1) 121(1): Conservation of Total Energy

The conservation of total energy is represented in ECE theory by:

$$D_\mu T^{\kappa\mu\nu} = R^{\kappa\ \mu\nu}_{\ \mu} = k E^{\kappa\nu} \quad -(1)$$

where $E^{\kappa\nu}$ is the canonical total energy density, with units of:

$$E^{\kappa\nu} = c^2 \text{ energy / volume} \quad -(2)$$

Eq. (1) is based directly on the Cartan / Evans dual identity, so automatically satisfies this fundamental theorem of geometry.

Conversely:

$$\boxed{E^{\kappa\nu} = \frac{1}{k} D_\mu T^{\kappa\mu\nu} = \frac{1}{k} R^{\kappa\ \mu\nu}_{\ \mu}.} \quad -(3)$$

Total energy / momentum is conserved, so the Noether Theorem is:

$$\boxed{D_\kappa E^{\kappa\nu} = 0.} \quad -(4)$$

The total energy momentum is made up of all kinds of energy. The latter may be inter-converted but the total amount of energy in a given system is constant.

2)

In the now obsolete Einstein field equation, the only energy momentum considered is the translational, and the Einstein field equation is incorrectly derived because of the omission of torsion. As is well known, angular motion is not considered at all in the Einstein field equation.

In ECE, both translational and rotational motion are considered, and the ECE equation of motion are based on conservation of total energy momentum directly on the correct Cartan Evans dual identity. Therefore conservation of energy / momentum density in ECE is guaranteed by the use of the correct geometry. The Einstein constant is retained, and is:

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

The next step is to investigate the correct lagrangian mechanism for producing eq. (4). It is also to be noted that eq (4) is similar to eq. (72) of paper 116 on the

3) generally covariant continuity equation. This means that the Noether theorem (4) is a special case of the tetrad postulate:

$$D_\mu q^a = 0 \quad — (5)$$

which is a basic geometrical property of complete vector fields.

Therefore conservation of total energy - momentum density and total charge - current density follow from the tetrad postulate. This is a more straightforward method than the Lagrangian method that leads to the Noether theorem. The total energy momentum density in general is:

$$\boxed{E^a_\mu = E^{(0)} q^a_\mu} \quad — (6)$$

and the total charge current density is:

$$\boxed{j^a_\mu = j^{(0)} q^a_\mu} \quad — (7)$$

so:

$$D_\mu E^a_\mu = 0 \quad — (8)$$

$$D_\mu j^a_\mu = 0 \quad — (9)$$