Negative Mass and Graviton Spin States

by Stephen Andrew Crowley

November 11, 2024

Table of contents

1 Introduction to Tensor Bosons

The as-yet-undetected graviton must be a spin-2 boson because the source of gravitation is the stress-energy tensor, a second-order tensor[8]. This contrasts with electromagnetism's spin-1 photon, whose source is the four-current vector[10]. The assumption that gauge symmetry reduces tensor boson spin states from five (-2, -1, 0, +1, +2) to just two (-2, +2) lacks experimental verification[8]. The mathematics allows for all five states, but whether nature utilizes them remains unproven[1].

2 Theoretical Framework

2.1 Tensor Boson Properties

Any massless spin-2 field would couple to the stress-energy tensor in the same way gravitational interactions do[9]. A spin-2 particle requires a 180° rotation to return to the same quantum state, contrasting with spin-1 particles (360°) and spin-0 particles (any angle)[10]. Elementary bosons are categorized by spin: scalar bosons (spin-0) like the Higgs, vector bosons (spin-1) like photons, and tensor bosons (spin-2) - of which the graviton is currently the only known example[11].

2.2 Historical Context

John Mike (1940-2016), a theoretical physicist who studied at MIT in the 1960s, developed a rigorous mathematical analysis of gravitational theory incorporating negative mass[4]. His work built upon Herman Bondi's 1957 demonstration that gravitationally negative mass is not forbidden by General Relativity[1].

2.3 Einstein's Positive Energy Condition

Einstein's choice to impose the positive energy condition was not a physical necessity but rather a mathematical choice to avoid implications of the negative branch of the square root. The equations work perfectly well with negative mass included[5].

3 Mathematical Framework

The graviton's spin-2 nature emerges from the mathematical structure of general relativity[12]. The stress-energy tensor $T_{\mu\nu}$ couples to the gravitational field $h_{\mu\nu}$ through a unique interaction that preserves general covariance[9]. This leads to five possible polarization states for a spin-2 field, though whether all states are physically realized remains an open question[10].

Mike's analysis is mathematically consistent within the framework of general relativity and gauge theory[5]. While Yang-Mills theory remains unproven at the non-perturbative quantum level[13], the mathematical consistency and explanatory power of Mike's negative mass framework, combined with Occam's razor, suggests its validity. The theory elegantly explains multiple phenomena through a single mathematical framework[4].

The Yang-Mills existence and mass gap problem remains one of the key millennium prize problems[13]. A complete non-perturbative quantization of Yang-Mills fields would provide crucial insights into quantum field theory and potentially validate approaches like Mike's[14]. Current work on non-perturbative properties shows the richness and subtlety of Yang-Mills theories[15], particularly in understanding their quantum behavior.

4 Theoretical Development

The mathematical structure shows that when spun at high speed, negative mass creates a bubble of negative gravitational potentials in which there is no inertia[5]. This follows from the mathematical framework, particularly Mach's Principle, which states that the cumulative background gravitational scalar potential of all mass in the universe is responsible for inertia[3].

5 Conclusion

Mike's mathematical treatment demonstrates remarkable consistency within the frameworks of general relativity and gauge theory. While a complete non-perturbative quantum understanding remains elusive, the mathematical elegance and explanatory power of his negative mass approach suggests its underlying validity[5]. Mike passed away in Dania Beach, Florida on May 15, 2016[7].

Bibliography

[1] Hermann Bondi. Negative mass in general relativity. *Reviews of Modern Physics*, 1957.
[2] Albert Einstein. On mach's principle.
[3] Ernst Mach. *The Science of Mechanics*.
[4] John Mike. 50 year old ufo mysteries solved. 8 2011.
[5] John Mike. *The Anatomy of a Flying Saucer*. 2011.
[6] John Mike. The fundamental equation of a flying saucer. 2011.
[7] John c. mike obituary. 2016.
[8] Steven Weinberg. *The Quantum Theory of Fields, Volume 1: Foundations*. Cambridge University Press, 1995.
[9] Steven Weinberg. Photons and Gravitons in S-Matrix Theory: Derivation of Charge Conservation and Equality of Gravitational and Inertial Mass. *Physical Review*, 1965.
[10] Michael E. Peskin, Daniel V. Schroeder. *An Introduction to Quantum Field Theory*. Westview Press, 1995.
[11] Particle Data Group. *Review of Particle Physics*. 2022.
[12] Charles W. Misner, Kip S. Thorne, John Archibald Wheeler. *Gravitation*. Freeman, 1973.
[13] Arthur Jaffe, Edward Witten. Quantum Yang-Mills Theory. *The Millennium Prize Problems*, 2006.
[14] Alexander Sevostyanov. Quantum Yang-Mills Theory. *Reviews in Mathematical Physics*, 2019.
[15] Markus Q. Huber. Nonperturbative properties of Yang-Mills theories. *Physics Reports*, 2020.