CORRECTION OF THE SECOND BIANCHI IDENTITY FOR TORSION.

by

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ABSTRACT

The second Bianchi identity of 1902 is corrected for torsion and several new identities of tensor analysis inferred. The starting point of the correction is the Jacobi identity of covariant derivatives acting on a vector in any space of any dimension. It is shown that torsion enters into the analysis through the action of the commutator of covariant derivatives on a vector and the derivative of a vector. If torsion is made to vanish through use of a symmetric connection the commutator vanishes and so does the curvature and gravitation of the Einsteinian type. So the connection is antisymmetric and torsion and curvature always co exist and both are always non zero. The resulting identity is named the Jacobi Cartan Evans (JCE) Identity. It contains the cyclical torsion identity inferred in UFT109, now named the First Evans Identity. The Bianchi Cartan Evans (BCE) Identity is also inferred from the Cartan identity. Therefore when torsion is correctly developed the Einstein field equation becomes wholly incorrect and unworkable. In ECE theory it is abandoned in favour of the field equations of UFT303 based on the Cartan identity and Cartan Evans identity in four dimensions.

Keywords: ECE theory, Second Bianchi identity corrected for torsion.

UFT313

1. INTRODUCTION

In the well known UFT88 of this series of three hundred and thirteen papers and books to date, {1 - 10} the first attempt was made to correct the second Bianchi identity of 1902 for torsion. This has become a well accepted and well read paper. In papers such as UFT99 it was shown that the commutator of covariant derivatives acting on a vector produces the tensorial format of the first and second Maurer Cartan structure equations of differential geometry. These define torsion and curvature respectively in any space of any dimension. It is clear that if a symmetric connection is used, the commutator vanishes, and along with it curvature and Einsteinian gravitation. So the connection must always be antisymmetric, and the torsion and curvature must always coexist and both must be non zero. In UFT109 a cyclical torsion identity was discovered. It is shown in section 2 that this cyclical identity is part of the second Bianchi identity corrected for torsion. The former is named the first Evans identity and latter is named the Jacobi Cartan Evans (JCE) identity. Once torsion is correctly considered, the latter is the result of the Jacobi identity of covariant derivatives acting on a vector in any space of any dimension. During the course of the derivation of the JCE identity from the Jacobi identity, the Ricci identity of tensor analysis is also corrected for torsion. The overall result verifies the result of UFT88, that if torsion is correctly considered the second Bianchi identity is changed completely, and so is the Einstein field equation. The latter becomes essentially unworkable and is replaced in ECE theory by the equations of the Engineering Model collected by Horst Eckardt in UFT303. In Section 2, the Bianchi Cartan Evans (BCE) identity is inferred from the Cartan identity {1 - 10} and also shows that once torsion is considered, the second Bianchi identity of 1902 is changed completely. Einsteinian general relativity is refuted in its entirety, and this has been named by van der Merwe {1 - 10} the Post Einsteinian Paradigm Shift.

As usual this paper should be read with its background notes, accompanying UFT313 on www.aias.us. Notes 313(1) and 313(2) are the first and final versions of the derivation of the Bianchi Cartan Evans (BCE) identity from the Cartan identity. Note 313(4) gives three BCE identities in cyclical permutation. Notes 313(3) and 313(5) are preliminary versions of Note 313(6), whish is used in Section 2 to prove the Jacobi Cartan Evans (JCE) identity. Note 313(7) conveniently summarizes and checks the proof of the First Evans identity first given in UFT109, and Note 313(8) gives the final format of Note 313(6).

2. THE JACOBI CARTAN EVANS (JCE) AND BIANCHI CARTAN EVANS (BCE) IDENTITIES

Consider the Jacobi identity of covariant derivatives:

$$\left([D_\rho, [D_\mu, D_\nu]] + [D_\nu, [D_\rho, D_\mu]] + [D_\mu, [D_\nu, D_\rho]] \right) V^\kappa := 0 \quad -(1)$$

where V^κ is a vector in any space of any dimension. This is an exact identity of group theory {1 - 10}. Consider the first term and use the Leibnitz Theorem to find that:

$$[D_\rho, [D_\mu, D_\nu]] V^\kappa = D_\rho \left([D_\mu, D_\nu] V^\kappa \right) - [D_\mu, D_\nu] D_\rho V^\kappa \quad -(2)$$

From UFT99:

$$[D_\mu, D_\nu] V^\kappa = R^\kappa{}_{\lambda\mu\nu} V^\lambda - T^\lambda{}_{\mu\nu} D_\lambda V^\kappa \quad -(3)$$

where $R^\kappa{}_{\lambda\mu\nu}$ is the curvature tensor and $T^\lambda{}_{\mu\nu}$ the torsion tensor. It is clear that the connection must be antisymmetric:

$$\Gamma^\lambda_{\mu\nu} = - \Gamma^\lambda_{\nu\mu} \quad -(4)$$

because otherwise the commutator vanishes:

$$[D_\mu, D_\nu] = 0\,, \quad \mu = \nu \qquad -(5)$$

and both curvature and torsion vanish. The use of a symmetric connection is the fatal flaw in twentieth century Einsteinian general relativity. This flaw is corrected in ECE theory, which is based on a non zero torsion and an antisymmetric connection:

$$T^\lambda_{\mu\nu} = \Gamma^\lambda_{\mu\nu} - \Gamma^\lambda_{\nu\mu} = -T^\lambda_{\nu\mu}. \qquad -(6)$$

The torsion tensor in Eq. (3) is defined as:

$$[D_\mu, D_\nu] V^\kappa = -\left(\Gamma^\lambda_{\mu\nu} - \Gamma^\lambda_{\nu\mu}\right) D_\lambda V^\kappa + R^\kappa{}_{\lambda\mu\nu} V^\lambda \qquad -(7)$$

so the commutator and connection have the same antisymmetry because they have the same indices mu and nu. If mu is the same as nu, the torsion and commutator vanish, and so does the curvature, so there is no gravitation.

As described in detail in Note 313(6), the Ricci identity with torsion is:

$$[D_\mu, D_\nu] D_\rho V^\kappa = R^\kappa{}_{\lambda\mu\nu} D_\rho V^\lambda - R^\lambda{}_{\rho\mu\nu} D_\lambda V^\kappa - T^\lambda_{\mu\nu} D_\lambda D_\rho V^\kappa \qquad -(8)$$

in which the commutator acts on a rank two tensor $D_\rho V^\kappa$. Therefore the fist term of the Jacobi identity (1) is:

$$[D_\rho, [D_\mu, D_\nu]] V^\kappa = D_\rho \left(R^\kappa{}_{\lambda\mu\nu} V^\lambda - T^\lambda_{\mu\nu} D_\lambda V^\kappa\right) - R^\kappa{}_{\lambda\mu\nu} D_\rho V^\lambda + R^\lambda{}_{\rho\mu\nu} D_\lambda V^\kappa + T^\lambda_{\mu\nu} D_\lambda D_\rho V^\kappa$$

$$= D_\rho R^\kappa{}_{\lambda\mu\nu} V^\lambda + R^\kappa{}_{\lambda\mu\nu} D_\rho V^\lambda - D_\rho T^\lambda{}_{\mu\nu} D_\lambda V^\kappa - T^\lambda{}_{\mu\nu} D_\rho D_\lambda V^\kappa$$

$$- R^\kappa{}_{\lambda\mu\nu} D_\rho V^\lambda + R^\lambda{}_{\rho\mu\nu} D_\lambda V^\kappa + T^\lambda{}_{\mu\nu} D_\lambda D_\rho V^\kappa$$

$$= D_\rho R^\kappa{}_{\lambda\mu\nu} V^\lambda - D_\rho T^\lambda{}_{\mu\nu} D_\lambda V^\kappa + R^\lambda{}_{\rho\mu\nu} D_\lambda V^\kappa - T^\lambda{}_{\mu\nu} [D_\rho, D_\lambda] V^\kappa \quad -(9)$$

The complete Jacobi identity is therefore

$$\left([D_\rho, [D_\mu, D_\nu]] + [D_\nu, [D_\rho, D_\mu]] + [D_\mu, [D_\nu, D_\rho]] \right) V^\kappa := 0$$

$$= \left(D_\rho R^\kappa{}_{\lambda\mu\nu} + D_\nu R^\kappa{}_{\lambda\rho\mu} + D_\mu R^\kappa{}_{\lambda\nu\rho} \right) V^\lambda$$

$$+ \left(R^\lambda{}_{\rho\mu\nu} + R^\lambda{}_{\nu\rho\mu} + R^\lambda{}_{\mu\nu\rho} - \left(D_\rho T^\lambda{}_{\mu\nu} + D_\nu T^\lambda{}_{\rho\mu} + D_\mu T^\lambda{}_{\nu\rho} \right) \right) D_\lambda V^\kappa$$

$$- \left(T^\lambda{}_{\mu\nu} [D_\rho, D_\nu] + T^\lambda{}_{\rho\mu} [D_\nu, D_\lambda] + T^\lambda{}_{\nu\rho} [D_\mu, D_\lambda] \right) V^\kappa \quad -(10)$$

Now use the Cartan identity:

$$D_\rho T^\lambda{}_{\mu\nu} + D_\nu T^\lambda{}_{\rho\mu} + D_\mu T^\lambda{}_{\nu\rho} := R^\lambda{}_{\rho\mu\nu} + R^\lambda{}_{\nu\rho\mu} + R^\lambda{}_{\mu\nu\rho} \quad -(11)$$

to give the Jacobi Cartan Evans (JCE) identity:

$$\left([D_\rho, [D_\mu, D_\nu]] + [D_\nu, [D_\rho, D_\mu]] + [D_\mu, [D_\nu, D_\rho]] \right) V^\kappa$$

$$= \left(D_\rho R^\kappa{}_{\lambda\mu\nu} + D_\nu R^\kappa{}_{\lambda\rho\mu} + D_\mu R^\kappa{}_{\lambda\nu\rho} \right) V^\lambda$$

$$- \left(T^\lambda{}_{\mu\nu} [D_\rho, D_\lambda] + T^\lambda{}_{\rho\mu} [D_\nu, D_\lambda] + T^\lambda{}_{\nu\rho} [D_\mu, D_\lambda] \right) V^\kappa$$

$$:= 0 \quad -(12)$$

In this identity:

$$\left(T^\lambda{}_{\mu\nu} [D_\rho, D_\lambda] + T^\lambda{}_{\rho\mu} [D_\nu, D_\lambda] + T^\lambda{}_{\nu\rho} [D_\mu, D_\lambda] \right) V^\kappa$$

$$= \left(T^\lambda_{\mu\nu} R^\kappa_{\ \alpha\rho\lambda} + T^\lambda_{\rho\mu} R^\kappa_{\ \alpha\nu\lambda} + T^\lambda_{\nu\rho} R^\kappa_{\ \alpha\mu\lambda}\right) V^\alpha$$

$$- \left(T^\lambda_{\mu\nu} T^\alpha_{\rho\lambda} + T^\lambda_{\rho\mu} T^\alpha_{\nu\lambda} + T^\lambda_{\nu\rho} T^\alpha_{\mu\lambda}\right) D_\alpha V^\kappa. \quad -(13)$$

Now use the first Evans identity inferred in UFT109:

$$T^\lambda_{\mu\nu} T^\alpha_{\rho\lambda} + T^\lambda_{\rho\mu} T^\alpha_{\nu\lambda} + T^\lambda_{\nu\rho} T^\alpha_{\mu\lambda} := 0 \quad -(14)$$

and proven in Note 313(7). The final format of the Jacobi Cartan Evans (JCE) identity is obtained:

$$\left([D_\rho, [D_\mu, D_\nu]] + [D_\nu, [D_\rho, D_\mu]] + [D_\mu, [D_\nu, D_\rho]] \right) V^\kappa$$

$$= \left(D_\rho R^\kappa_{\ \lambda\mu\nu} + D_\nu R^\kappa_{\ \lambda\rho\mu} + D_\mu R^\kappa_{\ \lambda\nu\rho} \right.$$

$$\left. - \left(T^\alpha_{\mu\nu} R^\kappa_{\ \lambda\rho\alpha} + T^\alpha_{\rho\mu} R^\kappa_{\ \lambda\nu\alpha} + T^\alpha_{\nu\rho} R^\kappa_{\ \lambda\mu\alpha} \right) \right) V^\lambda \quad -(15)$$

$$:= 0, \quad \text{i.e.}$$

$$D_\rho R^\kappa_{\ \lambda\mu\nu} + D_\nu R^\kappa_{\ \lambda\rho\mu} + D_\mu R^\kappa_{\ \lambda\nu\rho} := T^\alpha_{\mu\nu} R^\kappa_{\ \lambda\rho\alpha} + T^\alpha_{\rho\mu} R^\kappa_{\ \lambda\nu\alpha} + T^\alpha_{\nu\rho} R^\kappa_{\ \lambda\mu\alpha}$$

The original 1902 identity of Bianchi (apparently first inferred in 1880 by Ricci) is:

$$D_\rho R^\kappa_{\ \lambda\mu\nu} + D_\nu R^\kappa_{\ \lambda\rho\mu} + D_\mu R^\kappa_{\ \lambda\nu\rho} =? \ 0 \quad -(16)$$

and is completely incorrect due to neglect of torsion. The Einstein equation is based directly on the incorrect result (16) so the entire twentieth century in general relativity is meaningless. This becomes clear in UFT281, where it was shown that the Einstein theory fails qualitatively to describe the velocity curve of a whirlpool galaxy. The theory produces a curve that vanishes when the distance from the centre of the galaxy becomes very large, the experimental data go to a plateau. No clearer experimental demonstration of the failure of the Einstein theory is needed. In contrast the ECE theory describes the velocity curve {1 - 10} adequately, and the ECE theory is based on torsion (UFT303). It is obvious that the Einstein theory cannot describe any data, and that claims to have tested it with precision are meaningless. The 2014 x theory reproduces data in the solar system to experimental accuracy, and also produces the velocity curve of a whirlpool galaxy.

The Bianchi Cartan Evans (BCE) identity also shows that the second Bianchi identity of 1902 is completely incorrect due to neglect of torsion. The BCE identity is proven as follows. Consider the three Cartan identities:

$$D_\lambda T^\kappa{}_{\nu\rho} + D_\rho T^\kappa{}_{\lambda\nu} + D_\nu T^\kappa{}_{\rho\lambda} := R^\kappa{}_{\lambda\nu\rho} + R^\kappa{}_{\rho\lambda\nu} + R^\kappa{}_{\nu\rho\lambda} \quad -(17a)$$

$$D_\lambda T^\kappa{}_{\mu\nu} + D_\nu T^\kappa{}_{\lambda\mu} + D_\mu T^\kappa{}_{\nu\lambda} := R^\kappa{}_{\lambda\mu\nu} + R^\kappa{}_{\nu\lambda\mu} + R^\kappa{}_{\mu\nu\lambda} \quad -(17b)$$

$$D_\lambda T^\kappa{}_{\rho\mu} + D_\mu T^\kappa{}_{\lambda\rho} + D_\rho T^\kappa{}_{\mu\lambda} := R^\kappa{}_{\lambda\rho\mu} + R^\kappa{}_{\mu\lambda\rho} + R^\kappa{}_{\rho\mu\lambda} \quad -(17c)$$

It follows that:

$$\begin{aligned} & D_\mu \left(R^\kappa{}_{\lambda\nu\rho} + R^\kappa{}_{\rho\lambda\nu} + R^\kappa{}_{\nu\rho\lambda} \right) && := D_\mu \left(D_\lambda T^\kappa{}_{\nu\rho} + D_\rho T^\kappa{}_{\lambda\nu} + D_\nu T^\kappa{}_{\rho\lambda} \right) \\ & + D_\rho \left(R^\kappa{}_{\lambda\mu\nu} + R^\kappa{}_{\nu\lambda\mu} + R^\kappa{}_{\mu\nu\lambda} \right) && + D_\rho \left(D_\lambda T^\kappa{}_{\mu\nu} + D_\nu T^\kappa{}_{\lambda\mu} + D_\mu T^\kappa{}_{\nu\lambda} \right) \\ & + D_\nu \left(R^\kappa{}_{\lambda\rho\mu} + R^\kappa{}_{\mu\lambda\rho} + R^\kappa{}_{\rho\mu\lambda} \right) && + D_\nu \left(D_\lambda T^\kappa{}_{\rho\mu} + D_\mu T^\kappa{}_{\lambda\rho} + D_\rho T^\kappa{}_{\mu\lambda} \right) \end{aligned} \quad -(18)$$

Rearranging terms:

$$D_\mu R^\kappa{}_{\lambda\nu\rho} + D_\rho R^\kappa{}_{\lambda\mu\nu} + D_\nu R^\kappa{}_{\lambda\rho\mu} := D_\mu D_\lambda T^\kappa{}_{\nu\rho} + D_\rho D_\lambda T^\kappa{}_{\mu\nu} + D_\nu D_\lambda T^\kappa{}_{\rho\mu}$$
$$+ D_\mu \left(R^\kappa{}_{\rho\lambda\nu} + R^\kappa{}_{\nu\rho\lambda} \right) \qquad + D_\mu \left(D_\rho T^\kappa{}_{\lambda\nu} + D_\nu T^\kappa{}_{\rho\lambda} \right)$$
$$+ D_\rho \left(R^\kappa{}_{\nu\lambda\mu} + R^\kappa{}_{\mu\nu\lambda} \right) \qquad + D_\rho \left(D_\nu T^\kappa{}_{\lambda\mu} + D_\mu T^\kappa{}_{\nu\lambda} \right)$$
$$+ D_\nu \left(R^\kappa{}_{\mu\lambda\rho} + R^\kappa{}_{\rho\mu\lambda} \right) \qquad + D_\nu \left(D_\mu T^\kappa{}_{\lambda\rho} + D_\rho T^\kappa{}_{\mu\lambda} \right) \qquad -(19)$$

Assume that a solution of Eq. (19) is:

$$D_\mu D_\lambda T^\kappa{}_{\nu\rho} + D_\rho D_\lambda T^\kappa{}_{\mu\nu} + D_\nu D_\lambda T^\kappa{}_{\rho\mu} := D_\mu R^\kappa{}_{\lambda\nu\rho} + D_\rho R^\kappa{}_{\lambda\mu\nu} + D_\nu R^\kappa{}_{\lambda\rho\mu} \qquad -(20)$$

which is Eq. (105) of UFT255. Now add Eqs. (19) and (20) to give:

$$D_\mu D_\lambda T^\kappa{}_{\nu\rho} + D_\rho D_\lambda T^\kappa{}_{\mu\nu} + D_\nu D_\lambda T^\kappa{}_{\rho\mu}$$
$$+ D_\mu \left(D_\rho T^\kappa{}_{\lambda\nu} + D_\nu T^\kappa{}_{\rho\lambda} + D_\lambda T^\kappa{}_{\nu\rho} \right)$$
$$+ D_\rho \left(D_\nu T^\kappa{}_{\lambda\mu} + D_\mu T^\kappa{}_{\nu\lambda} + D_\lambda T^\kappa{}_{\nu\rho} \right)$$
$$+ D_\nu \left(D_\mu T^\kappa{}_{\lambda\rho} + D_\rho T^\kappa{}_{\mu\lambda} + D_\lambda T^\kappa{}_{\rho\mu} \right) \qquad -(21)$$
$$:= D_\mu R^\kappa{}_{\lambda\nu\rho} + D_\rho R^\kappa{}_{\lambda\mu\nu} + D_\nu R^\kappa{}_{\lambda\rho\mu}$$
$$+ D_\mu \left(R^\kappa{}_{\rho\lambda\nu} + R^\kappa{}_{\nu\rho\lambda} + R^\kappa{}_{\lambda\nu\rho} \right)$$
$$+ D_\rho \left(R^\kappa{}_{\nu\lambda\mu} + R^\kappa{}_{\mu\nu\lambda} + R^\kappa{}_{\lambda\mu\nu} \right)$$
$$+ D_\nu \left(R^\kappa{}_{\mu\lambda\rho} + R^\kappa{}_{\rho\mu\lambda} + R^\kappa{}_{\lambda\rho\mu} \right)$$

Using the Cartan identities (17a) to (17c) in Eq. (21) it becomes:

$$D_\mu D_\lambda T^{\kappa}_{\ \nu\rho} + D_\rho D_\lambda T^{\kappa}_{\ \mu\nu} + D_\nu D_\lambda T^{\kappa}_{\ \rho\mu} := D_\mu R^{\kappa}_{\ \lambda\nu\rho} + D_\rho R^{\kappa}_{\ \lambda\mu\nu} + D_\nu R^{\kappa}_{\ \lambda\rho\mu} \quad -(22)$$

so (20) is true, Q. E. D. This was first inferred in UFT255 and is named the Bianchi Cartan Evans Identity.

By cyclical permutation of the μ , ν , and ρ indices two more identities are obtained:

$$D_\mu R^{\kappa}_{\ \rho\lambda\nu} + D_\rho R^{\kappa}_{\ \nu\lambda\mu} + D_\nu R^{\kappa}_{\ \mu\lambda\rho} := D_\mu D_\rho T^{\kappa}_{\ \mu\nu} + D_\rho D_\nu T^{\kappa}_{\ \lambda\mu} + D_\nu D_\mu T^{\kappa}_{\ \lambda\rho} \quad -(23)$$

and

$$D_\mu R^{\kappa}_{\ \nu\rho\lambda} + D_\rho R^{\kappa}_{\ \mu\nu\lambda} + D_\nu R^{\kappa}_{\ \rho\mu\lambda} := D_\mu D_\nu T^{\kappa}_{\ \rho\lambda} + D_\rho D_\mu T^{\kappa}_{\ \nu\lambda} + D_\nu D_\rho T^{\kappa}_{\ \mu\lambda} . \quad -(24)$$

Each of the identities derived in this paper show that the Einstein field equation is irretrievably incorrect. When torsion is correctly included the second Bianchi identity develops into the BCE and JCE identities, together with the First Evans identity, a cyclical identity of torsion which is missing completely from Einsteinian general relativity. The first Bianchi identity of 1902 develops in to the Cartan identity upon which the ECE field equations are based (UFT303). Torsion was inferred in the early twenties by Cartan, but it has taken until the ECE series of papers and books {1 - 10} to show that torsion completely changes the second Bianchi identity and refutes the entire twentieth century in general relativity. This has been named the post Einsteinian paradigm shift by Alwyn van der Merwe.

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