

E8 Cosets and 4+4 Kaluza-Klein Lagrangian

Frank Dodd (Tony) Smith, Jr. - 2015

The Coset structure of E8 represents the structure of a 4+4 Kaluza-Klein Lagrangian.

As Steven Weinberg said in the 1986 Dirac Memorial Lectures:

“... Let’s examine the following equation:

$$\mathcal{L} = -\bar{\psi} \left(\gamma^\mu \frac{\partial}{\partial x^\mu} + m \right) \psi - \frac{1}{4} \left(\frac{\partial A_\nu}{\partial x^\mu} - \frac{\partial A_\mu}{\partial x^\nu} \right)^2$$

... L stands for Lagrangian density ...

the first term involves the [fermion] field ...

the next term involves the [gauge boson] field ...

the Lagrangian density [is] integrated over spacetime ...”.

Examine the Coset structure of E8 and see how it corresponds to Lagrangian Physics:

E8 / D8 = (OxO)P2 = 64-dim fermion particles + 64-dim fermion antiparticles

(O = Octonions)

(64 = 8 Kaluza-Klein spacetime components of 8 first-generation fermion types)

D8 / D4 x D4 = Gr(8,16) = 64-dim Octonionic Subspaces of R16

(Gr = Grassmanian and R16 = Vectors of Clifford Cl(16) Matrix Algebra for D8)

(8-dim Octonionic spacetime => Quaternionic 4+4 Kaluza-Klein M4 x CP2 spacetime which symmetry breaking produces second and third generation fermions and Higgs)

(M4 = Physical Minkowski Spacetime)

(CP2 = SU(3) / SU(2) x U(1) Internal Symmetry Space)

D4 / D3 x U(1) = 12 Standard Model Gauge Boson Ghosts

D3 = A3 = Spin(2,4) = SU(2,2) Conformal Gravity + Dark Energy

D4 / A3 x U(1) = 12 Gravity+DE Root Vector Ghosts

A3 / A2 x U(1) = 6 = 4 SU(2) x U(1) Gauge Bosons + 2 of 3 Gravity+DE Cartan Ghosts

(Electroweak SU(2) x U(1) are in CP2 = SU(3) / SU(2) x U(1) Internal Symmetry Space)

A2 = 8 SU(3) Color Gauge Bosons