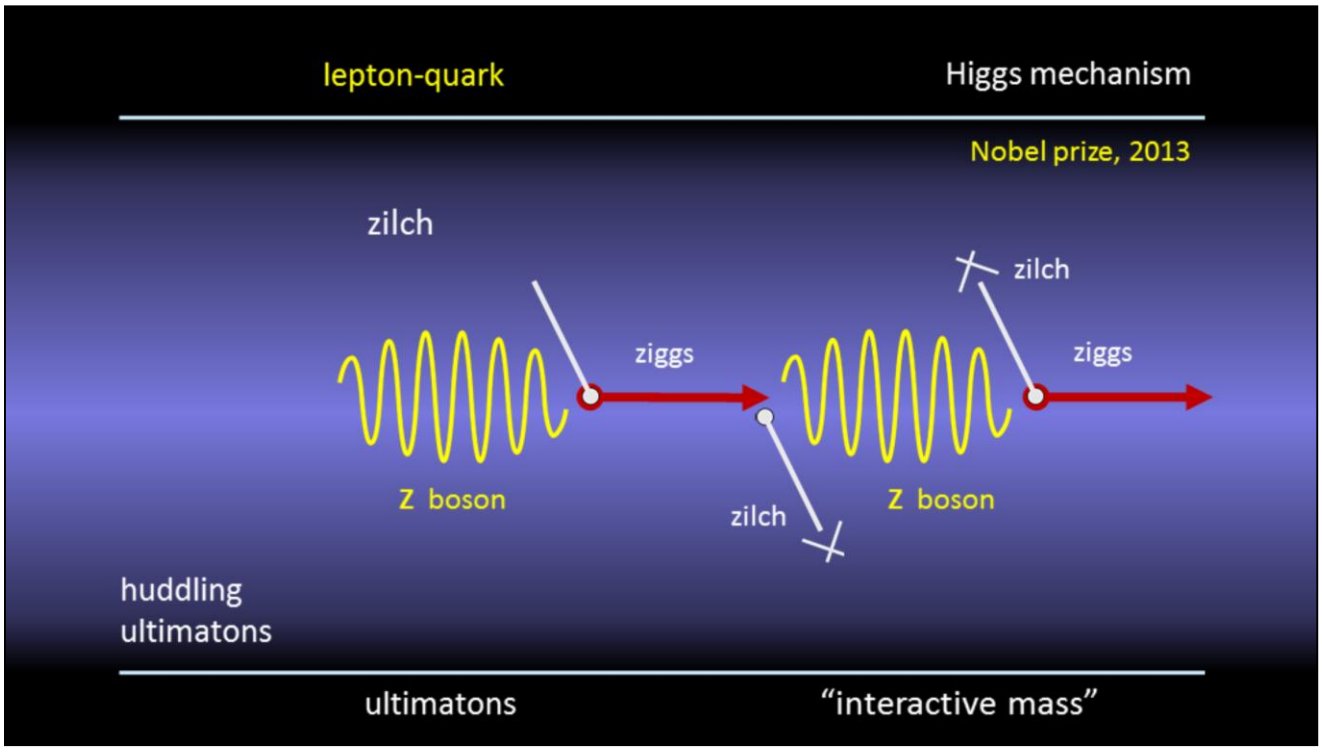
In 2012, scientists claimed to have proven that it does.

But "**condensate of weak hypercharge**" is a mouthful, so professor Leonard Susskind likes to call this stuff "**zilch**". Zilch.

I'll let the professor explain… [**Movie: Zilch_1.avi**]

So why does this matter?

Think of a standard model particle, say a Z-boson. It's the **interaction** of this sort of standard model particle with standard model zilch that generates an **interactive**, or standard model type of mass.



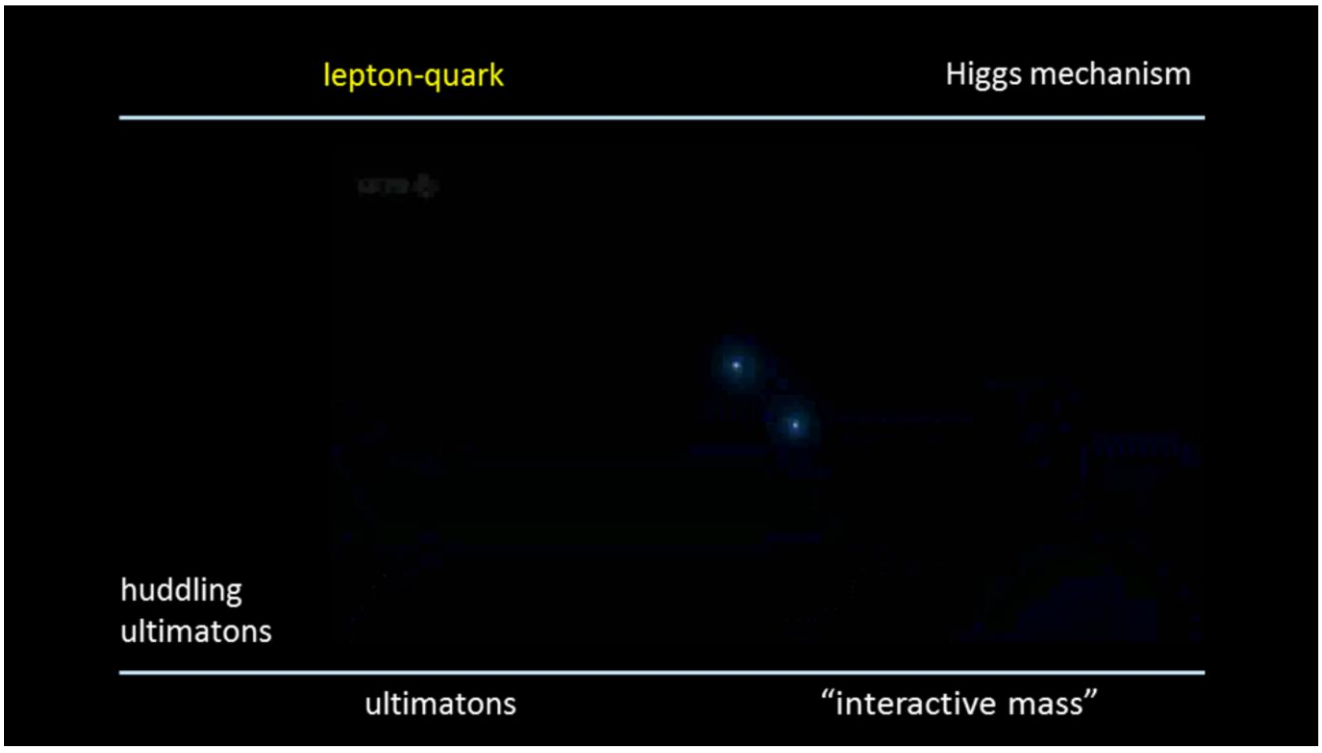
Now by "interaction" we mean something like this: a Z-boson hooks onto a bit of zilch, then lets it go. This **is** the Higgs mechanism. This is what got the 2013 Nobel prize for physics: Z-bosons hooking into this condensate of zilch.

We don't have a name for this mixture of Z-boson + zilch, but since it's so central to the Higgs mechanism, Susskind likes to call this [quantum state] a "**ziggs**".

Yep, a **ziggs**. Notice, this is **not** a "Higgs" particle. That's something completely different.

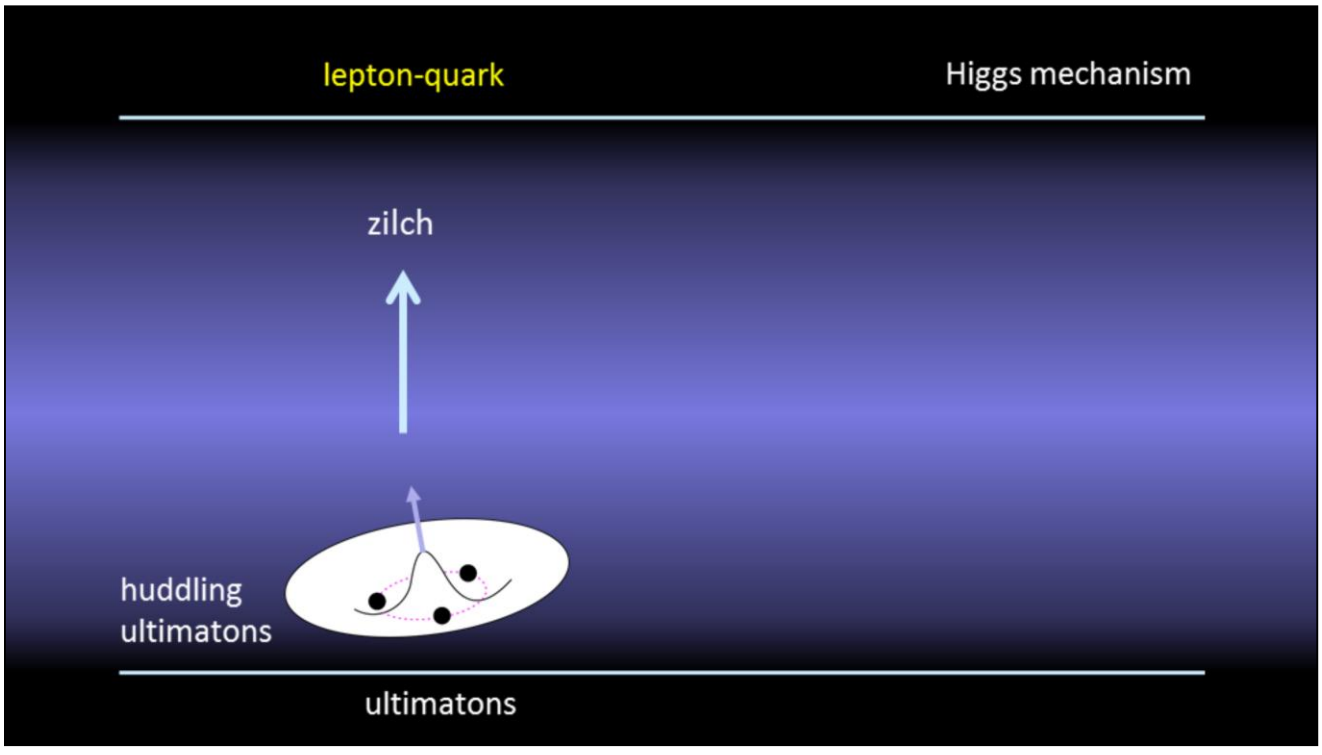
But here's the important bit: this flipping between states, between Z boson and ziggs, generates an inertia, an **interactive** type of mass… exactly the type of mass we might associate with the Urantia Book's "**interactive**" or linear type of gravity.

Regarding another, **non-linear** type of gravity and mass, we'll get to that in a moment.



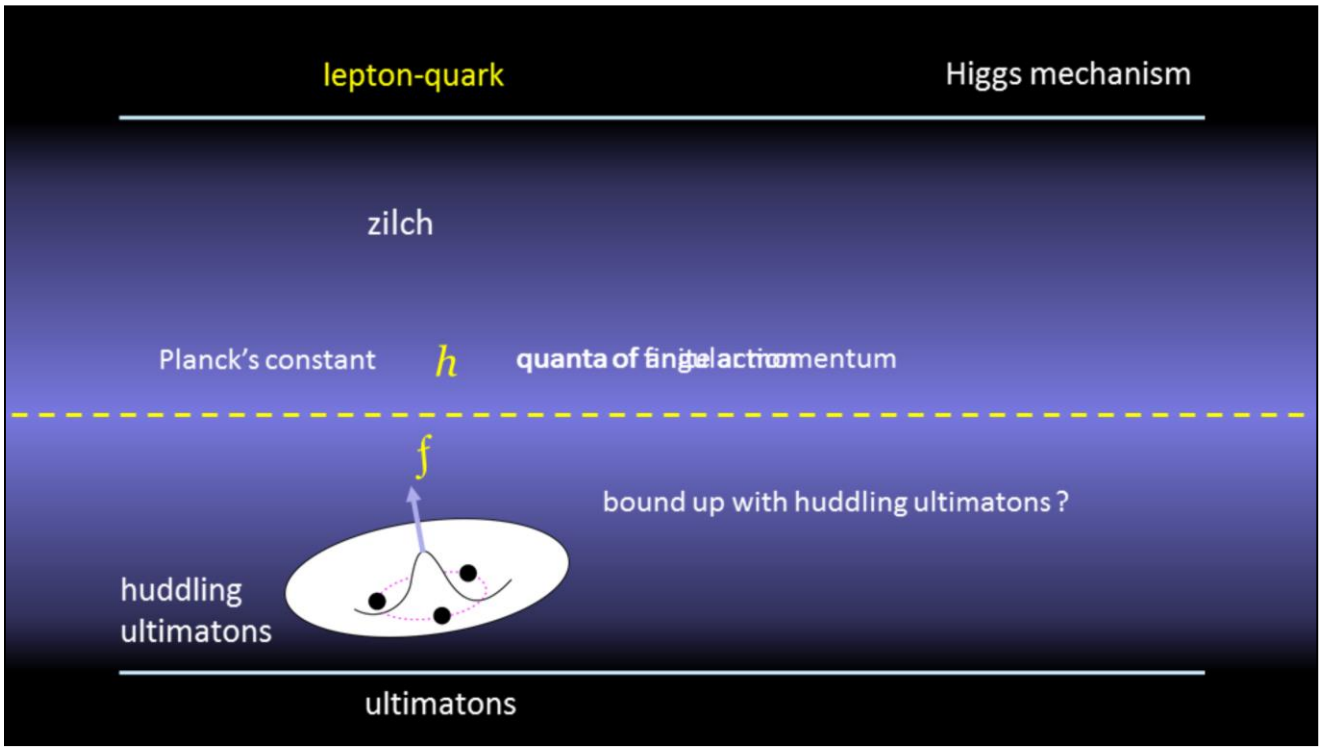
So how do we connect all this with real particles that collide?

[**Movie: electrons_collide.avi**]



Remember, to make contact with the standard model, all we need is for [**this**] to interact with [**this**].

For argument's sake,



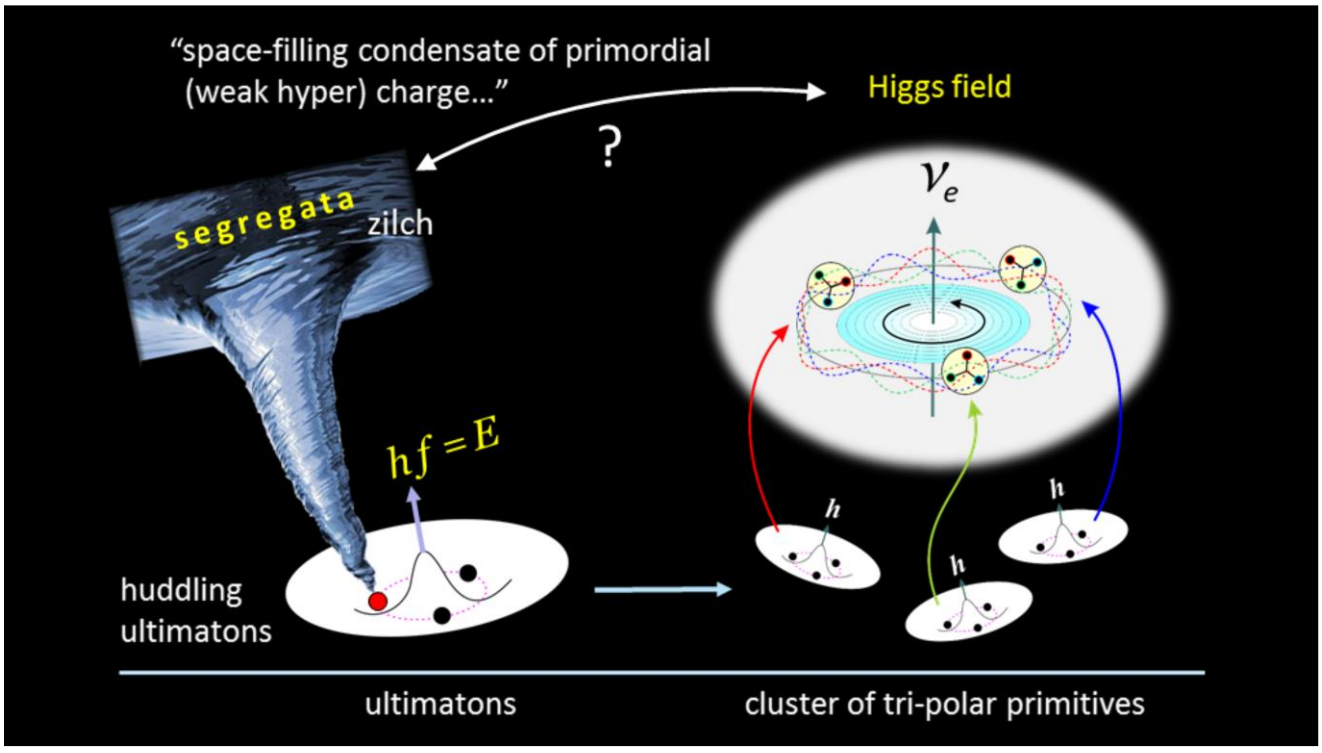
… let's say these [primitive] ultimatonic structures exist at the **Planck scale**. Then notice what we have: something that's "Planck-sized", and quantized, and spinning.

Which makes you wonder: is **this** where nature slips **Planck's constant** into physics?

Is **this** how measureable energy – **quanta of finite action** – get(s) locked into spacetime? As quanta of **angular momentum**, bound up with huddling ultimatons?

Ok, that's a convenient idea, but could nature **really** build standard model matter from such ultimatonic parts?

Let's see how this might work.



Imagine this basic building block to be some **photon-like** thing, and then imagine a simple cluster of such blocks.

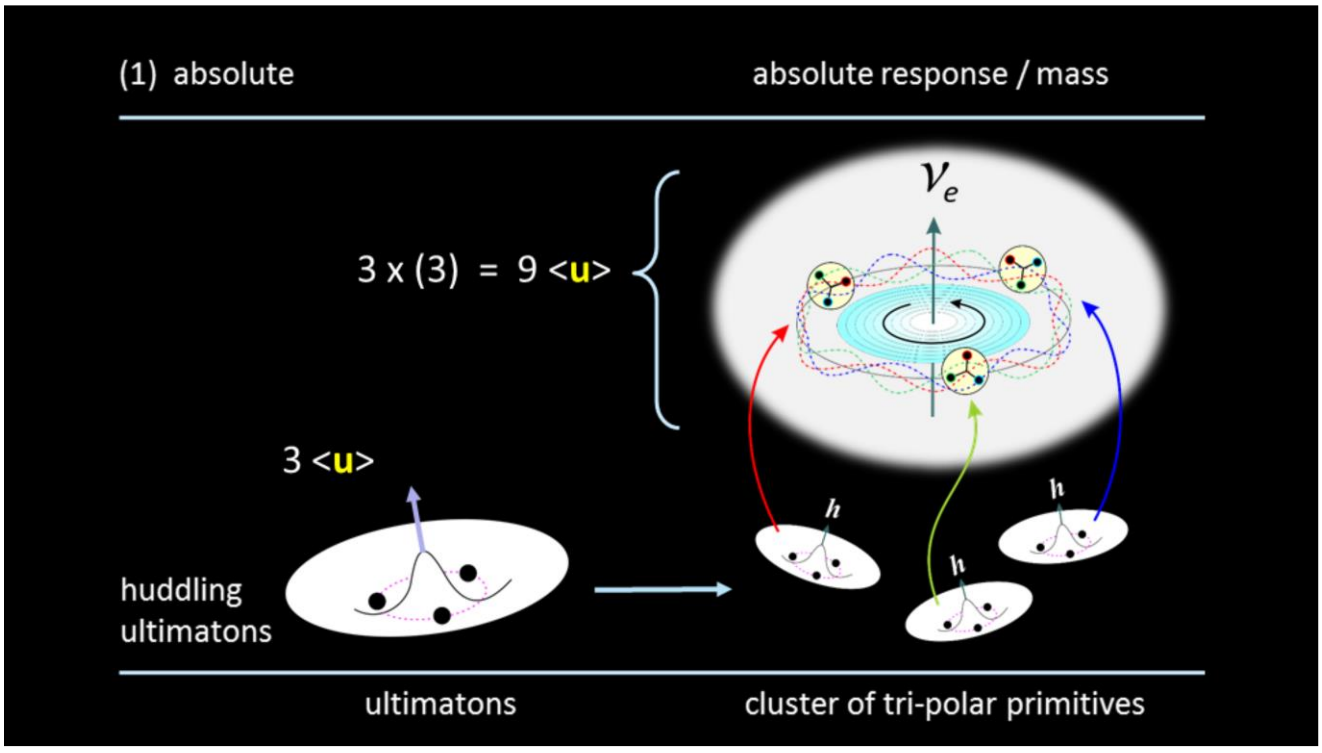
Currently, standard model neutrinos are thought of as a **superposition** (or mixture) of three primitive spinning things. So in a Urantia Book scheme, a neutrino might be something like this.

Now, what are neutrinos famous for? **Interacting with zilch**! In fact zilch – weak hypercharge – is the only thing a neutrino can feel. So picture this as some **chiral** structure in that condensate of zilch. What we have here is a standard model **particle**, interacting with standard model **zilch**... but built from very **non-standard** parts.

But there's more. As we know, this Higgs-type field is thought of as a "space-filling condensate of primordial charge. Which sounds a lot like "space-filling condensate of primordial charge", in other words, **segregata**; the very stuff from which these primitive particles are made.

So here's a question: could a region of segregata serve as the sort of "Higgs-type field" the standard model needs?

At this point, let's recall why a Higgs-type field was invented:



… to give a quantum property called **mass** to standard model particles.

Does the Urantia Book say anything about the mass of particles?

Well if we think of mass as "**response to gravity**", then these papers describe **two distinct types** of mass, which respond to **two very different** types of gravity.

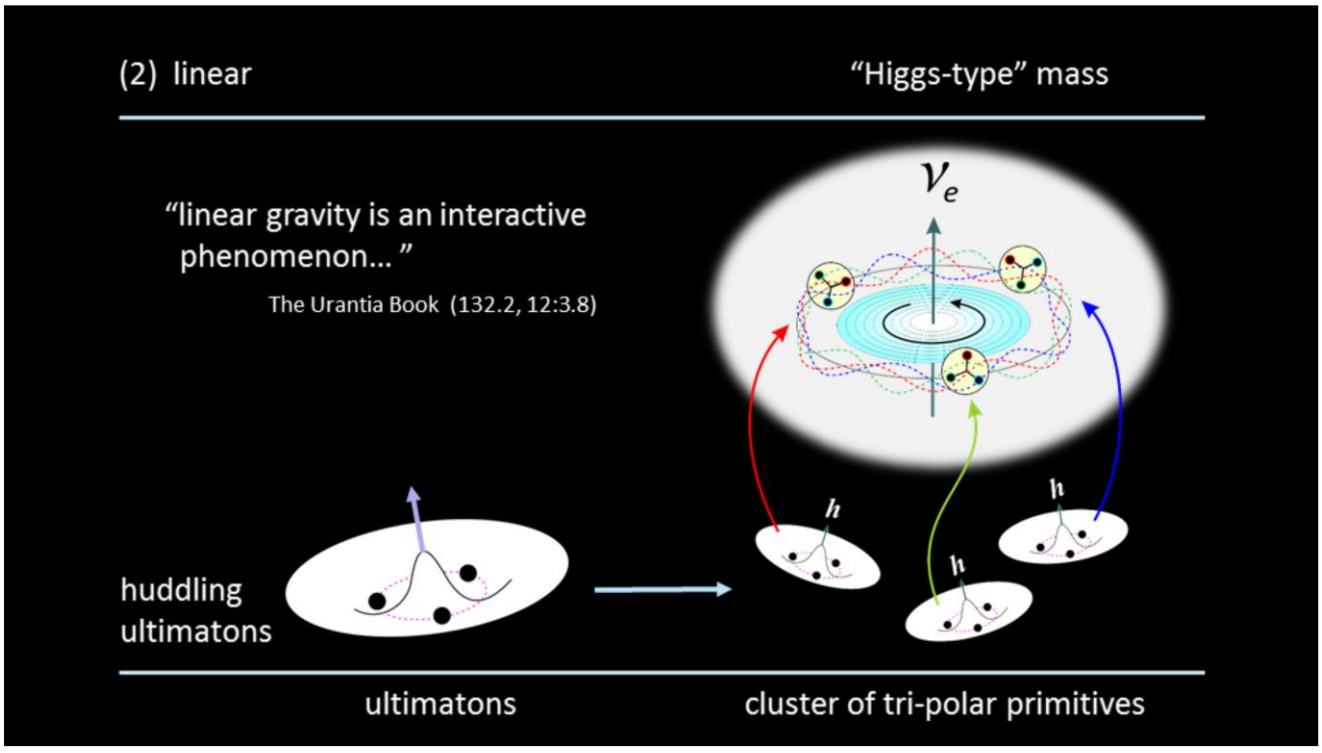
The first type of mass we might call "**absolute**" – a measure of absolute response to the [**source and center of gravity**]. It's this sort of mass that individual ultimatons are said to have.

So for example, if our building block has 3 ultimatons, and we build a **tiny structure** from three such blocks, then we have 3 x (3) equals **9** ultimatons,

9 units of **absolute**, ultimatonic **response**.

9 units of **absolute**, ultimatonic **mass**.

But in the standard model, this tiny structure, with its **9 units of absolute mass**, will be **interacting with zilch**.



It's this **interaction** that induces a second type of mass, a second type of "gravity and response" which the Urantia Book calls "**linear**". (132.2, 12:3.8)

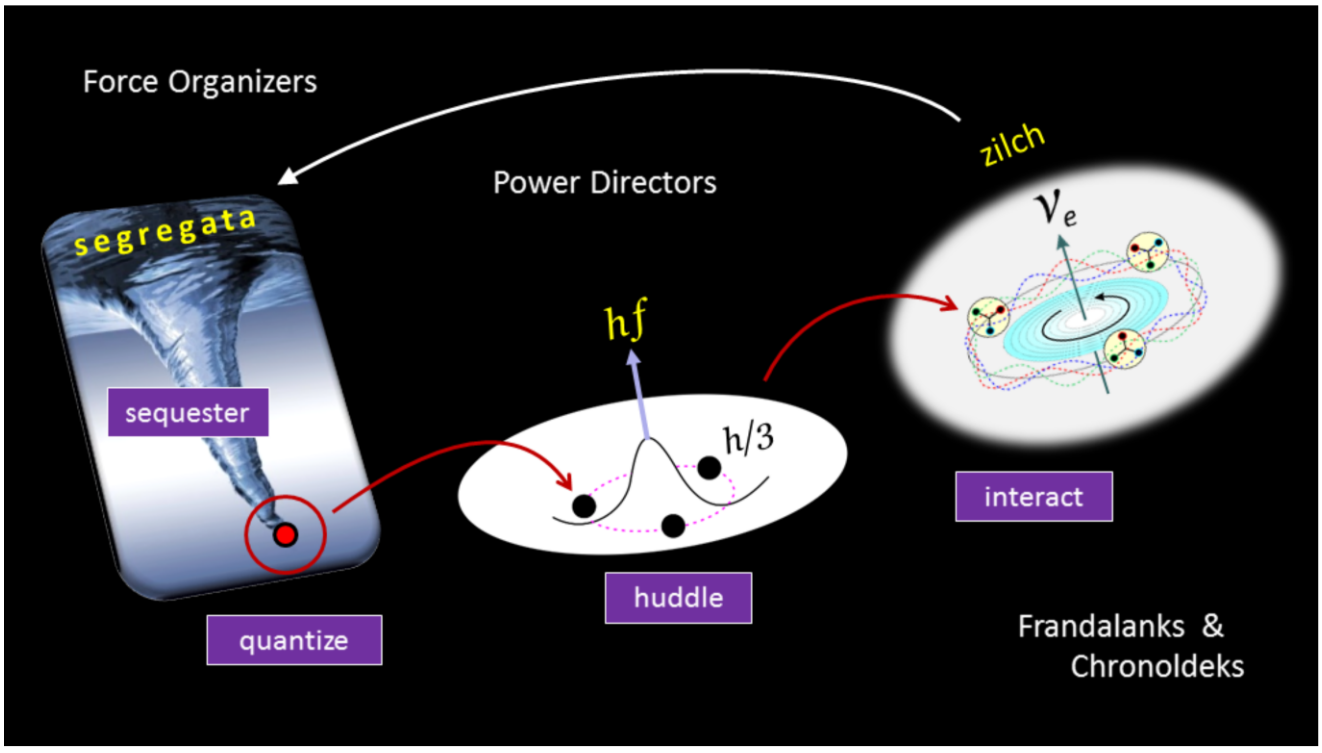
From paper 12 section 3: [quote]

"linear gravity is an interactive phenomenon..."

[end quote]

It's precisely this second type of mass, this linear or **interactive** response, that the **Higgs mechanism** was invented to explain.

In the next two sections, we'll see what this distinction – between two very different **types of mass** – means for black holes, and for galaxies.



So here's (what seems to be) the Urantia Book story so far:

From transcendental **Force Organizers** to finite **Power Directors**, all the way down to **Frandalanks** and **Chronoldeks** embedded in space and time,

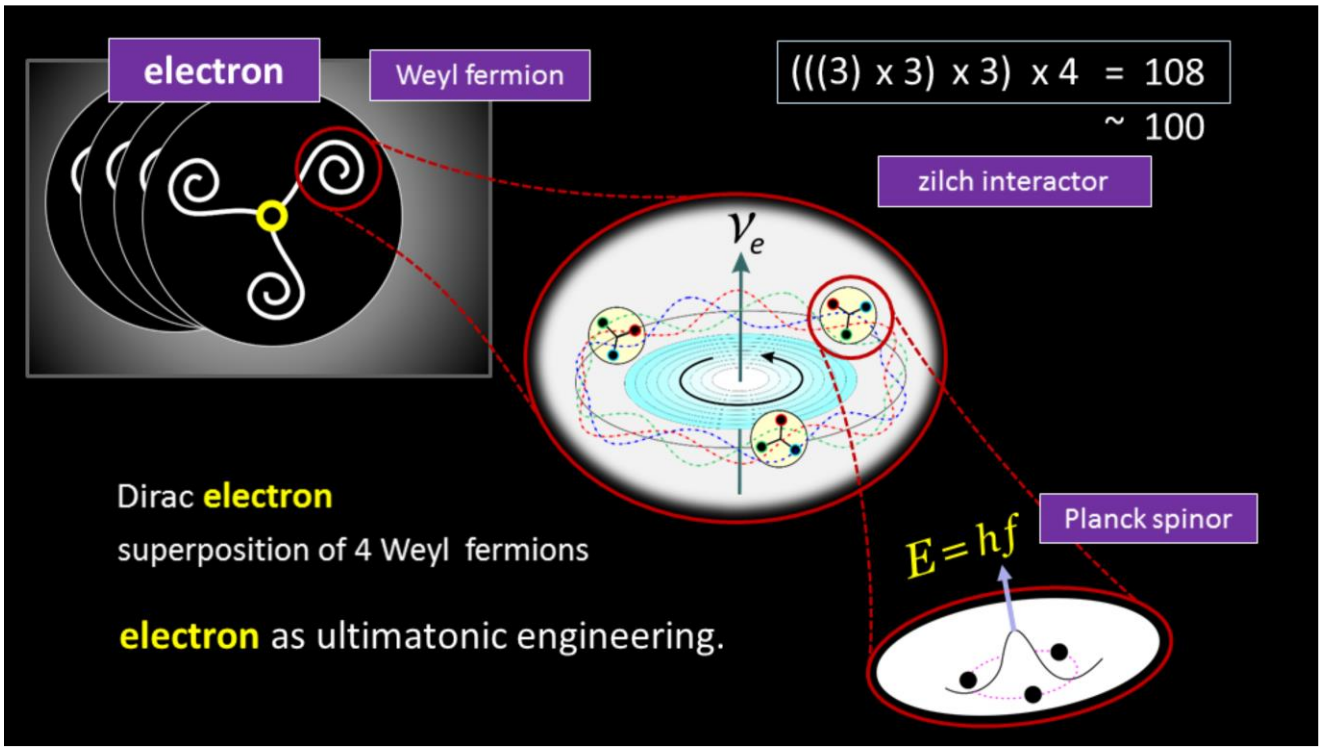
a condensate of space potency is sequestered… and quantized… and made to huddle. And then to interact with… **that same condensate** from which it came.

The point is – if we're going to build standard model matter from ultimatons, we're going to need building blocks something like this.

* * *

Ok, so we have hypothetical building blocks. What about the electron?

Paper 42 says electrons are built from 100 ultimatons. How might this work?



In the current standard model, the so-called **Dirac electron** is modelled as a superposition of **4 Weyl fermions** (or 2 pairs of 2).

In a Urantia Book scheme, we'd build these Weyl fermions from smaller parts, parts **designed** and **tuned**… to *interact* with zilch.

And we'd build these interactive parts from Planck-scale things, our huddling ultimatons.

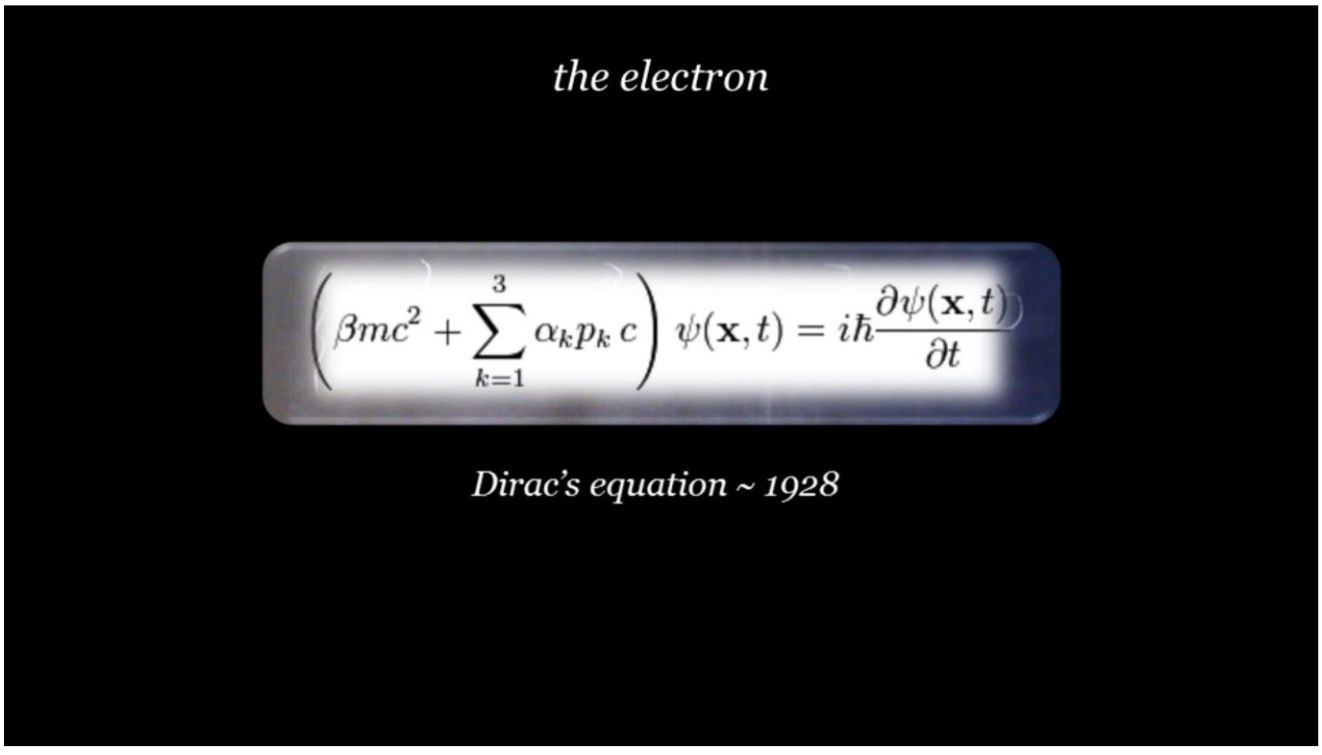
Now let's do the math: (((3) x 3) x 3) x 4 … that's **108**.

108 tiny units of absolute response. If we allow a few of these clusters to share dipoles and tripoles, like atoms in a molecule share electrons, then we can round this down to an even 100.

And there we have it, the electron as **ultimatonic engineering**.

Of course the issue here is that such **ultimatonic engineering** implies design. Which may be something that physics is not yet ready to explore.

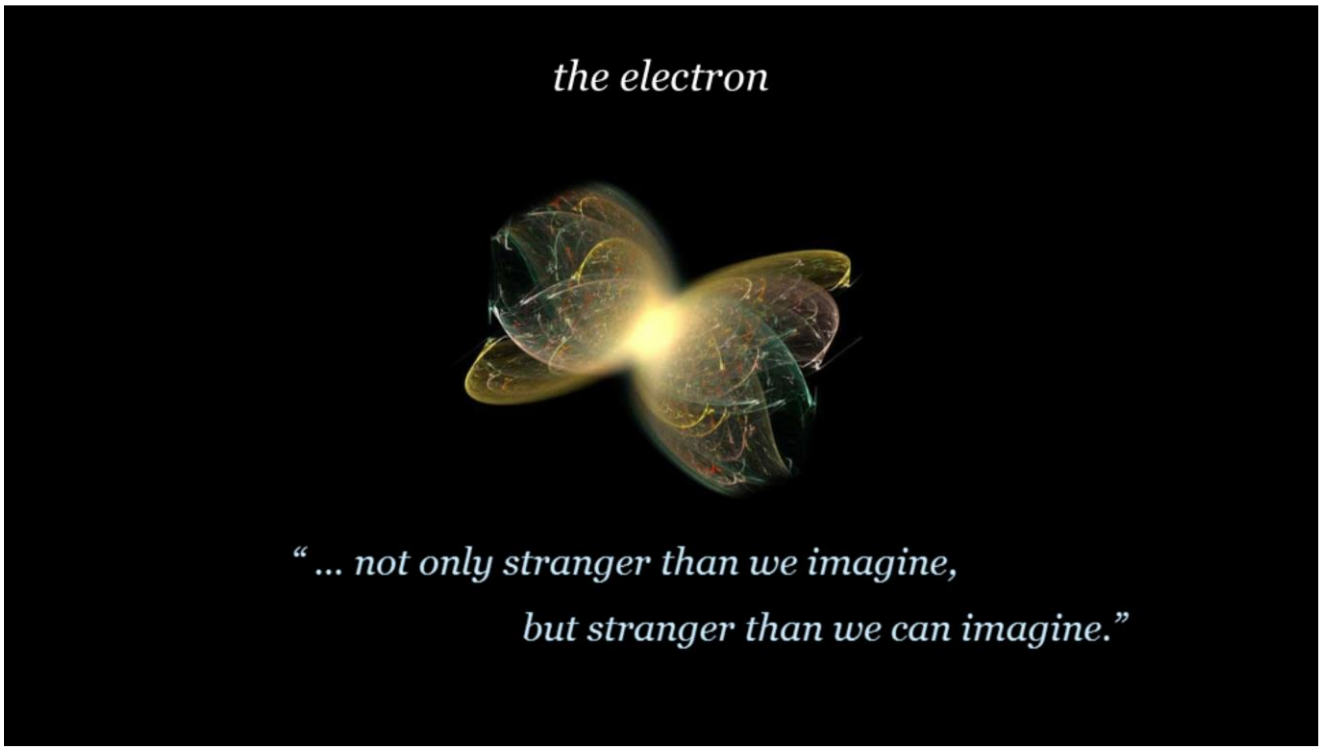
Nevertheless, does physics have room for a story like this?



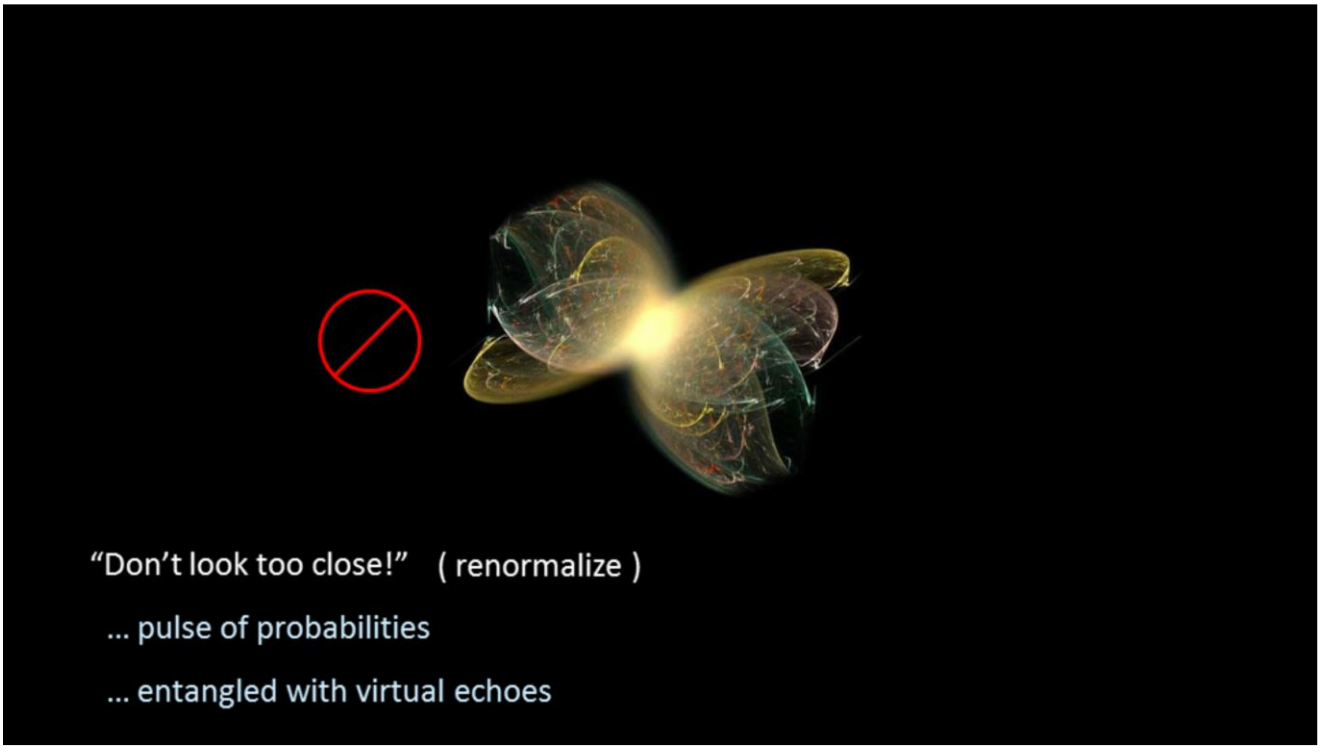
Think about Dirac's famous (1928) equation for the electron, which we still use today.

This equation tells us nothing about what the electron actually **is** ;

it simply helps us to predict (**with extraordinary precision**) certain values that we can expect to measure.



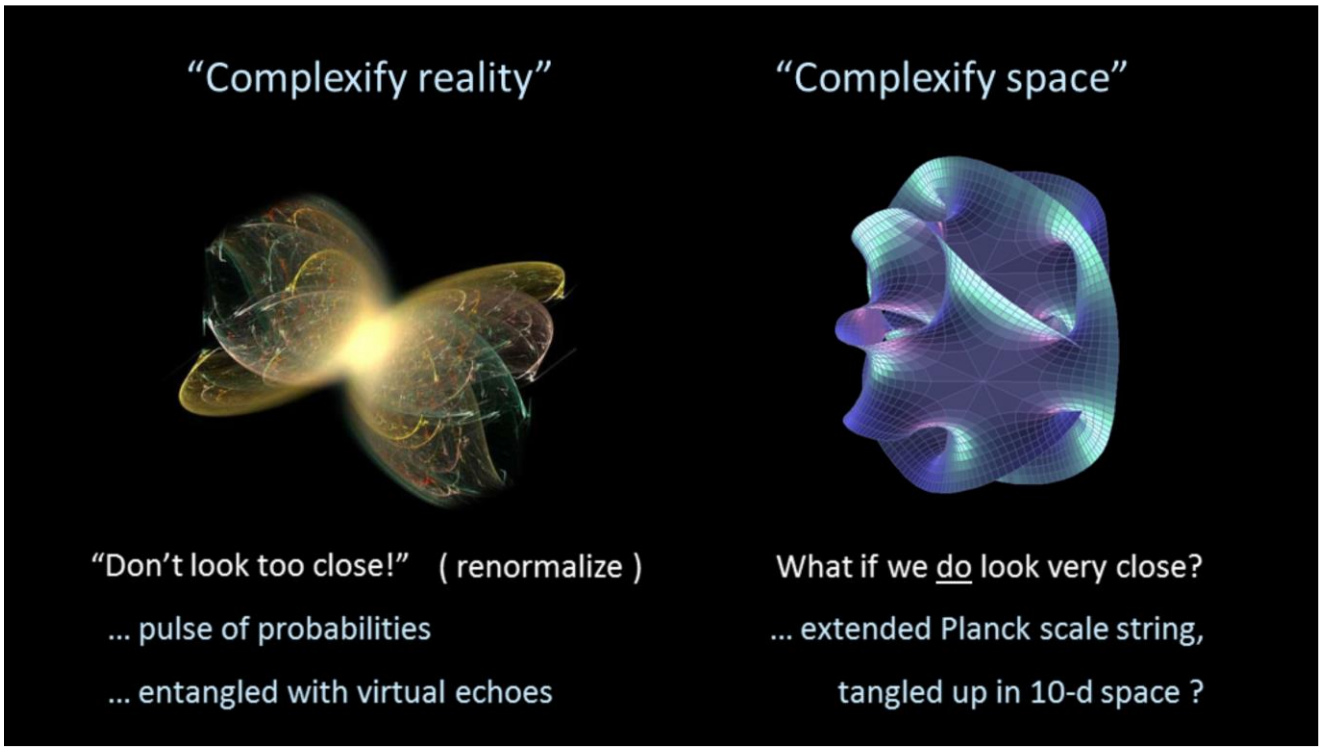
Which leaves plenty of scope for speculation…



The current **standard** view sees the electron as "**a point of charge**".

But this standard view comes with a rule: **renormalize** (or, don't look too close!)

In this scheme, **reality itself gets slippery**. The electron becomes a pulse of probabilities, somehow entangled with virtual echoes of itself… (!)

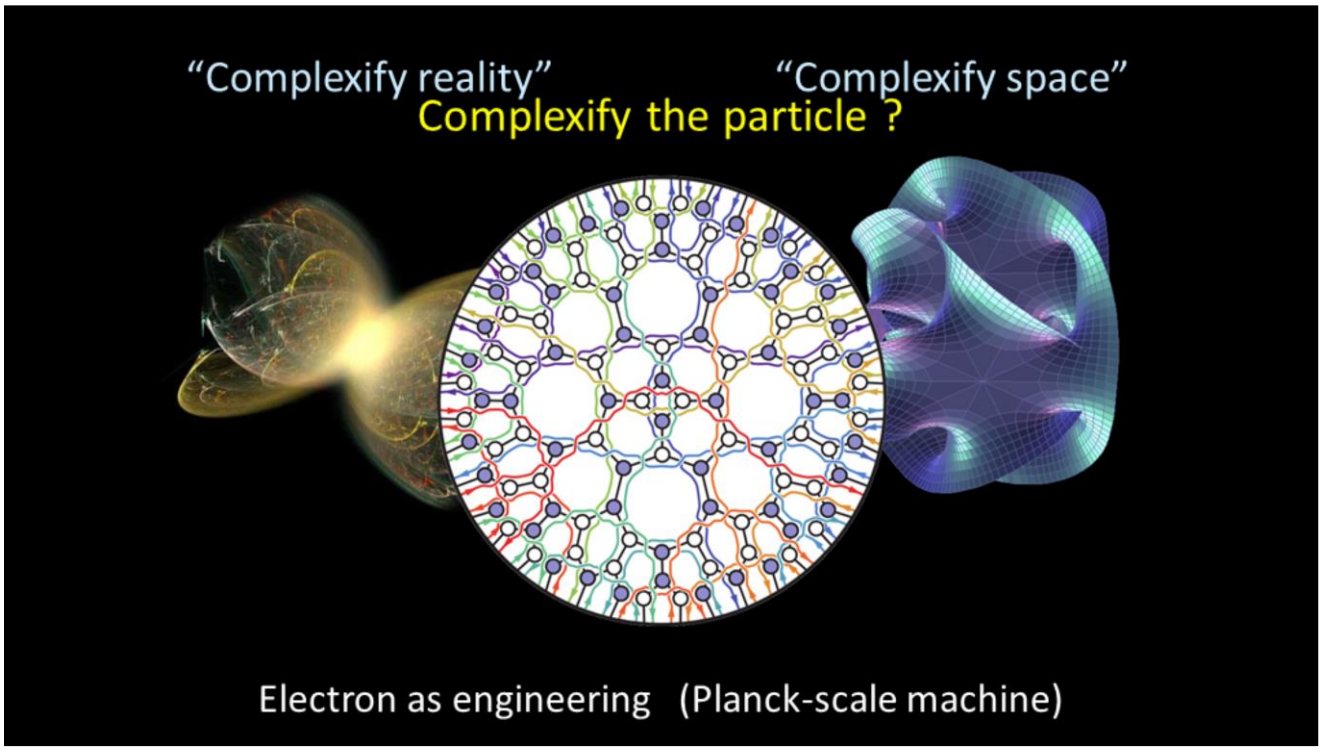


But what if we do look very, very close? Well, then things get weird. So weird that electrons **must** be something more than mere fluctuations in a field.

One alternative is a Planck-scale **string**, tangled up in 10-dimensional space.

Of these two currently popular (and incompatible) schemes, one requires that we complexify **reality**, the other that we complexify **space**.

The Urantia Book suggests a third possibility…

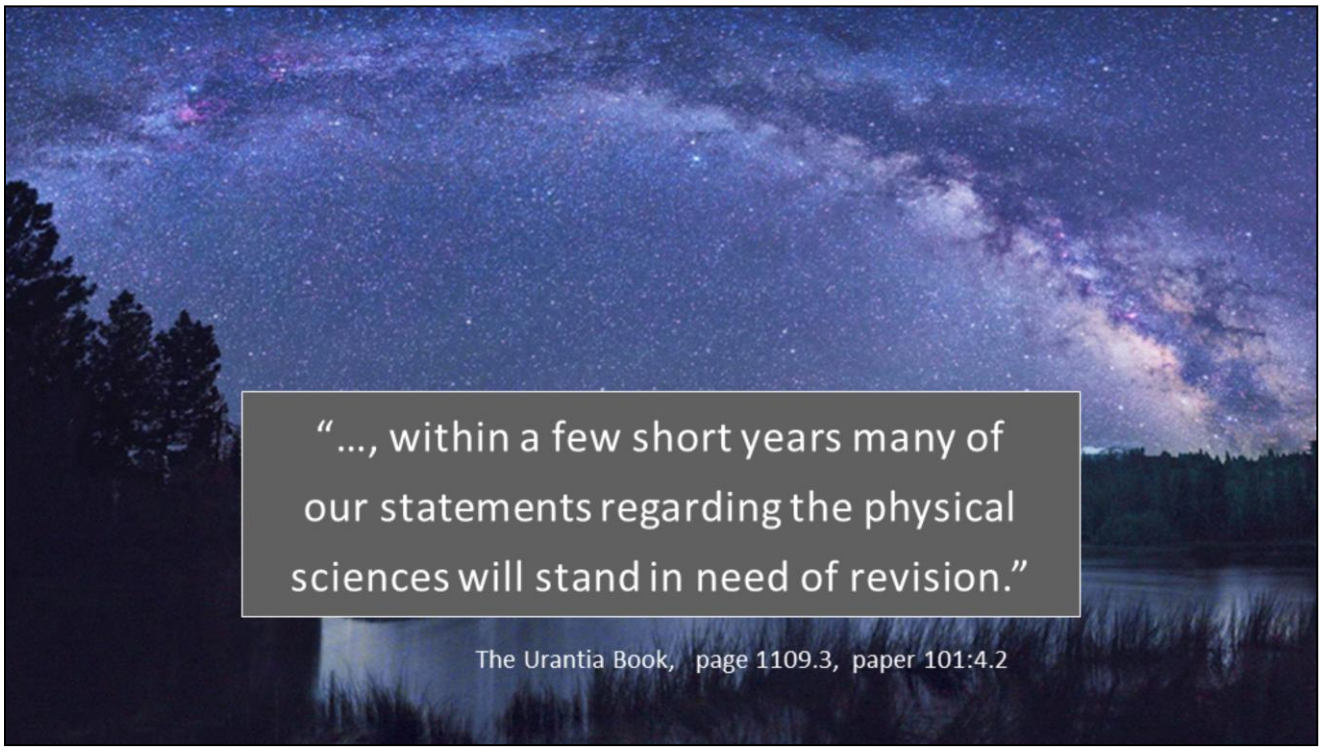


… complexify the **particle**.

In this Urantia Book scheme, the electron becomes…
a truly **fabulous** Planck-scale machine.

* * *

Remember how in paper 101 section 4, "**The Limitations of Revelation**", …



the author states that,

> "… within a few short years many of our statements regarding the physical sciences **will stand in need of revision**".
>
> (1109.3, 101:4.2)

"Will stand in need of revision."

So far we haven't attempted to revise the Urantia Book story.

With regard to the nature of mass and matter, and expressed in modern terms, this – or something like it – is that story.

And quite a tale it turns out to be!

So much for mass and matter.

Let's now think what all this means for **dark islands**, those so-called "black holes in space", and for the Milky Way.

First, dark islands:

My interest in dark islands was stirred by a comment from a long-time reader of the Urantia Book. Like many of us, he started off quite impressed by their fabulous, "sci-fi" cosmology, and for 10 years, he "championed" so-called "Urantia Book science".

But over time, as his naïve assumptions and misunderstandings got undermined, his interest in this "scientific content" cooled off, prompting him to ask (what he thought was) a rhetorical question: