SOME NOTES ON THE COULOMB LAW IN THE UNIFIED FIELD THEORY

The expression for the Coulomb Law in the unified field theory is:

$$\underline{\nabla} \cdot \underline{E}^a = -\phi^{(0)} \left(R^a{}_1{}^{10} + R^a{}_2{}^{20} + R^a{}_3{}^{30} \right). \quad -(1)$$

This can be written as:

$$\underline{\nabla} \cdot \underline{E}^a = -\phi^{(0)} \left(R_1{}^{10} + R_2{}^{20} + R_3{}^{30} \right)^a \quad -(2)$$

i.e. as

$$\boxed{\underline{\nabla} \cdot \underline{E}^a = -\phi^{(0)} R^a} \quad -(3)$$

for each a, where:

$$R^a := R^a{}_1{}^{10} + R^a{}_2{}^{20} + R^a{}_3{}^{30}. \quad -(4)$$

Here the units of $\phi^{(0)}$ are volts and the units of R^a are inverse square metres. The index a denotes a state of polarization and originates in the index of the tangent bundle spacetime.

For example if $\underline{E}^a$ is in the Z axis then:

$$a = 3 \quad -(5)$$

and we obtain:

$$\frac{\partial E^3}{\partial Z} = -\phi^{(0)} \left(R^3{}_1{}^{10} + R^3{}_2{}^{20} + R^3{}_3{}^{30} \right). \quad -(6)$$

2) using the antisymmetry properties of the Riemann tensor

$$\frac{\partial E^3}{\partial Z} = \frac{\partial E_Z}{\partial Z} = -\phi^{(0)}\left(R^{3}{}_{1}{}^{10} + R^{3}{}_{2}{}^{20}\right) - ($$

and we may define:

$$R := R^{3}{}_{1}{}^{10} + R^{3}{}_{2}{}^{20}, \quad -(8)$$

to obtain:

$$\boxed{\frac{\partial E_Z}{\partial Z} = -\phi^{(0)} R}. \quad -(9)$$

Eqn. (9) is therefore the law that governs the interactio[n] between two charges, and shows that the electric field is always generated by a scalar curvature R multiplied by a fundamental voltage $\phi^{(0)}$. This product gives the charge density ρ defined by:

$$\boxed{\rho = -\epsilon_0 \phi^{(0)} R}. \quad -(10)$$

Eqn (9) is equivalent to the inverse square law of Coulomb. The latter is therefore shown to be generated by scalar curvature, R, and the latter originates in the Einstein field theory. In the weak field limit the Einstein field theory becomes the Newton inverse square law. These two famous laws of physics are therefore unified in equation (9).

3)

The minus sign in eqn. (10) indicates that charge density is a compression of spacetime. The Einstein field eqn. indicates that:

$$R = -k_1 T \quad -(11)$$

where k_1 is a constant similar to the Einstein or Newton constant, and where T is an index contracted or scalar energy-momentum. The constant k_1 in eqn. (11) is not the same numerically as the Einstein constant k because R is not defined in the same way as in the Einstein field equation. However k_1 is proportional to the Newton constant G and this shows clearly that the Coulomb and Newton laws have been unified:

$$\boxed{\frac{\partial E_Z}{\partial Z} = \phi_1^{(0)} G T} \quad -(12)$$

where $\phi_1^{(0)}$ is a fundamental voltage different from $\phi^{(0)}$ numerically. Eqn (12) shows that the Coulomb law derives in the last analysis from energy-momentum T.

Conversely this energy-momentum can be engineered to generate an electric field E_Z. The curvature R is maximised near an electron, but never becomes infinite.