Why Are There 3 Generations of Fermions?

ABSTRACT

I conjecture that string theorists are guaranteed to fail unless they recognize the importance of the work of Milgrom, McGaugh, Kroupa, and Pawlowski. Milgrom's acceleration law is true or appears to be true for some unknown reason. What does Milgrom's acceleration law have to do with the 3 generations of fermions? I speculate that Milgrom's acceleration law implies that the law of conservation of gravitational energy is false and that the infinite nature hypothesis is false. Assume that nature is finite and digital. Conjecture (1). The 26-dimensional model of bosonic string theory, together with Lestone's heuristic string theory, implies that supersymmetry is an approximate symmetry within Wolfram's automaton. Conjecture (2). There are 3 generations of fermions because Wolfram's automaton provides a way for 3 copies of 26-dimensional bosonic string theory to map into 64 dimensions of fundamental particles, 2 dimensions of quantum spin, 3 dimensions of linear momentum, 3 dimensions of angular momentum, and 6 dimensions of quantum uncertainty. Wolfram's automaton provides approximations to quantum field theory and general relativity theory by means of 't Hooft's superdeterminism. Are conjectures (1) and (2) false? Perhaps, but the conjectures are testable. The main predictions are the Fernández-Rañada-Milgrom effect, the Space Roar Profile Prediction, and the hypothesis that gravitons, inflatons, and axions are the only fundamental particles that remain to be discovered. According to the "Meaning of Relativity", 5^{th} edition, page 93, a ray of light passing near a large mass M is deflected by an amount α = (κ/(2π)) * (M/Δ), where Δ is the ray's minimal (hypothetically undeflected in the flat coordinates) distance from the center of mass M, and κ is Einstein's gravitational constant. The Fernández-Rañada-Milgrom effect implies that ((1 – 2 * D-M-C-C)^–1) * (κ/(2π)) * (M/Δ), where D-M-C-C = dark-matter-compensation-constant. In the standard form of Einstein's field equations replace the –1/2 by –1/2 + dark-matter-compensation-constant (D-M-C-C) to get the alleged Fernández-Rañada-Milgrom effect, where the constant is approximately sqrt((60±10)/4) * 10^–5.

ARE THERE MORE THAN 3 GENERATIONS OF FERMIONS?

"In the mind of particle physicists, three is a very round number: three is the number of color charges a quark may have; and electrons have an electric charge that is three times larger than that of down quarks. But while the two above "coincidences" are in fact deeply intertwined, the presence of additional fermion generations would make no apparent damage to the overall structure of the Standard Model. However, there are experimental hints that point to three generations." — Tommaso Dorigo

http://dorigo.wordpress.com/2008/03/25/thou-shalt-have-three-generations/ A Quantum Diaries Survivor, 25 March 2008

MOND PARADIGM

"MOND is an alternative paradigm to Newtonian dynamics, whose original motivation was to explain the mass discrepancies in galactic systems without invoking dark matter (DM) … The MOND predictions concerning the mass discrepancies in galactic systems depend only on the present day baryon distribution. In contrast, the expected discrepancies; i.e., the relative quantities and distributions of baryons and DM in such systems depend strongly on their unknown (and unknowable) formation history …" — Mordehai Milgrom

http://arxiv.org/pdf/0801.3133v2.pdf "The MOND Paradigm", Mordehai Milgrom, 2008

If the ratio of mass-energy of dark matter particles to the mass-energy of baryons is over 5 to 1 in the universe, then why do models of the Sun, the Earth, and Jupiter work with negligible percentages of dark matter? If Milgrom is wrong then how did he convince McGaugh and Kroupa?

"The concordance model of cosmology, LCDM, provides a satisfactory description of the evolution of the universe and the growth of large scale structure. Despite considerable effort, this model does not at present provide a satisfactory description of small scale structure and the dynamics of bound objects like individual galaxies. In contrast, MOND provides a unique and predictively successful description of galaxy dynamics, but is mute on the subject of cosmology. …" Stacy S. McGaugh

http://arxiv.org/abs/1404.7525 "A Tale of Two Paradigms: the Mutual Incommensurability of LCDM and MOND", Stacy S. McGaugh, 2014

"The SMoC can thus be discarded with better than 99.9 per cent confidence, by this one test alone." — Pavel Kroupa

http://arxiv.org/pdf/1204.2546v2.pdf "The dark matter crisis: falsification of the current standard model of cosmology", Pavel Kroupa, 2012 (page 17)

WHAT IS THE MEANING OF MOND IN TERMS OF STRING THEORY?

"The role of duality in string theory was a unifying one. Apparently different compactifications of different 10-dimensional string theories were related by conjectured duality transformations for which stringent tests were proposed. String theory passed all the tests, and in each case did so by strikingly different dynamical mechanisms. During this period, it became more clear than ever that the underlying structure of string theory was very rigid and constrained, and that dualities were an intrinsic and deep property built into the theory." — Sunil Mukhi

http://arxiv.org/abs/1110.2569 "String theory: a perspective over the last 25 years", Sunil Mukhi, 2011 (pages 20–21)

"One of the most commonly cited problems with the Standard Model is that it lacks a compelling reason to introduce new elementary particles, such as WIMPs (weakly interacting massive particles), that could account for the behaviour of dark matter. The presence of so many superpartners in the MSSM provides a logical — indeed almost compelling — solution to this problem …" — S. James Gates, Jr

http://live.iop-pp01.agh.sleek.net/2014/09/25/sticking-with-susy/ "Sticking with SUSY", S. James Gates, Jr, 2014

String theory (or M-theory), with or without supersymmetry, seems to imply the string landscape unless some drastic additional physical hypothesis eliminates the landscape. The string landscape suggests a multiverse with Markov branching and with neither boundary nor interior. String theory with the finite nature hypothesis suggests a multiverse with Wolfram's automaton and with boundary and interior. Why does the multiverse need a boundary and an interior? The answer is the space roar and the photon underproduction crisis.

http://en.wikipedia.org/wiki/Space_roar

http://en.wikipedia.org/wiki/Photon_underproduction_crisis

My guess is that Wolframian quasi-supersymmetry enables string theory to explain dark matter, dark energy, the space roar, and the photon underproduction crisis. Why should anyone believe the following conjecture? There are 3 generations of fermions because Wolfram's automaton provides a way for 3 copies of 26-dimensional bosonic string theory to map into 64 dimensions of fundamental particles, 2 dimensions of quantum spin, 3 dimensions of linear momentum, 3 dimensions of angular momentum, and 6 dimensions of quantum uncertainty. Is the preceding conjecture nonsense? The 64 dimensions of fundamental particles might average to 4 dimensions of spacetime by averaging with respect to 16 dimensions of uncertainty generated with respect to hbar and alpha-prime for each spacetime coordinate. The four spacetime coordinates each have 16 dimensions of uncertainty. Wolfram's automaton might yield an approximate model of 6 dimensions of quantum uncertainty. The 3 generations of fermions allow an approximate supersymmetry to exist within Wolfram's automaton, and this approximate supersymmetry allows Wolfram's automaton to approximately simulate a version of M-theory. Why should there be 3 copies of 26-dimensional bosonic string theory? The three copies might be needed to implement Lestone's heuristic theory.

http://arxiv.org/pdf/physics/0703151v6.pdf "Physics based calculation of the finite structure constant", J. P. Lestone, 2009

I conjecture that there exists a generalized Koide formula for some 64 by 64 matrix based on string theory that implies the Koide formula.

http://en.wikipedia.org/wiki/Koide_formula

"Quantum mechanics as it stands would be perfect if we didn't have the quantum-gravity issue and a few other very deep fundamental problems. I want to understand what will happen to the Standard Model as we pursue higher energies, I want to understand what quantum mechanics is about, and I want to understand how gravity works. …" — Gerard 't Hooft

http://blogs.scientificamerican.com/critical-opalescence/2013/10/07/does-some-deeper-level-of-physics-underlie-quantum-mechanics-an-interview-with-nobelist-gerard-t-hooft/

"Does Some Deeper Level of Physics Underlie Quantum Mechanics? An Interview with Nobelist Gerard 't Hooft", Critical Opalescence, Scientific American Blog Network, George Musser, 7 October 2013

Is Milgrom's acceleration law the most important clue for understanding quantum gravity? How can string theorists (or M-theorists) explain the 3 generations of fermions?

DYSON'S QUESTIONS ON THE GRAVITATIONAL FIELD

"In this paper I am not advocating any particular theory of a classical gravitational field existing in an otherwise quantum-mechanical world. I am raising two separate questions. I am asking whether either one of two theoretical hypotheses may be experimentally testable. One hypothesis is that gravity is a quantum field and gravitons exist. A second hypothesis is that the gravitational field is a statistical concept like entropy or temperature, only defined for gravitational effects of matter in bulk and not for effects of individual elementary particles. If the second hypothesis is true, then the gravitational field is not a local field like the electromagnetic field. The second hypothesis implies that the gravitational field at a point in space-time does not exist, either as a classical or as a quantum field." — Freeman Dyson

http://publications.ias.edu/sites/default/files/poincare2012.pdf "Is a Graviton Detectable?", Poincaré Prize Lecture, Freeman Dyson, 2012

What are the implications of Dyson's questions for string theory and/or supersymmetry?

QUESTION CONCERNING STRING THEORISTS

"… string theory provides intuitive ways for seeing how singularities are resolved. When point-particles scatter at very high energy, the stringy degrees of freedom "open-up", effectively spreading over a finite spacetime region, smoothing out the interaction region. From a different perspective, in the perturbation expansion the Riemann surfaces corresponding to high momentum are the "thin" ones, but a modular transformation relates such surfaces to non-degenerate ones, effectively avoiding the ultraviolet regime. The reason for the stringy ultraviolet finiteness can therefore be traced to the very hypothesis at the basis of string theory, namely the existence of an infinite number of degrees of freedom besides the ones we see, defining extended elementary objects. These can smooth out the standard quantum field theory divergences." — Carlo Rovelli

http://arxiv.org/pdf/1108.0868v1.pdf "A critical look at strings", Carlo Rovelli, 2011

"Superstring theory is an extension of conventional quantum field theory that allows for stringlike and branelike material objects besides pointlike particles. The basic foundations on which the theory is built are amazingly shaky, and, equally amazingly, it seems to be this lack of solid foundations to which the theory owes its strength. We emphasize that such a situation is legitimate only in the development phases of a new doctrine. Eventually, a more solidly founded structure must be sought." — Gerard 't Hooft http://link.springer.com/article/10.1007%2Fs10701-012-9682-4 "On the Foundations of Superstring Theory", Gerard 't Hooft, 2013

“Of course the string theorists are physicists, but the string theorists in general will not attend lectures on experimental physics. They will talk to one another.” — Sheldon Glashow

http://www.pbs.org/wgbh/nova/elegant/view-glashow.html NOVA, The Elegant Universe, Sheldon Glashow, 2003, PBS

Have string theorists carefully studied MOND?

http://en.wikipedia.org/wiki/Modified_Newtonian_dynamics

ΛCDM MODEL

“While dark energy is well-represented by a cosmological constant Λ in Einstein’s field equations, the currently preferred dark matter candidate is a collection of stable, neutral, elementary particles that condensed from the thermal bath of the early Universe, and which are known as ‘cold dark matter’ (CDM) particles … On galaxy scales, however, predictions of this standard ΛCDM cosmological model, although plagued by the enormous complications of baryonic astrophysics, are difficult to reconcile with observations.” — Famaey & McGaugh

http://arxiv.org/abs/1301.0623 “Challenges for Lambda-CDM and MOND”, Benoit Famaey & Stacy McGaugh, 2013