

High Energy Particle Physics

Spinor Doubling and Evolution of Our Universe

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Spinors and their doubling up to $Cl(16)$ 64+64-dim half-spinors can be seen as an alternate (but substantially equivalent) way to look at E8 Physics which is outlined in vixra 1312.0036 as being based on a $Cl(k) \rightarrow Cl(Cl(k))$ Clifford process. For details about E8 Physics see 377-page viXra 1310.0182 and 11,445-page viXra 1311.0094.

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Spinor Doubling and Evolution of Our Universe

Frank Dodd Tony Smith Jr - 2013

E8 Physics based on a $Cl(k) \rightarrow Cl(Cl(k))$ Clifford Algebra process (vixra 1312.0036) can also be described based on

Spinors and their doubling up to $Cl(16)$ 64+64-dim half-spinors:

In the beginning there was $Cl(0)$ spinor fermion void



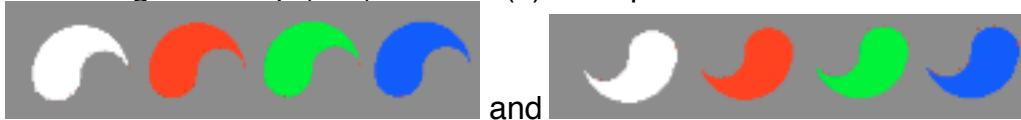
from which emerged $2 = \sqrt{2^2} = 1+1$ $Cl(2)$ half-spinor fermions/antifermions



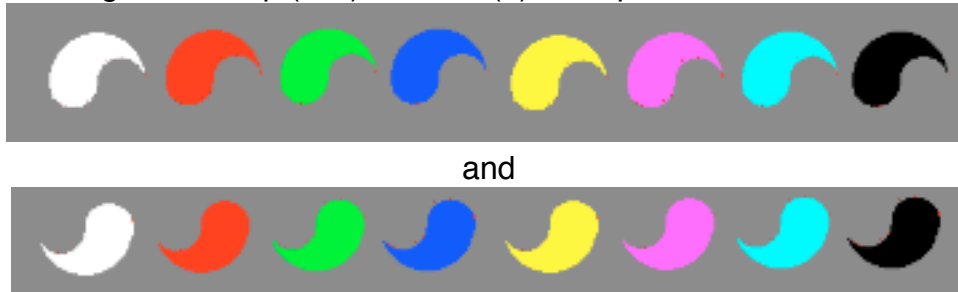
from which emerged $4 = \sqrt{2^4} = 2+2$ $Cl(4)$ half-spinor fermions/antifermions



from which emerged $8 = \sqrt{2^6} = 4+4$ $Cl(6)$ half-spinor fermions/antifermions



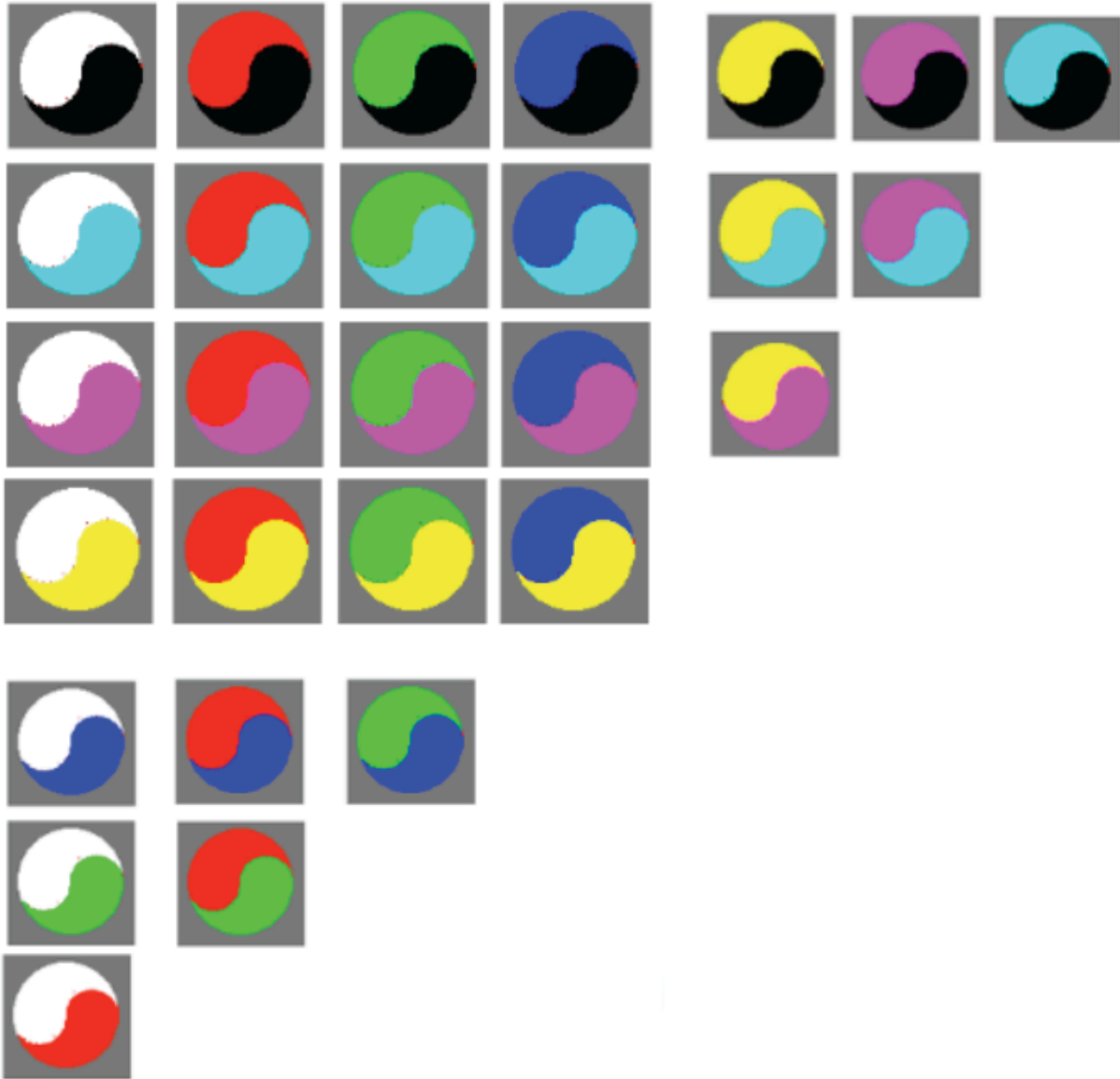
from which emerged $16 = \sqrt{2^8} = 8+8$ $Cl(8)$ half-spinor fermions/antifermions



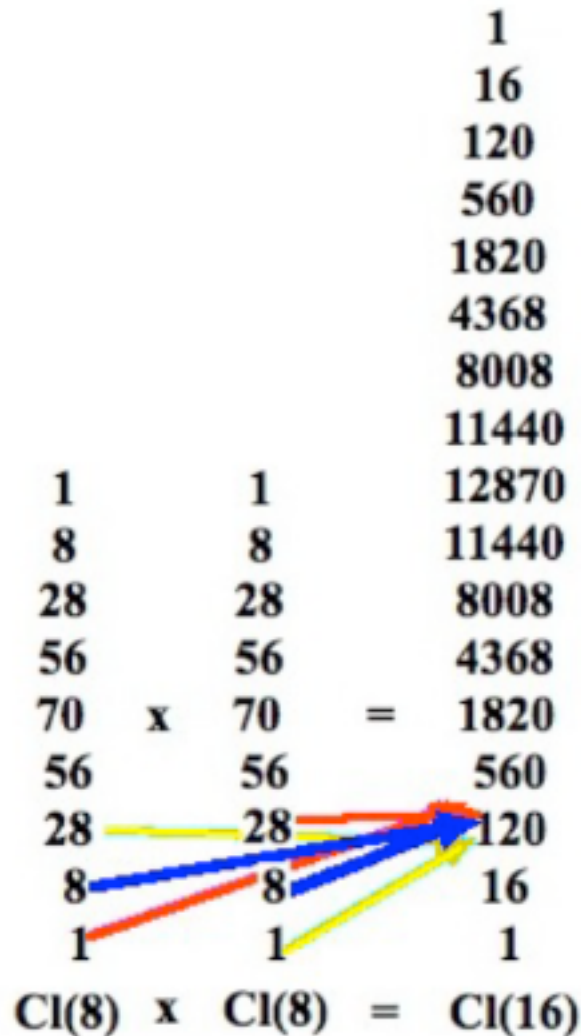
8 half-spinor fermions and 8 half-spinor antifermions are isomorphic by $Cl(8)$ Triality to each other and to the 8 $Cl(8)$ vectors



so that the 28 antisymmetric pairs of half-spinors are the 28 $Cl(8)$ bivectors of a D_4 Lie Algebra:



By Real Clifford Algebra Periodicity, the tensor product $Cl(8) \times Cl(8) = Cl(16)$:



Spinors: $(\boxed{8s \times 8s} + \boxed{8c \times 8c})$
 $(8s+8c) \times (8s+8c) = \quad + \quad$
 $(8s \times 8c + 8c \times 8s)$

$256 = \sqrt{2^{16}} = 128 + 128$ Cl(16) half-spinor generation/antigeneration

128 Cl(16) generation = $64 + 64$ quarter-spinor fermions/antifermions

$120 + 64 + 64 = E8$

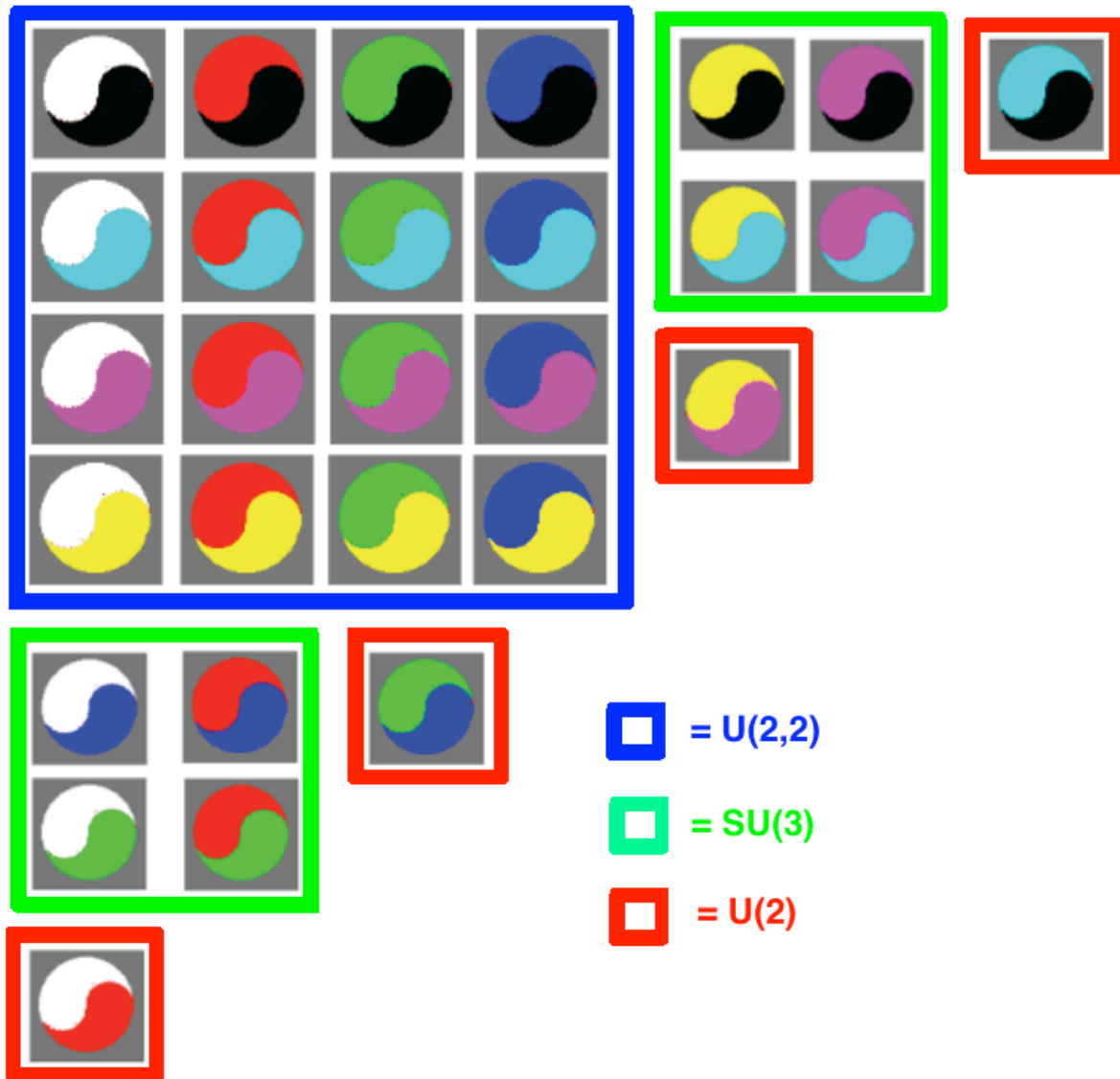
E8 root vectors = $112 + 64 + 64$

E8 contains $120 = D8 = 8 \times 8 + 1 \times 28 + 28 \times 1$

D8 contains $28 + 28 = D4 \times D4$

one D4 gives Gravity - other D4 gives the Standard Model

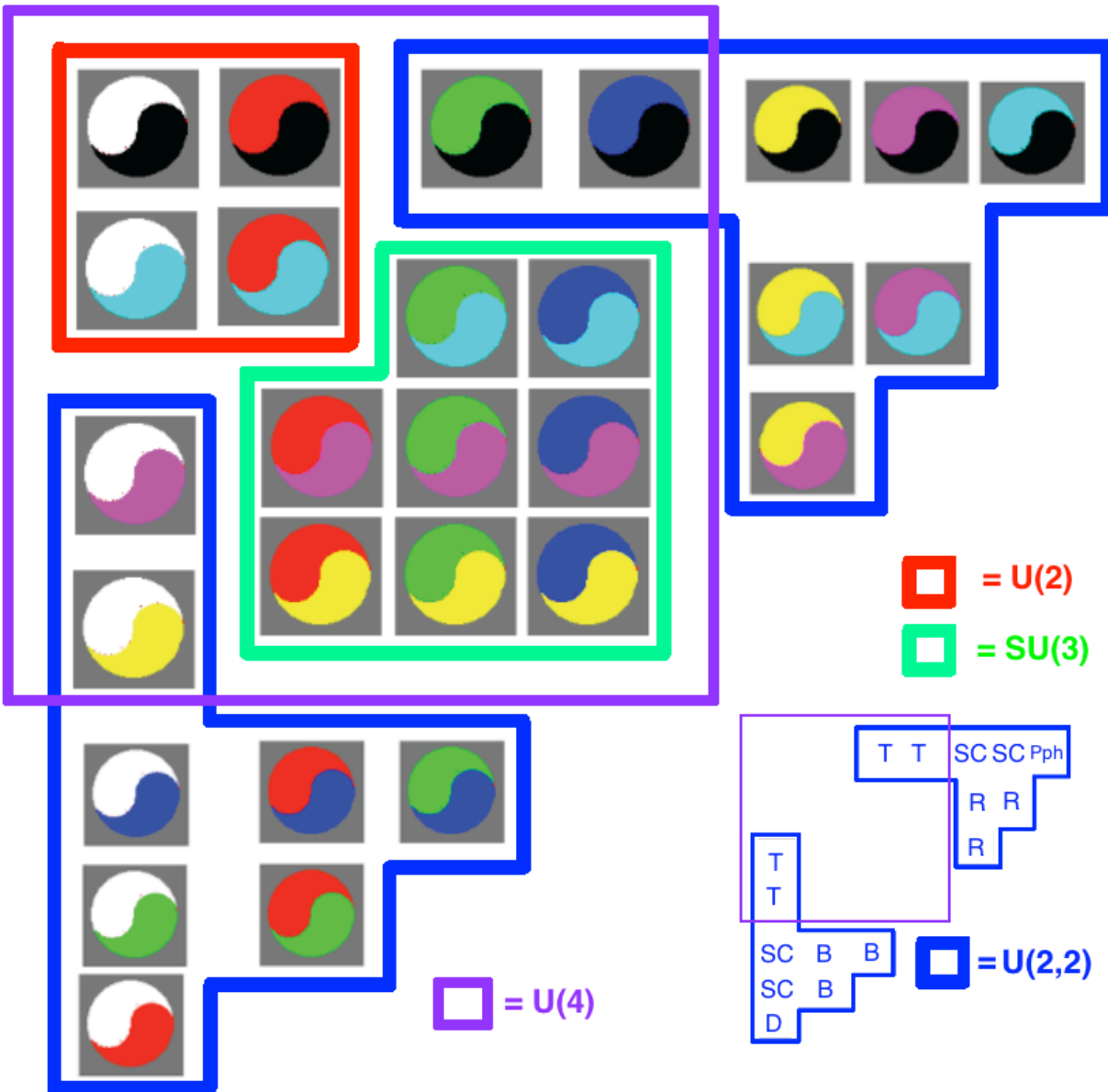
D4 acting on M4 of M4xCP2 4+4 = 8-dim Kaluza-Klein for Gravity:



16-dim $U(2,2)$ contains 15-dim $SU(2,2) = Spin(2,4)$ Conformal Group Algebra acting as Gauge Group Algebra on 4-dim M4 physical spacetime of 4+4 Kaluza-Klein that gives Gravity by the MacDowell-Mansouri mechanism and also contains 1-dim $U(1)$ Propagator Phase.

$D4 / U(2+2) = 12$ -dim rank 2 Symmetric Space corresponding to $SU(3)$ and $U(2)$ but not directly acting on M4 of M4xCP2 Kaluza-Klein.

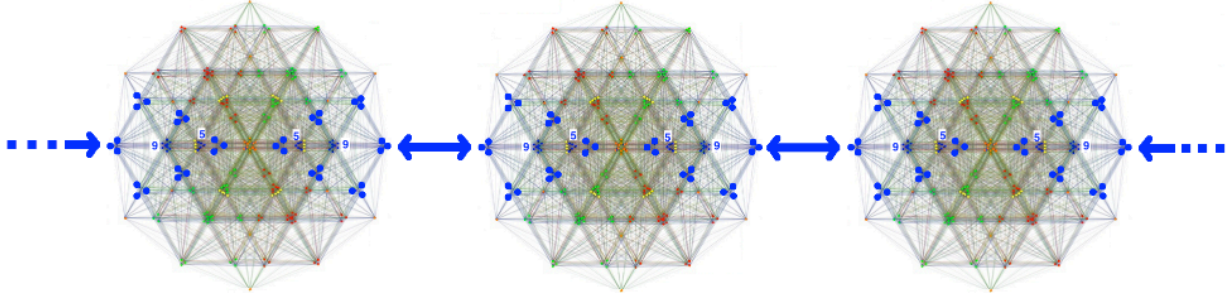
D4 acting on CP2 of M4xCP2 4+4 = 8-dim Kaluza-Klein for the Standard Model:



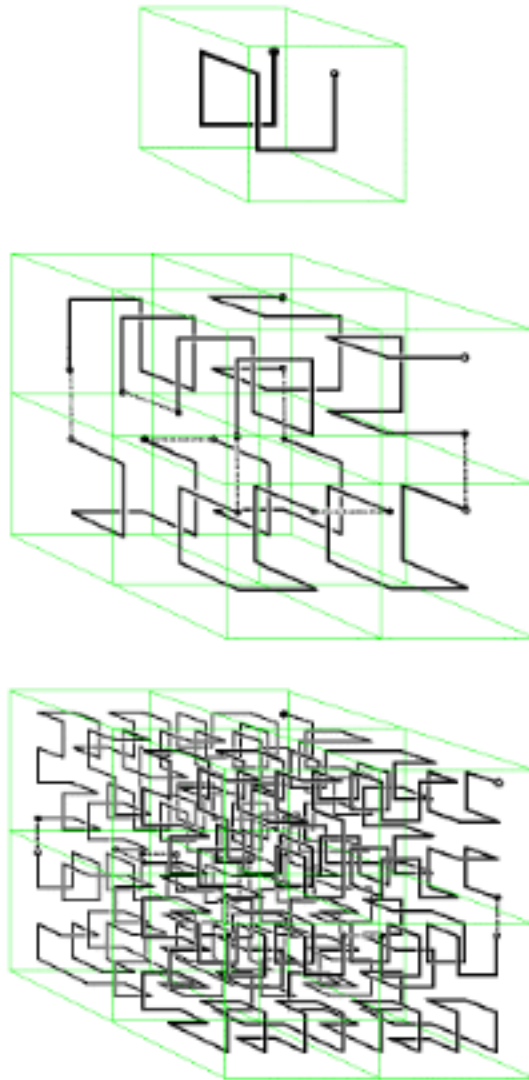
16-dim $U(4)$ contains 15-dim $SU(4)$ which contains 8-dim $SU(3)$ Color Force Algebra acting as Gauge Group Algebra on 4-dim CP^2 internal symmetry space of Kaluza-Klein that gives the Standard Model Color Force by the Batakis mechanism and also contains 4-dim $U(2)$ of $CP^2 = SU(3)/U(2)$ for Batakis ElectroWeak Force and also contains the 4 T-generators of $U(2,2)$ T-generators that propagate in MacDowell-Mansouri to describe Einstein-Hilbert Curvature and Dark Matter Black Holes.

$D4 / U(4) = 12$ -dim rank 2 Symmetric Space for AntideSitter Dark Energy + Dilaton + Propagator Phase of $U(2,2)$ but not directly acting on CP^2 of $M4 \times CP^2$ Kaluza-Klein.

One $Cl(16)$ containing one E_8 gives a Lagrangian description of only one local spacetime neighborhood. To get a realistic global spacetime structure, take the tensor product $Cl(16) \times \dots \times Cl(16)$ with all E_8 local 8-dim Octonionic spacetimes consistently aligned as described by 64-dim $D_8 / D_4 \times D_4$ (blue dots)



which then fill up spacetime according to Gray Code Hilbert's curves:



As our Universe evolves, there are some Special Times in its history:

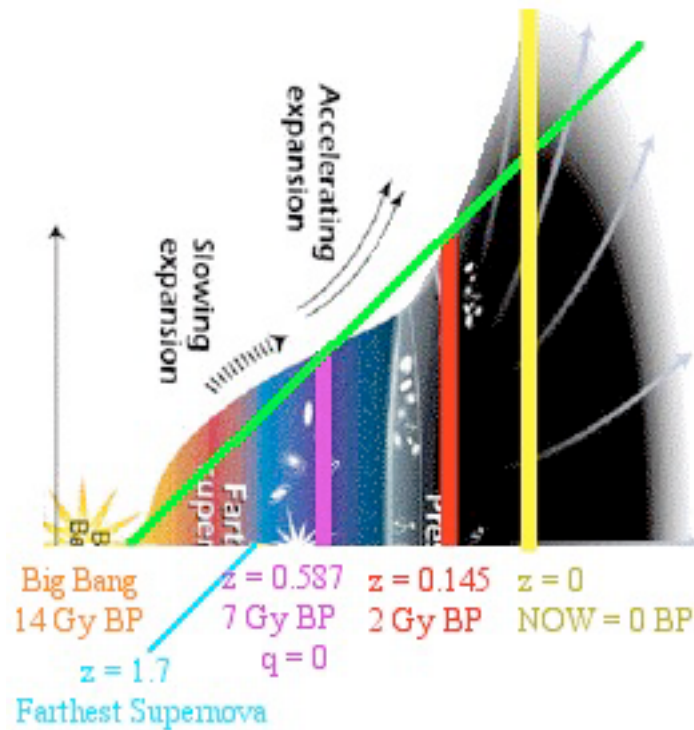
1 - the Big Bang Beginning of Non-Unitary Octonionic Inflation (about 13.7 Gy BP) during which Non-Unitary processes produce about 10^{89} particles;

2 - the End of Inflation = Beginning of Unitary Quaternionic Expansion that initially is Decelerating (beginning of green line also about 13.7 Gy BP);

3 - the End of Deceleration ($q=0$) = Inflection Point =
= Beginning of Accelerating Expansion (purple vertical line at about 7 Gy BP);

4 - the Last Intersection of the Accelerating Expansion of our Universe of Linear Expansion (green line) with the Third Intersection (at red vertical line at about 2 Gy BP);

5 - Now.



In E8 Physics the Conformal Group structure and the history of our Universe give the ratio Dark Energy : Dark Matter : Ordinary Matter that is roughly

$$DE : DM : OM = 75 : 20 : 05$$