

88(10): Torsion based Cosmology

It is now known that the only true Bianchi identity is:

$$D \wedge T^a := R^a_b \wedge q^b - (1)$$

because this implies the identity:

$$D \wedge R^a_b := q^a_b D \wedge (D \wedge T^a) - (2)$$

In the special case:

$$R^a_b \wedge q^b = 0 - (3)$$

then:

$$\begin{aligned} D \wedge (R^a_b \wedge q^b) &= D \wedge R^a + D(R^a_b \wedge q^b) \\ &= D \wedge R^a_b - (4) \\ &= 0 \end{aligned}$$

So eq. (3) implies eq. (4). In other words the traditional "first Bianchi identity" (eq. (3)) implies the traditional "second Bianchi identity", eq. (4).

The Noether forms are now defined by:

$$D \wedge N^a := N^a_b \wedge q^b - (5)$$

where:

$$R^a_b = k N^a_b - (6)$$

$$T^a = k N^a - (7)$$

2)

Here :

$$k = \frac{8\pi G}{c^2} = 1.86595 \times 10^{-26} \text{ m kg}^{-1} - (8)$$

is the Einstein constant,  $G$  being the Newton constant.  
So  $N^a_b$  has the units of  $\text{kg m}^{-3}$  (mass per unit volume) and  $N^a$  is  $\text{kg m}^{-2}$  (mass per unit area).

Eq. (5) is the generalization of the Noether theorem to Noether forms of differential geometry.

In the special case :

$$N^a_b \wedge v^b = 0 \quad - (9)$$

the:

$$D \wedge N^a_b = 0. \quad - (10)$$

Eq. (10) can be written as :

$$D^\mu N_{\nu\mu} = 0 \quad - (11)$$

which is the Noether theorem.

Since energy-momentum is always conserved, eq. (10) is true for fundamental or central energy-momentum density.

3) More generally, however, translational or central energy-momentum density is balanced with rotational or torsional energy-momentum density through eq. (5), which is the most general form of conservation of energy-momentum density. Eqs. (6) and (7) are the most general field equations of cosmology.

They were developed in paper 55, and plan to explain phenomena such as spiral galaxies and the gravitational equivalent of the Faraday law of induction.

There is only one Noether Theorem, eq. (5), which is also the most general law of thermodynamics. It can be written as:

$$d \wedge N^a = j^a = N^a{}_b \wedge \omega^b - \omega^a{}_b \wedge N^b - (12)$$

i.e. it is a form similar to the homogeneous field equations of ECE theory.