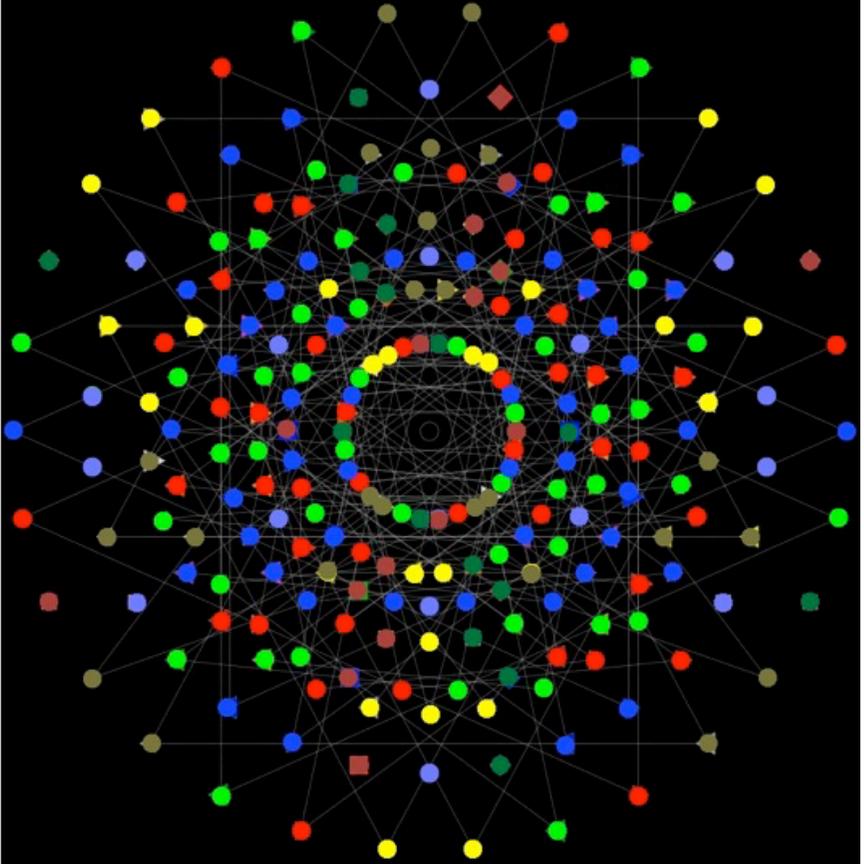


*E8 and Cl(16) = Cl(8) x Cl(8)*



by Frank Dodd (Tony) Smith, Jr.

**Physics from Ancient African Oracle to E8 and Cl(16) = Cl(8)xCl(8)**  
by Frank Dodd (Tony) Smith, Jr. – Georgia June 2008

Front Page Image –  
240 of 256 elements of the E8 Physics Unified Theory of  
Everything

For Technical Details – see 336-page (8 MB) pdf file at  
<http://www.tony5m17h.net/E8physicsbook.pdf>

Dedicated to Gerald Massey (<http://www.gerald-masse.org.uk/>)  
Here are excerpts from his last poem:

For Truth

... he fought for Truth, whose likeness was to him  
revealed ...  
but found ... The World against him, with its ranks all  
closed:  
He fought, he fell, he failed to win the day

But ... Victory ... came ... another way.

For Truth, it seemed, in very person came ...  
men caught a glimpse ... And turned to follow ...  
as if they had been Her champion from the first ...  
and he who had led Was left behind ... forgotten ... dead.

Further material ( not as much as in Borges's Book of Sand, but  
still several thousand pages worth ) about some of the subjects  
mentioned here can be found in the web sites at

<http://www.valdostamuseum.org/hamsmith/>  
<http://www.tony5m17h.net/>

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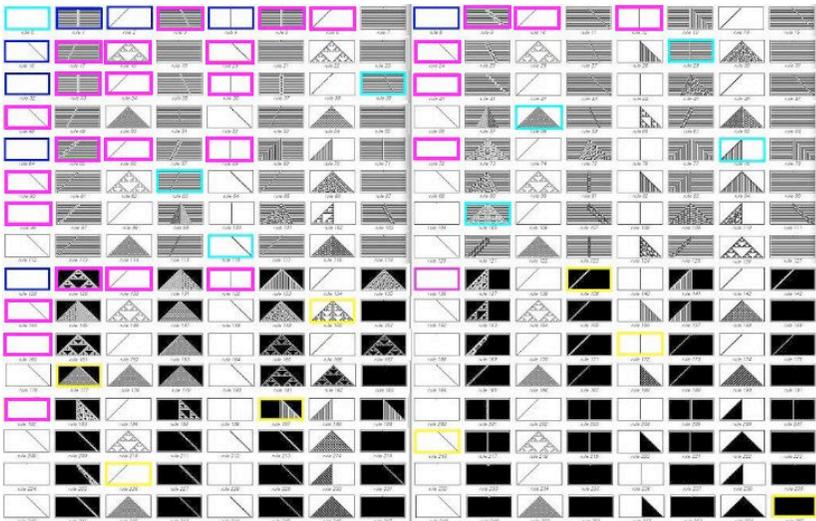
A little less than 15 billion years ago, our Universe emerged from the Void.

4 billion years ago, our Earth and Moon were orbiting our Sun.

2 billion years ago, bacteria built a nuclear fission reactor in Africa.

100,000 years ago, Humans were expanding from the African home-land to Eurasia and beyond.

12,000 years ago, Africans knew that the knowledge-patterns of 8 binary choices giving  $2^8 = 256 = 16 \times 16$  possibilities could act as an Oracle. Did they realize then that those 256 possibilities corresponded to



the 256 Fundamental Cellular Automata, some of which act as Universal Computers ?

The 16x16 African Oracle patterns spread throughout the Earth, so that by the 13th century parts of them were found in:

Judaism as the 248 positive Commandments plus the 365 negative Commandments given to Moses during the 50 days from Egypt to Sinai;

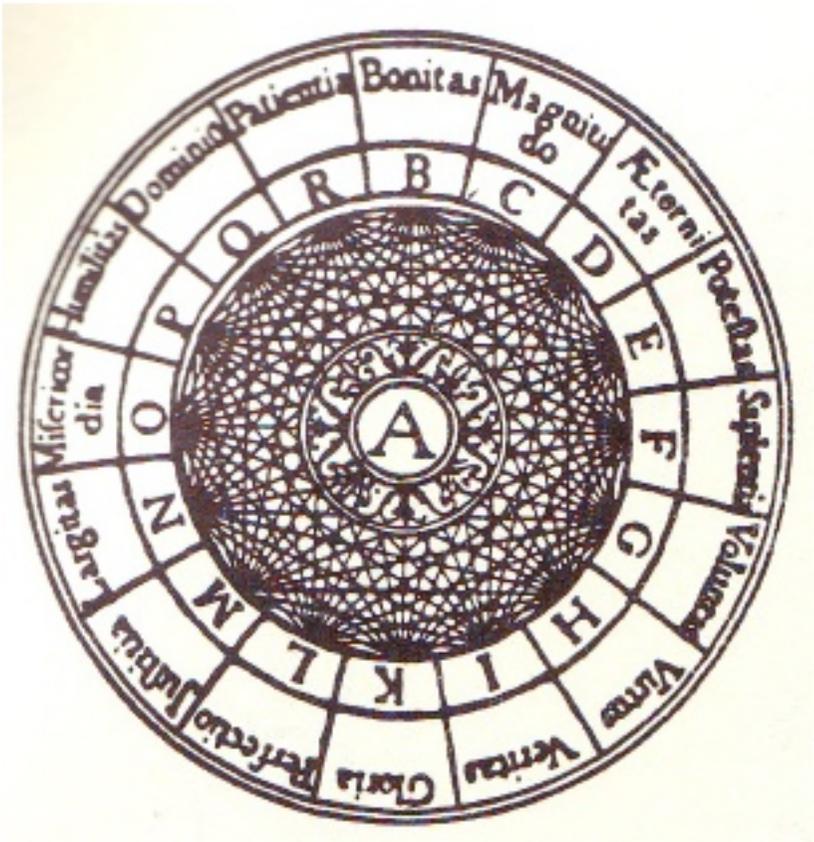
India as the 240 parts of the first sukt of the Rig Veda;

Japan as the 128 possibilities of Shinto Futomani Divination;

China as the 64 possibilities of the I Ching;

Mediterranean Africa as the 16 possibilities of the Ilm al Raml.

Near the end of the 13th century, Ramon Llull of Mallorca studied the 16 possibilities of the Ilm al Raml and realized that they had a Fundamental Organizational Principle that he summarized in a Wheel Diagram



with 16 vertices connected to each other by 120 lines.

If the 16 vertices represented a 16-dimensional vector space, then the 120 lines connecting pairs of vectors represented 120-dimensional bivectors of rotations in that 16-dimensional vector space. That total geometry is

described by the Real 16-dimensional Clifford Algebra Cl(16).

Cl(16) not only describes rotations in vector space, but also spinors that describe left-handed and right-handed properties with respect to the space. Half-spinors of Cl(16) have 128 dimensions.

When you combine the 120 bivectors of Cl(16) with the 128 half-spinors of Cl(16), you get the 248-dimensional object called the exceptional Lie Algebra E8.

In 8-dimensional space, 240 of the 248 generators of E8 form the 240 Root Vectors of E8 that are shown in the image at the front of this paper.

Cl(16) factors into the tensor product of two copies of the Real 8-dimensional Clifford Algebra Cl(8):

$$\text{Cl}(16) = \text{Cl}(8) \times \text{Cl}(8)$$

Since Cl(8), based on an 8-dimensional vector space,

has 256 dimensions, and  $256 = 16 \times 16$ ,

we have come full circle to the 16x16 possibilities of the ancient African Oracle.

Did Ramon Llull understand the detailed Clifford Algebra / Lie Algebra structures implicit in his diagram?

Maybe not consciously, but maybe he (like his ancient African ancestors when they developed the African Oracle) was subconsciously inspired.

Ramon Llull's explicit focus was on showing the unity of all religions. Since he was Catalan of the late 13<sup>th</sup> Century, in which Christianity, Judaism, and Islam coexisted, he tried to demonstrate to the leaders of those religions that they were all fundamentally the same.

Unfortunately for Llull, the interests of the various religious-political bureaucracies prevailed over the desire to see the Truth.

Since Llull was Roman Catholic, the Islamic and Judaic bureaucracies could (and did) ignore his work as that of an irrelevant outsider.

As to the Christians, in the 14th century, Dominican Inquisitors had Ramon Llull condemned as a heretic, his works were suppressed, and his ideas were relegated to a few obscure publications, plus an effort to preserve some aspects of the 16x16 Oracle-patterns in the form of the 78 Tarot cards and the subset of 52 cards that remains popular into the 21st century.

The story of Ramon Llull shows that the Laws of Nature are not always aligned with the Consensus of Human Institutions. Often the Human Institutions would succeed in the Short Term in enforcing their Consensus, but Nature is patient and plays a Long Term game.

For examples:

In 1600 the Roman Inquisition burned Giordano Bruno at the stake for beliefs such as that many Stars could be like our Sun; and

in 1633 Galileo was put under house arrest (continuing until his death in 1642) for beliefs such as that the Earth revolved around the Sun.

In both cases, despite the correct views of Nature held by Giordano Bruno and Galileo, the Human Institutions were victorious in the Short Term.

However, now, a few hundred years later, it is clear that Nature won the Long Term game, and the Spirits of Giordano Bruno and Galileo are Victoriously Vindicated.

What about the full significance of Ramon Llull's African Oracle Patterns?

Testing them (like telescope observations tested the ideas of Galileo and Bruno) required Human Science to advance far beyond the Chinese Taoist inventions of optical lenses, magnets, and gunpowder.

In the early 20th century, Human Science had advanced to understand Gravity through Relativity, and electricity and magnetism through a unified ElectroMagnetism, and a Quantum Mechanical picture of Atoms and Molecules,

but

the phenomenon of Radioactivity, although observed, was poorly understood.

Perhaps the most important Human Scientific Understanding since Galileo happened in 1939, when Lise Meitner (a Jewish physicist who had left Berlin for Sweden to escape Hitler's persecution) was the first Human to discover how the Uranium Fission Chain Reaction Process worked.

Her ideas were realized emphatically in 1945 when the USA dropped Nuclear Fission Bombs named "Little Boy" (a Uranium bomb) and "Fat Man" (a Plutonium bomb) that ended the Japanese part of World War II. The Japanese defeat liberated Saul-Paul Sirag, a child of Dutch-American Baptist missionaries, from a Japanese concentration camp in Java.

A decade later, Nuclear Fusion joined Fission as a part of Human Technology. For example: in 1952, trucks of limonite iron ore were waiting on a railroad loading ramp for a train. The stationmaster told the trucks to go away, as no train was scheduled to arrive any time soon. To his surprise, the tracks were cleared. A Military Train pulled up to the loading ramp. The limonite was loaded. As it left, the stationmaster and all those present were told that the train was never there, and anyone speaking about would be violating national security. The Train That Never Was went on the the Pacific Coast from which the limonite was shipped to Enewetak where the USA detonated the first Fusion H-bomb. The experiments at

Enewetak included testing materials for shielding. One material combined both heavy nuclei (Fe) and neutron-absorbing hydrogen (H) – the limonite ( $\text{Fe}_2\text{O}_3 + \text{H}_2\text{O}$ ) that had been shipped to Enewetak from the Pacific Coast terminus of the Train That Never Was.

During the 1950s and 1960s, David Finkelstein described Black Holes and worked on Quaternionic Physics, Jack Sarfatti studied physics ( BA from Cornell and PhD from U. C. Riverside ) and I learned about Lie Groups and Lie Algebras ( AB in math from Princeton ).

During the 1970s, Saul-Paul Sirag learned math and physics working with Arthur Young and the physics community developed the Standard Model showing how everything other than Gravity could be described, consistent with experimental results, by 3 forces of a Standard Model:

Electromagnetism, with the symmetry of a circle, denoted by  $S1 = U(1)$

Weak Force with Higgs, with the symmetry of a 3-dimensional sphere, denoted by  $S3 = SU(2)$

Color Force, with symmetry related to a Star of David, denoted by  $SU(3)$

From the 1980s on, I learned:

about Clifford Algebras from David Finkelstein at Georgia Tech;

about Weyl Groups and Root Vectors from the work of Saul-Paul Sirag;

about Quantum Consciousness, Space-Time and Higgs as Condensates, and Bohmian Back-Reaction from the work of Jack Sarfatti;

and about high-energy physics particles as Compton Radius Vortices from the work of B. G. Sidharth.

In contrast to the advances in experimental results and construction of the Standard Model of physics, the social structure of the Physics Scientific Community evolved during the 20th century into a rigid Physics Consensus Community much like the Inquisitorial Consensus Community of a few hundred years ago.

For example, in the USA physics community around the middle of the 20th century, J. Robert Oppenheimer enforced his dislike of the ideas of David Bohm by declaring, as head of the Princeton Institute for Advanced Study:

“... if we cannot disprove Bohm, then we must agree to ignore him ...”

**Physics from Ancient African Oracle to E8 and Cl(16) = Cl(8)xCl(8)**  
by Frank Dodd (Tony) Smith, Jr. – Georgia June 2008

As the 20th century ended and the 21st century began, the Physics Consensus Community continued to enforce conformity to Consensus so strongly that Stanford physicist Burton Richter said:

“... scientists are imprisoned by golden bars of consensus ...”

The rigidly enforced Physics Consensus Community was so void of independent thought that the 20th century ended without anyone seeing how Ramon Llull’s African Oracle Patterns explained both Gravity and the Standard Model in a unified way,

but in January 2008 the cover of the magazine of Science & Vie declared:



“Theorie du tout Enfin!

Un physicien ... chercheur hors norme ... aurait trouve la piece manquante”

The missing piece was the 248-dimensional Lie Algebra known as E8 that was naturally constructed from the Ancient African Oracle Patterns.

The beyond-the-norm physics researcher was a California-Hawaii Surfer Dude, Garrett Lisi, who realized that the structure of E8 could unify Gravity and the Standard Model in a way that satisfied Einstein’s Criterion for

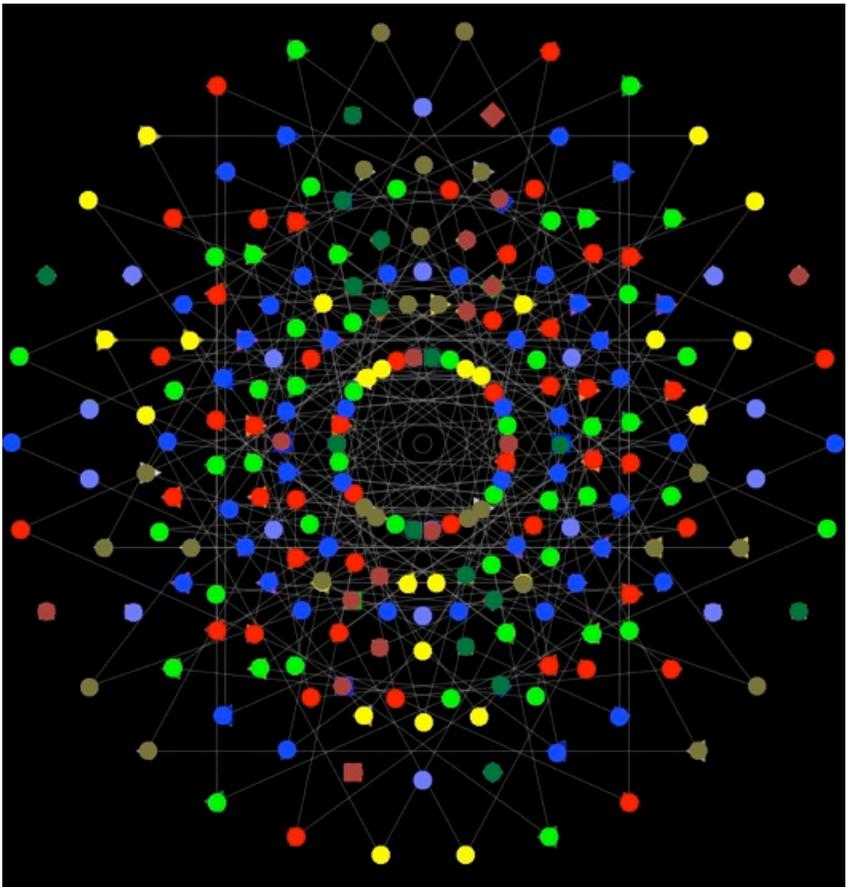
a structure “... based ... upon a faith in the simplicity ... of nature: there are no arbitrary constants ... only rationally completely determined constants ... whose ... value could ... not ... be changed without destroying the theory ...”.

Garrett Lisi published his E8 ideas on the Cornell physics arXiv as hep-th/0711.0770

When I saw Garrett Lisi’s E8 ideas, I realized that the 248 dimensions of E8 only needed 8 more to give the 256 = 16x16 of Ramon Llull’s Wheel Diagram founded on Ancient African Oracle Patterns, so that the Ancient African Oracle Patterns, as interpreted by Ramon Llull, not only showed the unity of all human religions, but also showed the unity of Gravity and the Standard Model.

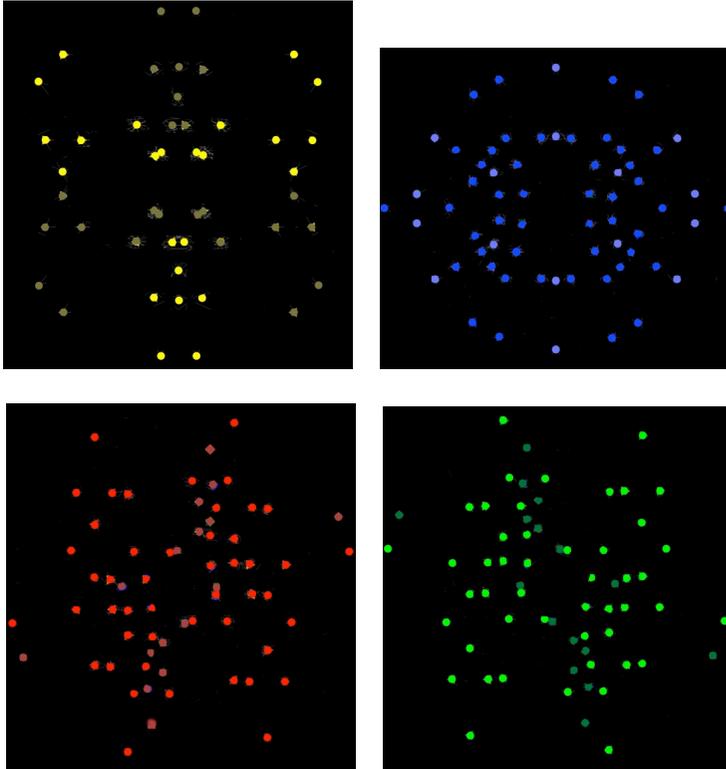
Ramon Llull, not only showed the unity of all human religions, but also showed the unity of Gravity and the Standard Model.

The 240 root vectors of E8 formed a representation of El Aleph of Jorge Luis Borges. Here is an image of the 240 root vectors and a sequence of images showing their physics meaning:



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Here are the separated yellow, blue, red, and green root vectors:



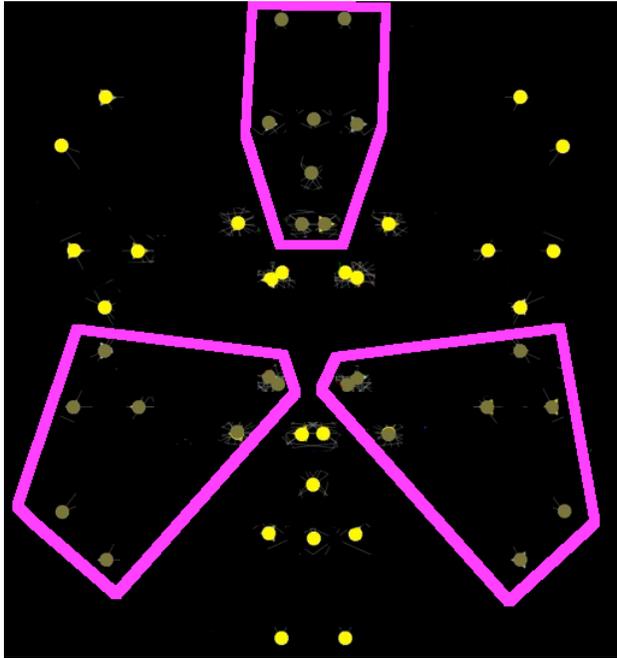
To see their physical meaning, look at E8 as

$$248\text{-dim E8} = 120\text{-dim D8} + 128\text{-dim half-spinor D8}$$

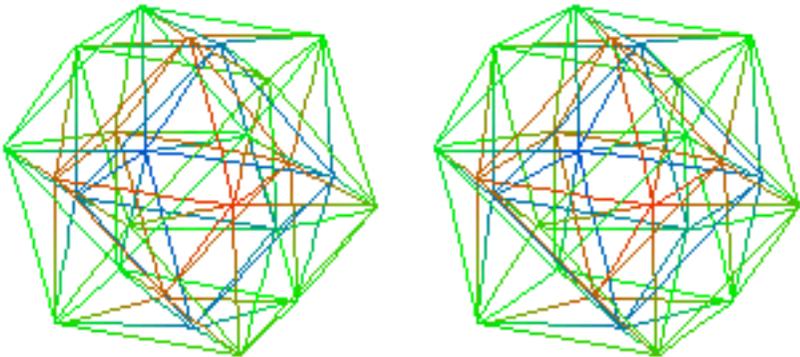
$$120\text{-dim D8} = 28\text{-dim D4} + 28\text{-dim D4} + 8 \times 8 = 64\text{-dim}$$

$$128\text{-dim half-spinor D8} = 64\text{-dim} + 64\text{-dim} = 8 \times 8 + 8 \times 8$$

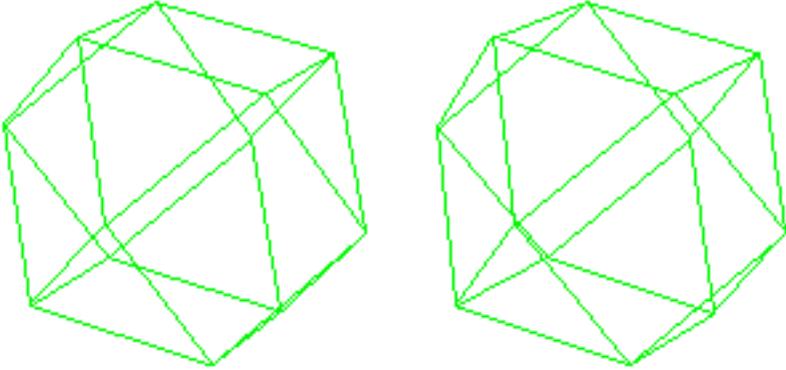
The  $3 \times 8 = 24$  dark yellow root vectors



form the 24 vertices of a 24-cell that is the root vector polytope of a  $24+4 = 28$ -dimensional D4 Lie algebra



and  $3 \times 4 = 12$  of those 24 vertices form the 12 vertices of the central cuboctahedron of the 24-cell.

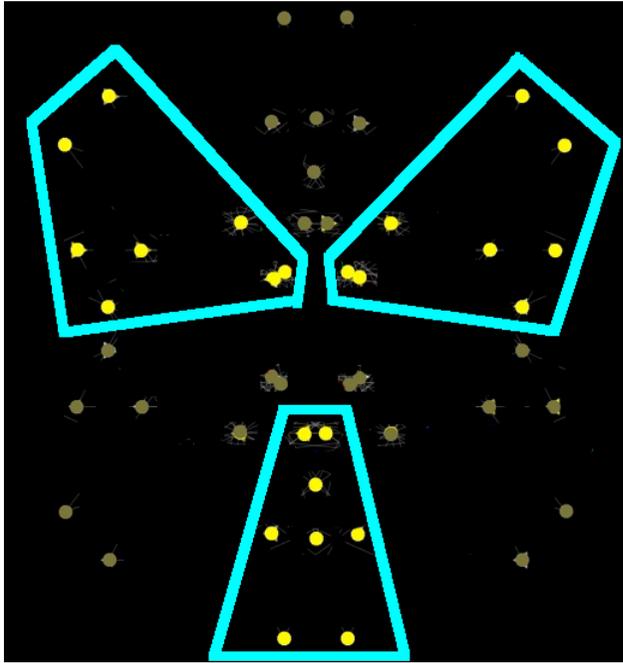


The cuboctahedron is the root vector polytope of Conformal Spin(2,4) = SU(2,2)

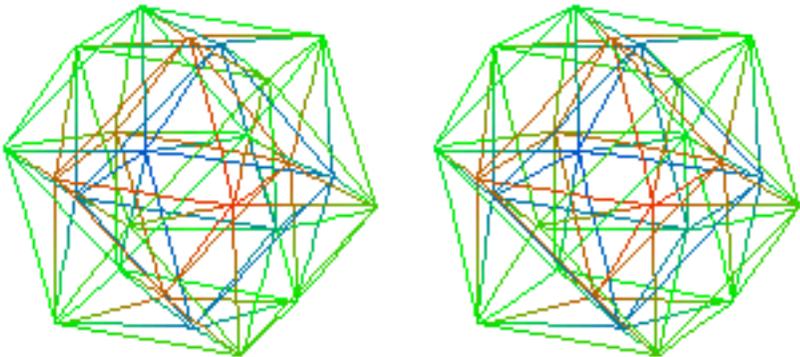
The full 16-dimensional  $U(2,2) = U(1) \times SU(2,2)$  comes from adding to the 12 cuboctahedron vertices, the 4 Cartan subalgebra elements of D4.

Gravity with Segal Conformal structure is given by the MacDowell-Mansouri mechanism.

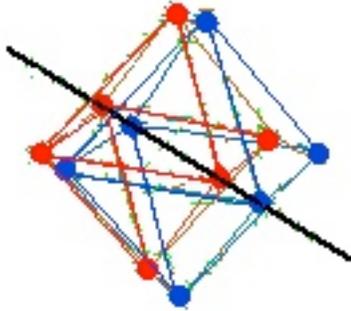
The  $3 \times 8 = 24$  bright yellow root vectors



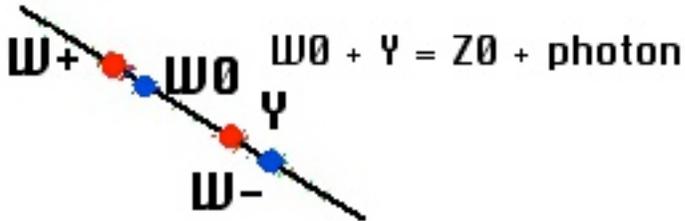
form the 24 vertices of a 24-cell that is the root vector polytope of another 28-dimensional D4 Lie algebra



and  $3 \times 4 = 12$  of those vertices form the  $12 = 6+6$  vertices of the two octahedra in the 24-cell



The 4 vertices of the common central axis of the two octahedra

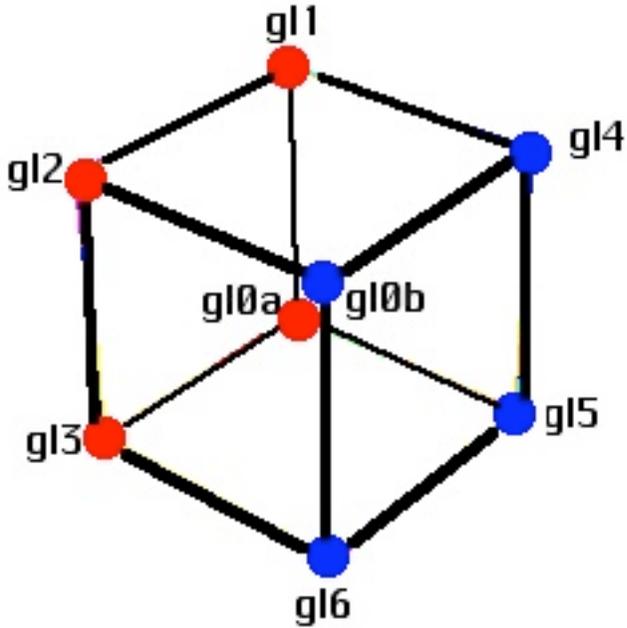


form the 4 elements of electroweak  $U(2) = U(1) \times SU(2)$ .

The remaining  $4+4 = 8$  vertices of the two octahedra from the vertices of a cube, which can be seen (by looking down one of the cube's main diagonals) as containing two central elements surrounded by a hexagon of 6 vertex elements,

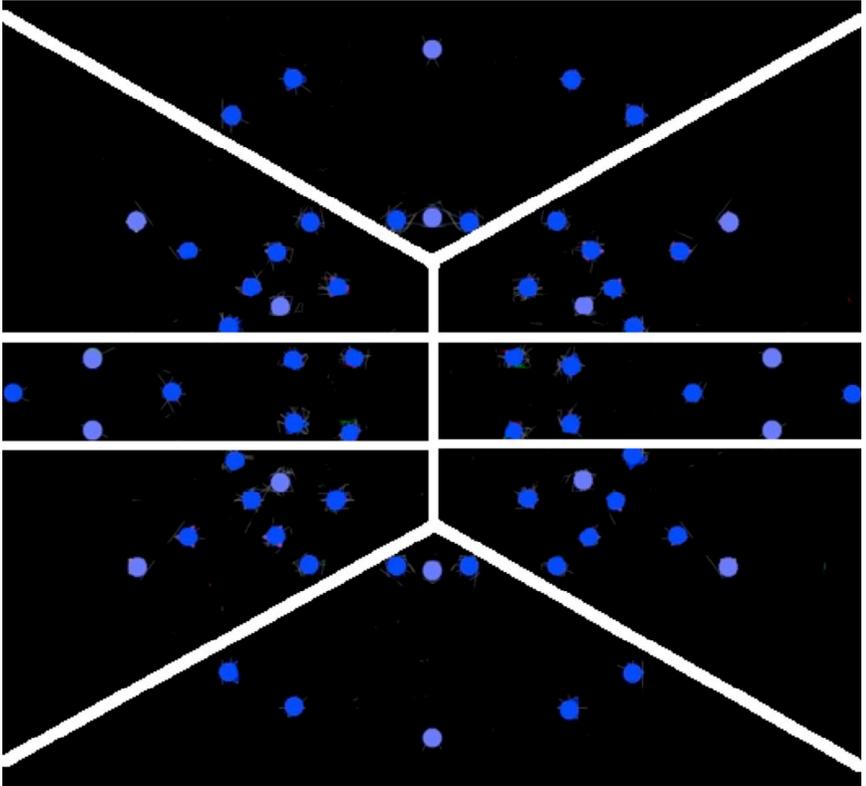
and thus forming the root vector diagram of color  $SU(3)$ .

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Since the two octahedra form U(1) and SU(2) and SU(3),  
the bright yellow root vectors form the gauge bosons of  
the Standard Model.

The  $8 \times 8 = 64$  blue root vectors



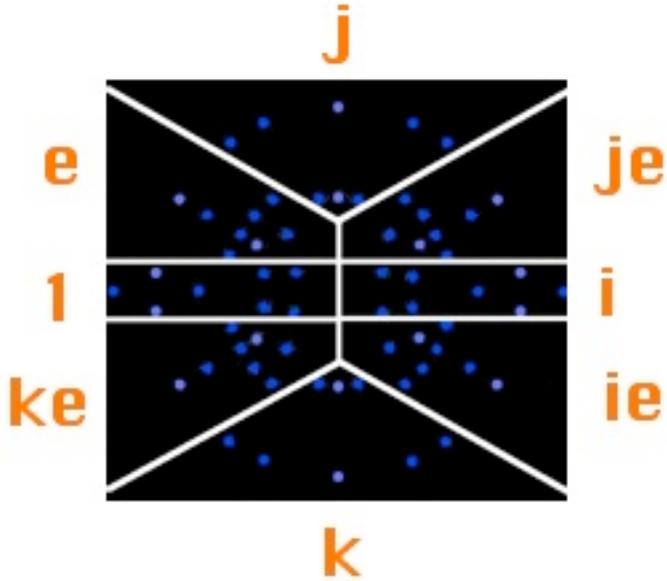
tell how the 8 vector spacetime dimensions of the D4 giving Gravity correlate with the 8 vector dimensions of the D4 giving the Standard Model.

Each set of 8 root vectors represent the 8 components, with respect to the SM D4 8-dim vector space (related to 8 Dirac gammas),

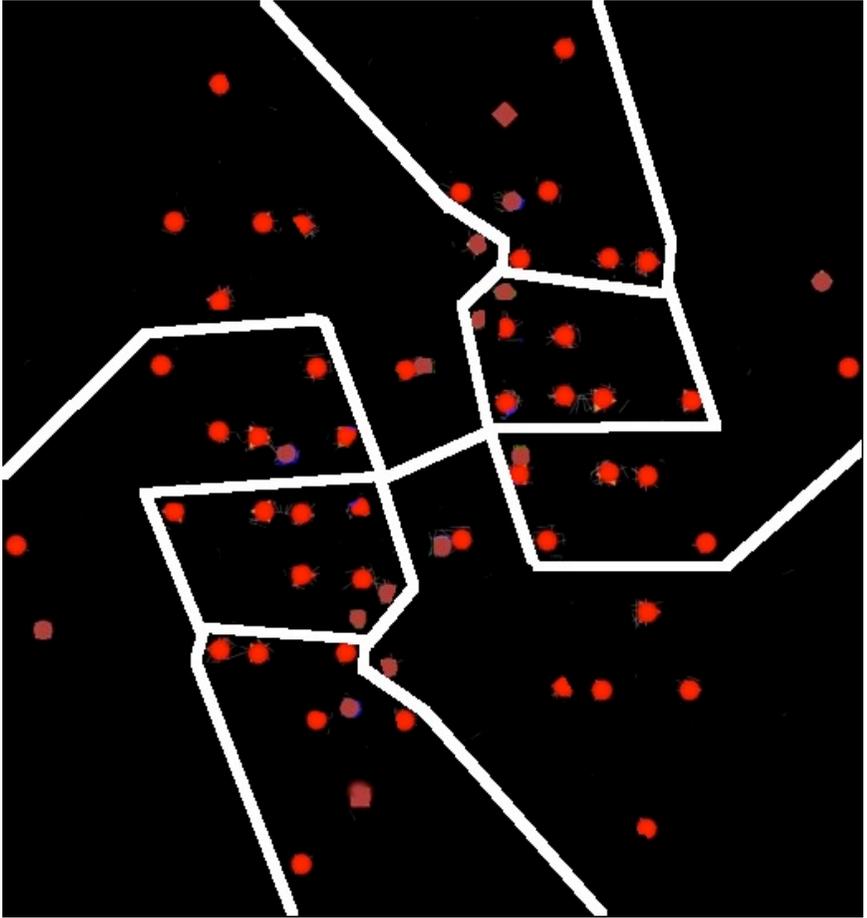
of one of the 8 spacetime dimensions of E8 physics that come from the Gravity D4 8-dim vector space.

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Giving the 8-dim spacetime of E8 physics octonionic coordinates with basis  $\{1, I, j, k, e, iue, je, ke\}$  shows the meaning of the  $8 \times 8 = 64$  blue root vectors to be

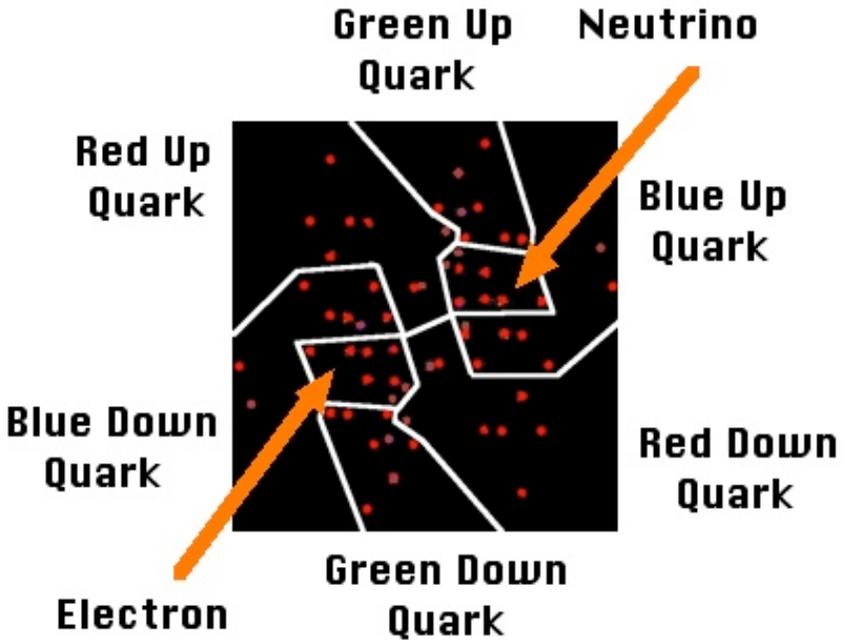


The  $8 \times 8 = 64$  red root vectors



correspond to the 8 covariant components (with respect to 8-dim spacetime) of the 8 fundamental first-generation fermion particles.

So, the meaning of the  $8 \times 8 = 64$  red root vectors is



Note that the Neutrino and Electron form a pair at the core of the red root vectors,

with the Neutrino surrounded by 3 Up Quarks

and the Electron surrounded by 3 Down Quarks,

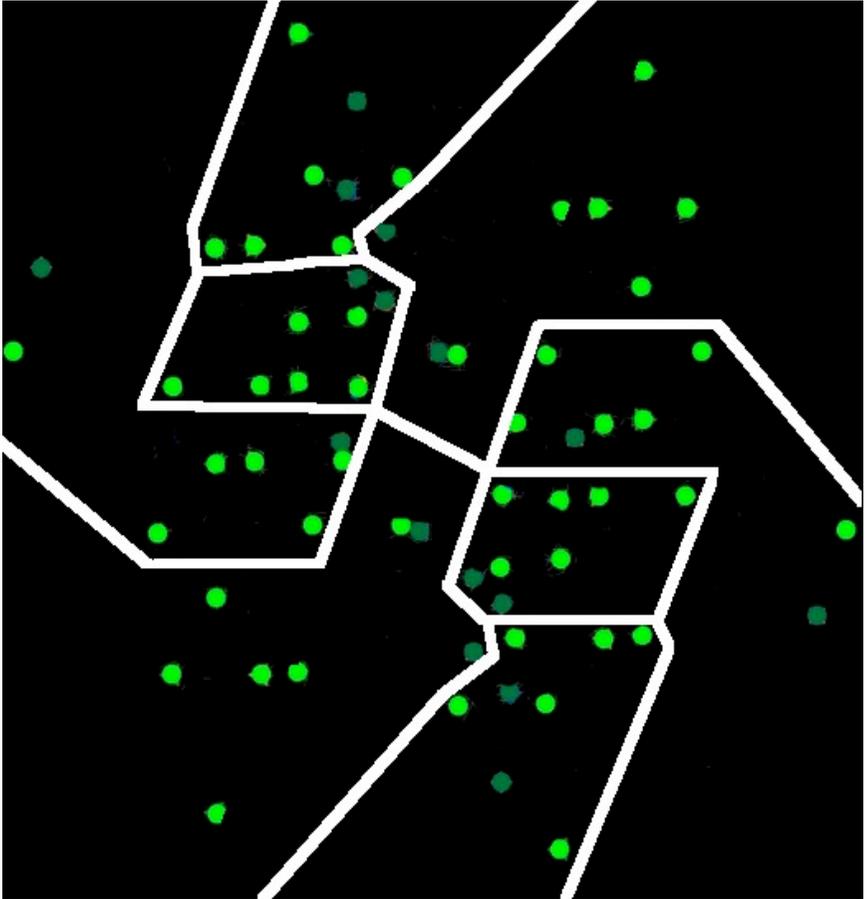
so that the total electric charge of

the Neutrino group is  $0 + 3 \times (+2/3) = +2$

and of the Electron group is  $-1 + 3 \times (-1/3) = -2$

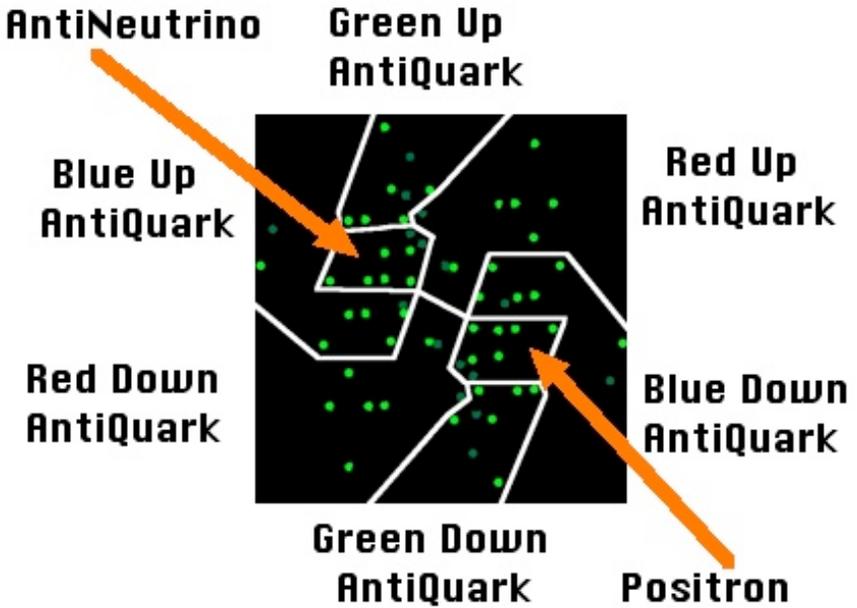
The total charge (electric and color) is neutral.

The  $8 \times 8 = 64$  green root vectors



correspond to the 8 covariant components (with respect to 8-dim spacetime) of the 8 fundamental first-generation fermion antiparticles.

So, the meaning of the  $8 \times 8 = 64$  red root vectors is



Note that the AntiNeutrino and Positron form a pair at the core of the red root vectors,

with the AntiNeutrino surrounded by 3 Up AntiQuarks

and the Positron surrounded by 3 Down AntiQuarks,

so that the total electric charge of

the AntiNeutrino group is  $0 + 3 \times (-2/3) = -2$

and of the Positron group is  $+1 + 3 \times (+1/3) = +2$

The total charge (electric and color) is neutral.

Further, using the 16x16 Oracle-pattern structure along with some non-Consensus ideas of people like Irving Segal, Meinhard Mayer, Armand Wyler, and David Bohm, I had been able to do the calculations that Richard Feynman had declared to be necessary when he said:

“... The whole purpose of physics is to find a number, with decimal points, etc! Otherwise you haven't done anything. ...”

A summary of those numerical calculations is set out in the Appendix of this paper.

Details of the calculations, and of the physical particle, spacetime, etc., correspondences illustrated above, are set out in a 336-page (8 MB) pdf file on the web at <http://www.tony5m17h.net/E8physicsbook.pdf>

Neither Garrett Lisi ( “physicien ... chercheur hors norme” = “physics researcher beyond the norm” ) nor I (lawyer working on physics in my spare time) had made E8 related discoveries while working within the Physics Consensus Community, which was mostly hostile. How hostile was the Physics Consensus Community? VERY!

Years ago, while I was working on what now is realized as E8 physics, the Cornell physics e-print arXiv blacklisted me so that I could not post my work and preserve it there for posterity.

The Cornell arXiv blacklisting affected not only me, but also others including but not limited to Carlos Castro (whose work, especially on Clifford Algebras and the Armand Wyler-type geometry of force strengths, is related to mine) and even Cornell graduate Jack Sarfatti.

Although Cornell makes pretensions of being pro-civil-rights, under its skin Cornell seems to be just another Roman Inquisition.

Cornell arXiv blacklisting hurt my feelings deeply, but even it was not as bad as what happened after I had compared my calculations with published results of experiments at Fermi National Laboratory ( Fermilab ) near Chicago, and seen that 6 events published in 1997 were consistent with my calculations.

By 2008, Fermilab had recorded so many more new events that, if the new events were made public, they would most likely either conclusively confirm my calculations or refute them.

So, I asked a Fermilab physicist for access to data about the new events.

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Despite the fact that Fermilab was not a private corporation, but was a National Laboratory funded by United States taxpayers,

Fermilab's response was that Fermilab would keep the data about the new events secret from the public so long as Fermilab existed.

The Physics Consensus Community was so afraid of the Truth that it buried the new events deeper than the Vatican had buried records of Inquisitions.

Past History shows we got to where we are, including what Science et Vie describes on its cover as:

**“Theorie du tout. Enfin!”**

Where does Human Society go from here?

What might be Our Future History?

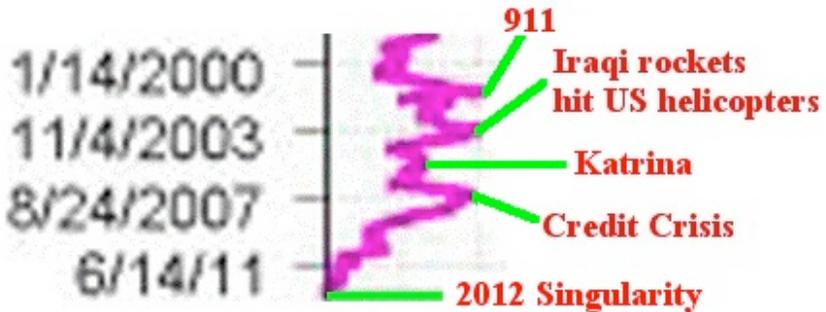
One person (definitely not a Conformist to Consensus) who tried to see History and its extension into the future was Terence McKenna. Matthew Watkins said “... Terence McKenna ... developed ... the Timewave theory ... which involved ... I Ching hexagrams [ a part of the 16x16 Ancient African Oracle Patterns ]...”.

In a 1993 Omni interview Terence McKenna said “... The world is not a single, one-dimensional, forward-moving, causal ... thing, but some kind of interdimensional nexus. ... Something in an unseen dimension is acting as an attractor for our forward movement in understanding ... It’s what we have naively built our religions around ... We are at the breakpoint ... What lies ahead is ...

[either] freedom and transcendence ...

[or] scarcity, preservation of privilege, forced control of populations ...”.

Terence McKenna died on 3 April 2000, but his Timewave description of History not only described Past History but also continued on to make Predictions up to the date of a Singularity: December 2012



McKenna's Predicted Peaks described:

a peak when the Twin Towers of New York were destroyed on 9/11 of 2001 - the City of New York Comptroller estimated the replacement cost of \$21.8 Billion - the USA failed to rebuild them;

a second peak on November 2003 when the US military first began to encounter real resistance (rockets shooting down helicopters) in Iraq - although the cost of a decade in Iraq might be \$2 Trillion, the prize of Iraq's 100 billion barrels of oil at \$100 per barrel would be \$10 Trillion - even so, the USA failed to either get out of Iraq or put in enough resources to conclusively defeat the resistance;

a third peak in 2005 when Katrina devastated New Orleans - estimates of Katrina damage ranged up to \$200 Billion - like the Twin Towers of New York, the USA failed to rebuild all the destroyed neighborhoods;

a fourth peak when, in the words of Nelson D. Schwartz and Julie Creswell writing in a New York Times web article dated 23 March 2008:

“... in ... August [2007] we were in a full-fledged credit crisis with C.E.O.'s of top banks running around like headless chickens ...”.

The magnitude of the crisis can be gauged by

the \$45 Trillion amount

of the Hedge Fund/Credit Default Swap smoke-and-mirrors shadow banking system assets, based on only \$7 Trillion total assets of the Mortgage Market, about half of the \$14 Trillion M3 Money Supply ( which M3 is now in 2008 being increased at an 18 percent per annum rate ).

If the Mortgage Market were to get government guarantees against default, the entire \$45 Trillion of Hedge Fund/Credit Default Swap assets would be worthless, and that \$45 Trillion ( much larger than the \$10 Trillion prize of Iraqi Oil at \$100 per barrel ) would disappear from the world economy.

After the August 2007 peak, the Timewave shows a steady decline to a Singularity in December 2012. The Singularity looks like Terence McKennas “breakpoint” leading to

[either] “freedom and transcendence”

[or] “scarcity, preservation of privilege, forced control of populations”.

A possible Way to Freedom and Transcendence has been outlined by the International Energy Agency (IEA). Joseph Coleman, in a 6 June 2008 AP news article , said:

“...The world needs to invest \$45 trillion in energy in coming decades, build some 1,400 nuclear power plants and vastly expand wind power in order to halve greenhouse gas emissions by 2050 ....”.

It seems to me that the USA might be able to lead the Way to Freedom and Transcendence by breaking free of its present Status Quo Consensus and

converting the \$45 Trillion of smoke-and-mirrors shadow-banking-system Hedge Fund/Credit Default Swap assets to finance a Nuclear Energy / Hydrogen Fuel / Desalted Sea-Water program using components

manufactured in new USA factories, through which the USA might be able to successfully compete with China, and become the leader of a Prosperous Democratic Earth.

That would effectively be a New Marshall Plan setting the Earth on a positive course for the next centuries,

much as the original post-World War II Marshall Plan generated prosperity for its participants for the decades after that war.

If the USA tries to maintain its present Consensus Status Quo by bailing out the Hedge Fund people, remaining Oil-Based throughout the remaining decade or so of Post-Peak Cheap Oil, and continuing to rely on Chinese Zero-Wage-Slave-Labor Manufacturing, it seems to me that it will go the way of “scarcity, preservation of privilege, forced control of populations”, leading to an era of Chinese Hegemony of Earth under a strict military dictatorship, effectively a Global Chinese Empire.

Under a Good Emperor, a Global Chinese Empire might be a Good Thing, but under a Bad Emperor without the Mandate of Heaven, it would be a Bad Thing .

The choices made by the USA in the near future, particularly with deciding what to do with the \$45 Trillion Hedge Fund assets,

may determine which way the Earth goes.

I hope that the choice of the USA will take into account  
the words of Rudyard Kipling:

### The Gods of the Copybook Headings:

As I pass through my incarnations in every age and race,  
I make my proper protestations to the Gods of the Market-Place.  
Peering through reverent fingers I watch them flourish and fall.

And the Gods of the Copybook Headings, I notice, outlast them all.  
We were living in trees when they met us. They showed us each in  
turn.

That water would certainly wet us, as Fire would certainly burn ...  
They denied that Wishes were Horses; they denied that a Pig had  
Wings.

So we worshiped the Gods of the Market Who promised these  
beautiful things ...

But, though we had plenty of money, there was nothing our money  
could buy,

And the Gods of the Copybook Headings said: 'If you don't work  
you die.'

Then the Gods of the Market tumbled, and their smooth-tongued  
wizards withdrew,

And the hearts of the meanest were humbled and began to believe  
it was true

That All is not Gold that Glitters, and Two and Two make Four ...

And the Gods of the Copybook Headings limped up to explain it  
once more ...

As surely as Water will wet us, as surely as Fire will burn,  
The Gods of the Copybook Headings with terror and slaughter  
return!

## APPENDIX -

### E8 Physics Calculation Results

Here are some unified physics numbers calculated by Fat Man using the 16x16 Oracle-pattern structure along with some non-Consensus ideas of people like Irving Segal, Meinhard Mayer, Armand Wyler, and David Bohm:

Force Strengths:

$$\text{Gravity} = 5 \times 10^{-39}$$

$$\text{Electromagnetic} = 1 / 137.03608$$

$$\text{Weak} = 1.05 \times 10^{-5}$$

Color at 245 MeV = 0.6286 Renormalization gives  
Color at 91 GeV = 0.106 and including other  
effects gives Color at 91 GeV = 0.125

Weak Boson Masses (based on a ground state Higgs  
mass of 1465 GeV):

$$M_{W^+} = M_{W^-} = 80.326 \text{ GeV};$$

$$M_{Z^0} = 80.326 + 11.536 = 91.862 \text{ GeV};$$

Tree-level fermion masses ( Quark masses are constituent masses due to a Bohmian version of Many-Worlds Quantum Theory applied to a confined fermion, in which the fermion is at rest because its kinetic energy is transformed into Bohmian PSI-field potential energy. ):

Neutrinos:  $m_e\text{-neutrino} = m_\mu\text{-neutrino} = m_\tau\text{-neutrino} = 0$  at tree-level ( first order corrected masses are given below)

Electron/Positron  $m_e = 0.5110 \text{ MeV}$

Up and Down Quarks  $m_d = m_u = 312.8 \text{ MeV}$

Muon  $m_\mu = 104.8 \text{ MeV}$

Strange Quark  $m_s = 625 \text{ MeV}$

Charm Quark  $m_c = 2.09 \text{ GeV}$

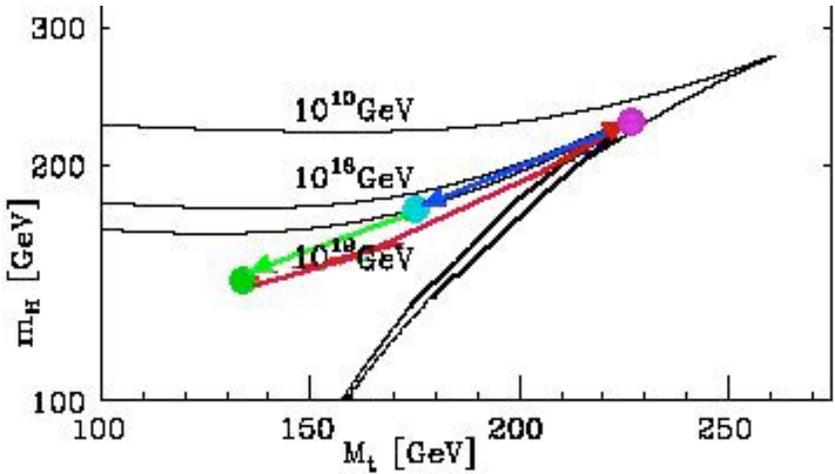
Tauon  $m_\tau = 1.88 \text{ GeV}$

Beauty Quark  $m_b = 5.63 \text{ GeV}$

Truth Quark  $m_t = 130 \text{ GeV}$

8-dimensional Kaluza-Klein spacetime with Truth-Quark condensate Higgs gives a 3-state system with a renormalization line connecting the 3 states:

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Low ground state: Higgs = 146 GeV and T-quark = 130 GeV

Medium Triviality Bound state: Higgs = 176-188 GeV  
and T-quark = 172-175 GeV

High Critical Point state: Higgs = 239 +/- 3 GeV and T-  
quark = 218 +/- 3 GeV

Kobayashi-Maskawa parameter calculations use phase angle  $d_{13} = 1$  radian ( unit length on a phase circumference ) to get the K-M matrix:

	d	s	b
u	0.975	0.222	0.00249 - - 0.00388i
c	-0.222-0.000161i	0.974-0.0000365i	0.0423
t	0.00698-0.00378i	-0.0418-0.00086i	0.999

Corrections to the tree-level neutrino calculations give neutrino masses

$$\nu_1 = 0$$

$$\nu_2 = 9 \times 10^{(-3)} \text{eV}$$

$$\nu_3 = 5.4 \times 10^{(-2)} \text{eV}$$

and the neutrino mixing matrix:

	nu_1	nu_2	nu_3
nu_e	0.87	0.50	0
nu_m	-0.35	0.61	0.71
nu_t	0.35	-0.61	0.71

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The mass of the charged pion is calculated to be 139 MeV

The Neutron-Proton mass difference is calculated to be 1.1 Mev,

The ratio Dark Energy : Dark Matter : Ordinary Matter for our Universe at the present time is calculated to be:

$$0.75 : 0.21 : 0.04$$

Further calculations based on the 16x16 Oracle-pattern indicate explanations of

the Pioneer Anomaly (increase in spacecraft acceleration beyond the orbit of Uranus) and

a Quantum Theory of Consciousness (based on the model of Hameroff and Penrose).

Combining many copies of the 16x16 Oracle-pattern Clifford Algebra structure produces a generalized Hyperfinite III von Neumann Algebra factor for an Algebraic Quantum Field Theory in which a Bohm-type Quantum Potential comes from an E6 version of 26-dimensional Bosonic String Theory (16 fermionic dimensions coming from orbifolding),

with strings seen as world-lines (closed strings being virtual loops) and

in which Many-Worlds Quantum superposition separation plays a fundamental role in Quantum Consciousness.

The Bohm-type Quantum Potential shows how fermions, viewed as Kerr-Newman Black Hole vortices, interact in accord with Non-Relativistic Constituent Quark models.

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For readers who understand the language of Lie Algebras, Lie Groups, and Symmetric Spaces, here is an outline of the E8 structure of the Unified Physics Model (i.e., why the dots in the image at the front of this paper are the colors they are):

E8 has graded structure

$$8 + ( 28 = D4 ) + 56 + ( 64 = U(8) ) + 56 + ( 28 = D4 ) + 8$$

$$\begin{aligned} \text{Even part of E8 graded structure} &= D8 = \\ &= ( 28 = D4 ) + ( 64 = U(8) ) + ( 28 = D4 ) \end{aligned}$$

$$\begin{aligned} E8 / D8 &= 64 + 64 = \\ &= 8 \times 8 + 8 \times 8 = \text{Fermion Particles and AntiParticles} \end{aligned}$$

$$D8 / D4 \times D4 = 64 = U(8) = 8 \times 8 = \text{Kaluza-Klein Spacetime}$$

$D4 / \text{Spin}(6) \times \text{Spin}(2) = D4 / U(4)$  is a Kahler manifold with Complex Structure that allows Wick Rotation Changes of Signature so that:

D4 can be  $\text{Spin}(0,8)$  or  $\text{Spin}(1,7)$  or Quaternionic  $\text{Spin}(2,6)$

$\text{Spin}(6)$  can change to  $\text{Spin}(2,4)$

$U(4)$  can change to  $U(2,2)$

There are two D4 in E8, so:

one D4 gives Conformal Gravity by  
 $D4 / U(2,2) = D4 / \text{Spin}(2,4) \times \text{Spin}(2)$

the other D4 gives the Standard Model by  
 $D4 / U(4) = D4 / \text{Spin}(6) \times \text{Spin}(2)$