The Relativistic Dirac Equation in Complex 8-Space and Unified Field Theory

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Abstract. In the attempt to develop a fundamental unified theory we examine the basic structure of physical theories and their interrelation in contrast to complex solutions to the Dirac equation. The basis and structure of the Dirac equation obeys proper relativistic invariant conditions so it comprises a quantum theory that obeys relativistic constraints on the lightcone. But higher dimensional geometry defines a complex space which is an idealization of the Lorentz invariant 4D space of physical objects, momentum and location that is only cyclically Lorentz invariant as recently shown in the conundrum of neutrino mass observations. The lightcone with its hyperbolic topology is a covariant representation of spacetime regions. A Lie group is a topological group. We examine the formalism for the Dirac equation in the complex 8-space where the additional nonlinear terms arise from the imaginary components of the 8D space. The current conundrum between quantum mechanics and general relativity has arisen as to the manner of finding a quantum gravity formalism. Standard model physicists typically consider black hole thermodynamics to reach this goal. The reconciliation of two distinctly structured theories, having different domains of applicability has been a conundrum to physicists for over seventy years. The basic structure of gravity, described by general relativity is a nonlinear tensor force and the basic formalism of quantum theory is that of linear superposition. The reconciliation of the formalism of gravity and quantum mechanics is essential for developing a unification of the forces and processes of nature as a "Theory of Everything" (TOE). Historically the development of these two uniquely different theories has their roots in classical Hamilton-Jacobi theory. A major link between quantum and relativistic theories is the Dirac equation. Our approach is different suggesting instead that the regime of unification for gravity is with the unified field and as such gravity is not quantized. The spacetime regime of quantum mechanics has a finite radius, beyond which the regime of the unified field (mother of the four forces) is not quantized.