The Waegell-Cohen-Elitzur-Tollaksen-Aharonov Prediction of Weak-Blind Fermions

Terry Bollinger
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https://youtu.be/qOLRzxPJPxM&lc=UgxiU85AGGJzCbPhmpV4AaABAg

A Comment on the Closer To Truth YouTube post:
Jeff Tollaksen - What is Ultimate Reality? (Jun 9, 2023)
https://youtu.be/qOLRzxPJPxM

Professor Tollaksen, and Robert Lawrence Kuhn, thank you for this excellent interview. It prompted me to look up your latest paper [1]. Headline first: Your team's Dirac-style prediction worked. Counterparticles are the weak-force-blind left-chiral fermions and the right-chiral antifermions. Their negative mass makes them blind to the weak force.

I was fascinated and deeply impressed that your team developed the concept of negative energy counterparticles starting only from pre- and post-selection reasoning. I have no idea how you did that! I would have thought the distinction was too subtle to show up under that style of analysis. I'm now intrigued to learn more.

My name for them is *contra* particles [2], but I seldom use that prefix at the particle level since these particles have been part of the Standard Model for several decades. As I've noted, your negative-energy counterparticles are identical to the weak-blind chiralities of the Standard Model: the left-chiral fermions and the right-chiral antifermions.

What you and your team have done is, in effect, a reverse Dirac. Using only mathematical arguments, your team predicted the existence of negative-energy versions of the weak-aware fermions and antifermions. While these particles were proven to exist decades ago, neither their finders nor your team immediately realized the connection.

The reason is easy to identify. Why should anyone in the Standard Model community think to question whether one of the fermion chiralities might have *negative energy?* There is no reason to postulate such an absurd-sounding idea, especially since the common perception is that particles such as electrons are always *equal* mixes of the two chiralities. Assigning negative mass to one would cancel both particles to null.

This assumption overlooks the importance of chain termination points, which define what non-physicists would call "the present." While the long-term history of the particle does indeed cancel to null, the terminal particle in the chain represents a slight excess of weak-aware chirality in our universe, with a corresponding and a weak-bind chirality chain end at the opposite end of the chain, in what I assume you would call a counterverse.

Sorry about adding a counterverse, but that outcome becomes almost unavoidable once you head down the negative energy path. Particles and counterparticles exist in *both* universes, but only the universe has a slight excess of particles, and only the contraverse has a slight excess of counterparticles. On the positive side, a counterverse rushing backward in geometric (but not causal) time eliminates the antimatter shortage problem in a nicely CPT-symmetric fashion. So your counterparticle prediction may make Boyle, Turok, and others happy (maybe Chen and Carroll? Barbour, too, I'd think).

The role of time-axis pair production — as opposed to "ordinary" space-axis pair production — in creating time is deeply fascinating [3] and hints at broader contexts.

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[1] M. Waegell, E. Cohen, A. Elitzur, J. Tollaksen, and Y. Aharonov, *Quantum Reality with Negative-Mass Particles*, arXiv Preprint arXiv:2201.09510 (2022). https://arxiv.org/abs/2201.09510

[2] T. Bollinger, *On Quantizing General Relativity: An Overview*, Apabistia Notes (2022), https://sarxiv.org/apa.2022-04-21.1039.pdf, Slide 13, "E+ and E-Fermion Groups."

[3] T. Bollinger, *On Quantizing General Relativity: An Overview*, Apabistia Notes (2022), https://sarxiv.org/apa.2022-04-21.1039.pdf, Slide 18, "Time as Destabilized Time Pairs."