Fermions as Bags of Frame Space

Terry Bollinger
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Message Excerpt

… I didn't see your entire message until now, only the first line!

Thanks for the positive feedback on the hypercube graphic. I use PowerPoint, but I likely qualify as an expert user. I can do a lot in a hurry using it.

OK, now you've done it: You've shifted my brain from SR mode to SM mode:

Another way to interpret the fermion hypercube is this: There are only _eight_ fermions, and they are vectors, not points. Flipping a fermion vector one way gives one particle, while the other position results in a very different particle that differs by one unit of electric charge. This symmetry is just the ancient "isospin" nucleon model applied at the quark level. That's what T_3 is.

To some degree, labeling fermions as vectors is just a matter of emphasis. However, since I like the idea that there's more simplicity in the Standard Model than we give it credit for, the notion that _every_ fermion is a vector in a 4D charge space rather than a point in 3D space strikes me as a better way to explore the deeper symmetries involved.

The T_3 space is identical to Maxwell's ancient charge displacement space. Flipping the eight vectors up or down -- isospin flips -- results in profoundly different properties due to the impact of electric charge in xyz space. Still, even that's a bit of an illusion created by how these vectors interact with our xyz rest frame.

And yes, I do mean "rest frame." Rest frames are collective states of Higgs-aware matter with well-defined scopes, energies, and limits. As collective states of matter, they are much more complicated than the simple image of particles floating in perfect space and time suggests. The existence of massive rest frames in our universe plays a critical role in stabilizing fermion vector orientations. It's not an accident that Dirac predicted the positron by doing nothing more than applying SR to wave functions.

Incidentally, did you notice how the eight more vectors are parallel and have identical lengths?

The vector offsets are different combinations of time colours and anti-colours. Since the six non-central quark vectors have RGB colour-time offsets, they cannot endure long in a universe that relies on RGB time for causality. That's also the deeper cause of quark confinement. In contrast, the charge and momentum of the electron-neutrino and positron-antineutrino vectors are unlimited due to their endpoints residing on the colorless RGB axis.

While the canonical fermion vector captures the length and time orientation of all the fermion vectors, it cannot exist as a unique vector due to the quantization of charge in xyz space. Charge quantization pushes each vector option away from the center and to the opposite faces of the hypercube.

Before I went back to working on special relativity age gradients, I did take those figures to the point where I was pretty sure that the best way to model the weak force is as an exchange between two oppositely pointed fermion vectors. The impact of this exchange -- essentially, the most straightforward possible answer to what the W force does, at least in terms of geometry -- is to flip the direction of both vectors:

u (or [u <-- d]) + e (or [nu --> e])
---- under W^(+,-) exchange gives ----
d (or [u -->d]) + nu (or [nu <-- e])

The above W interaction enables proton-proton fusion in the sun by allowing a proton to absorb an electron. It's infrequent because it requires time-energy uncertainty to send fusion energy backward in time as a sort of "loan" to fund the energy-costly W exchange.

The impact is profound since the conversion also makes the proton (uud) into a neutron (udd) while allowing now-charge-free electron-neutrino to zip off as a neutrino.

Anyway, as usual, thanks for commenting. I'm juggling many balls in the air at once, and sometimes they bump into each other in interesting and non-obvious ways. For example, the idea that frames are excited states of matter, meaning you _create_ the spaces that they use, not the other way around -- has profound relevance for particle physics if you consider time as a composite of three components, RGB. Each colour component can create frames, but the encompassing causality of colorless time limits what those mini-frames can accomplish.

More and more, it's looking like the particles of the standard model are not much more than micro-frames of created space-frames with several limits imposed by larger frames. For example, the Glashow hypercube is also a map of the set of possible chiral spaces created, in binary-tree fashion, by incrementally adding new orthogonal axes one by one.

The particle accelerator community has a voracious appetite for making particles more and more point-like by adding increasingly phenomenal energy levels. Thus, it would be delightfully ironic if those particles turned out to be nothing more than hadron-scale bags of colour-localized space at their most fundamental levels.

Cheers,
Terry

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