UNIFICATION OF GRAVITATIONAL AND STRONG NUCLEAR FIELDS

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Using the recently derived Evans wave equation of unified field theory, the strong nuclear field is described with an SU(3) representation of the gravitational field and the Gell-Mann color triplet is derived from general relativity as a three-spinor eigenfunction of the Evans wave equation.

Key words: Evans wave equation, strong field, gravitational field, Gell-Mann color triplet, field unification.

1. INTRODUCTION

Recently a wave equation for unified field theory has been derived [1-3] from a lemma of Cartan-Riemann differential geometry [4, 5] and used to give the first self consistent unified description of the gauge invariant gravitational and electromagnetic fields. The former is the Riemann form and the latter is the torsion form. One form is the Hodge dual of the other. The theory has been shown [1-3] to reduce to all the main equations of physics in the appropriate limits, these equations include: the four Newton laws; the Schrödinger equation; the Dirac equation; the d'Alembert equation; the Poisson equations of dynamics and electrostatics; and the correct generally covariant form of the Maxwell-Heaviside field equations. The latter are referred to as "O(3) electrodynamics" because the symmetry group of the underlying gauge field theory is O(3). The theory of O(3) electrodynamics has been extensively tested against experimental data, and found experimentally to have numerous advantages over the Maxwell-Heaviside field theory [6-8]. It has been inferred that in order to unify gravitation and elec-
tromagnetism within the theory of general relativity, electrodynamics must have a gauge symmetry higher than $U(1)$ [6-8]. This inference produces the fundamental Evans-Vigier magnetic field, which reaches mega-gauss in the inverse Faraday effect [9] of under dense plasma, and is now a routine observable. The theory reduces to two Maxwell-Heaviside equations for transverse plane waves, but in addition gives the observable Evans-Vigier field, governed by a third field equation [6-8] not present in Maxwell-Heaviside theory. The unified field theory therefore has all the hallmarks of a major paradigm shift in physics. The inter-relation between the gravitational and electromagnetic field is given, for example, by the first and second Bianchi identities of differential geometry. These identities inter-relate the Riemann and torsion forms, which are defined in terms of the spin connection and the tetrad by the second and first Maurer-Cartan structure relations, respectively. It has been inferred that the Riemann form is the Hodge dual of the torsion form, and that spin connection is the Hodge dual of the tetrad. In the condensed notation of differential geometry the first and second Maurer-Cartan structure relations are, respectively:

\begin{align}
T^a &= D \wedge q^a, \\
R^a_b &= D \wedge \omega^a_b, 
\end{align}

where $R^a_b$ is the Riemann form and $T^a$ the torsion form. The symbol $D \wedge$ denotes exterior covariant derivative, and $\omega^a_b$ and $q^a$ are, respectively, the spin connection and the tetrad. The first and second Bianchi identities are the homogeneous field equations of unified field/matter theory and are, respectively:

\begin{align}
D \wedge T^a &=: 0, \\
D \wedge R^a_b &=: -0.
\end{align}

The first and second Evans duality equations state that there exist the Hodge duality relations

\begin{align}
R^a_b &= \varepsilon^a_{bc} T^c, \\
\omega^a_b &= \varepsilon^a_{bc} q^c,
\end{align}

where $\varepsilon^a_{bc}$ is the appropriate Levi-Civita symbol in the well defined [4,5] orthonormal space of the tetrad.

In this notation, the Maxwell-Heaviside field theory is described by

\begin{align}
F &= d \wedge A, \\
d \wedge F &=: 0,
\end{align}

where $F$ is the gauge invariant electromagnetic field (a scalar-valued two-form), and where $A$ is the potential field (a scalar-valued one-form). In generally covariant unified field theory [1-3] $F$ becomes directly proportional to the torsion form $T^a$ (a vector valued two form)