THE SPINNING AND CURVING OF SPACETIME: THE ELECTROMAGNETIC AND GRAVITATIONAL FIELDS IN THE EVANS FIELD THEORY

M. W. Evans

Alpha Institute for Advanced Study
e-mail:Emyrone@aol.com

Received 15 May 2004

The unification of the gravitational and electromagnetic fields achieved geometrically in the generally covariant unified field theory of Evans implies that electromagnetism is the spinning of spacetime and gravitation is the curving of spacetime. The homogeneous unified field equation of Evans is a balance of spacetime spin and curvature and governs the influence of electromagnetism on gravitation using the first Bianchi identity of differential geometry. The second Bianchi identity of differential geometry is shown to lead to the conservation law of the Evans unified field, and also to a generalization of the Einstein field equation for the unified field. Rigorous mathematical proofs are given in appendices of the four equations of differential geometry which are the cornerstones of the Evans unified field theory: the first and second Maurer-Cartan structure relations and the first and second Bianchi identities. As an example of the theory, the origin of wavenumber and frequency is traced to elements of the torsion tensor of spinning spacetime.

Key words: Evans unified field theory, spinning and curving of spacetime, origin of the wavenumber and frequency.

1. INTRODUCTION

From 1925 to 1955 Einstein made various attempts to unify the gravitational and electromagnetic fields within general relativity. These attempts are summarized in updated appendices of various editions of Ref. [1] and are all based on geometry. The gravitational sector of the unified field was developed by Einstein and others in terms of Riemann
geometry with a symmetric Christoffel connection $\Gamma_{\mu\nu}^\kappa$, which implies the first Bianchi identity

$$R_{\sigma\mu\nu\rho} + R_{\sigma\nu\rho\mu} + R_{\sigma\rho\mu\nu} = 0$$  \hspace{1cm} (1)$$

by symmetry [2]. In Eq. (1) $R_{\sigma\mu\nu\rho}$ is the Riemann or curvature tensor with lowered indices, defined by

$$R_{\sigma\mu\nu\rho} = g_{\sigma\kappa} R_{\mu\nu\rho}^\kappa,$$  \hspace{1cm} (2)$$

where $g_{\sigma\kappa}$ is the symmetric metric tensor [1]. The Riemann curvature tensor is defined in terms of the gamma connection $\Gamma_{\mu\nu}^\kappa$ by

$$R_{\sigma\mu\nu}^\rho = \partial_{\mu} \Gamma_{\nu\sigma}^\rho - \partial_{\nu} \Gamma_{\mu\sigma}^\rho + \Gamma_{\mu\lambda}^\rho \Gamma_{\lambda\nu} - \Gamma_{\nu\lambda}^\rho \Gamma_{\lambda\mu}. \hspace{1cm} (3)$$

Equation (3) is true for any kind of gamma connection, as is the second Bianchi identity

$$D_\lambda R_{\sigma\mu\nu}^\rho + D_\mu R_{\sigma\nu\rho}^\lambda + D_\nu R_{\sigma\rho\mu}^\lambda = 0,$$ \hspace{1cm} (4)$$

where $D\wedge$ is the covariant derivative [2] defined with the general gamma connection of any symmetry. The symmetric Christoffel connection is the special case where the gamma connection is symmetric and defined by

$$\Gamma_{\mu\nu}^\kappa = \Gamma_{\nu\mu}^\kappa. \hspace{1cm} (5)$$

Using the metric compatibility postulate [2]

$$D_\rho g^{\mu\nu} = 0,$$ \hspace{1cm} (6)$$

the symmetric Christoffel connection can be expressed in terms of the symmetric metric

$$\Gamma_{\mu\nu}^\sigma = \frac{1}{2} g^{\sigma\rho} \left( \partial_{\mu} g_{\nu\rho} + \partial_{\nu} g_{\rho\mu} - \partial_{\rho} g_{\mu\nu} \right). \hspace{1cm} (7)$$

The use of Eq. (7) automatically implies that the torsion tensor $T_{\mu\nu}^\kappa$ vanishes:

$$T_{\mu\nu}^\kappa = \Gamma_{\mu\nu}^\kappa - \Gamma_{\nu\mu}^\kappa \hspace{1cm} (8)$$

So Einstein’s famous gravitational theory is one in which there is no spacetime torsion or spinning. The first Bianchi identity (1) is also a special case therefore, defined by Eq. (5). More generally the cyclic sum in Eq. (1) is *not* zero if the gamma connection is not symmetric, and this turns out to be of fundamental importance for unified field theory: any mutual influence of gravitation upon electromagnetism depends on the fact that Eq. (1) does not hold in general. In contrast,