B-mode Octonionic Inflation of E8 Physics

Frank Dodd (Tony) Smith, Jr. - 2014

viXra 1403.0300

BICEP2 in arXiv 1403.3985 said:
"... Inflation predicts ... a primordial background of ... gravitational waves ...[that]... would have imprinted a unique signature upon the CMB. **Gravitational waves induce local quadrupole anisotropies** in the radiation field within the last-scattering surface, **inducing polarization** in the scattered light ... **This polarization pattern will include a "curl" or ... inflationary gravitational wave (IGW) B-mode ... component** at degree angular scales that cannot be generated primordially by density perturbations. The amplitude of this signal depends upon **the tensor-to-scalar ratio ... r = 0.20 +0.07 -0.05** ... which itself is a function of the energy scale of inflation. ...".

In E8 Physics, Inflation is due to Non-Unitarity of Octonion Quantum Processes that occur in 8-dim SpaceTime before freezing out of a preferred Quaternionic Frame ends Inflation and begins Ordinary Evolution in (4+4)-dim M4 x CP2 Kaluza-Klein. The unit sphere in the Euclidean version of 8-dim SpaceTime (see viXra 1311.0088 for Schwinger's "unitary trick" to allow use of Euclidean SpaceTime) is the 7-sphere S7.

(for E8 Physics overview see viXra 1312.0036 and 1310.0182)

Curl-type B-modes (tensor) are Octonionic Quantum Processes on the surface of SpaceTime S7 which is a **7-dim NonAssociative Moufang Loop Malcev Algebra**.

(for Malcev Algebras see Appendix I) (image below from Sky and Telescope)

B-modes look like  Spirals on the Surface of S7

Divergence-type E modes (scalar and tensor) are Octonionic Quantum Processes from SpaceTime S7
plus a spinor-type S7 representing Dirac Fermions living in SpaceTime
plus a 14-dim G2 Octonionic Derivation Algebra connecting the two S7 spheres
all of which is a **28-dim D4 Lie Algebra Spin(8)**.

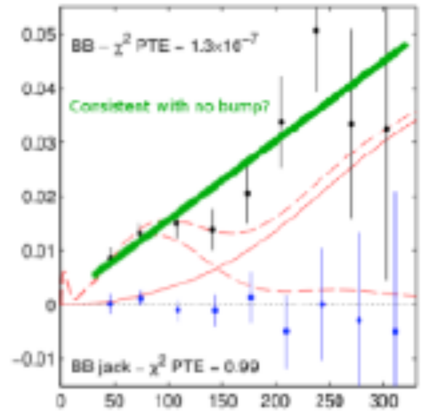
(image below from Sky and Telescope)

E-modes look like Fermion Pair Creation either

off (scalar)  or on (tensor)  the Surface of S7

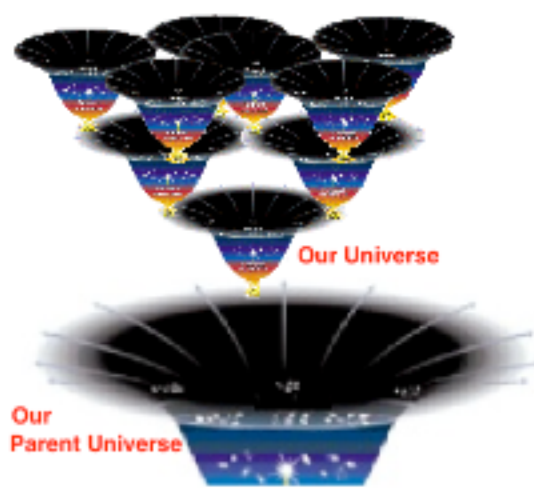
Therefore: **for E8 Physics Octonionic Inflation the ratio r = 7 / 28 = 0.25**

Phil Bull in his Lumps'n' Bumps blog (17 March 2014) said:
"... the blue points in the plot ... are the nulll tests for the BB power spectrum ... You'd ... expect about a third of the points to have their errorbars not overlapping with zero ...



... a straight line would fit the points quite well (green line; my addition). ...".

Here is an outline of how Octonionic Inflation works in E8 Physics:



As Our Parent Universe expanded to a Cold Thin State Quantum Fluctuations occurred.
Most of them just appeared and disappeared as Virtual Fluctuations,
but at least one Quantum Fluctuation had enough energy to produce 64 Unfoldings
and reach Paola Zizzi's State of Decoherence making it a Real Fluctuation
that became Our Universe.

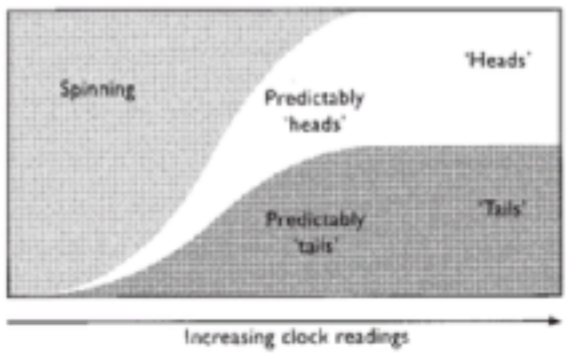
As Our Universe expands to a Cold Thin State, it will probably give birth
to Our Child, GrandChild, etc, Universes.

Unlike "the inflationary multiverse" decribed by Andrei Linde in arXiv 1402.0526 as
"a scientific justification of the anthropic principle",
in E8 Physics ALL Universes (Ours, Ancestors, Descendants)
have the SAME Physics Structure as E8 Physics (viXra 1312.0036 and 1310.0182)

In E8 Physics, our present 4-dimensional physical spacetime is based on a Quaternionic substructure of an Octonionic 8-dimensioal spacetime in which the physics of each Local Region is described by a Local Lagrangian with E8 structure from an E8 Lie Algebra that is embedded in a Cl(16) Real Clifford Algebra.
Our spacetime remains Octonionic 8-dimensional throughout inflation.

How do the Cl(16) E8 Local Lagrangian Regions fit together to describe the Quantum Physics of the MultiVerse ?

David Deutsch in his 1997 book "The Fabric of Reality" said (pages 276-283):
"… there is no fundamental demarcation between snapshots of other times and snapshots of other universes ... Other times are just special cases of other universes ... Suppose ... we toss a coin ... Each point in the diagram represents one snapshot



... in the multiverse there are far too many snapshots for clock readings alone to locate a snapshot relative to the others. To do that, we need to consider the intricate detail of which snapshots determine which others. …
in some regions of the multiverse, and in some places in space,
the snapshots of some physical objects do fall, for a period, into chains,
each of whose members determines all the others to a good approximation …".

Anthony Bonner in his 2007 book "The Art and Logic of Ramon Llull" said:
"… Giordano Bruno wrote five commentaries on Llull, four of them on the Art - more attention than he gave to any other thinker ...
Giordano Bruno ... saw .... Llull's ... Art ... as a way to explore the connections among his infinity of worlds …".

If you look at Llull's Art (especially his Quaternary Phase) you see that it is equivalent to E8 Physics (see viXra 1403.0178) with

the Clifford Algebra Cl(16) containing E8 giving the Local Lagrangian of a Region that is equivalent to a " snapshot" of the Deutsch "multiverse".
The completion of the union of all tensor products of all Cl(16) E8 Local Lagrangian Regions

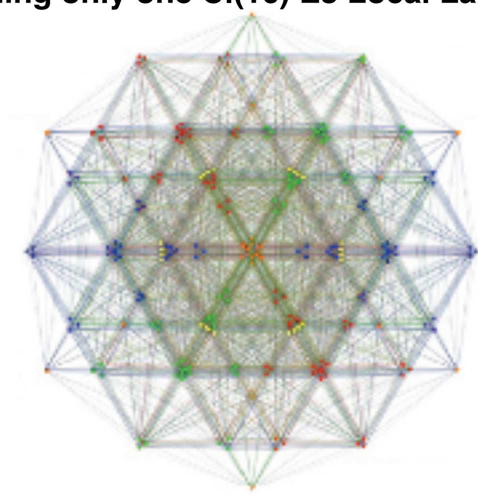
then

emergently self-assembles into a structure = Deutsch multiverse forming a generalized hyperfinite II1 von Neumann factor AQFT
(Algebraic Quantum Field Theory).

Stephen L. Adler in his book Quaternionic Quantum Mechanics and Quantum Fields (1995) said at pages 50-52, 561:
"... If the multiplication is associative, as in the complex and quaternionic cases, we can remove parentheses in ... Schroedinger equation dynamics ... to conclude that ... the inner product < f(t) I g(t) > ... is invariant ... this proof fails in the octonionic case, and hence one cannot follow the standard procedure to get a unitary dynamics. ...[so there is a]... **failure of unitarity in octonionic quantum mechanics** ...".

The **NonAssociativity and Non-Unitarity of octonions accounts for particle creation without the need for tapping the energy of a conventional inflaton field**.

Inflation begins in Octonionic E8 Physics with a Quantum Fluctuation initially containing only one Cl(16) E8 Local Lagrangian Region



The Fermion Representation Space for a Cl(16) E8 Local Lagrangian Region
is E8 / D8 = the 64+64 = 128-dim +half-spinor space 64s++ + 64s-- of Cl(16)

64s++ = 8 components of 8 Fermion Particles

64s-- = 8 components of 8 Fermion Antiparticles

By 8-Periodicity of Real Clifford Algebras Cl(16) = tensor product Cl(8) x Cl(8)
so since Cl(8) has two 8-dim half-spinor spaces 8s+ and 8s-

8s+ = 8 Fermion Particles

8s- = 8 Fermion Antiparticles

so that

64s++ = 8s+ x 8s+ and 64s-- = 8s- x 8s-

Denote the Representation Space for the 8 Fermion Particles + 8 Fermion Antiparticles on the original Cl(16) E8 Local Lagrangian Region by 8 of 64s++ + 8 of 64s-- =

_ _ _ _ _ _ _ _ + _ _ _ _ _ _ _ _

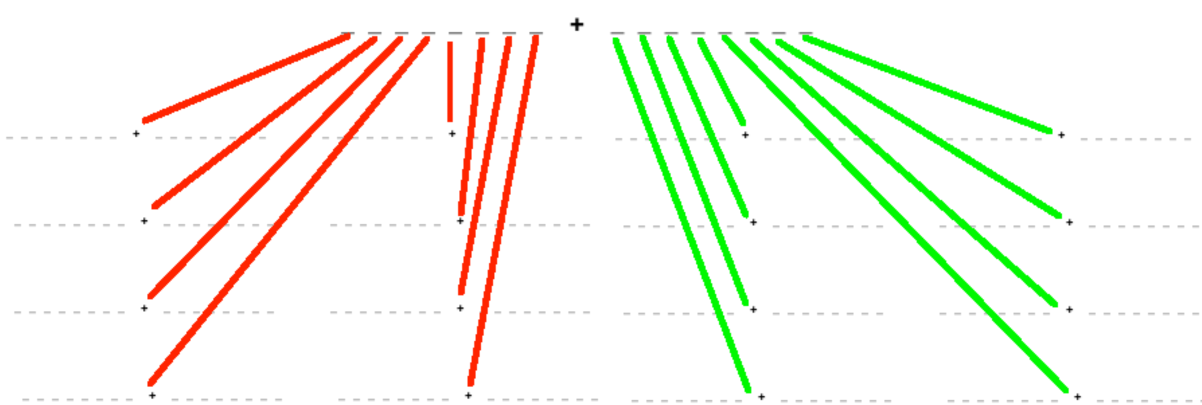
where a Fermion Representation slot _ of the 8+8 = 16 slots can be filled

by Real Fermion Particles or Real Fermion Antiparticles

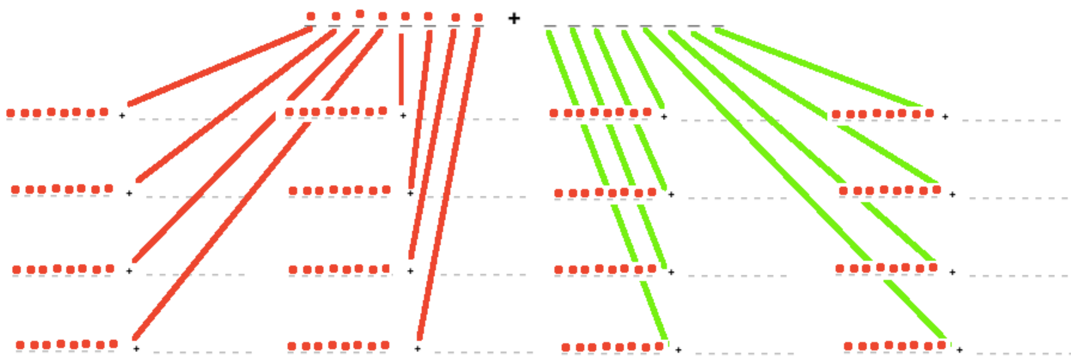
IF the Quantum Fluctuation(QF) has enough Energy to produce them as Real and
IF the Cl(16) E8 Local Lagrangian Region has an Effective Path from its QF Energy
to that Particular slot. (see Appendix III for Geoffrey Dixon's ideas and Effective Path of QF Energy)

Since E8 contains only the 128 +half-spinors and none of the 128 -half-spinors of Cl(16)
the only Effective Path of QF Energy to E8 Fermion Representation slots
goes to the only Fermion Particle slots that are also of type +
that is, to the 8 Fermion Particle Representation slots

Next, consider **the first Unfolding step of Octonionic Inflation**.It is based on
all 16 = 8 Fermion Particle slots + 8 Fermion Antiparticle Representation slots
whether or not they have been filled by QF Energy.
7 of the 8 Fermion Particle slots correspond to the 7 Imaginary Octonions and
therefore to the 7 Independent E8 Integral Domain Lattices and
therefore to 7 New Cl(16) E8 Local Lagrangian Regions.
The 8th Fermion Particle slot corresponds to the 1 Real Octonion and
therefore to the 8th E8 Integral Domain Lattice (not independent - see Kirmse's mistake) and
therefore to the 8th New Cl(16) E8 Local Lagrangian Region.
Similarly, the 8 Fermion Antiparticle slots Unfold into 8 more New New Cl(16) E8 Local
Lagrangian Regions, so that one Unfolding Step is a 16-fold multiplication
of Cl(16) E8 Local Lagrangian Regions:



If the QF Energy is sufficient, the Fermion Particle content after the first Unfolding is



so it is clear that **the Octonionic Inflation Unfolding Process creates Fermion Particles with no Antiparticles, thus explaining the dominance of Matter over AntiMatter in Our Universe**.

Each Unfolding has duration of the Planck Time Tplanck
and none of the components of the Unfolding Process Components are simultaneous,
so that **the total duration of N Unfoldings is 2^N Tplanck**.

Paola Zizzi in gr-qc/0007006 said: "... **during inflation,**
the universe can be described as a superposed state of quantum ... [qubits].
the self-reduction of the superposed quantum state is ... reached at the end of
inflation ...[at]... **the decoherence time ... [Tdecoh = 10^9 Tplanck = 10^(-34) sec]** ...
and **corresponds to a superposed state of ... [10^19 = 2^64 qubits]**. ...".

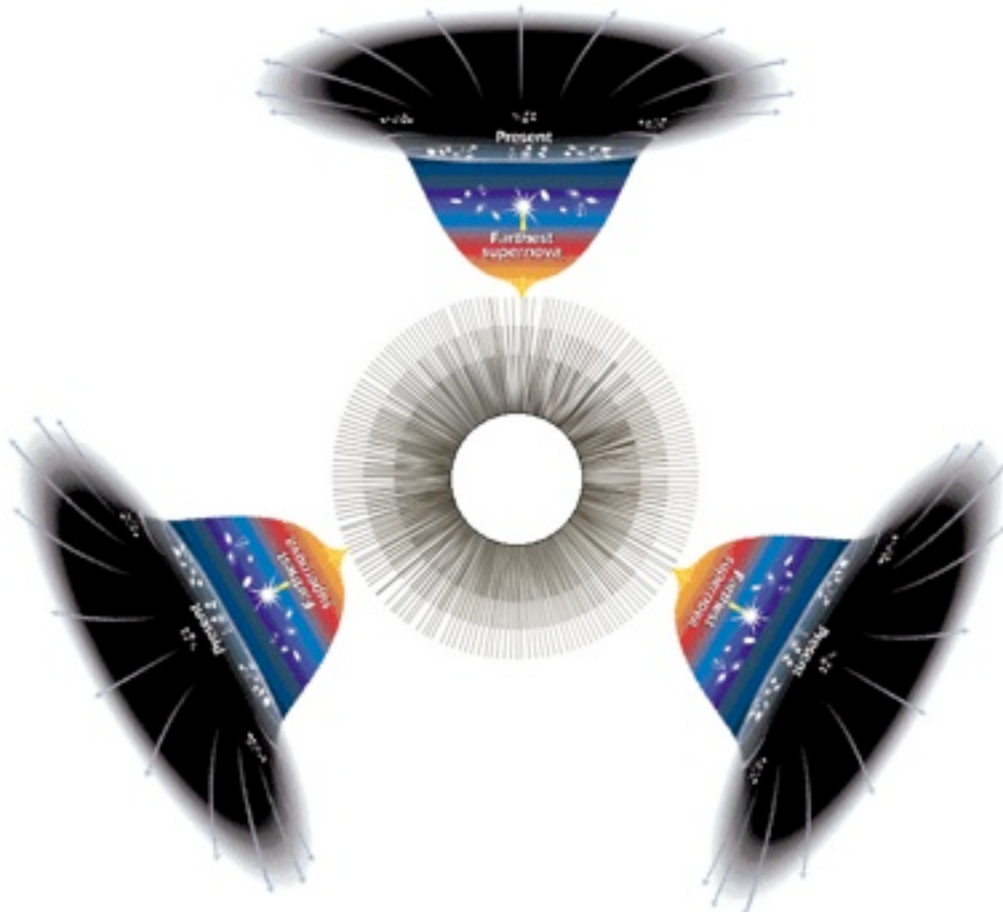
Why decoherence at 64 Unfoldings = 2^64 qubits ?

2^64 qubits corresponds to the Clifford algebra Cl(64) = Cl(8x8).
By the periodicity-8 theorem of Real Clifford algebras, Cl(64) is the smallest Real
Clifford algebra for which we can reflexively identify each component Cl(8)
with a vector in the Cl(8) vector space. This reflexive identification/reduction causes
our universe to decohere at N = 2^64 = 10^19
which is roughly the number of Quantum Consciousness Tubulins in the Human Brain.
At the end of 64 Unfoldings, Non-Unitary Octonionic Inflation ended having produced about (1/2) 16^64 = (1/2) (2^4)^64 = 2^255 = 6 x 10^76 Fermion Particles

The End of Inflation time was at about 10^(-34) sec = 2^64 Tplanck
and
the size of our Universe was then about 10^(-24) cm
which is **about the size of a Fermion Schwinger Source Kerr-Newman Cloud**.
(see viXra 1311.0088)

End of Inflation and Low Initial Entropy in Our Universe:

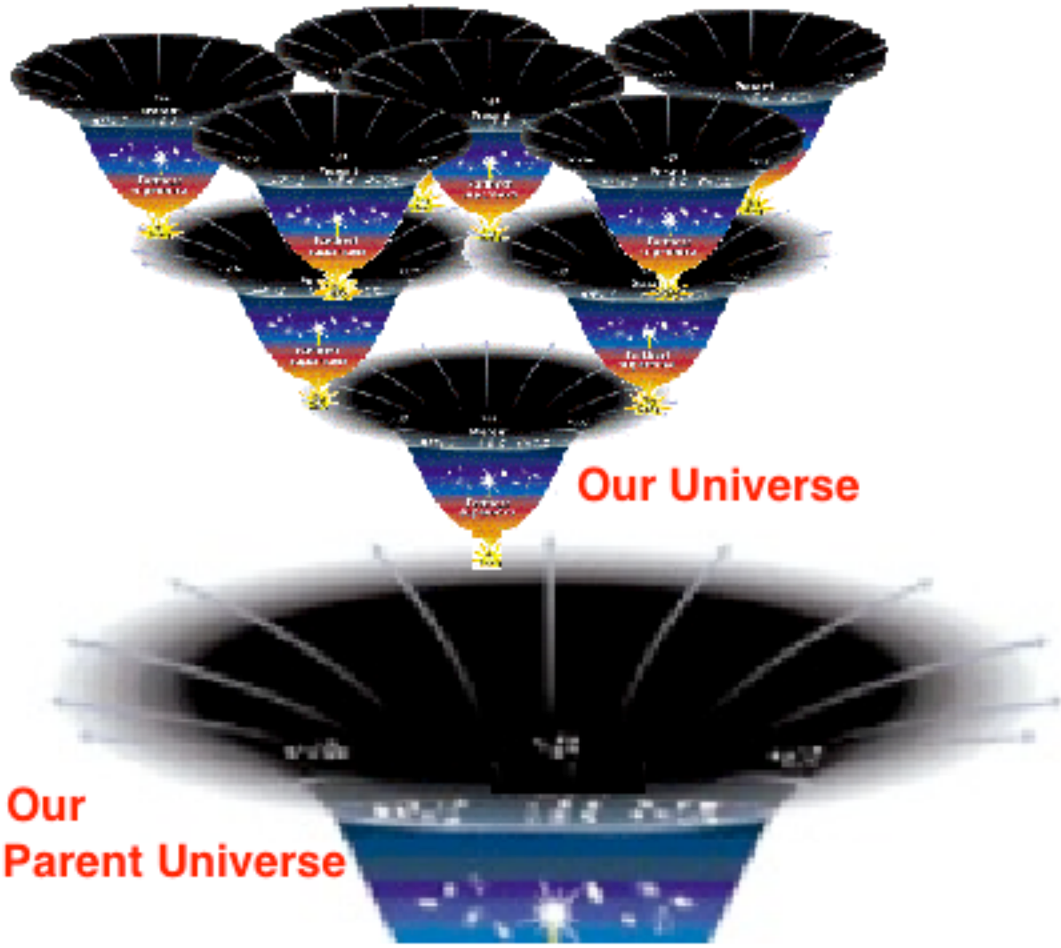
Roger Penrose in his book The Emperor's New Mind (Oxford 1989, pages 316-317) said:
"... in our universe ... Entropy ... increases ... Something forced the entropy to be low in the past. ... **the low-entropy states in the past are a puzzle**. ...".
The key to solving Penrose's Puzzle is given by Paola Zizzi in gr-qc/0007006:
"... **The self-reduction of the superposed quantum state is ... reached at the end of inflation ...[at]... the decoherence time ... [Tdecoh = 10^9 Tplanck = 10(-34) sec] ... and corresponds to a superposed state of ... [10^19 = 2^64 qubits]**. ...
... **This is also the number of superposed tubulins-qubits in our brain ... leading to a conscious event**. ...".
The Zizzi Inflation phase of our universe ends with decoherence "collapse" of the 2^64 Superposition Inflated Universe into Many Worlds of Quantum Theory,



only one of which Worlds is our World. The central white circle is the Inflation Era in which everything is in Superposition; the boundary of the central circle marks the decoherence/collapse at the End of Inflation; and each line radiating from the central circle corrresponds to one decohered/collapsed Universe World (of course, there are many more lines than actually shown), only three of which are explicitly indicated in the image, and only one of which is Our Universe World.

Since our World is only a tiny fraction of all the Worlds, it carries only a tiny fraction of the entropy of the 2^64 Superposition Inflated Universe, thus solving Penrose's Puzzle.

How did Inflation Begin ?



As Our Parent Universe expanded to a Cold Thin State, isolated Quantum Fluctuations occurred. Most of them just appeared and disappeared as Virtual Fluctuations,
but
at least one of the Quantum Fluctuations had enough energy to produce 64 Unfoldings and reach Zizzi's State of Decoherence making it a Real Fluctuation that became Our Universe with 16^64 = 2^256 = 10^77 Fermions.
As Our Universe expands to a Cold Thin State,
it will probably give birth to Our Child, GrandChild, etc, Universes.

Unlike "the inflationary multiverse" decribed by Andrei Linde in arXiv 1402.0526 as "a scientific justification of the anthropic principle", in E8 Physics
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Appendix I (3 pages): **Malcev Algebras**

Jaak Lohmus, Eugene Paal, and Leo Sorgsepp in their book Nonassociative Algebras in Physics (Hadronic Press 1994), said:
"... Moufang loops and Mal'tsev [another transliteration for "Malcev"] algebras ... are ... natural (minimal) generalizations of Lie groups and Lie algebras, respectively. Because of the uniqueness of octonions ... octonionic Moufang loop and the corresponding simple (non-Lie) Mat'tsev algebra are of exceptional importance
...
A Moufang loop is a set G with a binary operation (multiplication) ... so that ...
1) in the equation g h = k, the knowledge of any two of g,h,k [in] G specifies the third one uniquely;
2) there is a distinguished unit or identity element e of G with the property e g = g e = g, [for all] g [in] G;
3) the Moufang identity holds: (g h)(k g) = g((h k)g), [for all] g,h,k [in] G.
A set with such a binary operation that only axioms 1/ and 2) are satisfied is called a loop. ... roughly speaking, loops are the "nonassociative groups". ... The most remarkable property of Moufang loops is their diassociativity: the subloop generated by any two elements in a Moufang loop is associative (group). Hence, for any g,h in a Moufang loop G ... $(h g)g = h g^2$, $g(g h) = g^2 h$, (g h)g = g(h g) ... thanks to [which]... the Moufang identity can be written ... (g h)(k g) = g(h k) g.
... one can define the notion of the inverse element of g [in] G. The unique solution of the equation g x = e (x g = e) is called the right (left) inverse element of g [in] G and denoted as g-1R (g-1L). From ... diassociativity ... g-1R = g-1L = g-1 , g-1(g h) = (h g)g-1 = h , (g-1)-1 = g , (g h)-1 = h-1 g-1 ; [for all] g,h [in] G.
... The Moufang loop G is said to be analytic if G is a real analytic manifold so that both the Moufang lop operation G x G --> G : (g,h) --> g h and the inversion map G --> G : g --> g-1 are analytic ... denote the dimension of G by r ... introduce the antisymmetric quantities
$c^i_{jk} := a^i_{jk} - a^i_{kj}$ ... i,j,k = 1, ... , r ,
called the structure constants of G.
...
The tangent algebra *G* of G ...[with]... product
$[X,Y]^i := c^i_{jk} X^j Y^k = -[Y,X]^i$; i,j,k = 1, 2, ... , r .
...[with the]... Mal'tsev identity ...
[[X,Y],[Z,X]] + [[[X,Y],Z],X] + [[[Y,Z],X],X] + [[[Z,X],X],Y] = 0
... is ... the ... Mal'tsev algebra. ... the Jacobi identity ...[may fail] in *G*
...
... every Lie algebra is a Mal'tsev algebra
...
In a Mal'tsev algebra *G* the Yamaguti triple product ... may be defined as ...
[x,y,z] := [x,[y,z]] - [y,[x,z]] + [[x,y],z]
...
K. Yamaguti proved ... the possibility of embedding a Mal'tsev algebra into a Lie algebra ...

every Mal'tsev algebra can be realized as a subspace of some Lie algebra so that the Mal'tsev operation is a projection of the Lie algebra operation to this subspace.
....
Every Mal'tsev algebra is also a ... Lie triple system ...
Lie triple systems ... serve as tangent algebras for symmetric spaces ...".

S7 Moufang Loop

E. K. Loginov in his paper hep-th/0109206 Analytic Loops and Gauge Fields said:
"... simple nonassociative Moufang loops ...[are]... analytically isomorphic to one of the spaces S7, S3 x R4, or S7 x R7
...
... Suppose A is a complex (real) Cayley-Dickson algebra, M is its commutator Malcev algebra, and L(A) is the enveloping Lie algebra of regular representation of A.

It is obvious that the algebra L(A) is generated by the operators Rx and Lx, where x [is in] A. We select in L(A) the subspaces R(A), L(A), S(A), P(A) and D(A) generated by the operators

Rx,
Lx,
Sx = Rx + 2Lx,
Px = Lx +2Rx and
Dx,y = [Tx, Ty]+T[x,y],

where Tx = Rx -Lx, accordingly. ...

[Rx, Sy] = R[x,y] ...[and]... [Lx, Py] = L[y,x].

... the algebra L(A) is decomposed into the direct sums

L(A) = D(A) + S(A) + R(A),
L(A) = D(A) + P(A) + L(A),

of the Lie subalgebras D(A) + S(A), D(A) + P(A) and the vector spaces R(A), L(A) ... In addition, the map x --> Sx from M into S(A) is a linear representation of the algebra M, which transforms the space R(A) into M-module that is isomorphic ... to the regular Malcev M-module. ...

... the direct summands ... are orthogonal with respect to the scalar product tr{XY} on L(A) ...

[From 7-dim S7 to 28-dim Spin(8)]

...Let A be the complex Cayley-Dickson algebra [of Octonions]. Then A supposes the base 1, e1, ..., e7 such that ei ej = -delta_ij + c_ijk ek,

where the structural constants c_ijk are completely antisymmetric and different from 0 only if

c_123 = c_145 = c_167 = c_246 = c_257 = c_374 = c_365 = 1.

It is easy to see that in such base the operators

Rei = e[i0] - (1/2) c_ijk e[jk] ,
Lei = e[i0] + (1/2) c_ijk e[jk] ,

where e[uv] are skew-symmetric matrices 8 x 8 with the elements (euv)ab = delta_ma delta_nb - delta_mb delta_na .
Using the identity

c_ijk c_mnk = delta_im delta_jn - delta_in delta_jm + c_ijmn ,

where the completely antisymmetric tensor c_ijkl is defined by the equality

(ei,ej,ek) = 2 c_ijkl el ,

we have D_ei,ej = 8 e[ij] + 2 c_ijmn e[mn] . ...

... Its enveloping Lie algebra L(A) (in fixed base) consists of real skew-symmetric 8 x 8 matrices. Therefore we can connect every element F = F_mn e[mn] of L(A)
with the 2-form F = F_mn dx^m /\ dx^n . ... the factors of F are such that

epsilon F0i + (1/2) c_ijk F_ jk = 0 ,
if F [is in] S(A) + D(A) ...[or]... P(A) + D(A)

epsilon F0i = c_ijk F_ jk ,
if F [is in] R(A) ...[or]... L(A)

where there is no summing over j,k in [the second equations], c_ijk 6= 0, and

epsilon = 0, if F [is in] D(A),
epsilon = 1, if F [is in] S(A) + D(A), F [is not in] D(A) or F [is in] R(A),
epsilon = -1, if F [is in] P(A) + D(A), F [is not in] D(A) or F [is in] L(A).

For epsilon = -1 these are precisely the (anty-self-dual) equations of Corrigan et al. ...
In addition, R(A) and L(A) are not Lie algebras. Therefore the [second] equations, in contrast to [the first equationa], are not Yang-Mills equations. Nevertheless, there are a solution of the [second] equations, which generalizes the known (anty-)instanton solution of Belavin et al. ...".

Appendix II (3 pages): **E8 Lattices and Root Vectors**

Correspondence between Imaginary Octonions and E8 Integral Domain Lattices

```
     7-dim S7   EXPANDS TO  Spin(8) Lie Algebra containing S7 and S7 and G2
       / \
        |   corresponds to
       \ /
7 Imaginary Octonions  i j k E I J K
       / \
        |  corresponds to
       \ /
7 independent E8 Integral Domain Lattices
based on the 7 basic Heptavertons / Onarhedra

     Associative   Coassociative  Heptaverton
      Triangle         Square
                                      k J
        I                J---j        |/
i  -->  / \  ---------->  |   | -->    I--i--E
      E---i              K---k        /|
                                     K j

                                      k I
        J                K---k        |/
j  -->  / \  ---------->  |   | -->    J--j--E
      E---j              I---i        /|
                                     K i

                                      i J
        K                I---i        |/
k  -->  / \  ---------->  |   | -->    K--k--E
      E---k              J---j        /|
                                     I j

                                      I k
        j                I---J        |/
E  -->  / \  ---------->  |   | -->    J--E--j
      i---k              K---E        /|
                                     K i

                                      E j
        J                I---j        |/
I  -->  / \  ---------->  |   | -->    J--I--k
      i---K              k---E        /|
                                     K i

                                      E k
        j                J---i        |/
J  -->  / \  ---------->  |   | -->    K--J--i
      I---K              k---E        /|
                                     I i

                                      E i
        J                K---i        |/
K  -->  / \  ---------->  |   | -->    I--K--j
      I---k              j---E        /|
                                     J k
```

Kirmse's MIstake:

H. S. M. Coxeter in his paper Integral Cayley Numbers
(Duke Math. J., v. 13, no. 4, December 1946) said:
"... Kirmse ... selects an eight-dimensional module ... which is closed under subtraction and contains eight linearly independent members. ..
a module is called an INTEGRAL DOMAIN if it is closed under multiplication.
A simple instance is the module Jo consisting of all Cayley numbers ... [that are] integers. ...
[Kirmse] then defines a maximal ... integral domain over Jo as an extension of Jo which cannot be further extended without ceasing to be an integral domain.
He states that there are EIGHT such domains,
one of which he calls J1 and describes in detail.
Actually, there are only SEVEN, which presumably are the remaining seven of his eight.
... J1 itself is not closed under multiplication. ...
Since the 168-group is doubly transitive on the seven [imaginary octonions], ANY transposition [of the imaginary octonions] will serve to rectify J1 in the desired manner.
But there are only seven such domains, since the (7l2) = 21 possible transpositions fall into 7 sets of 3, each set having the same effect.
In each of the seven domains, one of the [imaginary octonions] plays a special role, viz., that one which is not affected by any of the three transpositions.
Comparing Kirmse's multiplication table with Cayley's
... we see that ... Kirmse's J1 could be used as it stands
if we replaced his multiplication table with Cayley's. ..."

H. S. M. Coxeter in his paper Regular and Semi-Regular Polyotpes III
(Math. Z. 200, 3-45, 1988) about the 240 units of an E8 Integral Domain said:
"... "... the 16 + 16 + 16 octaves

±1, ±i, ±j, ±k, ±e, ±ie, ±je, ±ke,
(±1±ie±je±ke)/2,
(±e±i±j±k)/2,

and the 192 others derived from the last two expressions by
cyclically permuting the 7 symbols [i,j,k,e,ie,je,ke]
in the peculiar order

e, i, j, ie, ke, k, je

... It seems somewhat paradoxical ... that the cyclic permutation

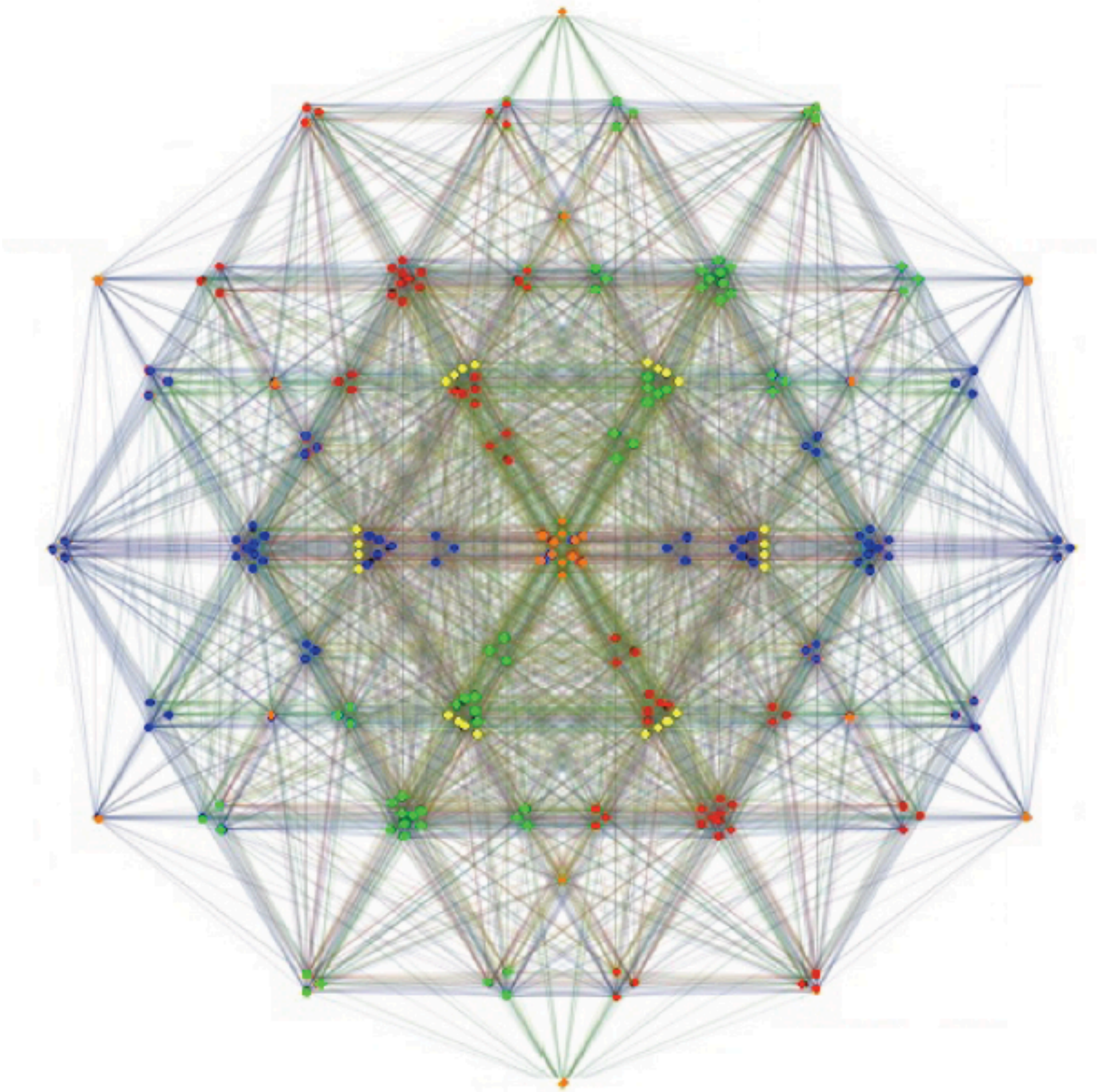
(e, i, j, ie, ke, k, je),

which preserves the integral domain (and the finite projective [Fano] plane ...)
is not an automorphism of the whole ring of octaves;
it transforms the associative triad ijk into the anti-associative triad j ie je.
On the other hand, the permutation

(e ie je i k ke j),

which IS an automorphism of the whole ring of octaves (and of the finite [Fano] plane ...)
transforms this particular integral domain into another one of R. H. Bruck's cyclic of seven such domains. ...".

240 Root Vectors of 248-dim E8 have physical interpretations in E8 Physics:



64 Red = 8 components of 8 Fermion Particles
64 Green = 8 components of 8 Fermion Antiparticles
64 Blue = 8 position x 8 momentum of 8-dim SpaceTime
28 Yellow include 12 of the 16 generators of U(2,2)
for Conformal Gravity, Dark Energy, and Propagator Phase
(the other 4 come from 4 of the 248 - 240 = 8 Cartan Subalgebra elements of E8)
28 Orange include 8 of the 12 generators of Standard Model SU(3)xSU(2)xU(1)
(the other 4 come from 4 of the 248 - 240 = 8 Cartan Subalgebra elements of E8)

Appendix III (4 pages): **Effective Path of QF Energy and Dixon CxHxO**

Another (probably equivalent) way to see that the Effective Path of QF Energy goes entirely to creation of Real Fermion Particles is to follow the work of **Geoffrey Dixon** who said (2012.09.20) "... based on **the algebra T := CxHxO** , an interpretation is developed that **implies the existence of a matter universe, and an anti-matter universe** ...".

Represent both 64-dim 64s++ and 64-dim 64s-- as tensor product C x H x O = T
where C = Complex Numbers, H = Quaternions, and O = Octonions
so that T+T = 128-dim +half-spinor space 64s++ + 64s-- of Cl(16)

Dixon says that T+T corresponds to a 1,9-spacetime
and
that there are 2 ways to reduce 1,9-spacetime to our physical 1,3-spacetime
with
one way producing a matter universe and the other producing an antimatter universe.

My view is that those 2 ways correspond to 2 copies of T+T which represent
128-dim +half-spinor space 64s++ + 64s-- of Cl(16) = Dixon's Matter Universe
and
128-dim -half-spinor space 64s+- + 64s-+ of Cl(16) = Dixon's AntiMatter Universe

E8 Physics uses only the 128 +half-spinors and none of the 128 -half-spinors of Cl(16)
so, using Geoffrey Dixon's ideas, **E8 Physics Octonionic Inflation produces Real Fermion Particles and a Matter Universe**
and the

Effective Path of Quantum Fluctuation Energy is to Creation of Real Fermion Particles
consistently with Dixon's reduction of 1,9-spacetime to 1,3-spacetime.

Here are some details about Geoffrey Dixon's ideas:

Geoffrey Dixon in his book Division Algebras, Lattices, Physics, Windmill Tilting (2011) said:
(in this quote I use T+T instead of Geoffrey Dixon's notation T2)
"... T inherits noncommutativity form H and O, and nonassociativity from O.
From the combination of H and O it also loses alternativity ...
TL uses only HL , and TA uses HA , which includes both HL , HR , and their combined actions.
...
T ... is a Pauli spinor doublet for a 1,9-spacetime
in exactly the same way P is a Pauli spinor doublet for 1,3-spacetime
...
In the Pauli algebra case, we got Dirac spinors buy doubling P to P+P ,
and the associated Clifford algebra is PL(2) = C x Cl(1,3)

...
To produce Dirac spinors we do for T what we did for P:
we double up and use T+T as our spinor space,
with the associated Clifford algebra TL(2) = C x Cl(1,9)
...
Note that in both these cases, if we absorb the C into the Clifford algebra,
we expand the dimensionality of the associated spacetime.
This is sometimes done, but not here. ...

As to $\mathbf{T}$, there a several ways to resolve its identity into four orthogonal *idempotents* (Δ_m, $m = 0, 1, 2, 3$), but only one way (I believe), up to automorphism, satisfying for all y in $\mathbf{T}$,

$$\begin{aligned}
&\Delta_0 + \Delta_1 + \Delta_2 + \Delta_3 = 1, \\
&\Delta_m(\Delta_n y) = \delta_{mn}\Delta_m y, \\
&(y\Delta_m)\Delta_n = \delta_{mn} y\Delta_m, \\
&\Delta_m(y\Delta_n) = (\Delta_m y)\Delta_n,
\end{aligned} \tag{3.23}$$

these properties ensuring the Δ_m can be treated as a set of orthogonal projection operators with which we can consistently decompose the spinor space $\mathbf{T}$.

Drawn from [7], we make the assignments:

$$\begin{aligned}
\Delta_0 &= \tfrac{1}{4}(1 + i\vec{x})(1 + ie_7) = (\tfrac{1}{2}(1 + i\vec{x}))(\tfrac{1}{2}(1 + ie_7)) = \lambda_0\rho_+, \\
\Delta_1 &= \tfrac{1}{4}(1 - i\vec{x})(1 + ie_7) = (\tfrac{1}{2}(1 - i\vec{x}))(\tfrac{1}{2}(1 + ie_7)) = \lambda_1\rho_+, \\
\Delta_2 &= \tfrac{1}{4}(1 + i\vec{y})(1 - ie_7) = (\tfrac{1}{2}(1 + i\vec{y}))(\tfrac{1}{2}(1 - ie_7)) = \lambda_2\rho_-, \\
\Delta_3 &= \tfrac{1}{4}(1 - i\vec{y})(1 - ie_7) = (\tfrac{1}{2}(1 - i\vec{y}))(\tfrac{1}{2}(1 - ie_7)) = \lambda_3\rho_-,
\end{aligned} \tag{3.24}$$

...

the following identifications fall out of the mathematics (at least the way I do it):

$$\begin{array}{ll} \rho_+\Psi : & \text{matter} \\ \rho_-\Psi : & \text{antimatter} \end{array} \tag{3.25}$$

Going one step further:

$$\begin{array}{ll} \rho_+\Psi\rho_+ : & \text{matter - lepton doublet - } SU(3) \text{ singlet} \\ \rho_+\Psi\rho_- : & \text{matter - quark doublets - } SU(3) \text{ triplet} \\ \rho_-\Psi\rho_- : & \text{antimatter - antilepton doublet - } SU(3) \text{ antisinglet} \\ \rho_-\Psi\rho_+ : & \text{antimatter - antiquark doublets - } SU(3) \text{ antitriplet} \end{array} \tag{3.26}$$

And one final step:

$$\begin{array}{ll} \rho_+\Psi\Delta_0 : & \text{matter - neutrino - } SU(3) \text{ singlet} \\ \rho_+\Psi\Delta_1 : & \text{matter - electron - } SU(3) \text{ singlet} \\ \rho_+\Psi\Delta_2 : & \text{matter - up quark - } SU(3) \text{ triplet} \\ \rho_+\Psi\Delta_3 : & \text{matter - down quark - } SU(3) \text{ triplet} \\ \rho_-\Psi\Delta_3 : & \text{antimatter - antineutrino - } SU(3) \text{ antisinglet} \\ \rho_-\Psi\Delta_2 : & \text{antimatter - positron - } SU(3) \text{ antisinglet} \\ \rho_-\Psi\Delta_1 : & \text{antimatter - anti-up antiquark - } SU(3) \text{ antitriplet} \\ \rho_-\Psi\Delta_0 : & \text{antimatter - anti-down antiquark - } SU(3) \text{ antitriplet} \end{array} \tag{3.27}$$

...".

Geoffrey Dixon in his paper Matter Universe: A Mathematical Solution said:
(in this quote I use T+T instead of Geoffrey Dixon's notation T2)
"... The algebra T := C x H x O is 2 x 4 x 8 = 64-dimensional.
It is noncommutative, nonassociative, and nonalternative.
...
In this model ... the foundation is the 128-dimensional ... space T+T
(the doubling of T in the spinor space is modeled on the notion
that a Dirac spinor is a double Pauli spinor). ...
the Dirac algebra ... PL := C x H ... is
the complexification of the Clifford algebra of 1,3-spacetime
...
T+T is acted upon by the complexification of the Clifford algebra of 1,9-spacetime,
represented by TL(2) , where TL is the algebra of left actions of T on itself,
which in the octonion case, due to nonassociativity, requires the nesting of actions.
...
In the T-theory ... the quarks are associated with the octonion units ep , p=1,...,6.
The extra six space dimensions ... also rest on these units

...
An elegant representation of the Clifford algebra Cl(1,9) represented in TL(2) that is aligned with the choice of the octonion unit e7 ... arises from the following set of ten anti-commuting 1-vectors:

$$\beta, \ \gamma q_{Lk} e_{L7}, \ k = 1,2,3, \ \gamma i e_{Lp}, \ p = 1, ..., 6,$$

where

$$\epsilon = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, \ \alpha = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}, \ \beta = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}, \ \gamma = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix},$$

...

Our observable spacetime has 3 space dimensions, not 9. There are two (what I would call) canonical ways of reducing the 1-vectors of $\mathcal{CL}(1,9)$, a mix of observable and unobservable dimensions, to the 1-vectors of observable $\mathcal{CL}(1,3)$:

$$\rho_{L\pm} \{\beta, \ \gamma q_{Lk} e_{L7}, \ k = 1,2,3, \ \gamma i e_{Lp}, \ p = 1, ..., 6\} \rho_{L\pm}$$

$$= \{\beta, \ \gamma i q_{Lk}, \ k = 1,2,3\} \rho_{L\pm}.$$

These two collections of $\mathcal{CL}(1,3)$ 1-vectors act on half of the full spinor space $\mathbf{T}^2$. In particular, they act respectively on

$$\rho_{L\pm}[\mathbf{T}^2] = \rho_{\pm}\mathbf{T}^2,$$

where the underlying mathematics implies that these are, respectively, the matter and anti-matter halves of $\mathbf{T}^2$ ($\rho_+\mathbf{T}^2$ being a full family of lepton and quark Dirac spinors, and $\rho_-\mathbf{T}^2$ the corresponding anti-family) (see [2][3]).

Our observable universe is a 1,3-spacetime. There are those two ways of reducing the initial 1,9-spacetime above to 1,3-spacetimes, one associated with matter, one anti-matter. It now seems perfectly obvious to me to interpret this to mean that our observable 1,3-spacetime must be one, or the other (since it is ours, we call it matter). That is, the observable (habitable, if you will) spacetime in which we reside must of necessity be a matter universe, with anti-matter arising from secondary interactions - or an anti-matter universe - and that both must exist. ...".

My view is that those 2 ways correspond to 2 copies of T+T which represent
128-dim +half-spinor space 64s++ + 64s-- of Cl(16) = Dixon's Matter Universe and
128-dim -half-spinor space 64s+- + 64s-+ of Cl(16) = Dixon's AntiMatter Universe
However,
E8 Physics uses only the 128 +half-spinors and none of the 128 -half-spinors of Cl(16)
so **E8 Physics has only a Matter Universe**.