Cosmos 2014 - Bruno - Llull - E8 Physics

viXra

Frank Dodd (Tony) Smith, Jr. - 2014

Cosmos (2014) with Neil deGrasse Tyson discusses Giordano Bruno's MultiVerse. David Deutch defines the MultiVerse in terms of SnapShots that are equivalent to Cl(16) E8 Local Lagrangian Regions that can be combined by completing the union of all tensor products of all copies of Cl(16) for such E8 Local Lagrangian SnapShot Regions to produce a generalization of the Hyperfinite II1 von Neumann factor that is a realistic Algebraic Quantum Field Theory for E8 Physics. Ramon Llull's 13th Century Quaternary Phase Art gives a remarkably detailed picture of the Structure of E8 Physics. In the 16th Century Giordano Bruno had access only to Llull's Ternary Art which was far less detailed than the earlier Quaternary Art, but even so was able to see that Llull's Art was, as Anthony Bonner said,
"… a way to explore the connections among his infinity of worlds …",
a way that can now in the 21st Century be seen to be consistent with the realistic E8 Physics model.

"**Cosmos: A SpaceTime Odyssey**" (2014) with **Neil deGrasse Tyson** said:

"... **Giordano Bruno** ... dared to read the books banned by the Church ...
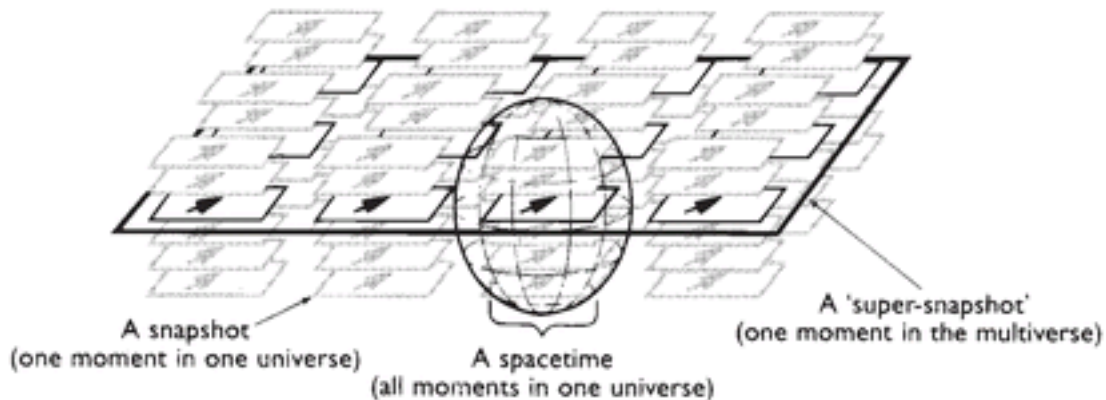

... [and declared]
**"... our infinite God has created a boundless universe
with an infinite number of worlds ..."**

... many of us suspect that all of this ...
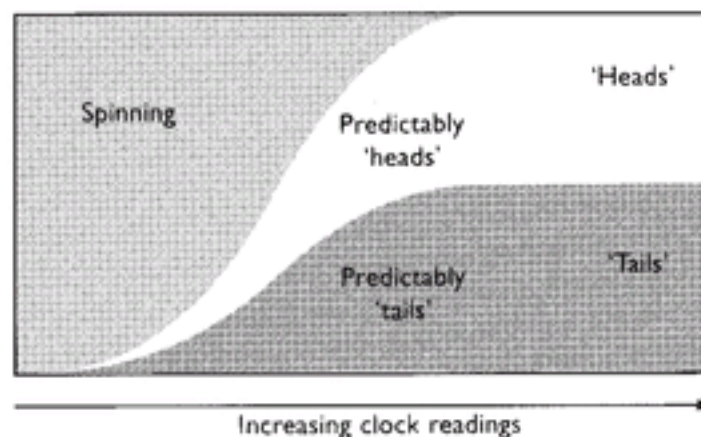is but one tiny bubble in an infinite ocean of other universes ...

a MultiVerse ...".

"The Fabric of Reality" (1997) by **David Deutsch** said:
"... If the **multiverse** were literally a collection of spacetimes, the quantum concept of
time would be the same as the classical one ...

A snapshot
(one moment in one universe)

A spacetime
(all moments in one universe)

A 'super-snapshot'
(one moment in the multiverse)

... time would ... be a sequence of moments. The only difference would be be that at a
particular moment in the multiverse, many universes would exist instead of one. ...
The whole of reality for the whole of time would be the stack of all the super-
snapshots ... Because of quantum interference, each snapshot would no longer be
determined entirely by previous snapshots of the same spacetime ... But the super-
snapshots beginning with a particular moment would be entirely and exactly determined
by the previous super-snapshots ...
though the laws of quantum physics are perfectly deterministic at the multiverse level,
they do not partition the multiverse ... into separate spacetimes, or into super-snapshots
each of which entirely determines the others ...
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

'Heads'

Spinning   Predictably
                'heads'

                Predictably   'Tails'
                'tails'

Increasing clock readings

... **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 the multiverse ... the state of one group of identical snapshots (... 'spinning')...
determines the state of an equal number of differing snapshots (... 'heads' and 'tails') ...
Because of the time-reversibility ... of ... the laws of quantum physics,
the overall, multi-valued state of the latter group also determines the state of the former.
However, in some regions of the multiverse, and in some places in space, the
snapshots of some physical objects to fall, for a period, into chains, each of whose
members determines all the others to a good approximation. Successive snapshots of
the solar system would be the standard example. ... We do not expect that
approximation to break down in any forseeable terrestrial experiment, but ... it must
break down badly in certain types of physical process. The first is the ... Big Bang ... the
earliest moments which are, to a good approximation, sequential occur roughly when
classical physics would extrapolate that the Big Bang had happened 10^(-43) seconds
(the Planck time) earlier. A second and similar sort of breakdown ... is thought to occur
in the interiors of black holes ... Thirdly ... on a sub-microscopic scale quantum effects
again warp and tear the fabric of spacetime, and ... closed loops of time ... exist ...
this ... is also ... possible on a large scale ... near ... rotating black holes ...
in our vicinity in the multiverse ... the number of distinct types of snapshot tends to
increase rapidly with time, and hardly ever decreases ... related to the second law of
thermodynamics ..."

Deutsch MultiVerse SnapShot Region = Cl(16) E8 Local Lagrangian Region

E8 Physics (viXra 1312.0036 and 1310.0182 and 1311.0094) is based on the structure
of the Lie Algebra E8 embedded in the Real Clifford Algebra Cl(16) by
        248-dim E8 = 120-dim Bivectors of Cl(16) + 128-dim Half-Spinors of Cl(16)

In each MultiVerse SnapShot Region E8 Physics is described by a Local Lagrangian
constructed by integration over 8-dim Spacetime from D8 / D4xD4 in E8 of
Gravity and the Standard Model terms from the two D4 subalgebras in E8 and
a Dirac Fermion Particle-AntiParticle term from the D8 half-spinors in E8.
Details about (4+4) M4 x CP2 Klauza-Klein SpaceTime, Fermion Generations 2 and 3,
Higgs, Truth Quark Condensate, Dark Energy, Coleman-Mandula, etc
are given in viXra 1310.0182 and 1311.0094 .

The Deutsch MultiVerse Quantum Theory comes from taking all tensor products of all
copies of Cl(16) MultiVerse Snapshots and then completing the union of all those tensor
products to produce a generalization of the Hyperfinite II1 von Neumann factor
that constitutes a realistic Algebraic Quantum Field Theory (AQFT) for E8 Physics.

Consistency of the AQFT structure is ensured by Real Clifford Algebra 8-periodicity
Cl(16) = Cl(8)xCl(8) whereby any Real Clifford Algebra, no matter how large, can be
embedded in a tensor product of factors of Cl(8), and therefore of Cl(8)xCl(8) = Cl(16).

Ramon Llull described the Structure of E8 Physics

(for details see viXra 1305.0060)
(images in this section from "The Art and Logic of Ramon Llull" (2007) by Anthony Bonner
and for Universal Figure from quisestlullus.narpan.net)

Correspondences of the initial Quarternary Phase of Llull's Art with E8 Physics are:

Figures Y and Z are a Binary Pair - the basis of Real Clifford Algebras.

Figure A has 16 vertices and 120 connecting lines
corresponding to Cl(16) and its 120 D8 BiVectors.

248-dim E8 = 120-dim D8 Bivectors of Cl(16) + 128-dim D8 Half-Spinors of Cl(16)

Figure X divides the 16 vertices into two groups of 8 vertices
thus dividing the 120 connecting lines into 3 sets:
28 that connect vertices of one group of 8 with each other
28 that connect vertices of the other group of 8 with each other
64 that connect vertices of one group of 8 with vertices of the other group of 8

Elemental Figure has 4x4x4 = 64 elements
corresponding to 64-dim D8 / D4xD4 contained in the 120-dim D8 BiVectors and to
the 64 Figure X lines that connect vertices of one group of 8 with vertices of the other
which physically represent 8-dim SpaceTime Position x Momentum
and therefore by Triality also to
64-dim +half of 128-dim D8 Half-Spinors of Cl(16)
which physically represent 8 components of 8 First-Generation Fermion Particles
and to
64-dim -half of 128-dim D8 Half-Spinors of Cl(16)
which physically represent 8 components of 8 First-Generation Fermion AntiParticles.

Figure V describes the two 28-dim D4 of the 120-dim D8 of 248-dim E8
by which 64-dim D8 / D4xD4 is formed. Figure V has 14 vertices
divided into two groups of 7 vertices
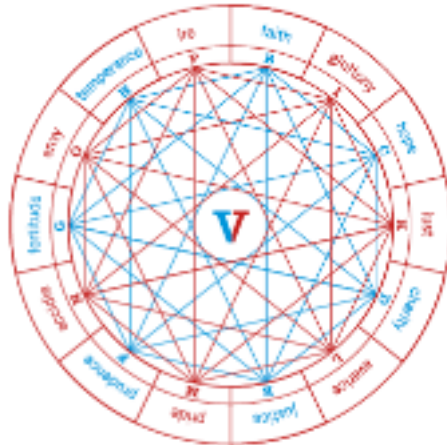
each with 21 lines connecting vertices of one group of 7 with each other.

Each set of 7 vertices + 21 lines corresponds to one of the 28-dim D4.

Mathematically, each set of 7 vertices represents 7 Imaginary Octonions = 7-sphere S7.
The Non-Associativity of Octonions prevents the 7-sphere S7 from forming a Lie Group.
If you try to make a Lie Algebra out of the 7 generators of S7
you find that the products do NOT form a closed 7-dim Lie Algebra
but
they generate: a 14-dim G2 Lie Algebra of the Automorphisms of the Octonions
and a second 7-sphere S7
so
if you combine the initial 7 with the newly generated 14 + 7
you get a 28-dim D4 Lie Algebra.

Each of the 7-vertex 21-line systems
is related to the 168-element group PSL(2,7) = SL(2,3)
and to the 480 Octonion Multiplications.

Figure S   contains 4 squares:

The 4 vertices of the central square correspond to the 4-dim Quaternionic subspaces
that emerge below the Planck energy to break Octonionic 8-dim Spacetime
into (4+4)-dim Kaluza-Klein spacetime with 4-dim Minkowski Physical Spacetime plus
4-dim Internal Symmetry Space CP2 = SU(3) / SU(2)xU(1)

The remaining 3x4 = 12 vertices correspond to 12 of the 28 Figure X lines
that connect vertices of one group of 8 with each other
and represent the 12 Standard Model gauge group generators of SU(3)xSU(2)xU(1)

Two of the remaining 3 squares of Llull's S-wheel form the vertices of a cube

```
x-----y                              x
|\      |\
|  o-----x              y                  y
|  |    | |                    o  o
y-|---o  |              x                  x
  \|      \|
   x-----y                        y
```

Looking at the cube along a diagonal axis and projecting all 8 vertices onto a
perpendicular plane shows the Root Vector Diagram of SU(3) and its 8 Gluons.
Since each Gluon links 4-dim Physical SpaceTime to color Internal Symmetry Space
the gauge group SU(3) acts globally on Internal Symmetry Space C2 = SU(3) / U(2)

The third of the remaining squares, that is the final square, corresponds to
the 3 SU(2) weak bosons and the U(1) electromagnetic photon.
Since SU(2)xU(1) = U(2), and since CP2 = SU(3) / U(2),
they act locally on CP2 Internal Symmetry Space.

Figure T   contains 5 triangles:

The 5x3 = 15 vertices correspond to 15 of the 28 Figure X lines
that connect vertices of the other group of 8 with each other
and represent the 15-dimensional Conformal Group SU(2,2) = Spin(2,4)
that describes Gravity and Dark Energy
and lives in 16-dimensional U(2,2) as U(2,2) = U(1) x SU(2,2).

The U(1) of U(2,2) corresponds to the 16th of the 28 Figure X lines
and represents the Complex Phase of Propagators.
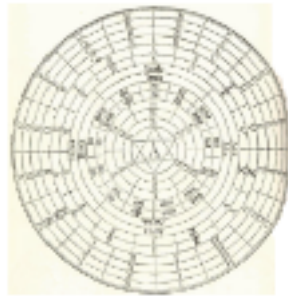
Llull's Universal Figure   shows how the parts fit together:

The outer 4 rings of 16 elements represent 64-Element-Things. There are 3 of these,
related by Triality: 8 Position x 8 Momentum, 64 components of Fermion Particles, and
64 components of Fermion Antiparticles,

The next (going in toward the center) 2 rings of 14 elements each represent 28-dim D4
and its Lie subalgebras. There are two of these D4, producing Gauge Groups of Gravity
and the Standard Model, respectively.

The next 2 rings of 4 elements each represent the 4+4 = 8 dimensions of Spacetime.

The next 2 rings of 13 elements each represent the 26-dimensional String Theory
with Strings seen as World-Lines of Fermions, producing a Bohm-type Quantum Theory.

At the center are 3 rings of 6 elements each surrounding a 6-vertex Star of David whose
3x6 + 6 = 24 elements correspond to the 24-dim Leech Lattice whose Monster Group
symmetry defines the size (about 10^(-24) cm of Physical Particles as
Schwinger Source Kerr-Newman Black Hole clouds of virtual particle-antiparticle pairs.
(see viXra 1311.0088)

Therefore:
The correspondence of the Quaternary Phase of Lullian Art
to E8 Physics
is Very Clear and Detailed

However,
in the time of Giordano Bruno the Llullian Quaternary Phase was not printed
so that Giordano Bruno (and others of the time such as Agrippa and Leibniz)
had access only to Llull's later Ternary Phase works.

Giordano Bruno did not see the full Quaternary Phase of the Art of Ramon Llull
but
only saw the 16th century version of the Ternary Phase.
Even so,
Bruno saw that Lull's ideas were key to understanding Multiverse Physics.

Comparison of Quaternary and Ternary versions of Figure A indicates
how severely Bruno's work was limited by his ignorance of the Quaternary Phase.

It is great credit to Bruno that he was able to see so much
through the limited window of Llull's Ternary Phase.

"The Art and Logic of Ramon Llull" (2007) by **Anthony Bonner** said:

"... With the introduction of printing and with the sixteenth-century search for a general
method of science and learning, interest in Llull's Art increased ... the only works of the
Art which saw their way into print were those of the ternary phase. This is clear from ...
the commentaries on the Ars brevis by Agrippa von Nettesheim and Giordano Bruno ...
Agrippa von Nettesheim's commentary on the Ars brevis was printed fifteen or sixteen
times between 1531 and 1651 ... The complete absence of printed editions of works of
the quaternary phase was not remedied until Salzinger's great anthology of the early
eighteenth century ...
      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

..."

about **1274 ... began ... the quaternary phase ... Figure A** ... a circle around which are

... sixteen virtues .... out of which are formed a hundred and twenty compartments ...

the change from the quaternary to **the ternary phase ... begins ... in 1290** ...
Figure ... A ...

contains nine principles ... Figure A has none of the crisscrossed lines of the quaternary
version ... as often represented in ... another fashion ... that began with Lavinheta's
Explanatio of 1523 ...". The Figure A with 9 vertices and 36 crisscrossed lines that was
commonly shown in Ternary Art works beginning in 1523 is

(image from "Llull and Bruno" (1982) by Frances Yates)

Although Llull excluded the 36 from his simplified Figure A of the Ternary Art, he included the 36 in the Ternary Art as the Third Figure:

The Third Figure

BC	CD	DE	EF	FG	GH	HI	IK
BD	CE	DF	EG	FH	GI	HK	
BE	CF	DG	EH	FI	GK		
BF	CG	DH	EI	FK			
BG	CH	DI	EK				
BH	CI	DK					
BI	CK						
BK							

(image from Bonner book)

Quaternary Phase Figure A has 16 vertices and 120 lines corresponding to

the Real Clifford Algebra Cl(16) with 120 bivectors.

Cl(16) contains the E8 of E8 Physics as the 120 bivectors plus 128 half-spinors

so
if Giordano Bruno had been aware of the Quaternary Phase
he might have anticipated more aspects of E8 Physics.

Ternary Phase Figure A has only 9 vertices. Although the corresponding 36 lines
were omitted from Figure A by Llull, they had been by the time of Bruno been put into
Ternary Figure A by Lavinheta et al. Llull's inclusion of the 36 in his Ternay Phase as the
Third Figure of the Ternary Art

The Third Figure

(image from Bonner book)

may have represented the 36-dimensional Spin(9) Lie Algebra
whose relation to E8 Physics is indirect at best:
If you add the 16-dimensional spinors of Spin(9) to 36-dimensional Spin(9) itself
you get 52-dimensional F4.
F4 is embedded in the Real Clifford Algebra Cl(8) as
        52-dim F4 = 8-dim Vectors + 28-dim BiVectors + 16-dim Spinors

By 8-Periodicity of Real Clifford Algebras the tensor product Cl(8) x Cl(8) = Cl(16) and
      248-dim E8 = 120-dim Bivectors of Cl(16) + 128-dim Half-Spinors of Cl(16)
           (see viXra 1208.0145 for more about F4 and E8)

The F4 / Cl(8) Physics of Llull's Ternary Art
is only a Pale Shadow of the E8 / Cl(16) Physics of Llull's Quaternary Art
but was sufficient
for Giordano Bruno to propose that Llullian Art could give
a realistic description of the Physics of the MultiVerse.