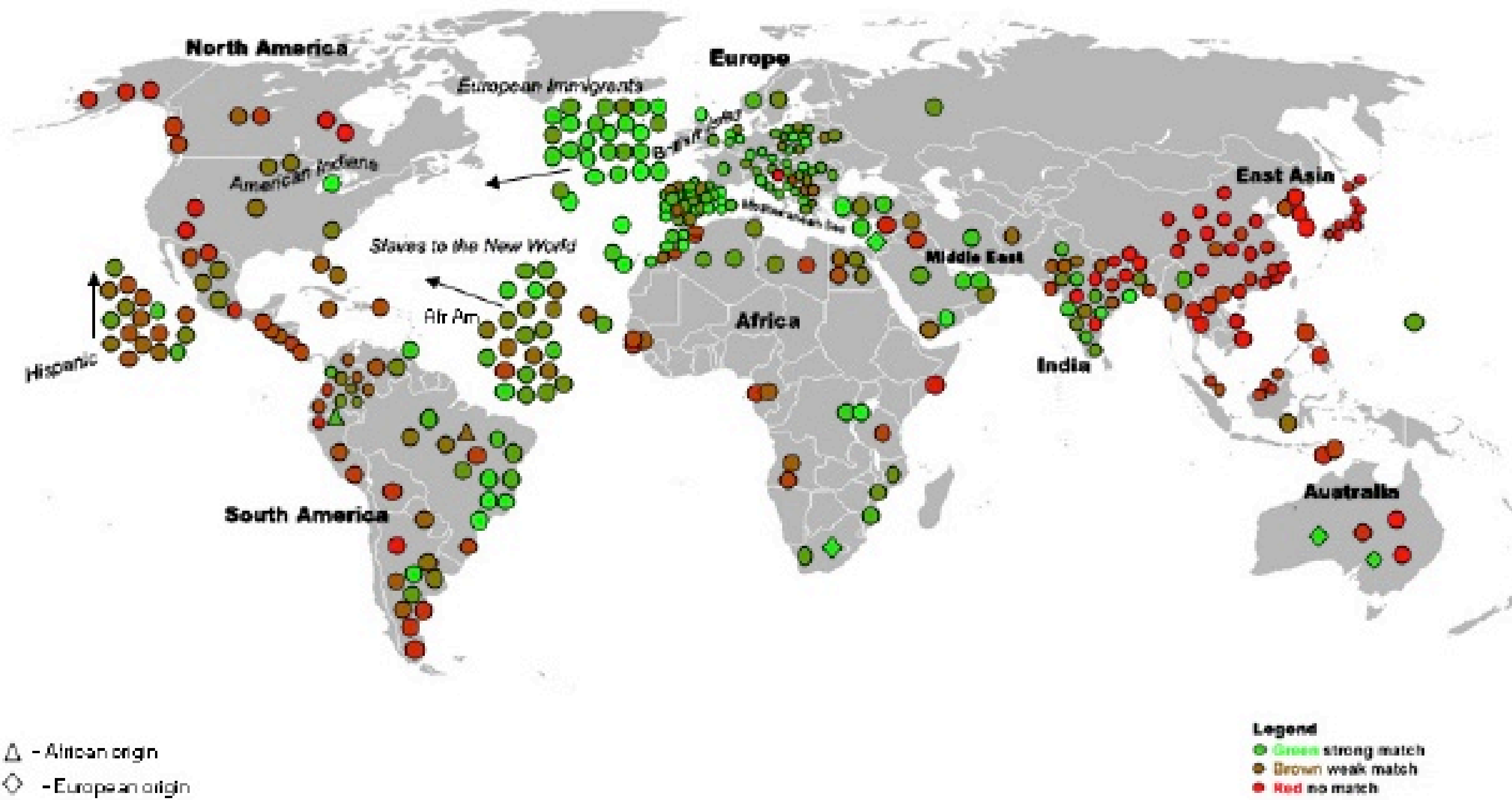
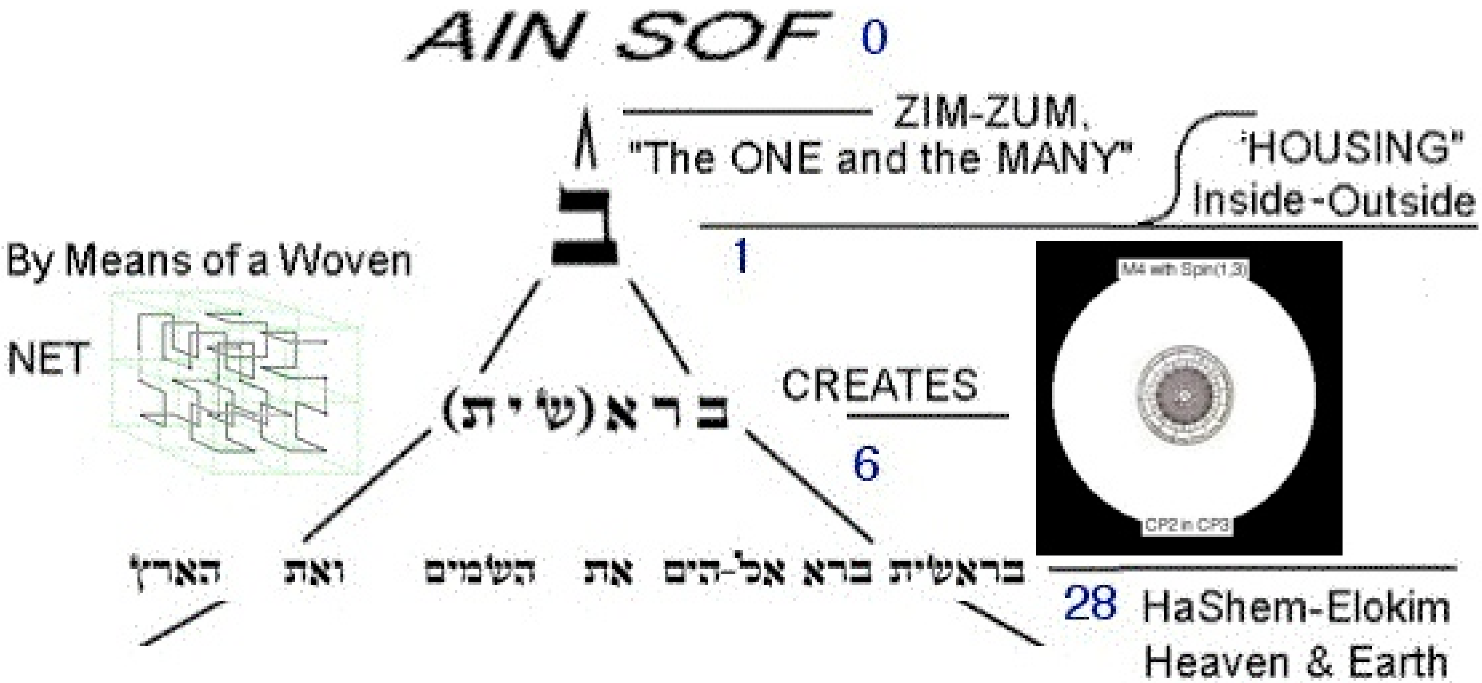
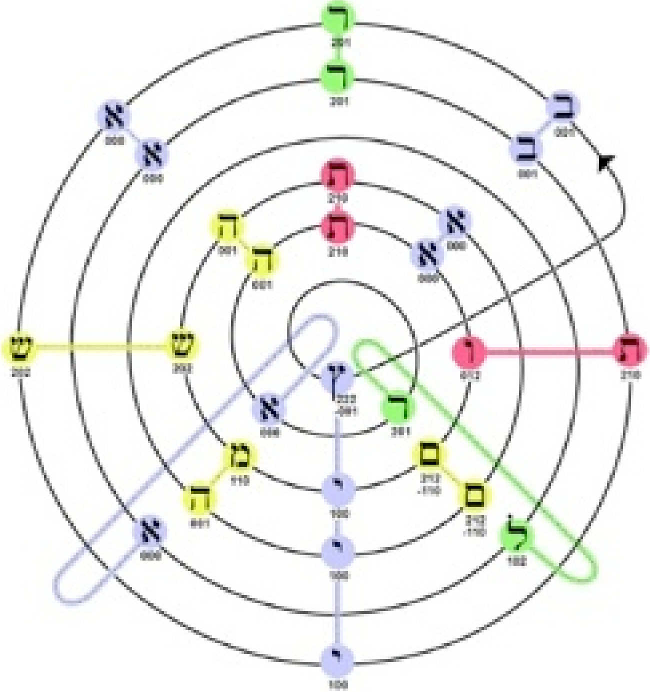

STETSON

World Ancestry of Frank D. Smith, Jr.

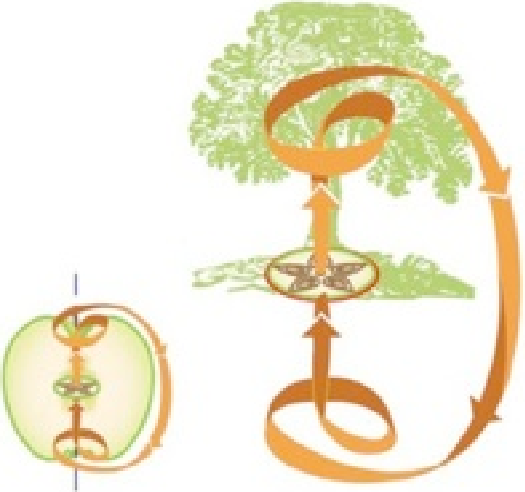


ב


AIN SOF 0
ZIM-ZUM,
"The ONE and the MANY"
'HOUSING"
Inside-Outside
ב
1
By Means of a Woven
NET
ב ר א (ש י ת)
CREATES
6
M4 with Spin(1,3)
CP2 in CP3
בראשית ברא אל-הים את השמים ואת הארץ
28 HaShem-Elokim
Heaven & Earth



Gen 1,11: *"Fruit Tree Yielding Fruit Whose Seed is Inside Itself"*



Chapter 1 Verse 11

ח וַיִּקְרָא אֱלֹהִים לָרָקִיעַ, שָׁמָיִם; וַיְהִי-עֶרֶב וַיְהִי-בֹקֶר, יוֹם שֵׁנִי. {פ}

8 And God called the firmament Heaven. And there was evening and there was morning, a second day. **{P}**

ט וַיֹּאמֶר אֱלֹהִים, יִקָּווּ הַמַּיִם מִתַּחַת הַשָּׁמַיִם אֶל-מָקוֹם אֶחָד, וְתֵרָאֶה, הַיַּבָּשָׁה; וַיְהִי-כֵן.

9 And God said: 'Let the waters under the heaven be gathered together unto one place, and let the dry land appear.' And it was so.

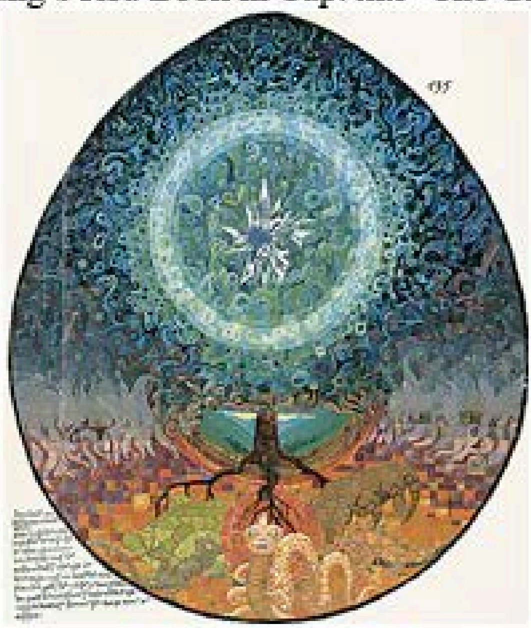
י וַיִּקְרָא אֱלֹהִים לַיַּבָּשָׁה אֶרֶץ, וּלְמִקְוֵה הַמַּיִם קָרָא יַמִּים; וַיַּרְא אֱלֹהִים, כִּי-טוֹב.

10 And God called the dry land Earth, and the gathering together of the waters called He Seas; and God saw that it was good.

יא וַיֹּאמֶר אֱלֹהִים, תַּדְשֵׁא הָאָרֶץ דֶּשֶׁא עֵשֶׂב מַזְרִיעַ זֶרַע, עֵץ פְּרִי עֹשֶׂה פְּרִי לְמִינוֹ, אֲשֶׁר זַרְעוֹ-בוֹ עַל-הָאָרֶץ; וַיְהִי-כֵן.

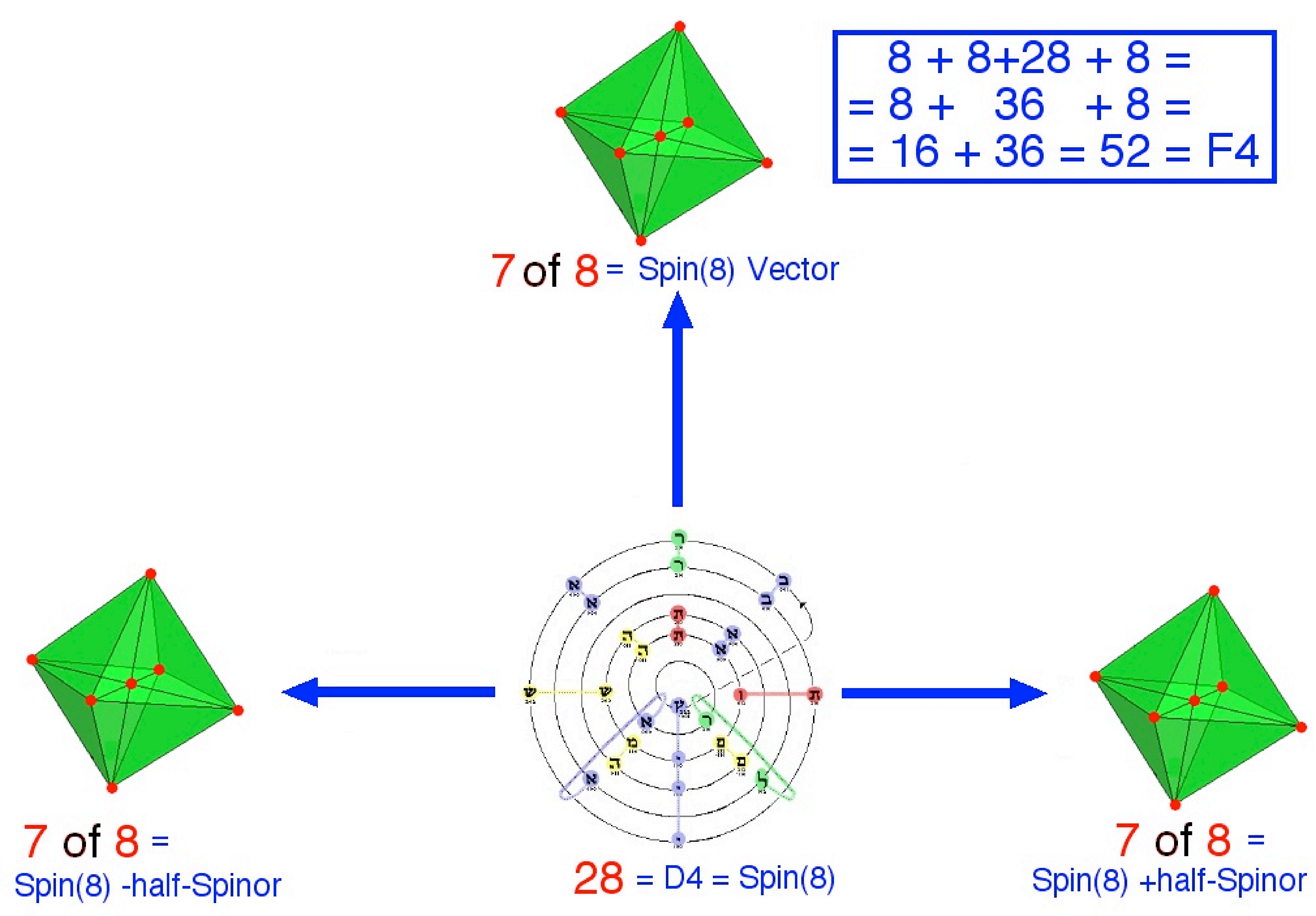
11 And God said: 'Let the earth put forth grass, herb yielding seed, and fruit-tree bearing fruit after its kind, wherein is the seed thereof, upon the earth.' And it was so.

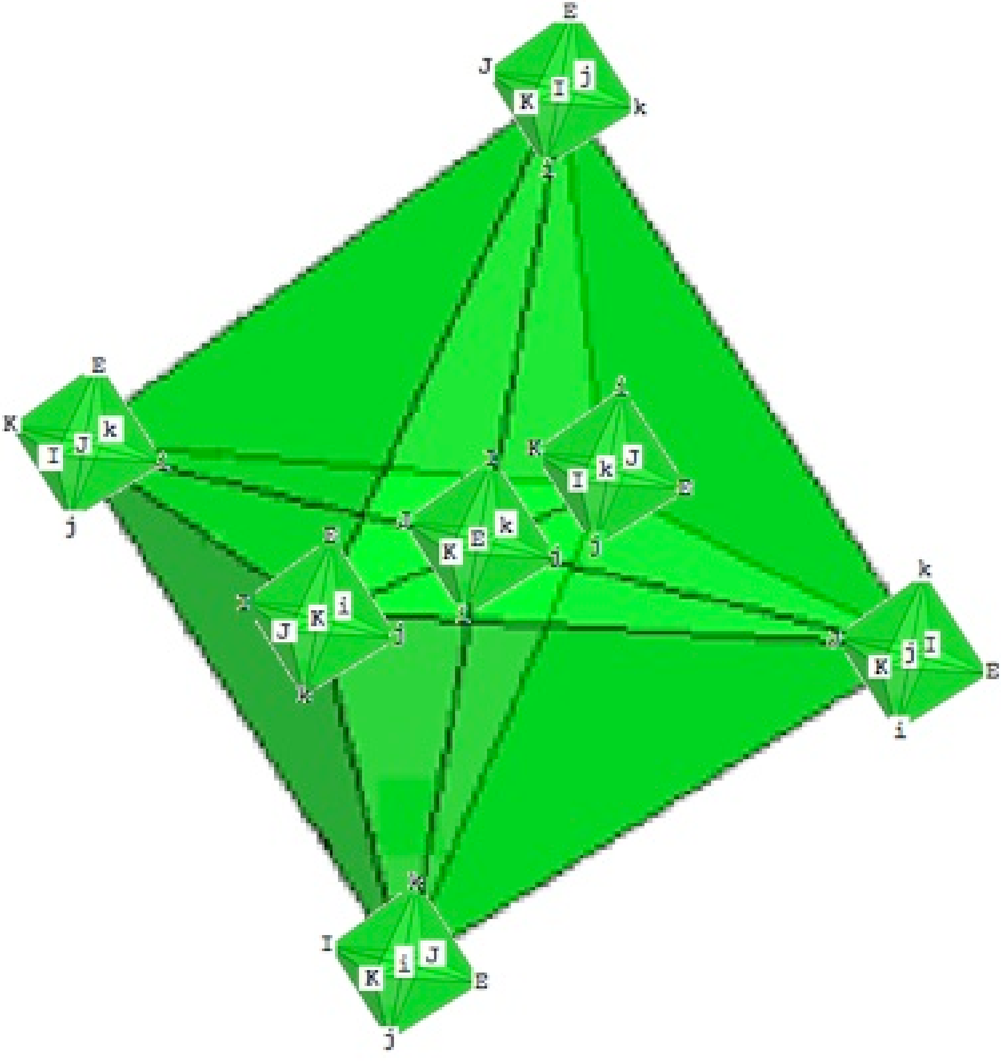
Shin שֶׁ looks like a Tree of Life that Grows, Multiplies by its Seeds, and Evolves. Compare page 135 of Jung's Red Book in Cap. xix "The Gift of Magic"



where Jung says (English translation footnote 248): "Completed on 25 November 1922. The fire comes out of Muspilli and grasps the tree of life. A cycle is completed, but it is the cycle within the world egg. A strange God, the unnameable God of the solitary, is incubating it. New creatures form from the smoke and ashes."

Miklos Redei in Studies in the History and Philosophy of Modern Physics 27 (1996) 493-510 said: "... John von Neumann ... [said that]... Hilbert space vectors ... represent the physical states ... redundantly ...
if we wish to gneralize the lattice of all linear closed subspaces from a Euclidean space to infinitely many dimensions,
then one does not obtain Hilbert space ... case I_∞,
but
... case II1 ... a type II1 (factor) von Neumann algebra ...".


8 + 8+28 + 8 =
= 8 + 36 + 8 =
= 16 + 36 = 52 = F4
7 of 8 = Spin(8) Vector
7 of 8 =
Spin(8) -half-Spinor
28 = D4 = Spin(8)
7 of 8 =
Spin(8) +half-Spinor


E
J
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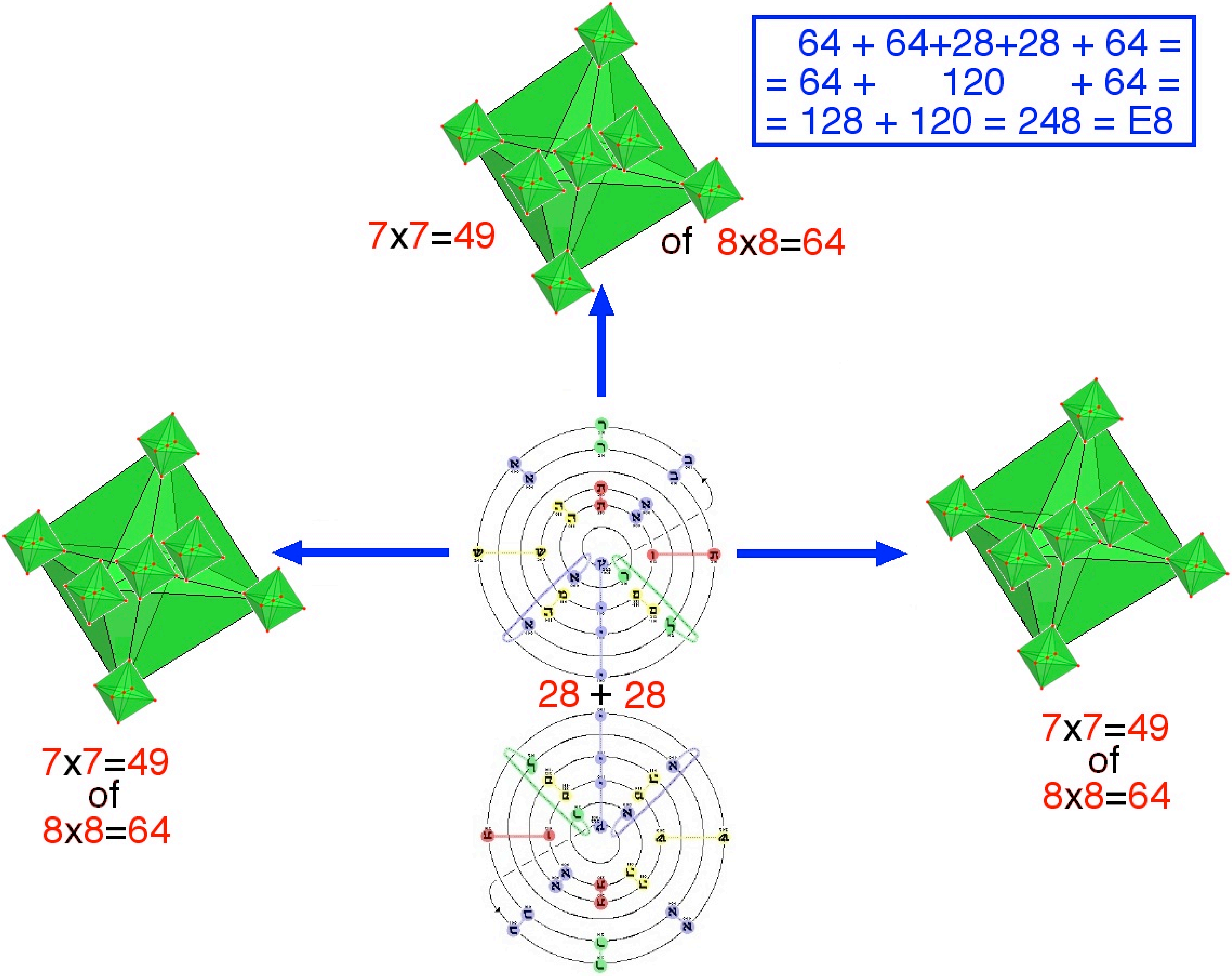
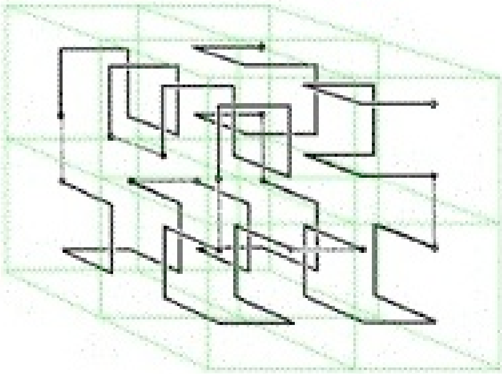
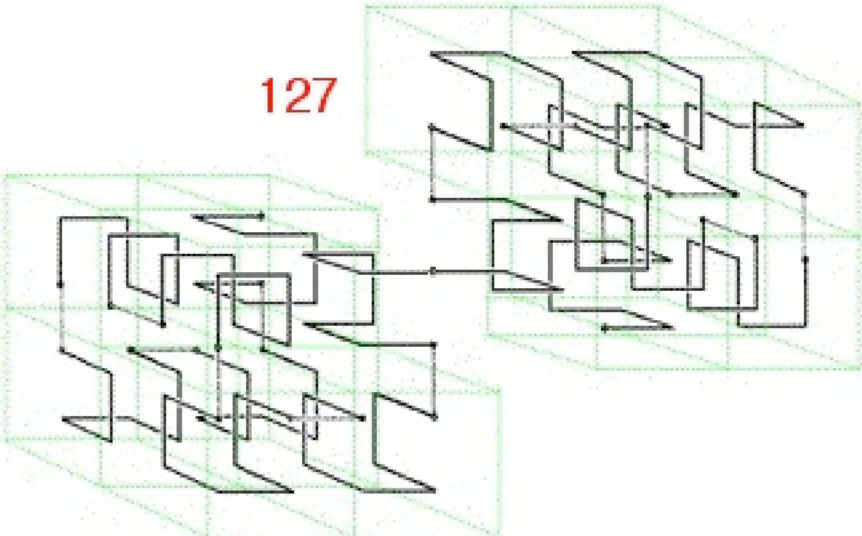

64 + 64+28+28 + 64 =
= 64 + 120 + 64 =
= 128 + 120 = 248 = E8
7x7=49
of 8x8=64
7x7=49
of
8x8=64
28 + 28
7x7=49
of
8x8=64

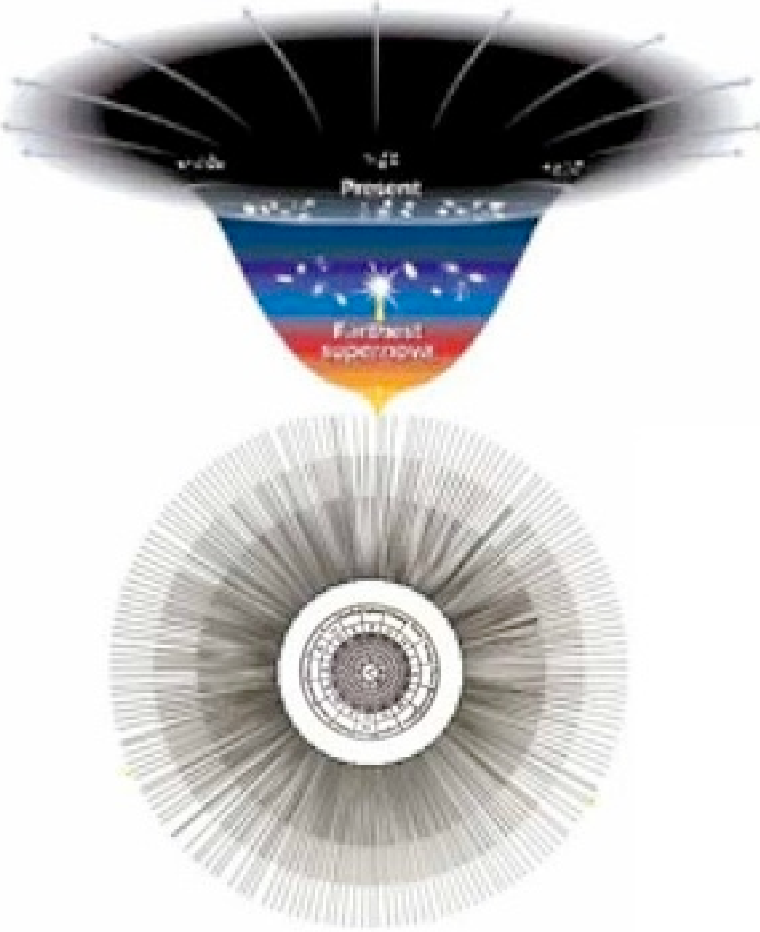
64

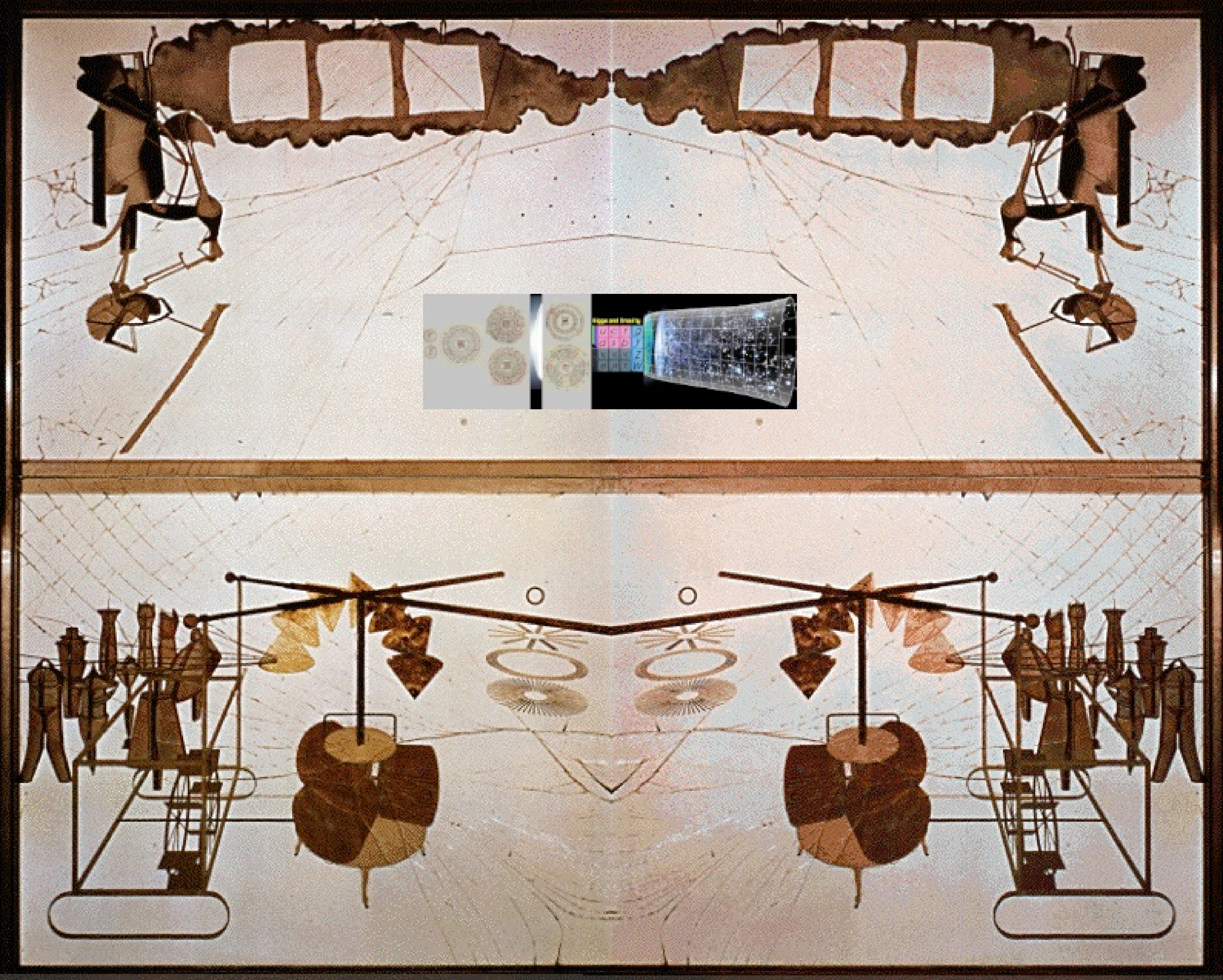


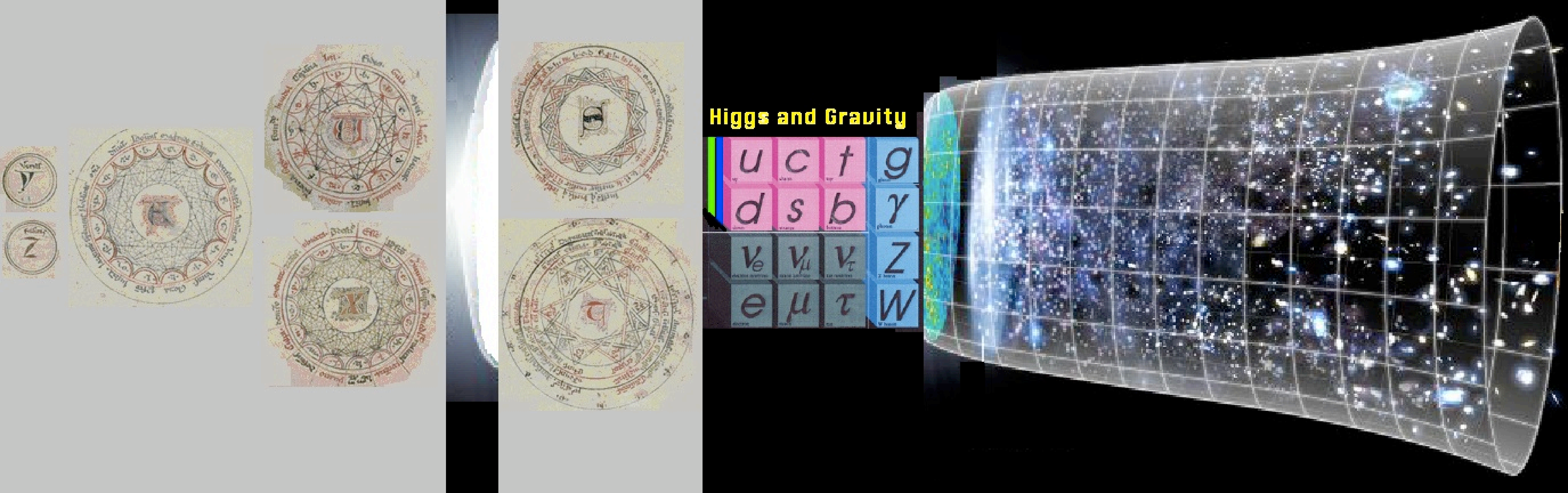
127



$64 \times 127 = 8{,}128$

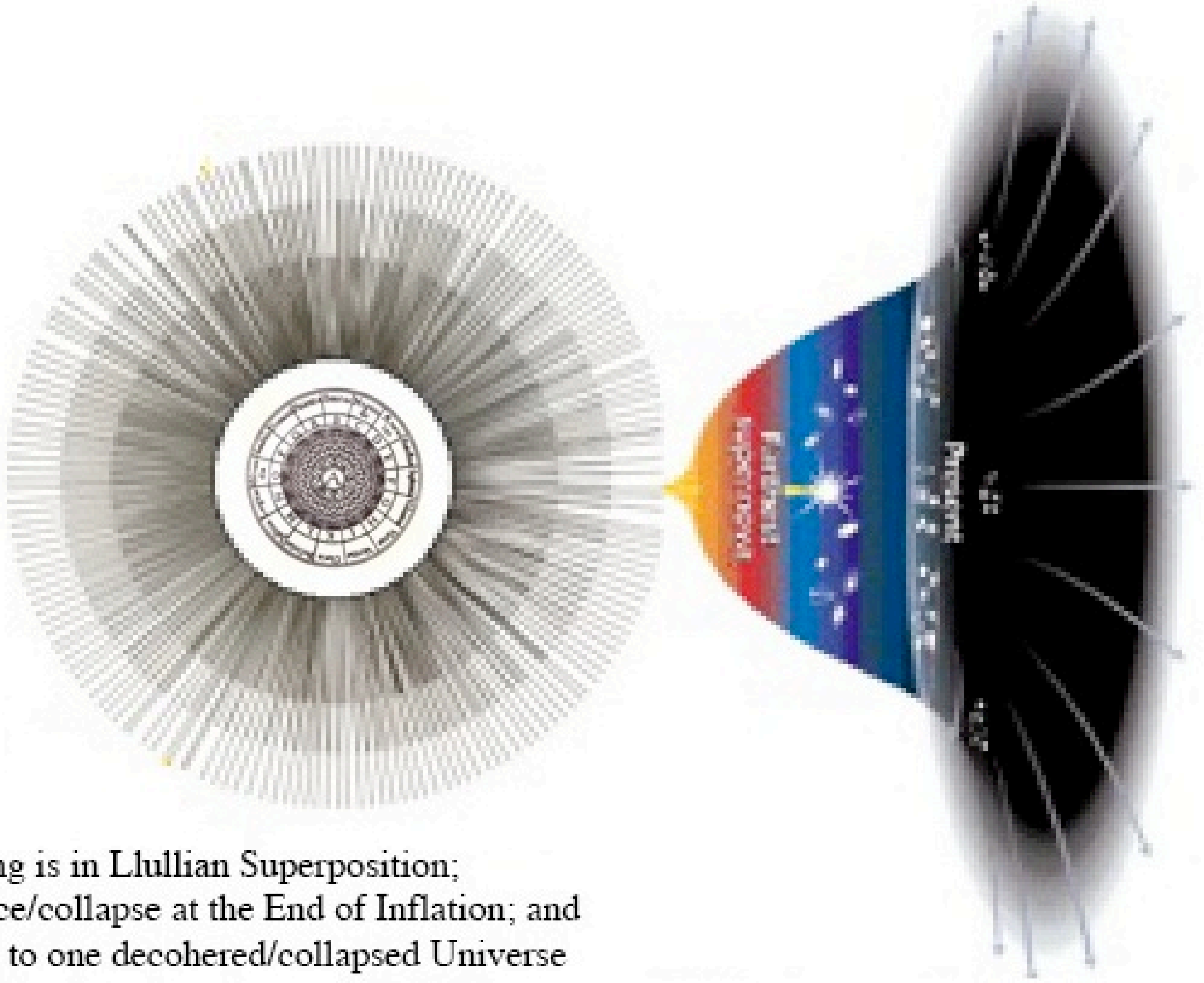

Present
Farthest supernova



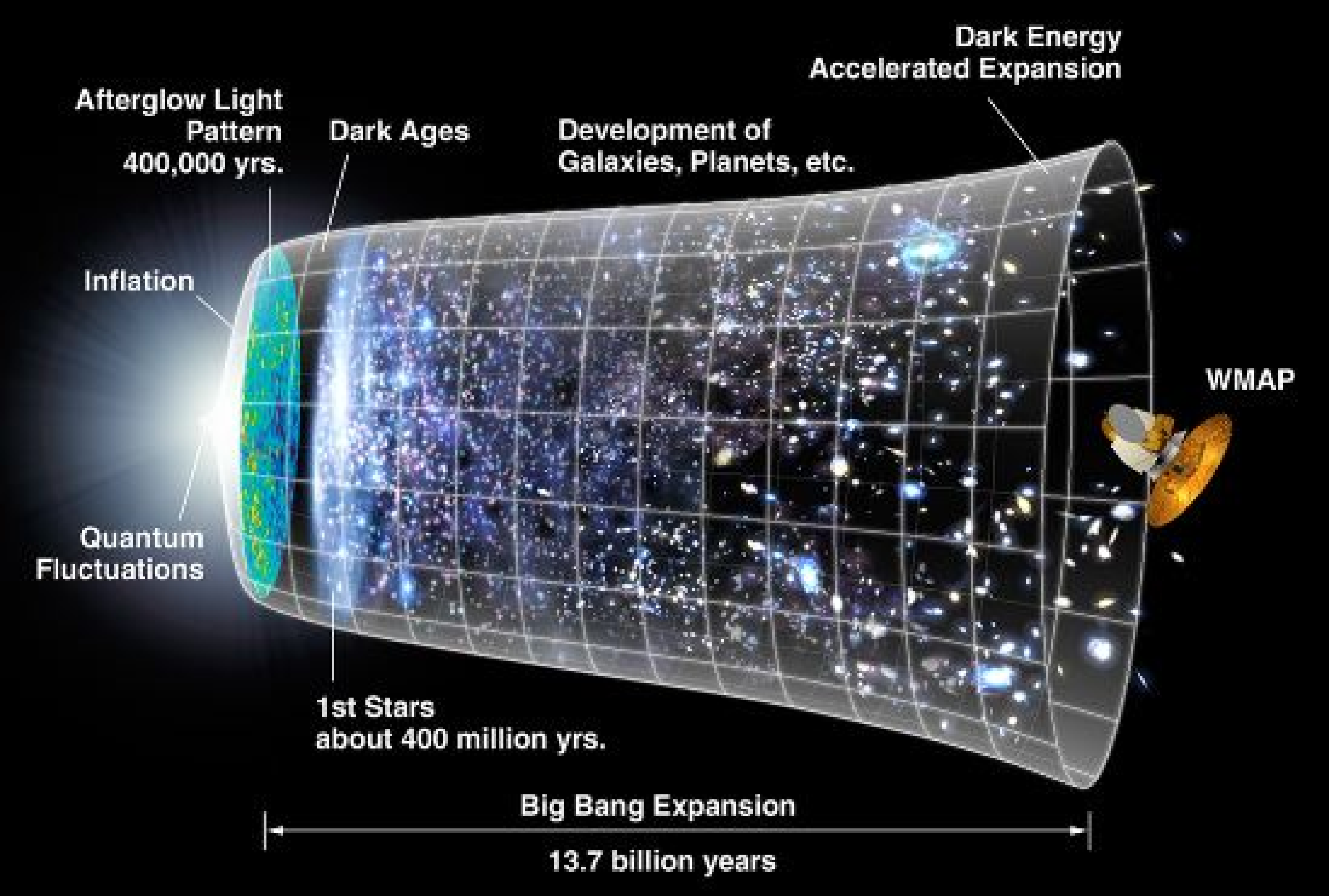

Higgs and Gravity
u c t g
d s b γ
νe νμ ντ Z
e μ τ W

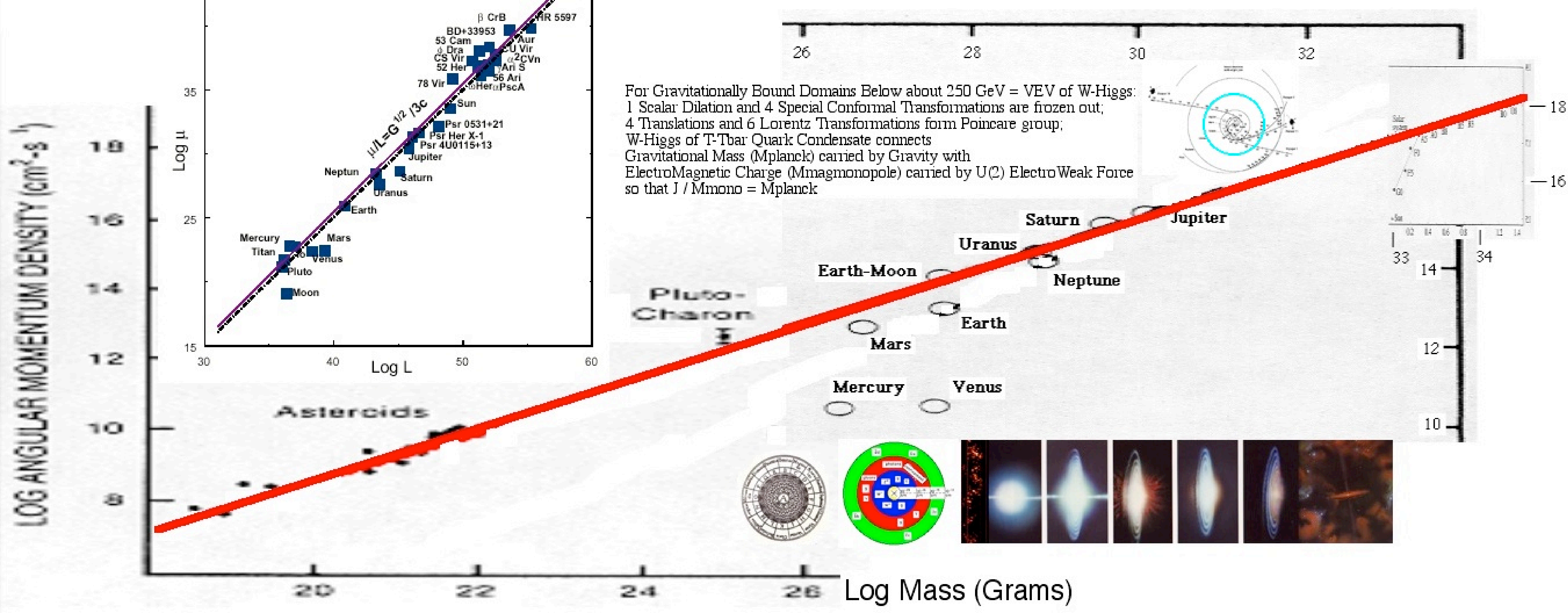
The Zizzi Inflation phase of our universe ends with decoherence "collapse" of the 2^64 Superposition Inflated Universe into Many Worlds of the Many-Worlds Quantum Theory, only one of which Worlds is our World.

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.



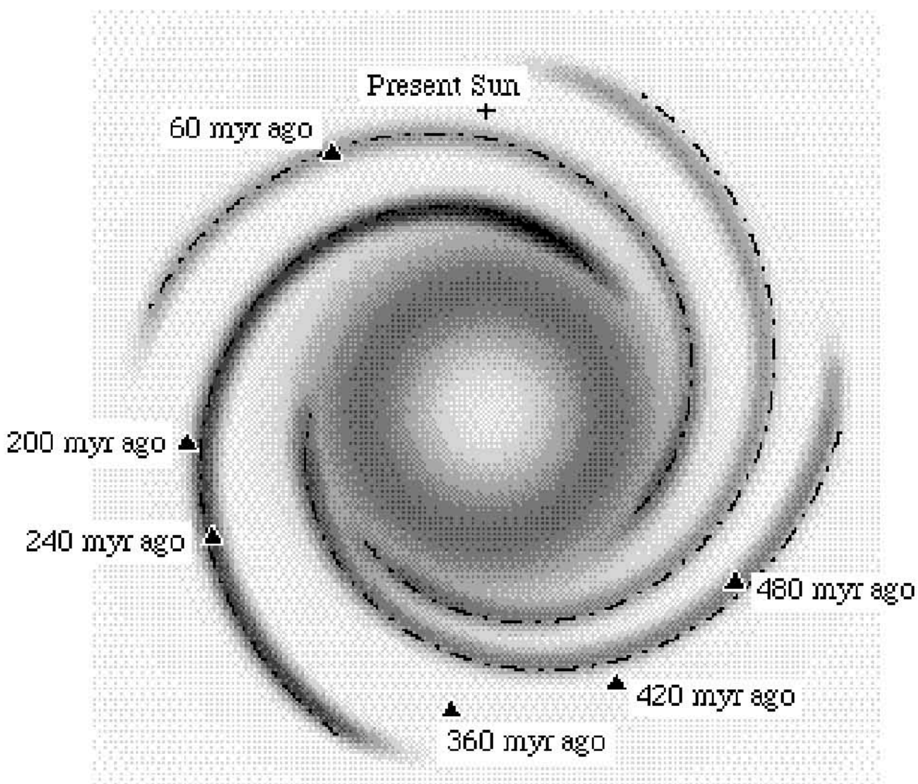
- the central circle is the Inflation Era in which everything is in Llullian Superposition;
- the boundary of the central circle marks the decoherence/collapse at the End of Inflation; and
- each line radiating from the central circle corresponds to one decohered/collapsed Universe World (of course,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


Dark Energy
Accelerated Expansion
Afterglow Light
Pattern
400,000 yrs.
Dark Ages
Development of
Galaxies, Planets, etc.
Inflation
WMAP
Quantum
Fluctuations
1st Stars
about 400 million yrs.
Big Bang Expansion
13.7 billion years



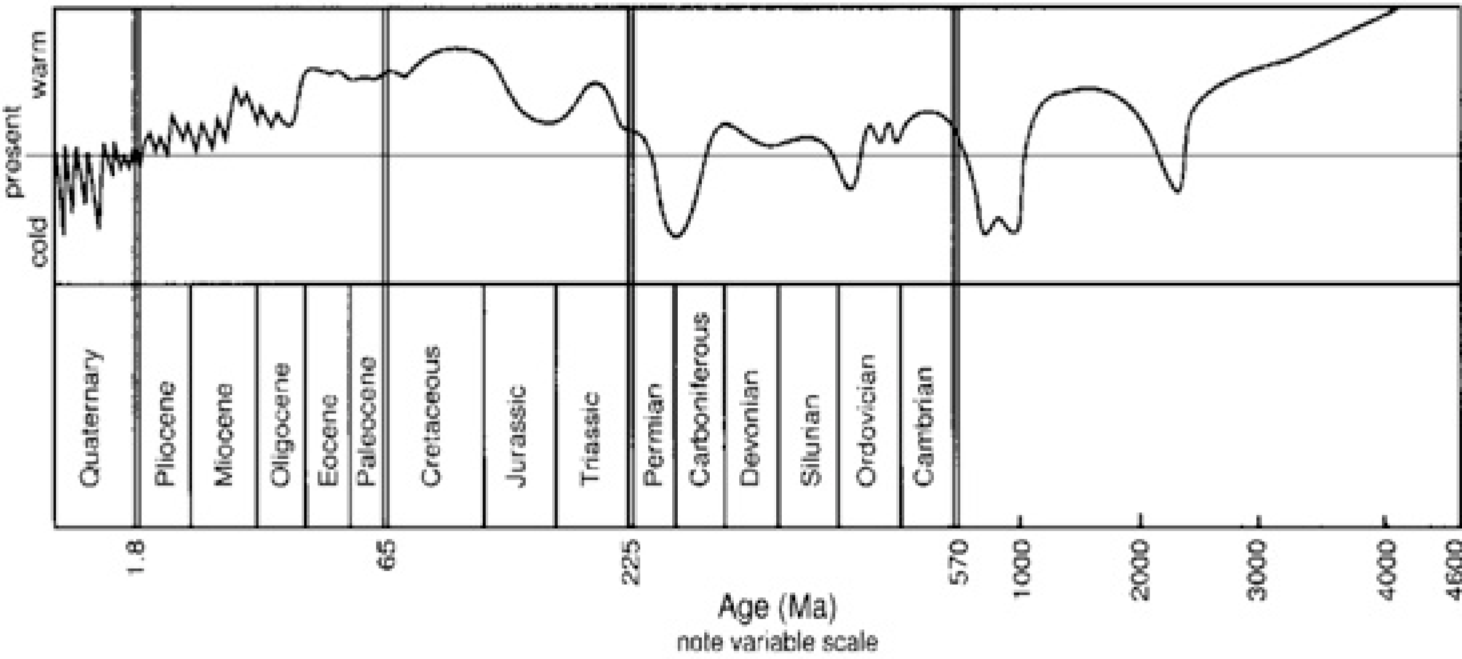
For Gravitationally Bound Domains Below about 250 GeV = VEV of W-Higgs:
1 Scalar Dilation and 4 Special Conformal Transformations are frozen out;
4 Translations and 6 Lorentz Transformations form Poincare group;
W-Higgs of T-Tbar Quark Condensate connects
Gravitational Mass (Mplanck) carried by Gravity with
ElectroMagnetic Charge (Mmagmonopole) carried by U(2) ElectroWeak Force
so that J / Mmono = Mplanck
LOG ANGULAR MOMENTUM DENSITY (cm2-s-1)
Log Mass (Grams)
Asteroids
Pluto-Charon
Mercury
Venus
Mars
Earth
Earth-Moon
Uranus
Neptune
Saturn
Jupiter
Log μ
Log L
μ/L=G 1/2 /3c
Moon
Pluto
Titan
Mercury
Mars
Venus
Earth
Neptun
Uranus
Saturn
Jupiter
Psr 4U0115+13
Psr Her X-1
Psr 0531+21
Sun
78 Vir
52 Her
CS Vir
53 Cam
BD+33953
β CrB
HR 5597

- 15,330,000,000 years ago, our Universe formed and Inflation began.
- 5,000,000,000 years ago, the Sun formed.
- 4,600,000,000 years ago, the Earth formed.
- 4,400,000,000 years ago, the Moon formed.
- 3,800,000,000 years ago, Fe3O4 Magnetite ferrous Banded Iron formations begin to be formed by bacteria.
- 3,000,000,000 years ago, photosynthesis releases O2 oxygen.
- 2,500,000,000 years ago, end of Archaean and beginning of Proterozoic.
- 2,400,000,000 years ago, Fe2O3 Hematite ferric iron Red Bed formations start to form from atmospheric O2.
- 2,200,000,000 years ago, Earth was a Snowball, glaciers extending to within 11 degrees of its Equator.
- 2,000,000,000 years ago, Oklo fission reactor starts in Gabon.
- 850,000,000 (to 650,000,000) years ago, a severe Ice Age.



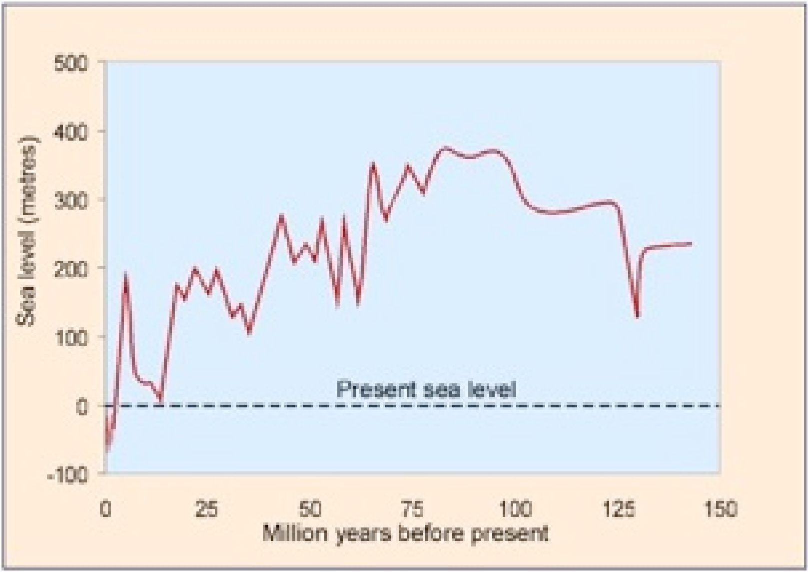
Our Sun, located in a Local Bubble, orbits our Milky Way Galaxy in 200 myr at 230 km/sec, while spiral density waves orbit in 290 myr at about 160 km/sec at the 8.5 kpc = 27,700 lyr radius of the Sun. See astro-ph/9802174

- 570,000,000 years ago, Cambrian begins - Species Explosion.
- 480,000,000 years ago, end of Cambrian.


warm
present
cold
Quaternary
Pliocene
Miocene
Oligocene
Eocene
Paleocene
Cretaceous
Jurassic
Triassic
Permian
Carboniferous
Devonian
Silurian
Ordovician
Cambrian
1.8
65
225
570
1000
2000
3000
4000
4600
Age (Ma)
note variable scale

- 420,000,000 years ago, end of Ordovician.
- 400,000,000 (to 350,000,000) years ago, North America and Europe began to collide with Gondwanaland (including Africa) to form Pangaea (and the Appalachian Mountains), - millipedes, insects, primitive sharks, amphibians, and ferns appear - Chinese 380,000,000+ year Superior Epoch - date described on Maya Stela D at Quirigua.
- 360,000,000 years ago, end of Devonian - does not seem to coincide with Sun being in Galactic spiral arm.
- 250,000,000 years ago, Permo-Triassic Extinction due to comet impact, perhaps coincident with Cosmic Ray Bursts from merging neutron stars.
- 200,000,000 years ago, end of Triassic - Pangaea breakup begins with formation of massive Central Atlantic Magmatic Province.
- 90,000,000 years ago, Pangaea breakup forms North Atlantic Ocean - modern sharks appear - Chinese 96,961,740 year Superior Epoch - date described on Maya Stela F at Quirigua.
- 64,000,000 years ago, Mesozoic-Cenozoic Extinction, perhaps due to asteroid impact. The primary impact site may have been in Yucatan, Mexico, with many secondary impacts, including 3 along a great circle: Manson in Iowa, USA; Siberia; and China. Taking continental drift into account, antipodal to Yucatan, the massive Deccan lava flows occurred in India. David Carlisle claims "... we ... have found unequivocal supernova debris ...[from 64,000,000 years ago]... in the form of the silver isotope [107 made from palladium 107] anomaly and in the iodine 129 anomaly."
- 50,000,000 years ago - early Cetaceans appeared.
- 35,000,000 years ago to 30,000,000 years ago - Antarctica separates from South America and Australia - glaciation lowers sea level - whales thrive.
- 20,000,000 years ago - Chinese 23,639,040 year Three Sequences - Cetaceans with large brains, including Dolphins, appeared.
- 3,000,000 years ago - Steve Stanley, Children of the Ice Age (Harmony Books 1996), describes what happened: The present Ice Age began when the Isthmus of Panama emerged to block the Atlantic-Pacific connection, creating a conveyor belt of cold salty water that sinks near the Arctic 0cean and goes back south, instead of carrying heat to the Arctic Ocean. Australopithecus lived in transitional woodlands near trees, because with no stone weapons and no fire, trees were the only way Australopithecus could avoid the lions. The ice age killed the trees, and with the trees gone, the lions killed Australopithecus. Homo, smart enough to defend itself with fire and stone, could live on the ground. Homo's intelligence required a large brain, which meant difficult childbirth and a long dangerous childhood. Homo's survival required couples to mate for life to care for their few children over a long childhood.
- 2,000,000 years ago - Yellowstone volcanic caldera eruption vented 2500 cubic kilometers of ash and pumice, another stress event that could have affected human evolution.
- 788,000 years ago - the latest reversal of Earth's magnetic field. Such reversals have occurred throughout the Earth's history, with no obvious regularity, and with roughly equal total timein each of the two polarities.

Figure 5.7. *Global sea levels during the last 150 million years*



The Roof of Africa – Ethiopia's Highlands – a Huge Dome of Rock 500 Miles Wide

Seventy Million Years Ago was just as Flat and as Deep as the Danakil Depression

- 340,000-330,000 years ago - Geminga supernova explosion irradiates Earth. Glaciation of Earth. Neanderthals displaced Homo Erectus.
- 270,000-230,000 years ago - Glaciation of Earth.
- 160,000-130,000 years ago - Glaciation of Earth, beginning the African/Oceanic Ice Age Civilization, as Modern Humans displaced the Neanderthals in Africa and Oceanic areas.
- 115,000 years ago - Early Wisconsin Glaciation of North America.
- 70,000 years ago - Early Wurm Glaciation of Europe - Toba Explosive Volcanic Eruption of 800 cubic kilometers of ash into the air - a stress event that may have produced a bottleneck minimum of human population at the level of about a few thousand people.
- 35,000 years ago - Geminga shock wave hits Earth. Late Wisconsin Glaciation of Earth, beginning the European Ice Age Civilization, as the Cro-Magnon Modern Humans displaced the Neanderthals in Europe.
- 21,000 to 18,000 years ago - last Glacial Maximum of Earth.
- 11,600 years ago - Younger Dryas cold snap, with temperatures 14 degrees C below present-day, after which the Vela X supernova was seen on Earth and the Taurid/Encke comet fragmented, and a very sudden (50 years or so) warming event ended the Ice Age and marked the start of the HOLOCENE AGE of warm climate and glacial retreat.

After the end of the Ice Age about 11,600 years ago, the glaciers melted and sea level rose about 35 meters to its present level, a process that took about 4,000 years. In the very early stages of the process, about 11,600 years ago, the northern Sunda Shelf near China, Korea, and Japan began to flood, forcing the Jomon people to move to the high ground of what is now the Japanese Islands, and disrupting the Jomon/Sunda Shelf part of Ice Age Civilization. In Africa, Arabia, and India, things were more gradual and displacements less severe. The African part of Ice Age Civilization had large lakes for another 1,000 years or so following the 4,000 year melting process, so that the Abyssinian/African Nile Lake area of the Ice Age Civilization was its most highly organized remnant, and the probable source of ways to cope with the changed circumstances of the post-Ice Age world, including agriculture, mining,written communication, and organized armies, thus forming a Global Early Civilization with a Global Early Language. After about 6,000 years ago, higher mathematics and related theories were lost, except as preserved in the structure and patterns of the Pyramids at Giza or in the underlying patterns of divination, poems, and games such as IFA of Africa, Rig Veda of India, Futomani of Japan, I Ching of China, and Tarot.

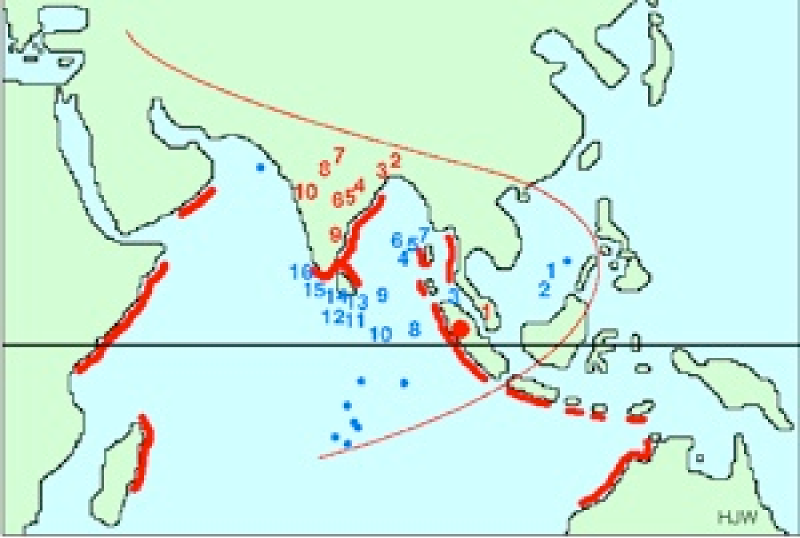
11,600 years ago to about 6,000 years ago may have been the period about which Diodorus of Sicily said: "Now the Ethiopians ... were the first of all men. ... the Egyptians are colonists sent out by the Ethiopians, Osiris having been the leader of the colony ... Osiris ... gathered together a great army, with the intention of visiting all the inhabited earth and teaching the race of men how to cultivate ... for he supposed that if he made men give up their savagery and adopt a gentle manner of life he would receive immortal honors. ...", and that Osiris then went from Egypt and Ethiopia to Arabia, Greece, and India.

Figure 5.11. *Global sea level during the last 150 thousand years*

In Nature 405 (4 MAY 2000) 65-69, Walter et al report

> "... the 'out of Africa' hypothesis contends that modern humans evolved in Africa between 200 and 100 kyr ago, migrating to Eurasia at some later time ... the discovery of early Middle Stone Age artefacts in an emerged reef terrace on the Red Sea coast of Eritrea, which we date to the last interglacial (about 125 kyr ago) ... this is the earliest well-dated evidence for human adaptation to a coastal marine environment,

> heralding an expansion in the range and complexity of human behaviour from one end of Africa to the other. This new, widespread adaptive strategy may, in part, signal the onset of modern human behaviour, which supports an African origin for modern humans by 125 kyr ago. ...". (Image is from News and Views article in Nature 405 (4 MAY 2000) 24-27.)



I limits the area in which Toba fallout (YTT) has been found or where substantial amounts of fallout are likely to have been deposited.

I indicates likely locations of Toba pumice floats washed up on beaches

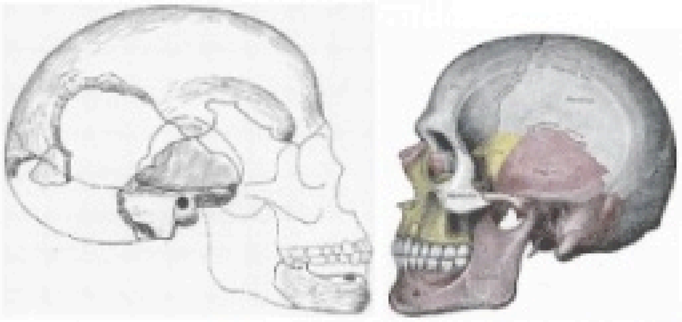
1 red numbers: traces of Toba ash found on land

1 blue numbers: traces of Toba ash found at the bottom of the sea


Boskop
Nile
Tibet
Danube
Japan
Rhine
Britain

According to the book Big Brain by Gary Lynch and Richard Granger (Macmillan 2008):

the Boskop "... walked the plains of southern Africa ... 30,000 ... to ... 10,000 years ago ...



Comparison of Restoration of Boskop skull next to a Modern Human Skull.

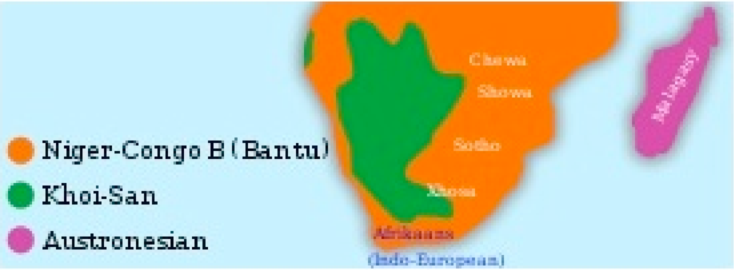
they were about our size ... but their brains were far larger than our own. ...".


M2
L0

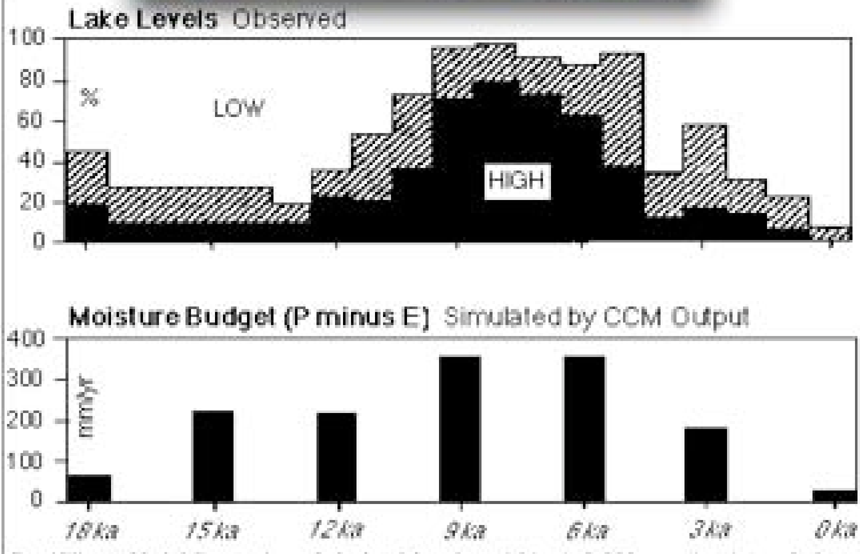
What legacy did the Boskop leave for the Era of the Rule of Man of the past 11,600 years ?

Although all the Boskop may have been physically killed off around 11,600 years ago, the remaining humans could have picked up some of the Boskop language and culture.

As to language, the language of Africans most closely related to the Boskop may shed light on Boskop language. The language characteristic of the South African Boskop region is the KhoiSan group, as shown in this image from Wikipedia



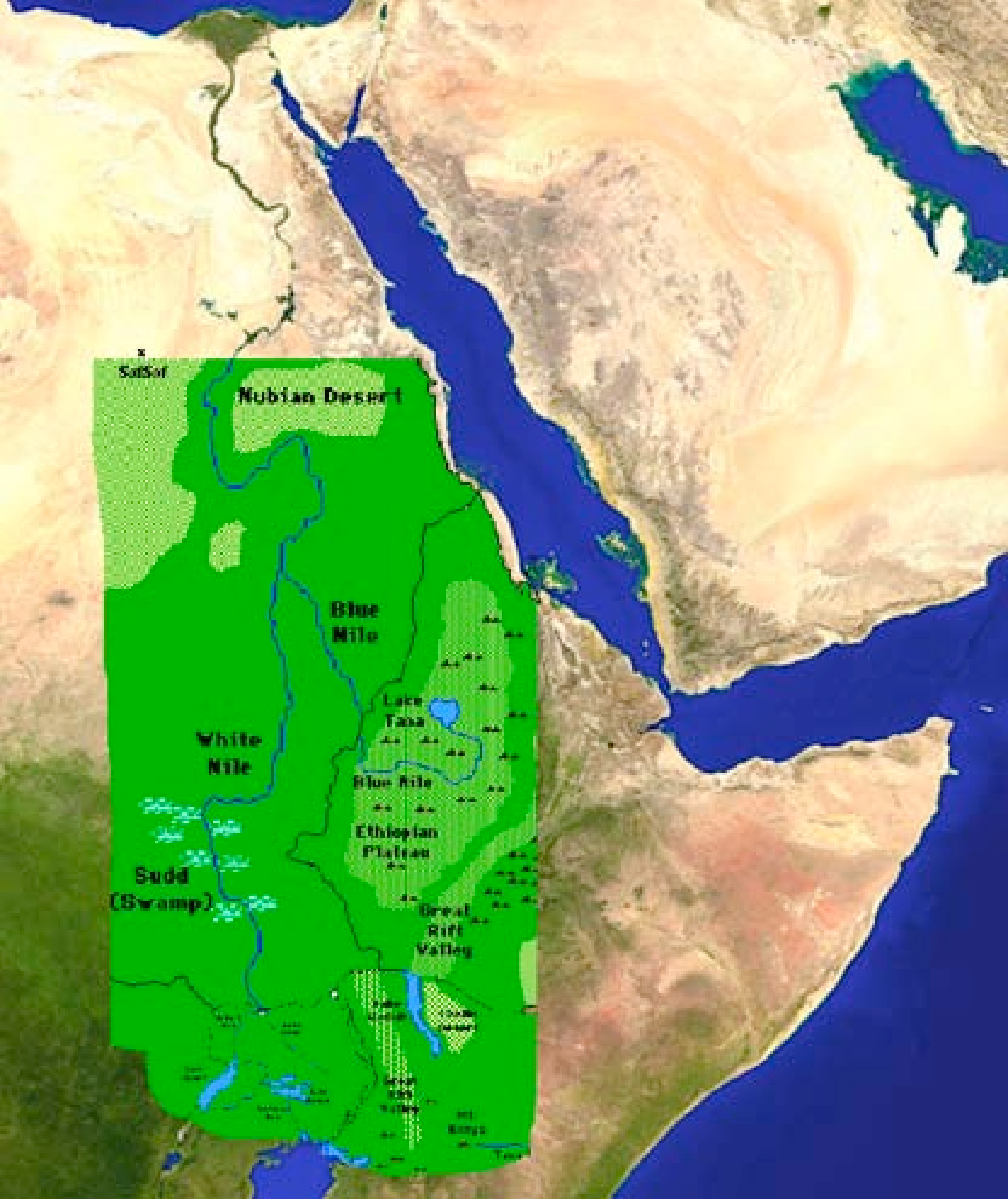

MAMMOTH
MAMMOTH
UPPER PLEISTOCENE HUNTERS
UPPER PLEISTOCENE
UPPER PLEISTOCENE
MAGHREB

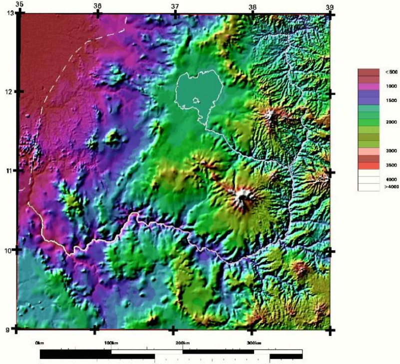


Data/Climate Model Comparison. Lake level data from Africa in 3,000-year time intervals from 18,000 years before present are compared with climate model (NCAR-CCM-0) simulations of effective moisture (P-E, precipitation minus evaporation) for the same time period.


India
China
Pamir
Eden
Europe


Boskop
Nile
Tibet
Danube
Japan
Rhine
Britain


SalSol
Nubian Desert
Blue
Nile
Lake
Tana
White
Nile
Blue Nile
Ethiopian
Plateau
Sudd
(Swamp)
Great
Rift
Valley



35
36
37
38
39
13
12
11
10
9
< 500
1000
1500
2000
3000
3500
4000
>4000
0km
100km
200km
300km
0mi
100mi
200mi

IFA has 2^8 = 16x16 = 256 Odu based on 16 Orishas

0 Ogbe (light of creation) - Orunmila (wisdom Tao)

1 Osa (creativity) - Oya (wind)

2 Otura (unity of everything) - Osain (forest spirits)

3 Owonrin ((rain) - Oshun (rivers (He Xiangu)

4 Irete (fate) - Babalu Aye (healer) (TieGuai Li)

5 Ofun (taboo) - Eshu Legba (trickster)

6 Edi (womb) - Obatala (hermaphrodite father of humanity)

7 Okanran (lightning) - Chango (thunderr)

8 Ogunda (sword) - Ogun (iron) (Lu Dongbin)

9 Iwori (consciousness) - Eshu Legba (messenger)

10 Ose (victim of abuse) - Osum (guardian angel)

11 Oturopon (trap) - Ochosi (hunter)

12 Irosun (fire) - Aganyu (volcano)

13 Ika (forest land) - Yemayua (ocean)

14 Obara (rainbow 2 hands) - Inle (2 snakes, medicine)

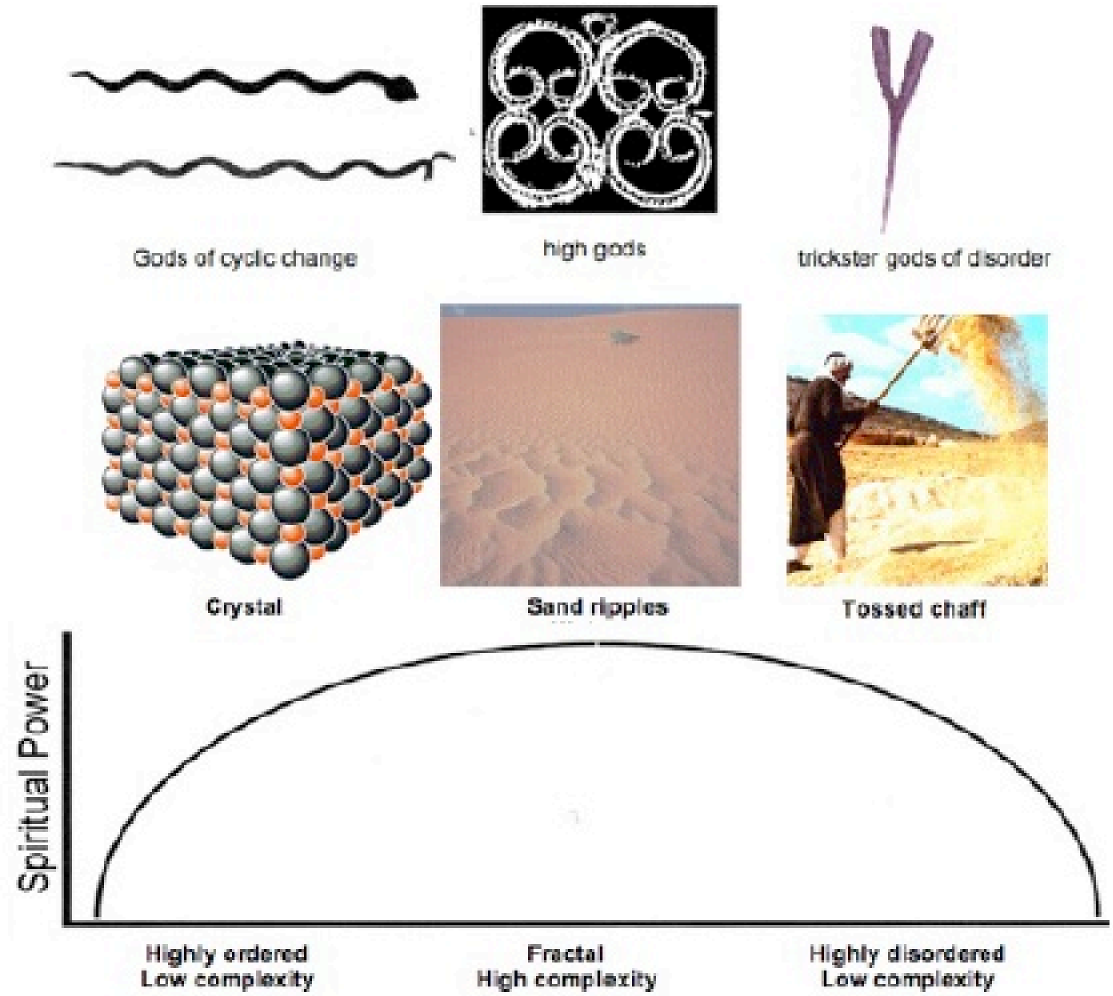
15 Oyeku (dark of the earth) - Ibeyi (twins Yin-Yang)

Pairs of the 16 Orishas give 16x16 = 256 Odu

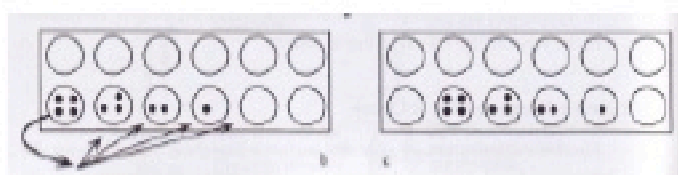
240 Oyeku - Ogbe	224 Obara - Ogbe	208 Ika - Ogbe	192 Irosun - Ogbe	176 Oturupon - Ogbe	160 Ose - Ogbe	144 Iwori - Ogbe	128 Ogunda - Ogbe	112 Okanran - Ogbe	96 Edi - Ogbe	80 Ofun - Ogbe	64 Irete - Ogbe	48 Owonrin - Ogbe	32 Otura - Ogbe	16 Osa - Ogbe	0 Ogbe - Ogbe
241 Oyeku - Osa	225 Obara - Osa	209 Ika - Osa	193 Irosun - Osa	177 Oturupon - Osa	161 Ose - Osa	145 Iwori - Osa	129 Ogunda - Osa	113 Okanran - Osa	97 Edi - Osa	81 Ofun - Osa	65 Irete - Osa	49 Owonrin - Osa	33 Otura - Osa	17 Osa - Osa	1 Ogbe - Osa
242 Oyeku - Otura	226 Obara - Otura	210 Ofun - Otura	194 Irosun - Otura	178 Oturupon - Otura	162 Ose - Otura	146 Iwori - Otura	130 Ogunda - Otura	114 Okanran - Otura	98 Edi - Otura	82 Ofun - Otura	66 Irete - Otura	50 Owonrin - Otura	34 Otura - Otura	18 Osa - Otura	2 Ogbe - Otura
243 Oyeku - Owonrin	227 Obara - Owonrin	211 Ika - Owonrin	195 Irosun - Owonrin	179 Oturupon - Owonrin	163 Otura - Owonrin	147 Iwori - Owonrin	131 Ogunda - Owonrin	115 Okanran - Owonrin	99 Edi - Owonrin	83 Ofun - Owonrin	67 Irete - Owonrin	51 Owonrin - Owonrin	35 Otura - Owonrin	19 Osa - Owonrin	3 Ogbe - Owonrin
244 Oyeku - Irete	228 Obara - Irete	212 Ika - Irete	196 Irosun - Irete	180 Oturupon - Irete	164 Ose - Irete	148 Iwori - Irete	132 Ogunda - Irete	116 Okanran - Irete	100 Edi - Irete	84 Ofun - Irete	68 Irete - Irete	52 Owonrin - Irete	36 Otura - Irete	20 Osa - Irete	4 Ogbe - Irete
245 Oyeku - Ofun	229 Obara - Ofun	213 Ika - Ofun	197 Irosun - Ofun	181 Oturupon - Ofun	165 Ose - Ofun	149 Iwori - Ofun	133 Ogunda - Ofun	117 Okanran - Ofun	101 Edi - Ofun	85 Ofun - Ofun	69 Irete - Ofun	53 Owonrin - Ofun	37 Otura - Ofun	21 Osa - Ofun	5 Ogbe - Ofun
246 Oyeku - Edi	230 Obara - Edi	214 Ika - Edi	198 Irosun - Edi	182 Oturupon - Edi	166 Ose - Edi	150 Iwori - Edi	134 Ogunda - Edi	118 Okanran - Edi	102 Edi - Edi	86 Ofun - Edi	70 Irete - Edi	54 Owonrin - Edi	38 Otura - Edi	22 Osa - Edi	6 Ogbe - Edi
247 Oyeku - Okanran	231 Obara - Okanran	215 Ika - Okanran	199 Irosun - Okanran	183 Oturupon - Okanran	167 Ose - Okanran	151 Iwori - Okanran	135 Ogunda - Okanran	119 Okanran - Okanran	103 Edi - Okanran	87 Ofun - Okanran	71 Irete - Okanran	55 Owonrin - Okanran	39 Otura - Okanran	23 Osa - Okanran	7 Ogbe - Okanran
248 Oyeku - Ogunda	232 Obara - Ogunda	216 Ika - Ogunda	200 Irosun - Ogunda	184 Oturupon - Ogunda	168 Ose - Ogunda	152 Iwori - Ogunda	136 Ogunda - Ogunda	120 Okanran - Ogunda	104 Edi - Ogunda	88 Ofun - Ogunda	72 Irete - Ogunda	56 Owonrin - Ogunda	40 Otura - Ogunda	24 Osa - Ogunda	8 Ogbe - Ogunda
249 Oyeku - Iwori	233 Obara - Iwori	217 Ika - Iwori	201 Irosun - Iwori	185 Oturupon - Iwori	169 Ose - Iwori	153 Iwori - Iwori	137 Ogunda - Iwori	121 Okanran - Iwori	105 Edi - Iwori	89 Ofun - Iwori	73 Irete - Iwori	57 Owonrin - Iwori	41 Otura - Iwori	25 Osa - Iwori	9 Ogbe - Iwori
250 Oyeku - Ose	234 Obara - Ose	218 Ika - Ose	202 Irosun - Ose	186 Oturupon - Ose	170 Ose - Ose	154 Iwori - Ose	138 Ogunda - Ose	122 Okanran - Ose	106 Edi - Ose	90 Ofun - Ose	74 Irete - Ose	58 Owonrin - Ose	42 Otura - Ose	26 Osa - Ose	10 Ogbe - Ose
251 Oyeku - Oturupon	235 Obara - Oturupon	219 Ika - Oturupon	203 Irosun - Oturupon	187 Oturupon - Oturupon	171 Ose - Oturupon	155 Iwori - Oturupon	139 Ogunda - Oturupon	123 Okanran - Oturupon	107 Edi - Oturupon	91 Ofun - Oturupon	75 Irete - Oturupon	59 Owonrin - Oturupon	43 Otura - Oturupon	27 Osa - Oturupon	11 Ogbe - Oturupon
252 Oyeku - Irosun	236 Obara - Irosun	220 Ika - Irosun	204 Irosun - Irosun	188 Oturupon - Irosun	172 Ose - Irosun	156 Iwori - Irosun	140 Ogunda - Irosun	124 Okanran - Irosun	108 Edi - Irosun	92 Ofun - Irosun	76 Irete - Irosun	60 Owonrin - Irosun	44 Otura - Irosun	28 Osa - Irosun	12 Ogbe - Irosun
253 Oyeku - Ika	237 Obara - Ika	221 Ika - Ika	205 Irosun - Ika	189 Oturupon - Ika	173 Ose - Ika	157 Iwori - Ika	141 Ogunda - Ika	125 Okanran - Ika	109 Edi - Ika	93 Ofun - Ika	77 Irete - Ika	61 Owonrin - Ika	45 Otura - Ika	29 Osa - Ika	13 Ogbe - Ika
254 Oyeku - Obara	238 Obara - Obara	222 Ika - Obara	206 Irosun - Obara	190 Oturupon - Obara	174 Ose - Obara	158 Iwori - Obara	142 Ogunda - Obara	126 Okanran - Obara	110 Edi - Obara	94 Ofun - Obara	78 Irete - Obara	62 Owonrin - Obara	46 Otura - Obara	30 Osa - Obara	14 Ogbe - Obara
255 Oyeku - Oyeku	239 Obara - Oyeku	223 Ika - Oyeku	207 Irosun - Oyeku	191 Oturupon - Oyeku	175 Ose - Oyeku	159 Iwori - Oyeku	143 Ogunda - Oyeku	127 Okanran - Oyeku	111 Edi - Oyeku	95 Ofun - Oyeku	79 Irete - Oyeku	63 Owonrin - Oyeku	47 Otura - Oyeku	31 Osa - Oyeku	15 Ogbe - Oyeku

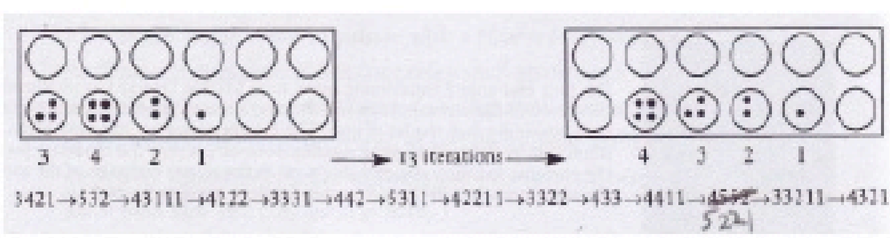
Ron Eglash (in his book "African Fractals" (Rutgers 1999) and on his web site at www.csdt.rpi.edu) says:

"...

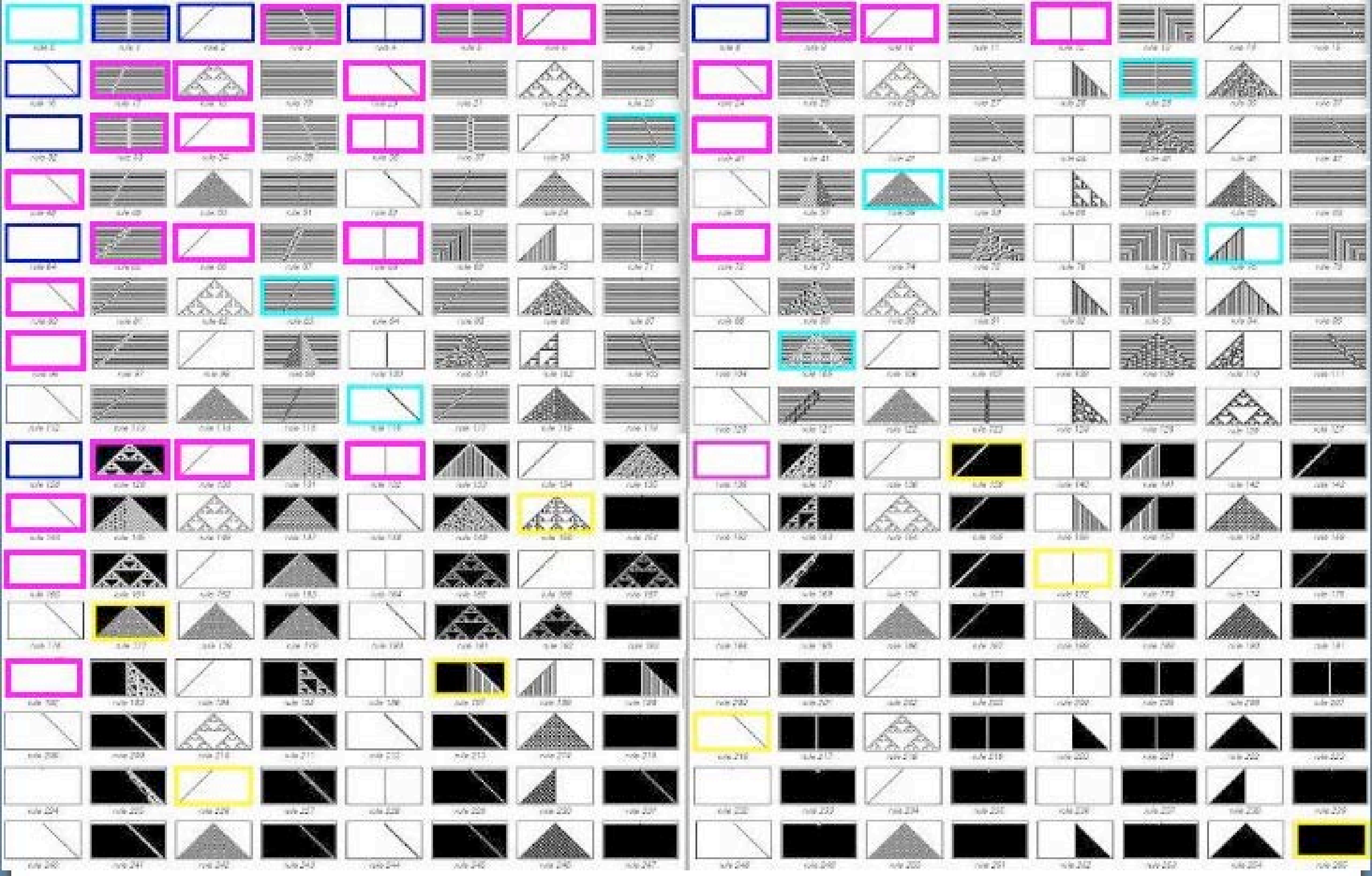


... the owari marching-group system can be used as a one-diemnsional cellular automaton ...

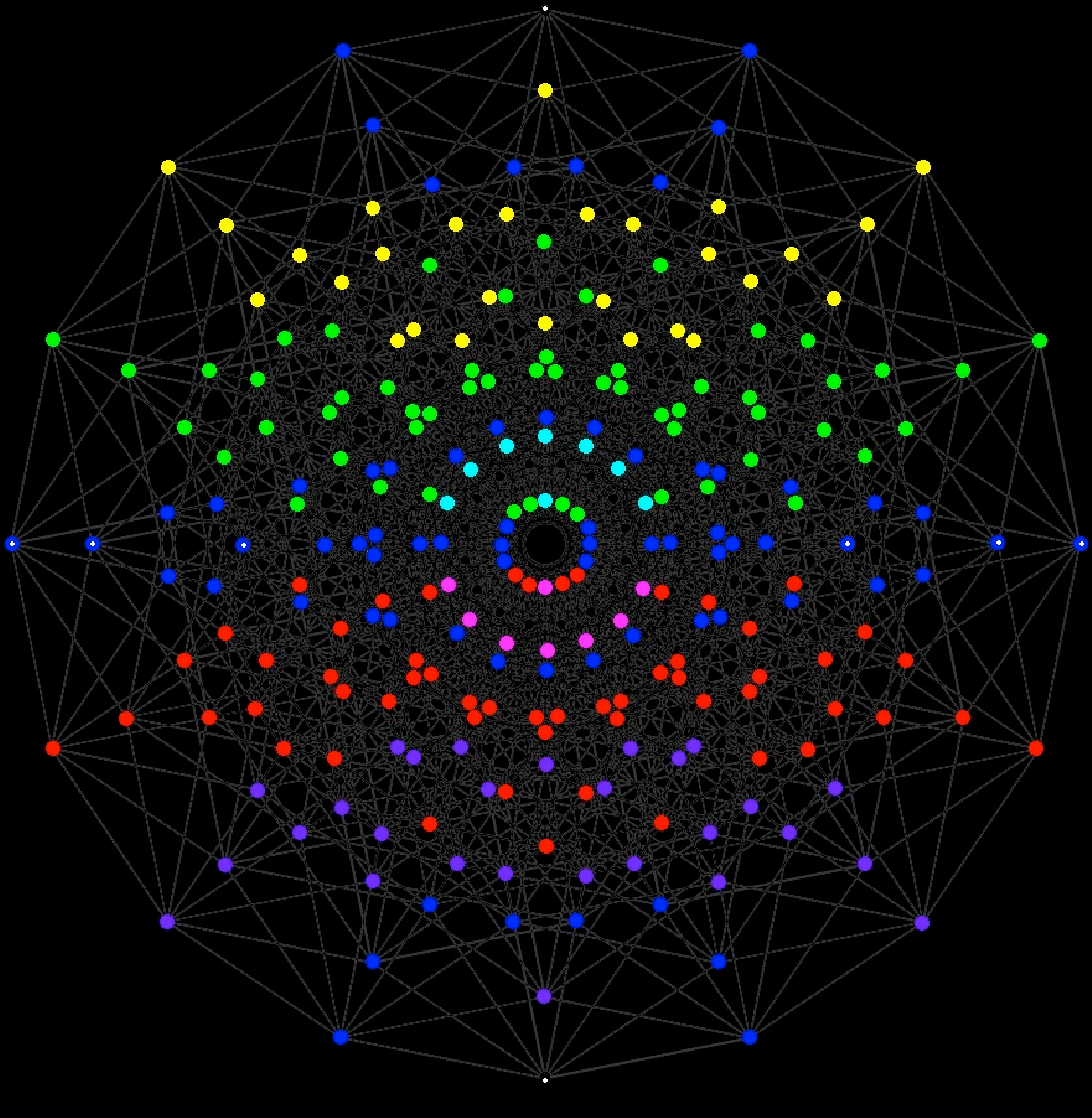


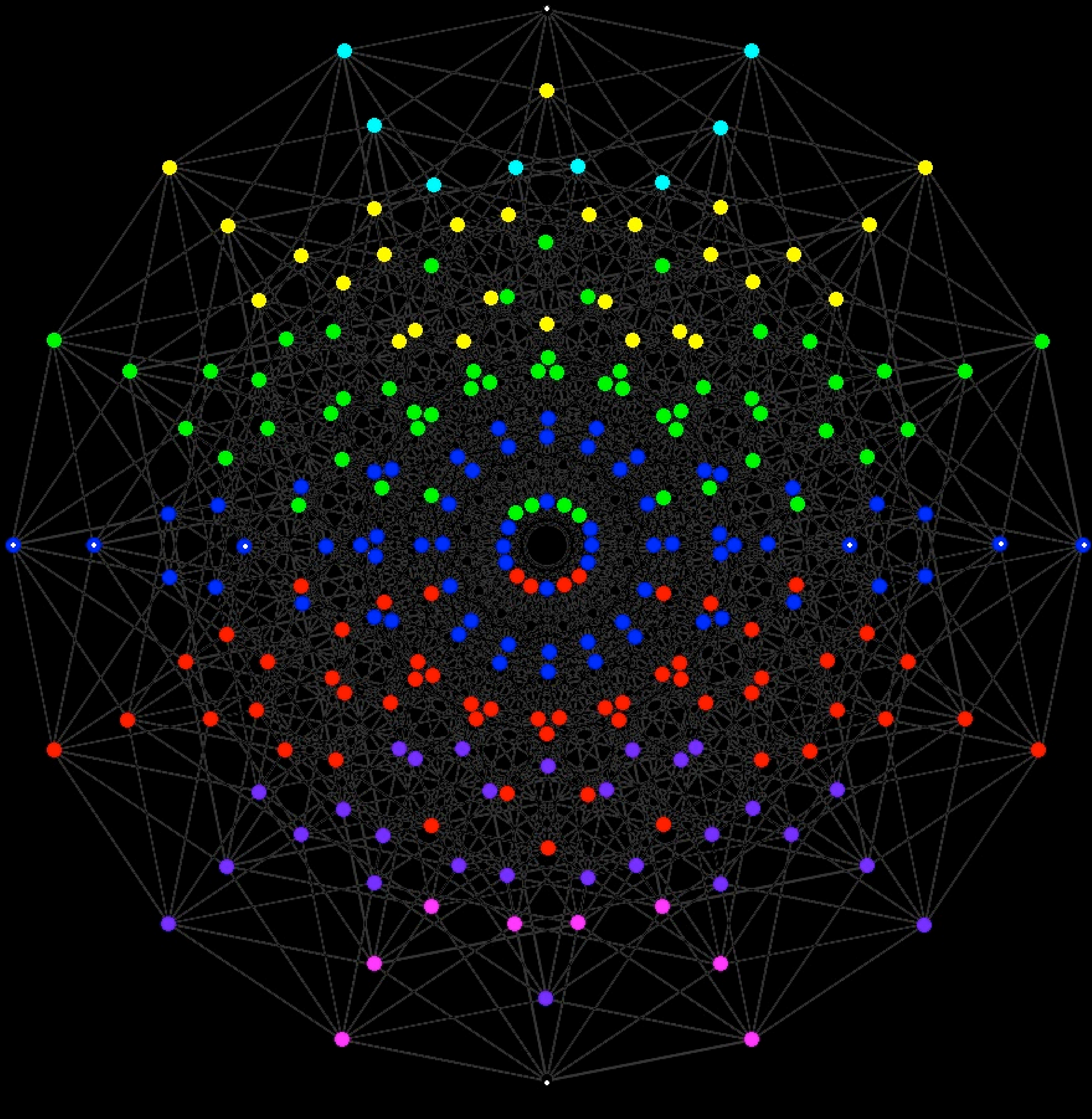


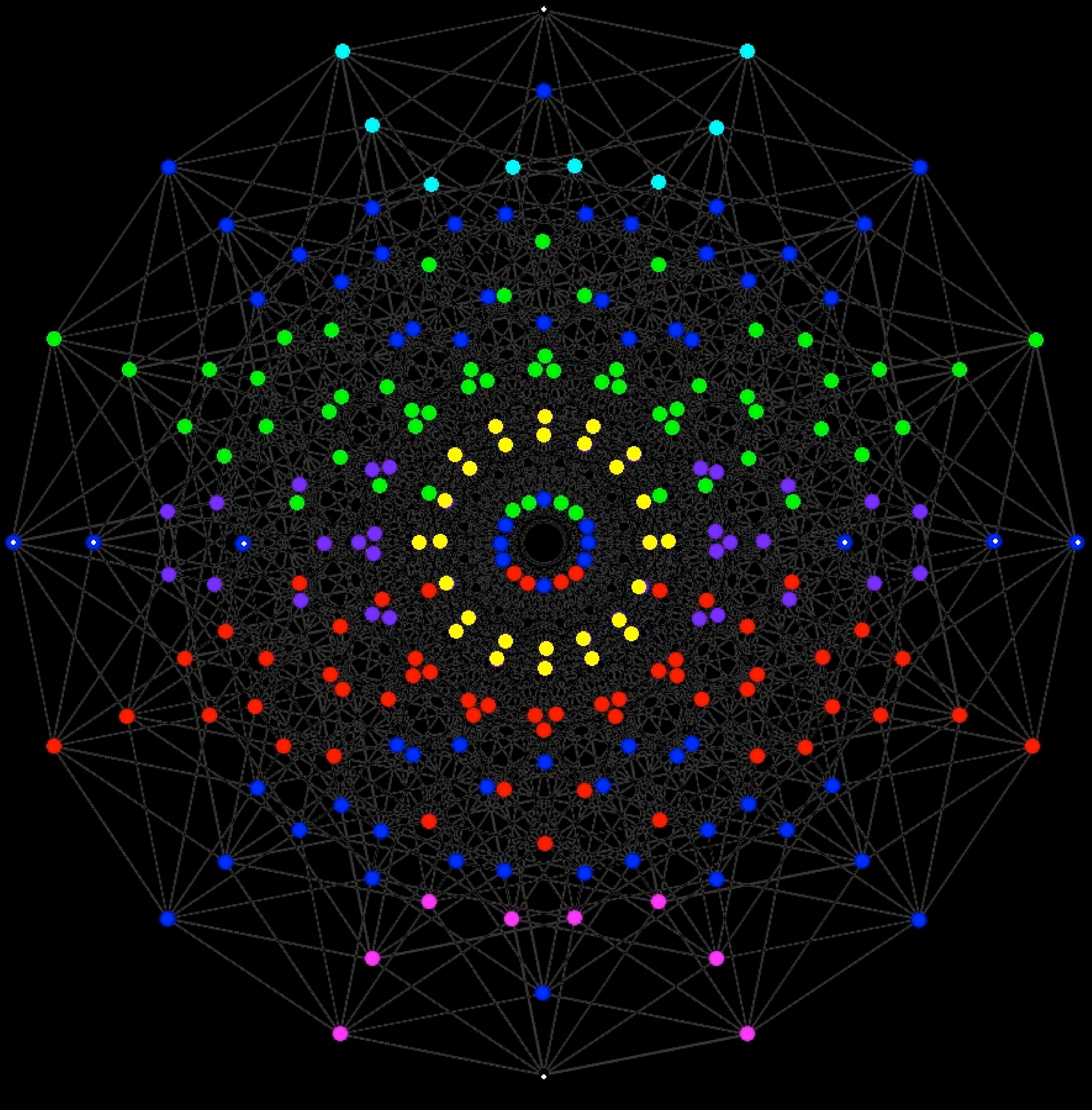
... transients of many different lengths can be produced. ... the constant pattern is called a "point attractor", and the transients would be said to lie in the "basin of attraction".

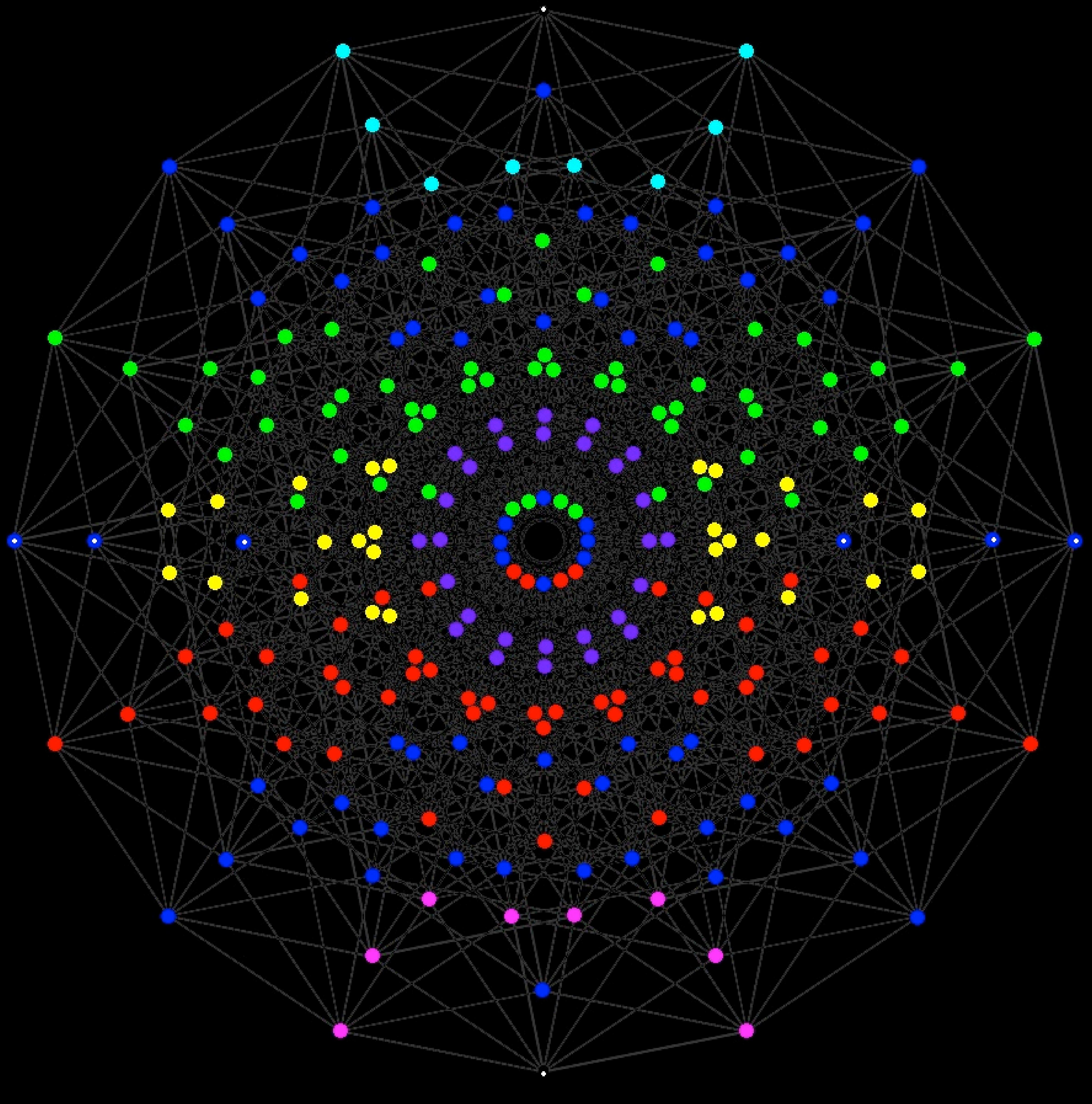


$M_{16}(\mathbf{R})$	$M_{16}(\mathbf{C})$	$M_{16}(\mathbf{H})$	$M_{16}(\mathbf{H}) \oplus M_{16}(\mathbf{H})$	$M_{32}(\mathbf{H})$	$M_{64}(\mathbf{C})$	$M_{128}(\mathbf{R})$	$M_{128}(\mathbf{R}) \oplus M_{128}(\mathbf{R})$	$M_{256}(\mathbf{R})$
$M_{8}(\mathbf{C})$	$M_{8}(\mathbf{H})$	$M_{8}(\mathbf{H}) \oplus M_{8}(\mathbf{H})$	$M_{16}(\mathbf{H})$	$M_{32}(\mathbf{C})$	$M_{64}(\mathbf{R})$	$M_{64}(\mathbf{R}) \oplus M_{64}(\mathbf{R})$	$M_{128}(\mathbf{R})$	$M_{128}(\mathbf{C})$
$M_{4}(\mathbf{H})$	$M_{4}(\mathbf{H}) \oplus M_{4}(\mathbf{H})$	$M_{8}(\mathbf{H})$	$M_{16}(\mathbf{C})$	$M_{32}(\mathbf{R})$	$M_{32}(\mathbf{R}) \oplus M_{32}(\mathbf{R})$	$M_{64}(\mathbf{R})$	$M_{64}(\mathbf{C})$	$M_{64}(\mathbf{H})$
$M_{2}(\mathbf{H}) \oplus M_{2}(\mathbf{H})$	$M_{4}(\mathbf{H})$	$M_{8}(\mathbf{C})$	$M_{16}(\mathbf{R})$	$M_{16}(\mathbf{R}) \oplus M_{16}(\mathbf{R})$	$M_{32}(\mathbf{R})$	$M_{32}(\mathbf{C})$	$M_{32}(\mathbf{H})$	$M_{32}(\mathbf{H}) \oplus M_{32}(\mathbf{H})$
$M_{2}(\mathbf{H})$	$M_{4}(\mathbf{C})$	$M_{8}(\mathbf{R})$	$M_{8}(\mathbf{R}) \oplus M_{8}(\mathbf{R})$	$M_{16}(\mathbf{R})$	$M_{16}(\mathbf{C})$	$M_{16}(\mathbf{H})$	$M_{16}(\mathbf{H}) \oplus M_{16}(\mathbf{H})$	$M_{32}(\mathbf{H})$
$M_{2}(\mathbf{C})$	$M_{4}(\mathbf{R})$	$M_{4}(\mathbf{R}) \oplus M_{4}(\mathbf{R})$	$M_{8}(\mathbf{R})$	$M_{8}(\mathbf{C})$	$M_{8}(\mathbf{H})$	$M_{8}(\mathbf{H}) \oplus M_{8}(\mathbf{H})$	$M_{16}(\mathbf{H})$	$M_{32}(\mathbf{C})$
$M_{2}(\mathbf{R})$	$M_{2}(\mathbf{R}) \oplus M_{2}(\mathbf{R})$	$M_{4}(\mathbf{R})$	$M_{4}(\mathbf{C})$	$M_{4}(\mathbf{H})$	$M_{4}(\mathbf{H}) \oplus M_{4}(\mathbf{H})$	$M_{8}(\mathbf{H})$	$M_{16}(\mathbf{C})$	$M_{32}(\mathbf{R})$
$\mathbf{R} \oplus \mathbf{R}$	$M_{2}(\mathbf{R})$	$M_{2}(\mathbf{C})$	$M_{2}(\mathbf{H})$	$M_{2}(\mathbf{H}) \oplus M_{2}(\mathbf{H})$	$M_{4}(\mathbf{H})$	$M_{8}(\mathbf{C})$	$M_{16}(\mathbf{R})$	$M_{16}(\mathbf{R}) \oplus M_{16}(\mathbf{R})$
$\mathbf{R}$	$\mathbf{C}$	$\mathbf{H}$	$\mathbf{H} \oplus \mathbf{H}$	$M_{2}(\mathbf{H})$	$M_{4}(\mathbf{C})$	$M_{8}(\mathbf{R})$	$M_{8}(\mathbf{R}) \oplus M_{8}(\mathbf{R})$	$M_{16}(\mathbf{R})$









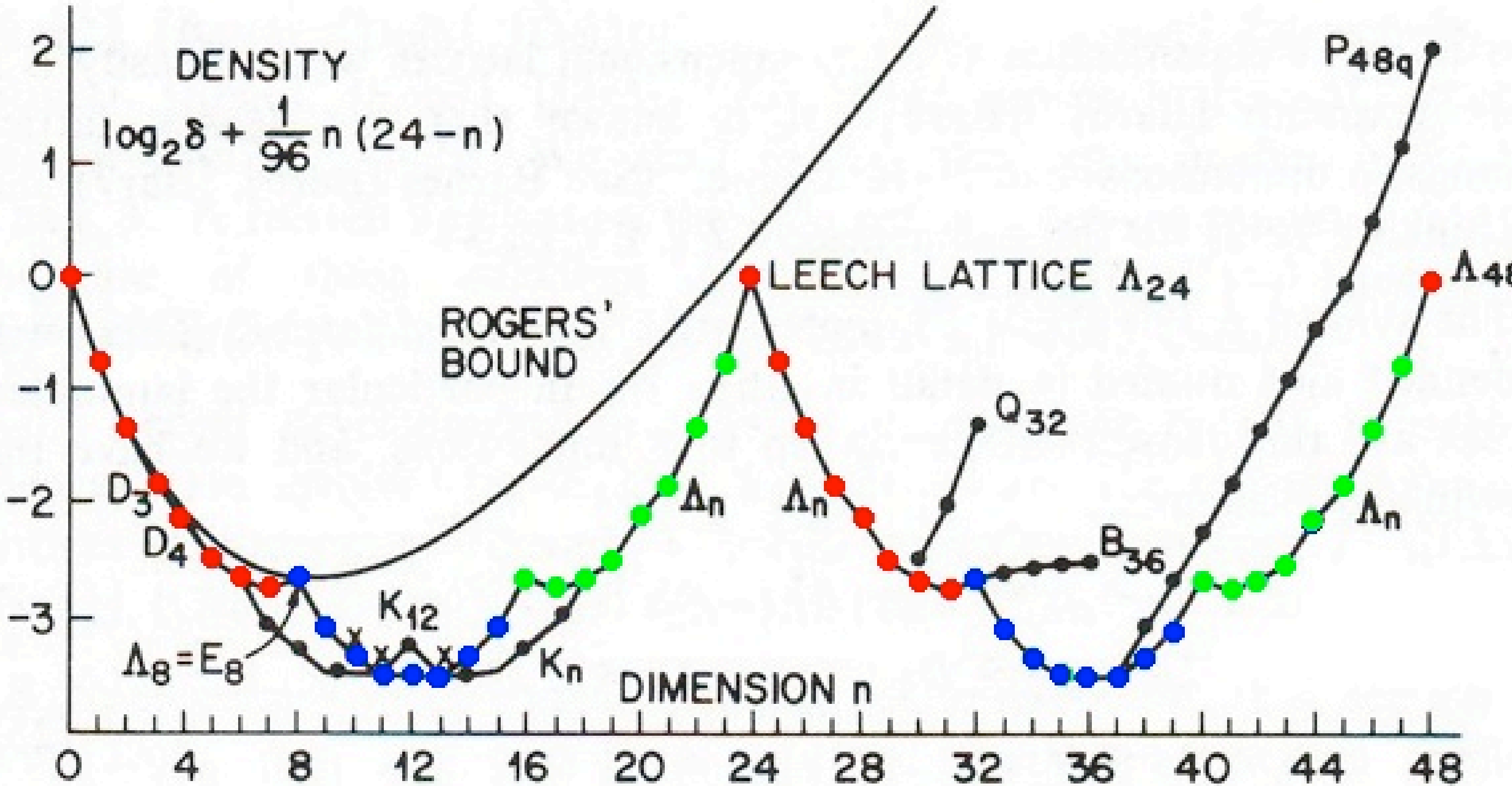


Figure 1.5. The densest sphere packings known in dimensions $n \leq 48$. The vertical axis gives $\log_2 \delta + n(24-n)/96$, where δ is the center density. The Λ_n are laminated lattices, the K_n are described in Chap. 6, K_{12} is the Coxeter-Todd lattice, the crosses are nonlattice packings (Chap. 5, §§2.6,4.3), and Q_{32}, B_{36} and P_{48q} are described in Table 1.3a. The upper bound is Rogers' bound (39), (40). (See also Table I.1 of the Introduction.)

E8 Physics:

from

Fundamental Fermion Dixon Spinors

to

26-dim String World-Line Theory

to

Kerr-Newman Clouds

to

Schwinger Source Regions

to

Wyler/Hua Force Strengths

Frank Dodd (Tony) Smith, Jr. - 2012

The following seven pages are an outline sketch of how E8 Physics emerges
from fundamental spinor fermions
to condense into a 26-dim String structure with strings as fermion World-Lines
with each fundamental fermion being surrounded by a Quantum Cloud
that has Kerr-Newman physical structure
corresponding to a Schwinger Source region
with complex harmonic Wyler/Hua Green's function propagator.
The Wyler/Hua complex bounded domain structure allows
realistic calculation of force strength constants and particle masses.

The outline sketch omits many details which are covered in vixra 1108.0027

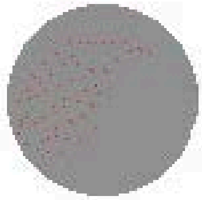
Here are some historical speculation questions:

Could Wyler's Green's function based on harmonic analysis of complex domains
have been used by Schwinger
to give more detailed models of his finite-region sources ?

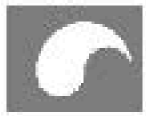
Could Wyler's rejection at IAS Princeton under Dyson in the 1970s
have been at least in part due to Dyson's Feynman-type view
of point particles as fundamental ?

If Wyler had gone to see Schwinger at UCLA instead of Dyson at IAS Princeton
could Wyler and Schwinger together have developed source theory
in great enough detail that its advantages (no renormalization etc)
would have been clear to most physicists ?

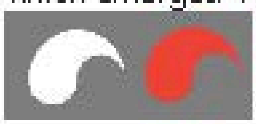
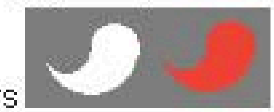
In the beginning there was Cl(0) spinor fermion void



from which emerged 2 = sqrt(2^2) Cl(2) half-spinor fermions

 and its mirror 

from which emerged 4 = sqrt(2^4) Cl(4) half-spinor fermions

 and 2 mirrors 

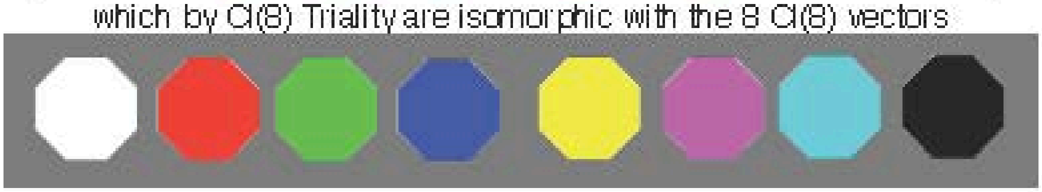
from which emerged 8 = sqrt(2^6) Cl(6) half-spinor fermions

and 4 mirrors

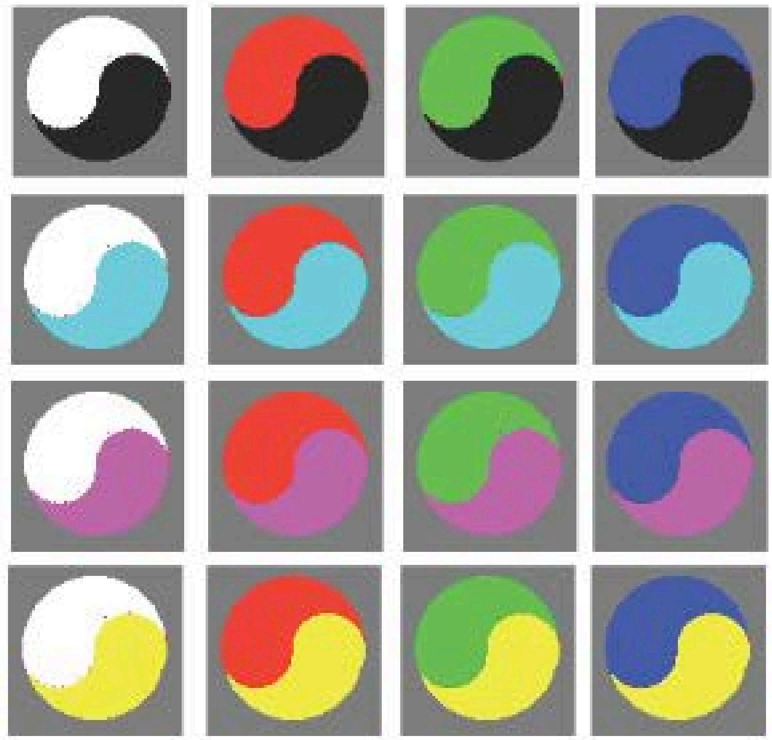
from which emerged 16 = sqrt(2^8) Cl(8) half-spinor fermions

and 8 mirrors

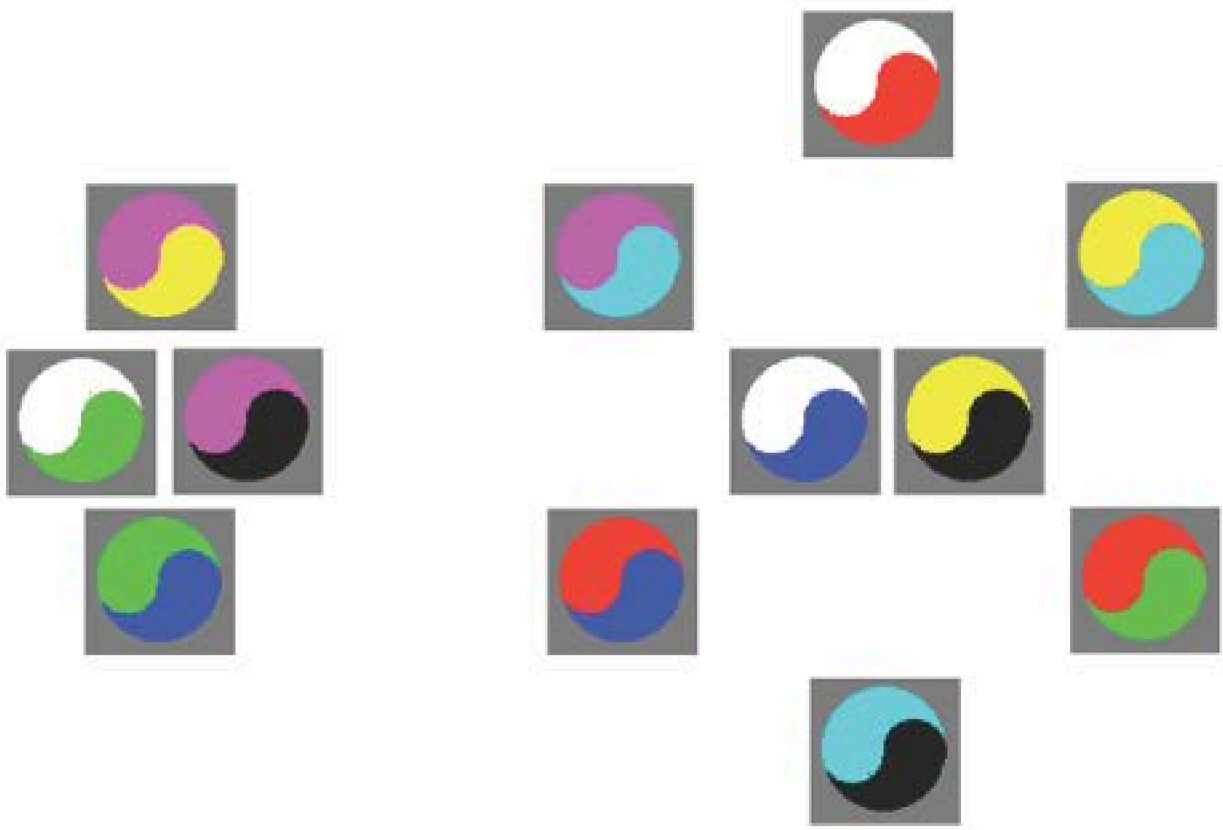
which by Cl(8) Triality are isomorphic with the 8 Cl(8) vectors



so that the 28 antisymmetric pairs of half-spinors and their mirrors are the 28 Cl(8) bivectors of the Lie Algebra of Gauge Groups:

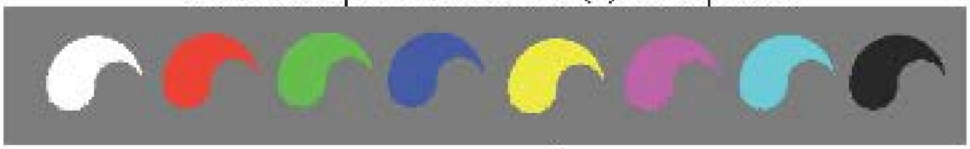


16 of U(2,2) = U(1)xSU(2,2) = U(1)xSpin(2,4) for Conformal Gravity



4 of U(2) = U(1)xSU(2) and 8 of SU(3) for the Standard Model.

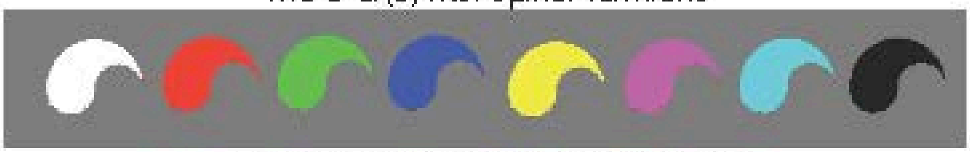
As fermion particles the 8 Cl(8) half-spinors



represent
neutrino; red down quark, green down quark, blue down quark;
blue up quark, green up quark, red up quark; electron
(yellow, magenta, cyan, black are used for blue, green, red up quarks and electron)

The 8 mirror Cl(8) half-spinors represent the corresponding fermion antiparticles.

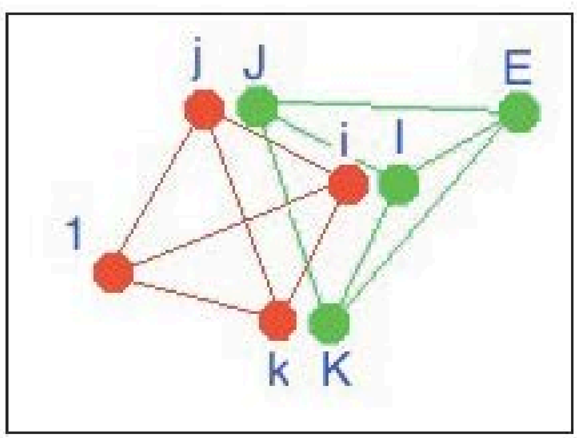
The 8 Cl(8) half-spinor fermions



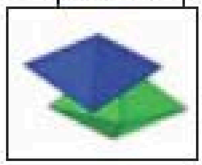
and their 8 mirror Triality equivalents

and their 8 Cl(8) vector Triality equivalents

correspond to
the Octonion basis elements {1,i,j,k,K,J,I,E}
and
can be represented as a pair of tetrahedra

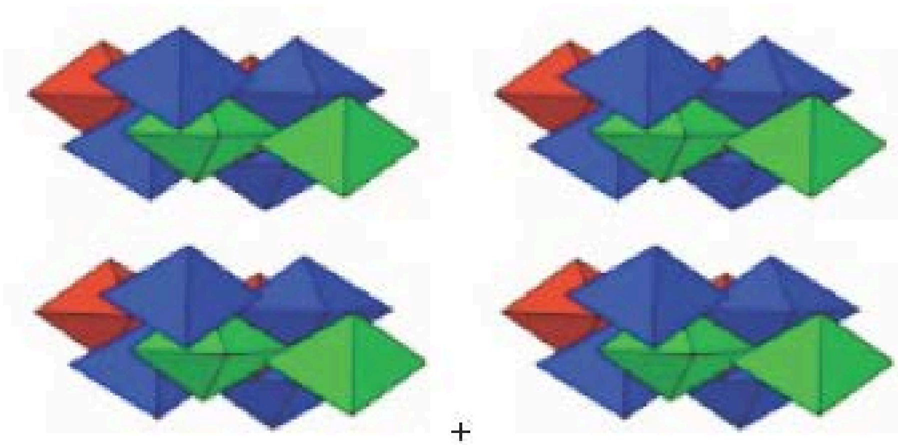


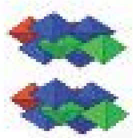
By Real Clifford Algebra 8-periodicity any large spinor space can be embedded in
a tensor product of a number copies of the 16-dim full spinors of Cl(8)
representable as a pair of a pair of tetrahedra



the tensor product of two of which

form the 128+128 = 256-dim full spinors of Cl(8)xCl(8) = Cl(16)

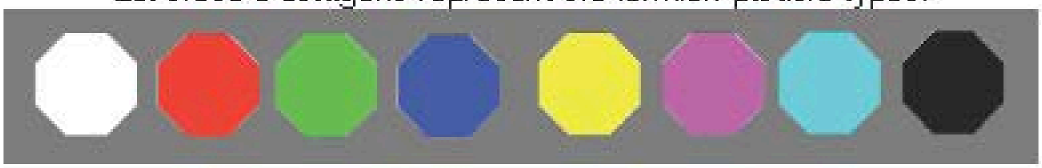


One set of 128-dim Cl(16) half-spinors  is the spinor/fermion part of the 248-dim Lie algebra E8 = 120-dim Spin(16) + 128-dim half-spinor of Spin(16)
and is also a representation of
the 128-dim spinor space denoted as T2 by Geoffrey Dixon who says in
his paper "Matter Universe: Message in the Mathematics":
"... the 128-dimensional hyperspinor space T2 ...[is]... the doubling of T ...
The algebra T = C x H x O ...(complex algebra, quaternions, and octonions)... is 2x4x8
= 64-dimensional ... noncommutative, nonassociative, and nonalternative ...".

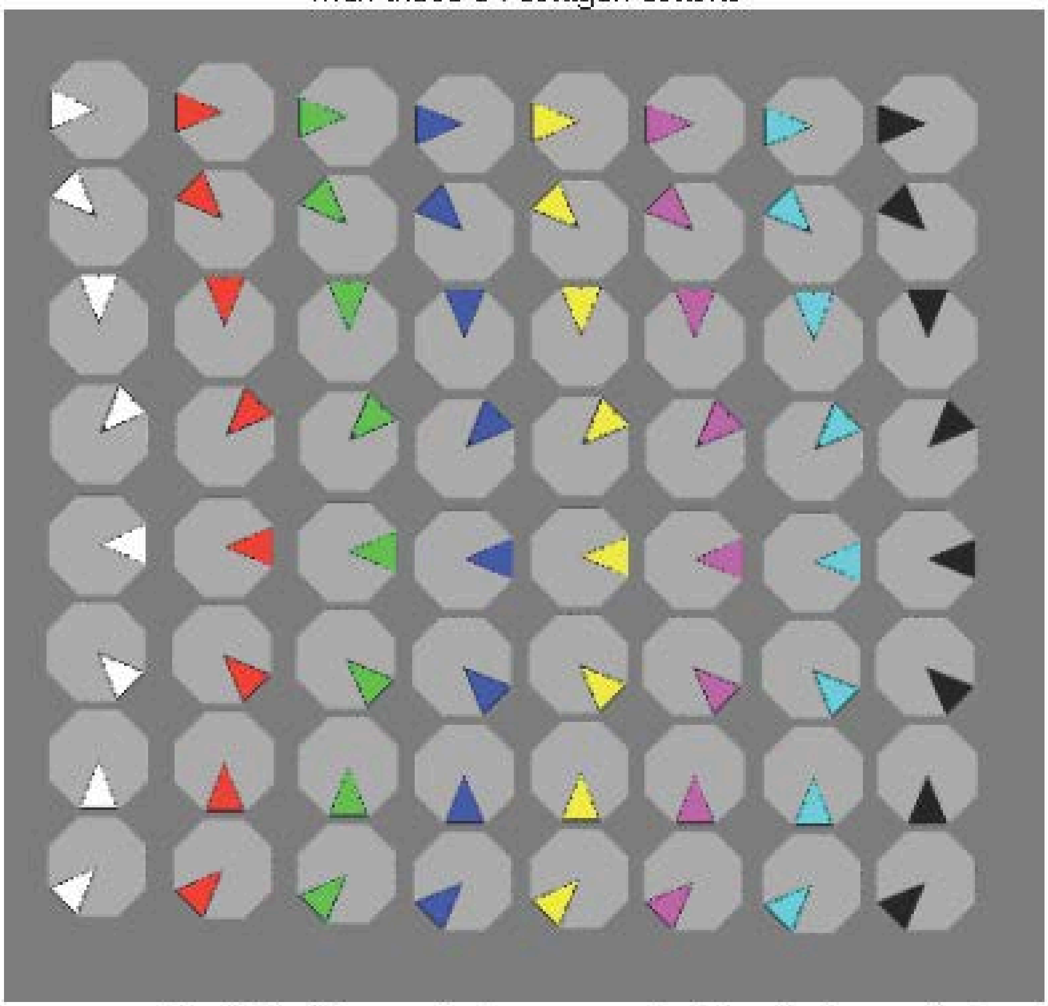
Within 128-dim T2,

each 64-dim factor T is represented by  half of the Spin(16) half-spinor space.
One 64-dim T represents fermion spinor particles
while the other T of T2 represents fermion spinor antiparticles.

Let these 8 octagons represent the fermion particle types:



Then these 64 octagon octants



represent the 8x8 = 64 covariant components of the fermion particles.
With respect to Cl(16) and E8 the Cl(8) Triality induces
Triality isomorphsim between the two 64-dim factors T
that represent fermion particles and antiparticles
and also of both of them
with the 64-dim D8 / D4xD4 space representing 8-dim position and momentum.

How does T2 represent the first-generation fermions seen in experiments ?

Using basis {c1,ci} for C and {q1,qi,qj,qk} for H and {1,i,j,k,E,I,J,K} for O
each T can be decomposed as follows:
{q1,qi,qj,qk} represent { lepton , red quark , green quark , blue quark }
{c1,ci} represent { neutrino / down quark , electron / up quark }
{1,i,j,k,E,I,J,K} represent 8 covariant components of each fermion
with respect to 4+4 = 8-dim Kaluza-Klein Spacetime M4xCP2
with {1,i,j,k} representing 4-dim M4 Minkowski Physical Spacetime
and (E,I,J,K} representing 4-dim CP2 Internal Symmetry Space.

How do T2 fermions interact with each other ?

Consider fermionic 128-dim T2 as the spinor part of E8.
Construct a Local Lagrangian using the 120-dim Spin(16) part of E8
which can be decomposed into
two copies of the 28-dim Spin(8) Lie algebra
plus 64-dim of 8-dim spacetime position x 8-dim spacetime momentum
so that **the Lagrangian density has**
a fermionic term from the T2 spinor space and
gauge boson terms from the two copies of Spin(8)
which are integrated over the 8-dim spacetime as base manifold.

How does the Local Lagrangian Physics extend Globally ?

Since the E8 Lagrangian is Local, it is necessary to patch together Local Lagrangian Regions to form a Global Structure describing a Global E8 Algebraic Quantum Field Theory (AQFT). Each E8 of each region is embedded into Cl(16) and the completion of the union of all tensor products of all the Cl(16) are taken thus producing a generalized **Hyperfinite II1 von Neumann factor Algebraic Quantum Field Theory**.

What is the Physics of World-Line Histories of Particles/Antiparticles ?

8 + 8 + 8 = 24-dim of fermion particles and antiparticles and of spacetime can be represented by a Leech lattice underlying 26-dim String Theory in which strings represent World-Lines in the E8 Physics model.

The automorphism group of a single 26-dim String Theory cell modulo the Leech lattice is the Monster Group of order about 8 x 10^53.

A fermion particle/antiparticle does not remain a single Planck-scale entity because Tachyons create a cloud of particles/antiparticles.

The cloud is one Planck-scale Fundamental Fermion Valence Particle plus an effectively neutral cloud of particle/antiparticle pairs forming a Kerr-Newman black hole whose structure comes from the 24-dim Leech lattice part of the Monster Group which is 2^(1+24) times the double cover of Co1, for a total order of about 10^26.

(Since a Leech lattice is based on copies of an E8 lattice and since there are 7 distinct E8 integral domain lattices there are 7 (or 8 if you include a non-integral domain E8 lattice) distinct Leech lattices, and the physical Leech lattice is a superposition of them, effectively adding a factor of 8 to the order.)

The volume of the Kerr-Newman Cloud should be on the order of 10^27 x Planck scale, and **the Kerr-Newman Cloud should contain on the order of 10^27 particle/antiparticle pairs** and **its size should be** somewhat larger than, but roughly similar to, 10^(27/3) x 1.6 x 10^(-33) cm = roughly **10^(-24) cm**.

Kerr-Newman Clouds as Schwinger Sources:
Green's Function Propagators

Schwinger, in Nottingham hep-ph/9310283, said:

"... in the phenomenological **source theory ...**
there are no divergences, and no renormalization ...
the source concept ... is abstracted from the physical possibility
of creating or annihilating any particle in a suitable collision. ...
The basic physical act begins with the creation of a particle by a source,
followed by the propagation ... of that particle
between the neighborhoods of emission and detection,
and is closed by the source annihilation of the particle.
Relativistic requirements largely constrain the structure of
the propagation function - Green's function ...".

Wyler/Hua Complex Domain Structure of Schwinger Sources:
Bergman Kernels and Green's functions

Armand Wyler, in "The Complex Light Cone, Symmetric Space of the Conformal Group" (IAS Princeton, June 1972), said:

"... define the Bergman metric, the invariant differential operators
and their elementary solutions (Green functions) in the bounded realization
Dn of SO(n,2) / (SO(n) x SO(2) with Silov boundary Qn ...
the value of the structure constant alpha is obtained
as coefficient of the Green function of the Dirac equation in D5 ...".

E8 Physics Model and 26D String Theory with Monster Group Symmetry

viXra 1210.0072 Frank Dodd (Tony) Smith, Jr. - 2012

A physically realistic Lattice Bosonic String Theory with Strings = World-Lines and Monster Group Symmetry containing gravity and the Standard Model can be constructed consistently with the E8 physics model 248-dim E8 = 120-dim adjoint D8 + 128-dim half-spinor D8 = (28 + 28 + 64) + (64 + 64)

Joseph Polchinski, in his books String Theory vols. I and II(Cambridge 1998), says:
"... the **closed ... unoriented ... bosonic string ... theory** has the maximal 26-dimensional Poincare invariance ... It is possible to have a consistent theory ... [with]... the **dilaton** ... the **[string-]graviton** ...[and]... the **tachyon** ...[whose]... negative mass-squared means that the no-string 'vacuum' is actually unstable ... ".
The **dilaton** of E8 Physics sets the Planck scale as the scale for the 16 dimensions that are orbifolded fermion particles and anti-particles and the 4 dimensions of the CP2 Internal Symmetry Space of M4xCP2 spacetime.
The remaining 26-16-4 = 6 dimensions are the Conformal Physical Spacetime with Spin(2,4) = SU(2,2) symmetry that produces M4 Physical Spacetime.
The **string-graviton** of E8 Physics is a spin-2 interaction among strings.
If Strings = World Lines and World Lines are past and future histories of particles, then string-graviton interactions determine a Cramer Transaction Quantum Theory discussed in quantum-ph/0408109. Roger Penrose in "Road to Reality" (Knopf 2004) says: "... **quantum** mechanics ... alternates between ... **unitary** evolution **U** ... and state reduction R ... quantum state **reduction** ... is ... **objective** ... **OR** ... it is always a gravitational phenomenon ... [A] conscious event ... would be ... orchestrated OR ... of ... large-scale quantum coherence ... of ... microtubules ...".
String-Gravity produces Sarfatti-Bohm Quantum Potential with Back-Reaction.
It is distinct from the MacDowell-Mansouri Gravity of stars and planets.
The **tachyon** produces the instability of a truly empty vacuum state with no strings.
It is natural, because if our Universe were ever to be in a state with no strings, then tachyons would create strings = World Lines thus filling our Universe with the particles and World-Lines = strings that we see. Something like this is necessary for particle creation in the Inflationary Era of non-unitary Octonionic processes.

Our construction of a 26D String Theory consistent with E8 Physics uses a structure that is not well-known, so I will mention it here before we start:

There are 7 independent E8 lattices, each corresponding to one of the 7 imaginary octionions. They can be described as iE8, jE8, kE8, EE8, IE8, JE8, and KE8 and each of the 7 has 240 first-shell vertices. Further, an 8th 8-dim lattice 1E8 with 256 first-shell vertices related to the Cl(8) Clifford Algebra is closely related to the 7 octonion imaginary lattices (pp. 279-306; viXra 1301.0150v2) . It can act as an effectively independent lattice as part of the basis subsets {1E8,EE8} or {1E8,iE8,jE8,kE8}.
With that in mind, here is the construction:

Step 1:

Consider the 26 Dimensions of Bosonic String Theory as the 26-dimensional traceless part J3(O)o

a	O+	Ov
O+*	b	O-
Ov*	O-*	-a-b

(where Ov, O+, and O- are in Octonion space with basis {1,i,j,k,E,I,J,K} and a and b are real numbers with basis {1})

of the 27-dimensional Jordan algebra J3(O) of 3x3 Hermitian Octonion matrices.

Step 2:

Take a D3 brane to correspond to the Imaginary Quaternionic associative subspace spanned by {i,j,k} in the 8-dimenisonal Octonionic Ov space.

Step 3:

Compactify the 4-dimensional co-associative subspace spanned by {E,I,J,K} in the Octonionic Ov space as a CP2 = SU(3)/U(2), with its 4 world-brane scalars corresponding to the 4 covariant components of a Higgs scalar.

Add this subspace to D3, to get D7.

Step 4:

Orbifold the 1-dimensional Real subspace spanned by {1} in the Octonionic Ov space by the discrete multiplicative group Z2 = {-1,+1}, with its fixed points {-1,+1} corresponding to past and future time. This discretizes time steps and gets rid of the world-brane scalar corresponding to the subspace spanned by {1} in Ov. It also gives our brane a 2-level timelike structure, so that its past can connect to the future of a preceding brane and its future can connect to the past of a succeeding brane.

Add this subspace to D7, to get D8.

D8, our basic Brane, looks like two layers (past and future) of D7s.

Beyond D8 our String Theory has 26 - 8 = 18 dimensions, of which 25 - 8 have corresponding world-brane scalars:

- 8 world-brane scalars for Octonionic O+ space;
- 8 world-brane scalars for Octonionic O- space;
- 1 world-brane scalars for real a space; and
- 1 dimension, for real b space, in which the D8 branes containing spacelike D3s are stacked in timelike order.

Step 5:

To get rid of the world-brane scalars corresponding to the Octonionic O+ space, orbifold it by the 16-element discrete multiplicative group Oct16 = {+/-1,+/-i,+/-j,+/-k,+/-E,+/-I,+/-J,+/-K} to reduce O+ to 16 singular points {-1,-i,-j,-k,-E,-I,-J,-K,+1,+i,+j,+k,+E,+I,+J,+K}.

- Let the 8 O+ singular points {-1,-i,-j,-k,-E,-I,-J,-K} correspond to the fundamental fermion particles {neutrino, red up quark, green up quark, blue up quark, electron, red down quark, green down quark, blue down quark} located on the past D7 layer of D8.
- Let the 8 O+ singular points {+1,+i,+j,+k,+E,+I,+J,+K} correspond to the fundamental fermion particles {neutrino, red up quark, green up quark, blue up quark, electron, red down quark, green down quark, blue down quark} located on the future D7 layer of D8.

The 8 components of the 8 fundamental first-generation fermion particles = 8x8 = 64 correspond to the 64 of the 128-dim half-spinor D8 part of E8.

This gets rid of the 8 world-brane scalars corresponding to O+, and leaves:

- 8 world-brane scalars for Octonionic O- space;
- 1 world-brane scalars for real a space; and
- 1 dimension, for real b space, in which the D8 branes containing spacelike D3s are stacked in timelike order.

Step 6:

To get rid of the world-brane scalars corresponding to the Octonionic O- space, orbifold it by the 16-element discrete multiplicative group Oct16 = {+/-1,+/-i,+/-j,+/-k,+/-E,+/-I,+/-J,+/-K} to reduce O- to 16 singular points {-1,-i,-j,-k,-E,-I,-J,-K,+1,+i,+j,+k,+E,+I,+J,+K}.

- Let the 8 O- singular points {-1,-i,-j,-k,-E,-I,-J,-K} correspond to the fundamental fermion anti-particles {anti-neutrino, red up anti-quark, green up anti-quark, blue up anti-quark, positron, red down anti-quark, green down anti-quark, blue down anti-quark} located on the past D7 layer of D8.
- Let the 8 O- singular points {+1,+i,+j,+k,+E,+I,+J,+K} correspond to the fundamental fermion anti-particles {anti-neutrino, red up anti-quark, green up anti-quark, blue up anti-quark, positron, red down anti-quark, green down anti-quark, blue down anti-quark} located on the future D7 layer of D8.

The 8 components of the 8 fundamental first-generation fermion anti-particles = 8x8 = 64 correspond to the 64 of the 128-dim half-spinor D8 part of E8.

This gets rid of the 8 world-brane scalars corresponding to O-, and leaves:

- 1 world-brane scalars for real a space; and
- 1 dimension, for real b space, in which the D8 branes containing spacelike D3s are stacked in timelike order.

Step 7:

Let the 1 world-brane scalar for real a space correspond to a Bohm-type Quantum Potential acting on strings in the stack of D8 branes.

Interpret strings as world-lines in the Many-Worlds, short strings representing virtual particles and loops.

Step 8:

Fundamentally, physics is described on HyperDiamond Lattice structures.

There are 7 independent E8 lattices, each corresponding to one of the 7 imaginary octionions. They can be described as iE8, jE8, kE8, EE8, IE8, JE8, and KE8. Each has 240 first-shell vertices.

Further, an 8th 8-dim lattice 1E8 with 256 first-shell vertices related to the Cl(8) Clifford Algebra is closely related to the 7 octonion imaginaries.

Give each D8 brane structure based on Planck-scale E8 lattices so that each D8 brane is a superposition/intersection/coincidence of the eight E8 lattices.
(see viXra 1301.0150v2)

Step 9:

Since Polchinski says "... If r D-branes coincide ... there are r^2 vectors, forming the adjoint of a U(r) gauge group ...", make the following assignments:

- a gauge boson emanating from D8 from its 1E8 and EE8 lattices is a U(2) ElectroWeak boson thus accounting for the photon and W+, W- and Z0 bosons.
- a gauge boson emanating from D8 from its IE8, JE8, and KE8 lattices is a U(3) Color Gluon boson thus accounting for the 8 Color Force Gluon bosons.

The 4+8 = 12 bosons of the Standard Model Electroweak and Color forces correspond to 12 of the 28 dimensions of 28-dim Spin(8) that corresponds to the 28 of the 120-dim adjoint D8 part of E8.

- a gauge boson emanating from D8 from its 1E8, iE8, jE8, and kE8 lattices is a U(2,2) boson for conformal U(2,2) = Spin(2,4)xU(1) MacDowell-Mansouri gravity plus conformal structures consistent with the Higgs mechanism and with observed Dark Energy, Dark Matter, and Ordinary matter.

The 16-dim U(2,2) is a subgroup of 28-dim Spin(2,6) that corresponds to the 28 of the 120-dim adjoint D8 part of E8.

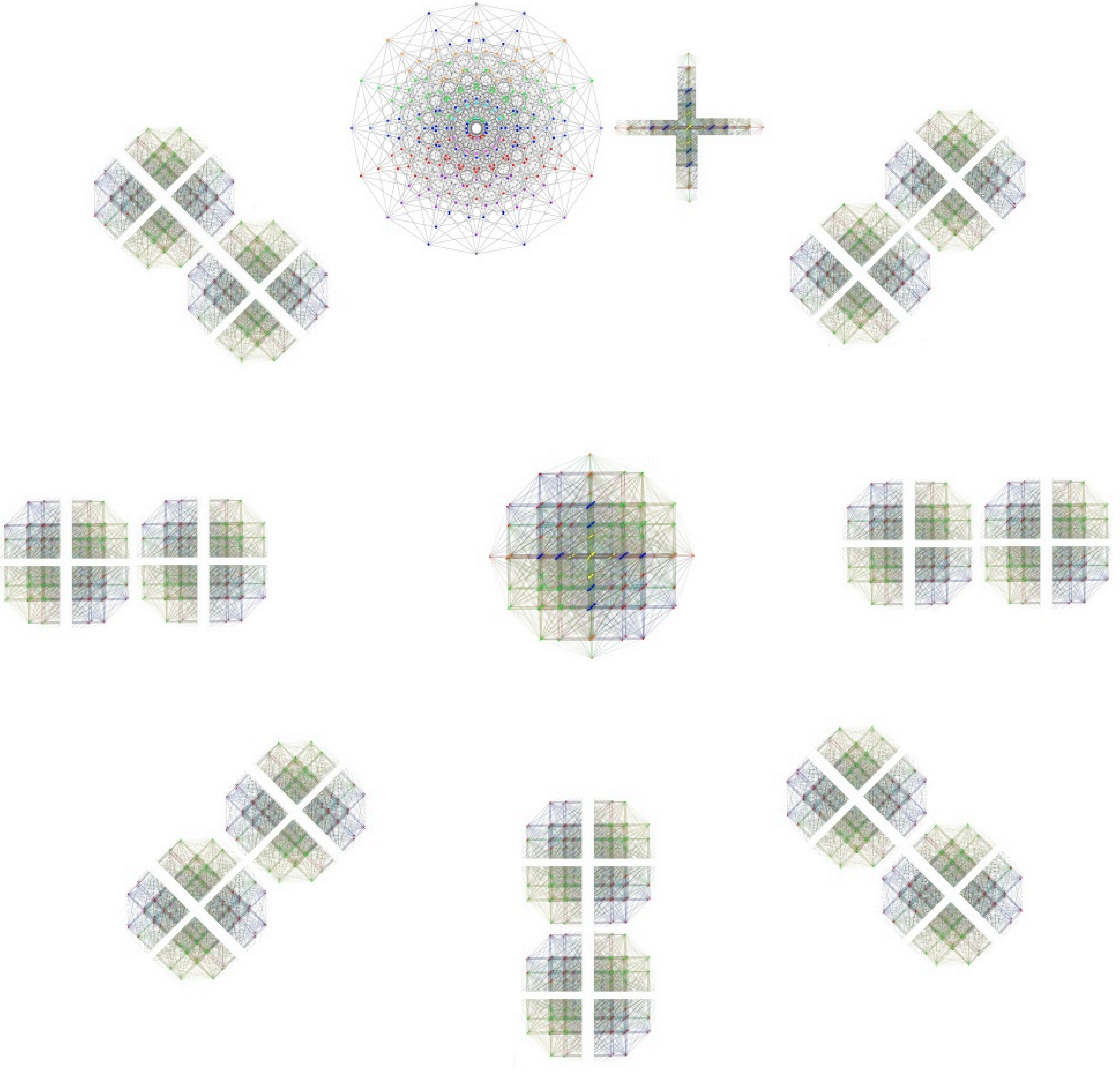
Step 10:

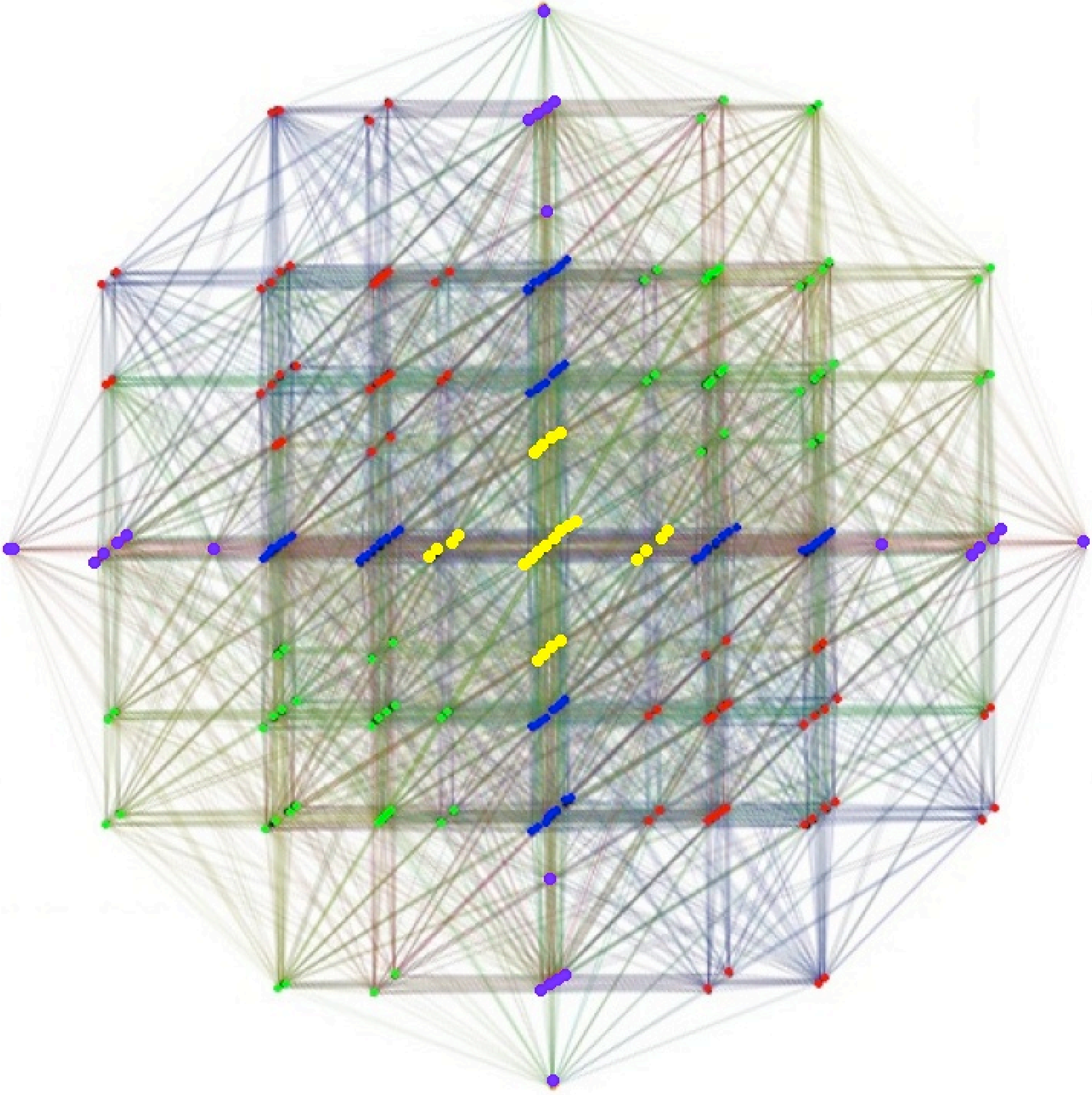
Since Polchinski says "... there will also be r^2 massless scalars from the components normal to the D-brane. ... the collectives coordinates ... X^u ... for the embedding of n D-branes in spacetime are now enlarged to nxn matrices. This 'noncummutative geometry' ...[may be]... an important hint about the nature of spacetime. ...", make the following assignment:

The 8x8 matrices for the collective coordinates linking a D8 brane to the next D8 brane in the stack are needed to connect the eight E8 lattices of the D8 brane to the eight E8 lattices of the next D8 brane in the stack.

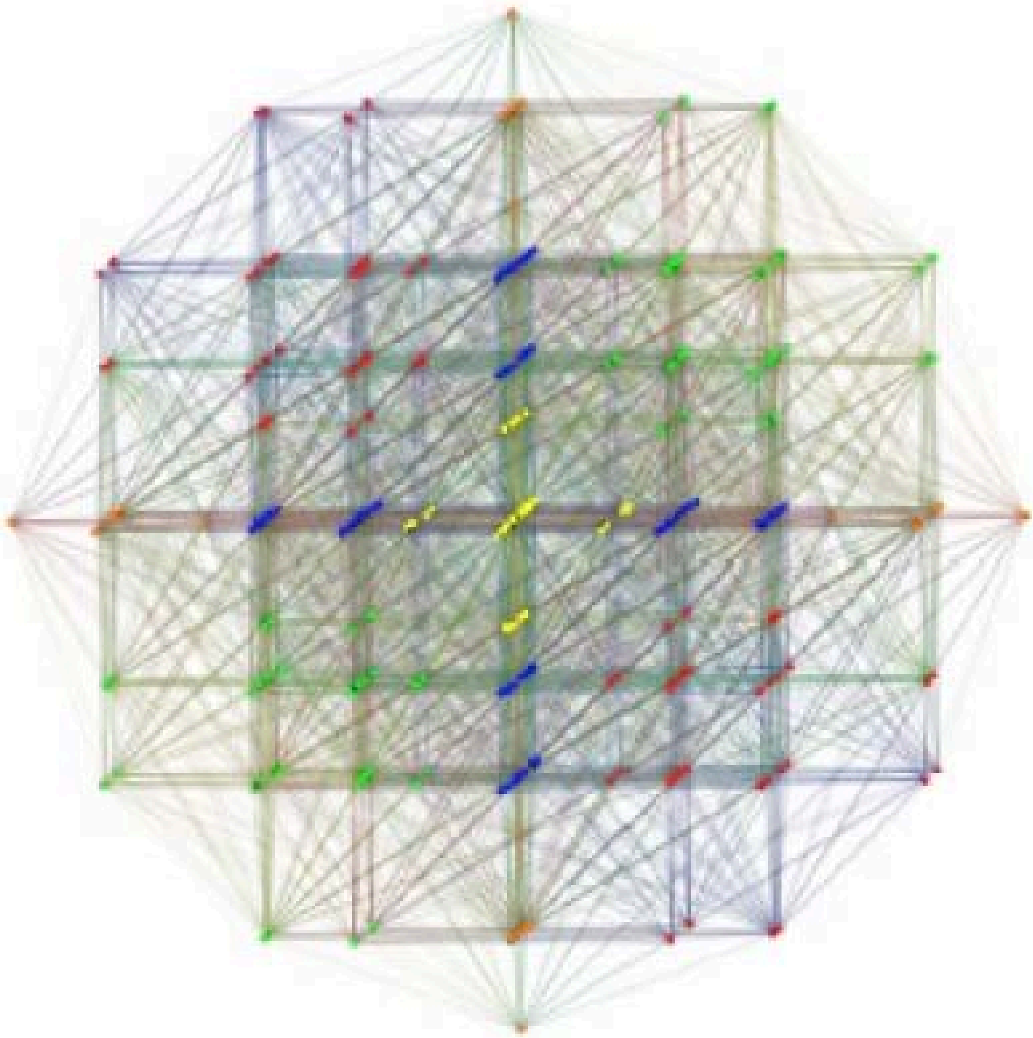
The 8x8 = 64 correspond to the 64 of the 120 adjoint D8 part of E8.

We have now accounted for all the scalars
and
have shown that the model has the physics content of the realistic E8 Physics model with Lagrangian structure based on E8 = (28 + 28 + 64) + (64 + 64)
and AQFT structure based on Cl(16) with real Clifford Algebra periodicity and generalized Hyperfinite II1 von Neumann factor algebra.





The 240 root vectors of the 248-dimensional Lie Algebra E8



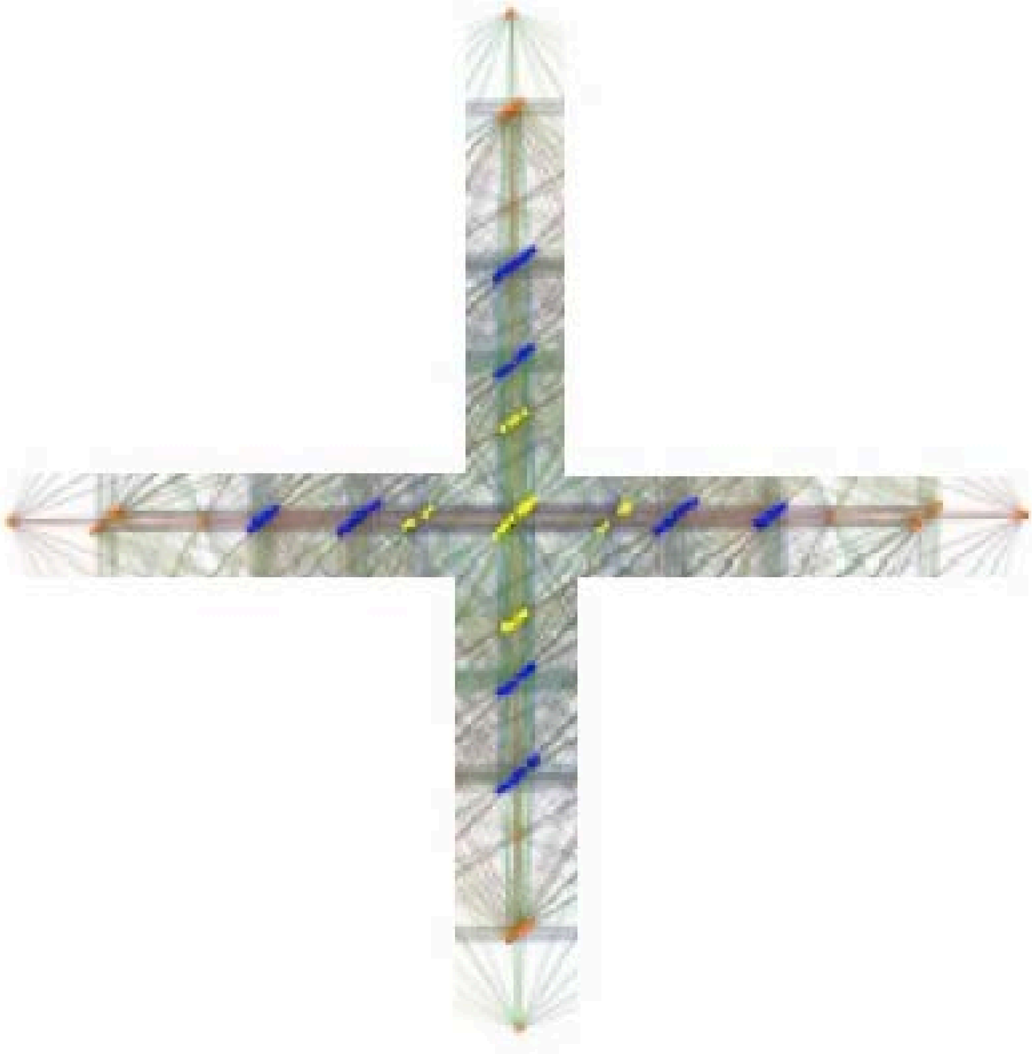
The 240 Root Vectors are color-keyed as:

24 Yellow
24 Orange
64 Blue

64 Red
64 Green

They are made up of

112 Root Vectors that represent the 112 Root Vectors of the 120-dimenisonal Lie Algebra D8

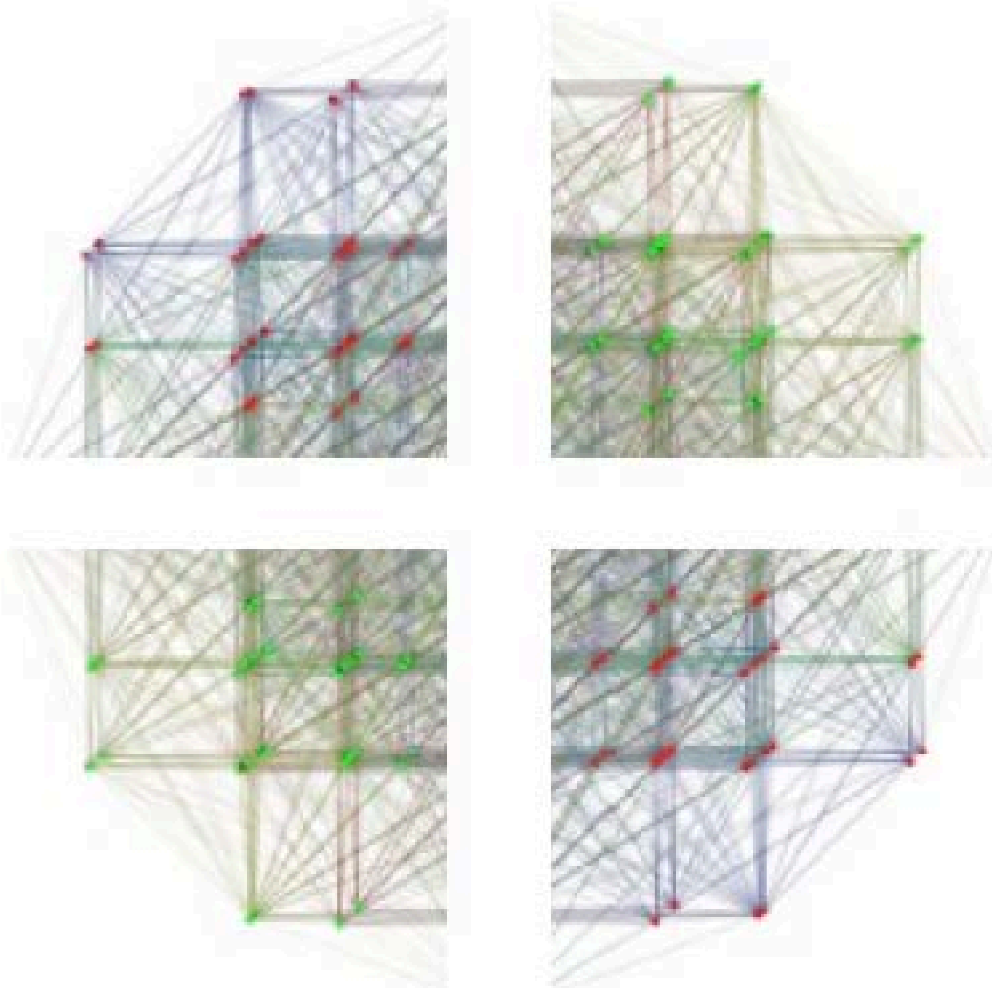


These 112 Root Vectors are color-keyed as:

- 24 Yellow
- 24 Orange
- 64 Blue

plus

128 Root Vectors that correspond to one of the 128-dimensional half-spinor representations of the Lie Algebra D8



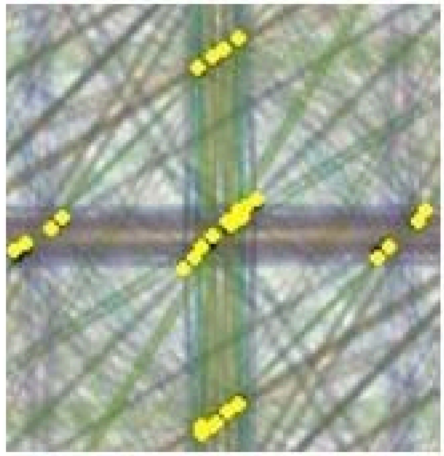
These 128 Root Vectors are color-keyed as:

64 Red

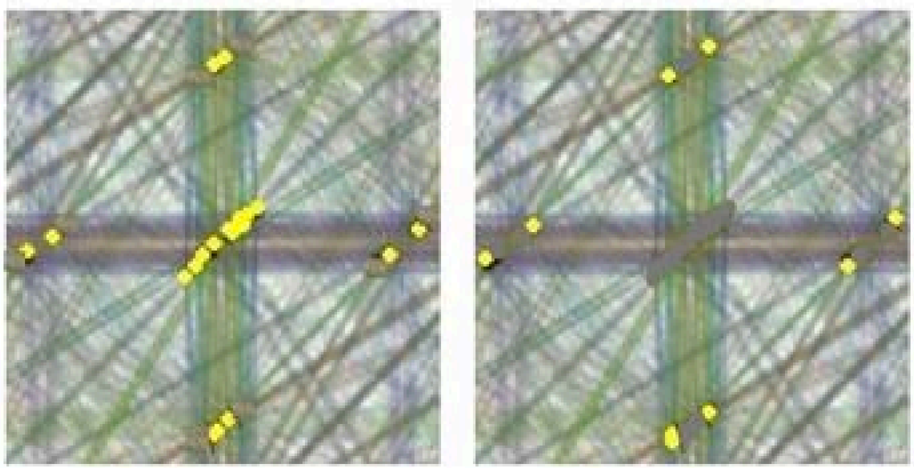
64 Green

Physical interpretations of the 240 E8 Root Vectors are given on the following pages:

The 24 Yellow Root Vectors correspond to the Standard Model Gauge Bosons which act on CP2 Internal Symmetry Space of M4xCP2 Kaluza-Klein Spacetime.

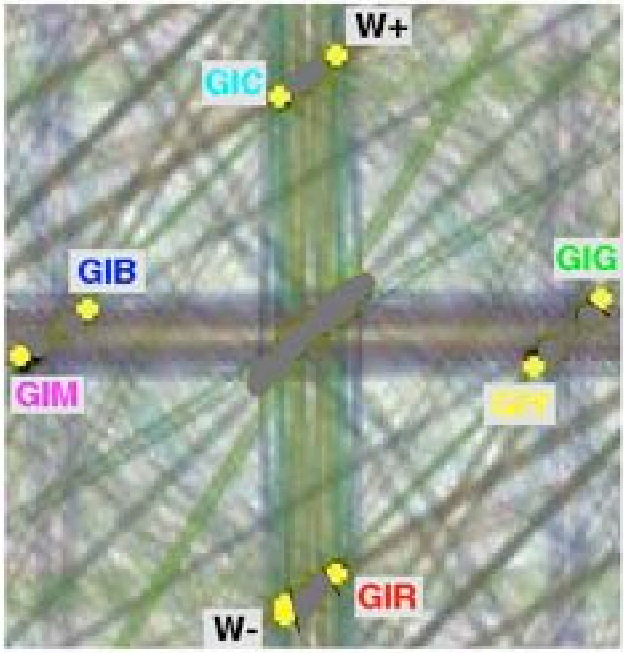


The 16 inner Root Vectors act to coordinate the Standard Model Gauge Bosons with the M4 Minkowski Space of M4xCP2 Kaluza-Klein Spacetime



while the 8 outer Root Vectors form a cube that represents

the W+ and W- Weak Bosons
and
the 6 Gluons that carry Color Charge:



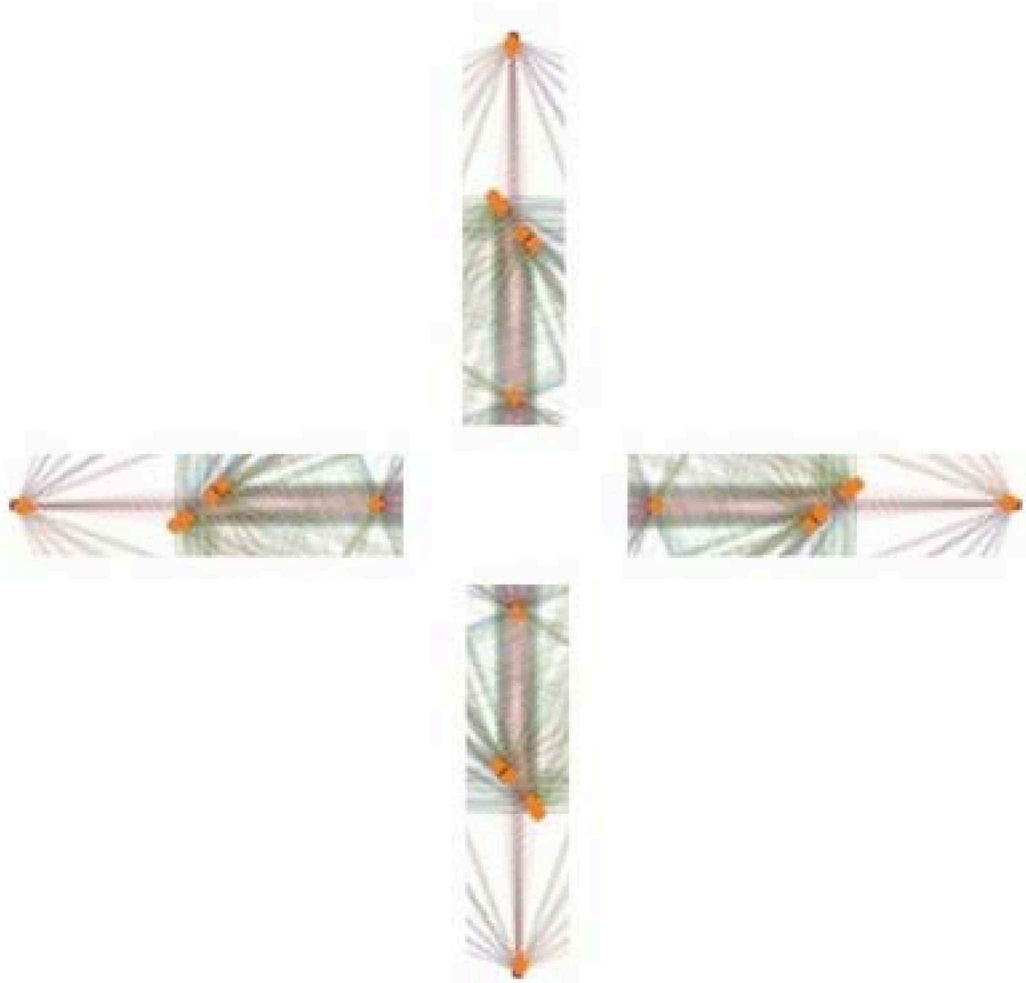
When combined with 4 of the 8 Cartan Subalgebra elements of E8
(that is, 4 of the 8 elements that are not represented by the 240 Root Vectors)
these 8 Root Vectors form the Standard Model Gauge Groups of:

8-dimensional SU(3) Color Force

3-dimensional SU(2) Weak Force

1-dimensional U(1) Electromagnetic Force.

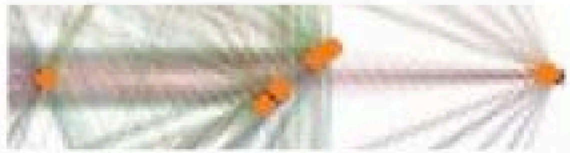
The 24 Orange Root Vectors correspond to the U(2,2) Conformal Group that by a MacDowell-Mansouri mechanism produces Gravity which acts on the M4 Minkowski space of M4xCP2 Kaluza-Klein Spacetime.

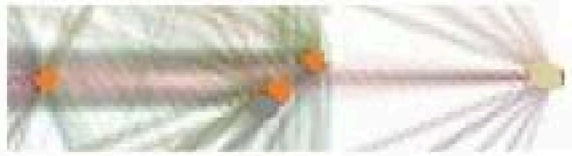


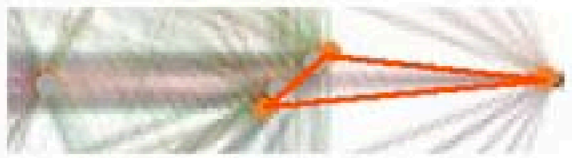
The 24 Orange Root Vectors are composed of 4 sets of 6 as shown above.

Each set of 6 breaks down

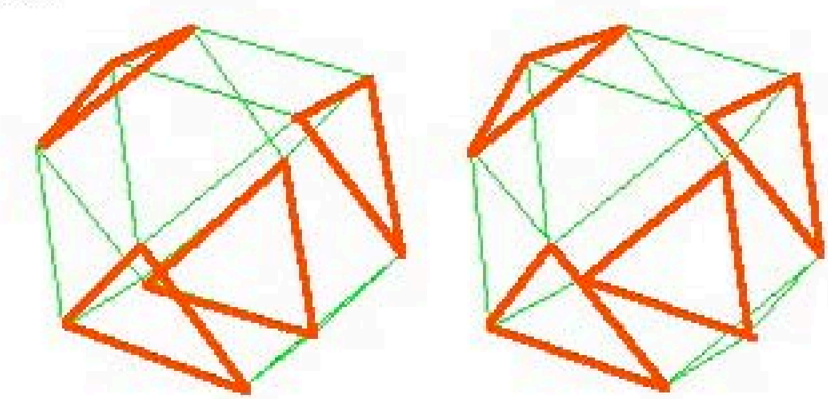
into 3 inner Root Vectors plus 3 outer Root Vectors







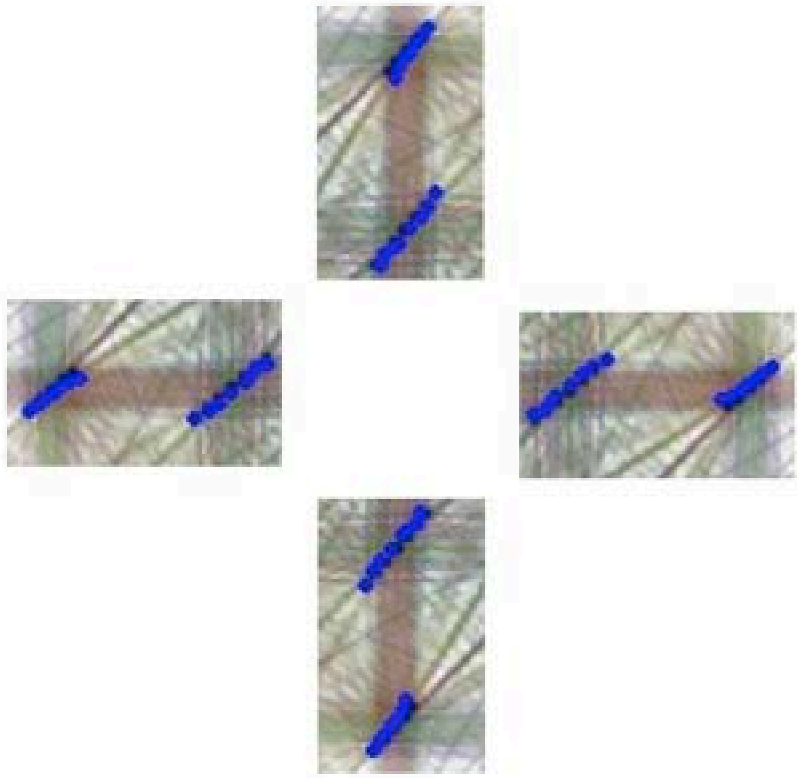
The 3 outer Root Vectors form a triangle,
and
the 12 vertices of the 4 triangles of the outer Root Vectors correspond to a cuboctahedron



that is the Root Vector Polytope for the U(2,2) Lie Algebra.

The 12 inner Root Vectors act to coordinate the Conformal Group with the CP2 Internal Symmetry Space of M4xCP2 Kaluza-Klein Spacetime while the 12 outer Root Vectors combine with 4 of the 8 Cartan Subalgebra elements of E8 (that is, 4 of the 8 elements that are not represented by the 240 Root Vectors) to form the 16-dimensional U(2,2) Conformal Group.

The 8x8 = 64 Blue Root Vectors correspond to the 8 position dimensions of Kaluza-Klein Spacetime and the corresponding 8 dual momentum dimensions.



63 of the 8x8 = 64 Blue Root Vectors correspond to
the 63 dimensions of the SL(8) Lie Algebra that is the subalgebra of E8
to which E8 contracts in its maximal contraction

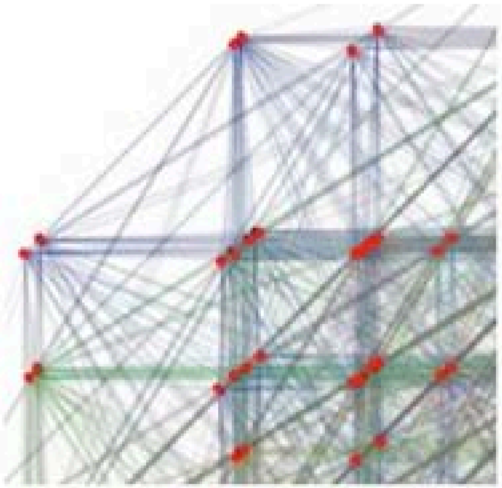
E8 -> SL(8) + h_92

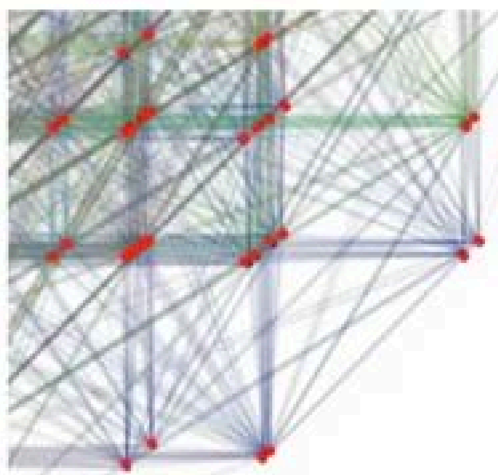
where h_92 is a 185-dimensional Heisenberg Lie Algebra
for 92 sets of creation-annililation operators:

64 Fermion Particle Creators + 64 Fermion AntiParticle Creators
28 Gravity Boson Creators + 28 Standard Model Boson Creators.

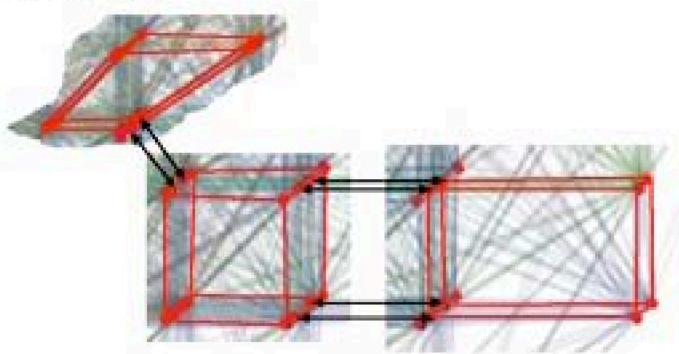
The 64th Blue Root Vector corresponds to the 1 central element of h_92.

The 8x8 = 64 Red Root Vectors correspond to the 8 covariant components of the 8 fundamental (First-Generation) Fermion Particles

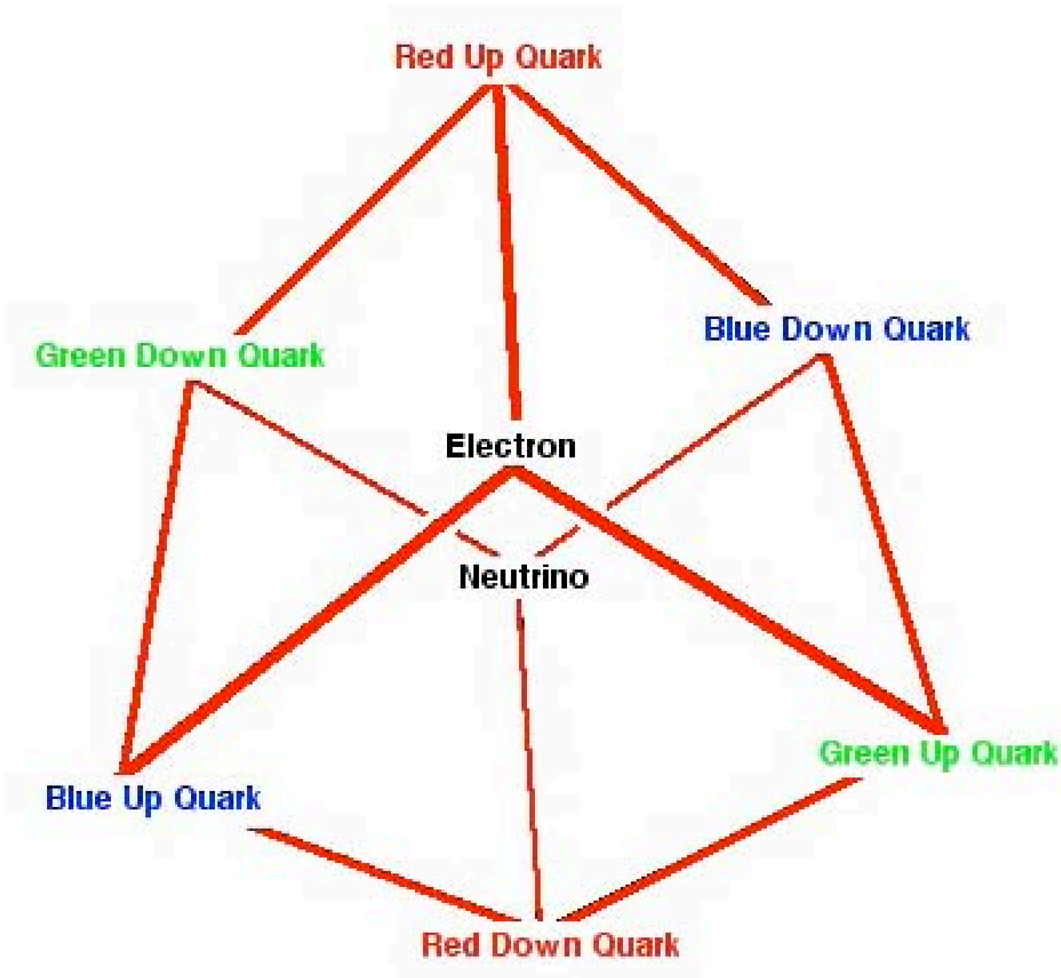




Each subset of 32 is geometrically equivalent to 4 cubes. Here is a diagram of how some of the cubes fit together:

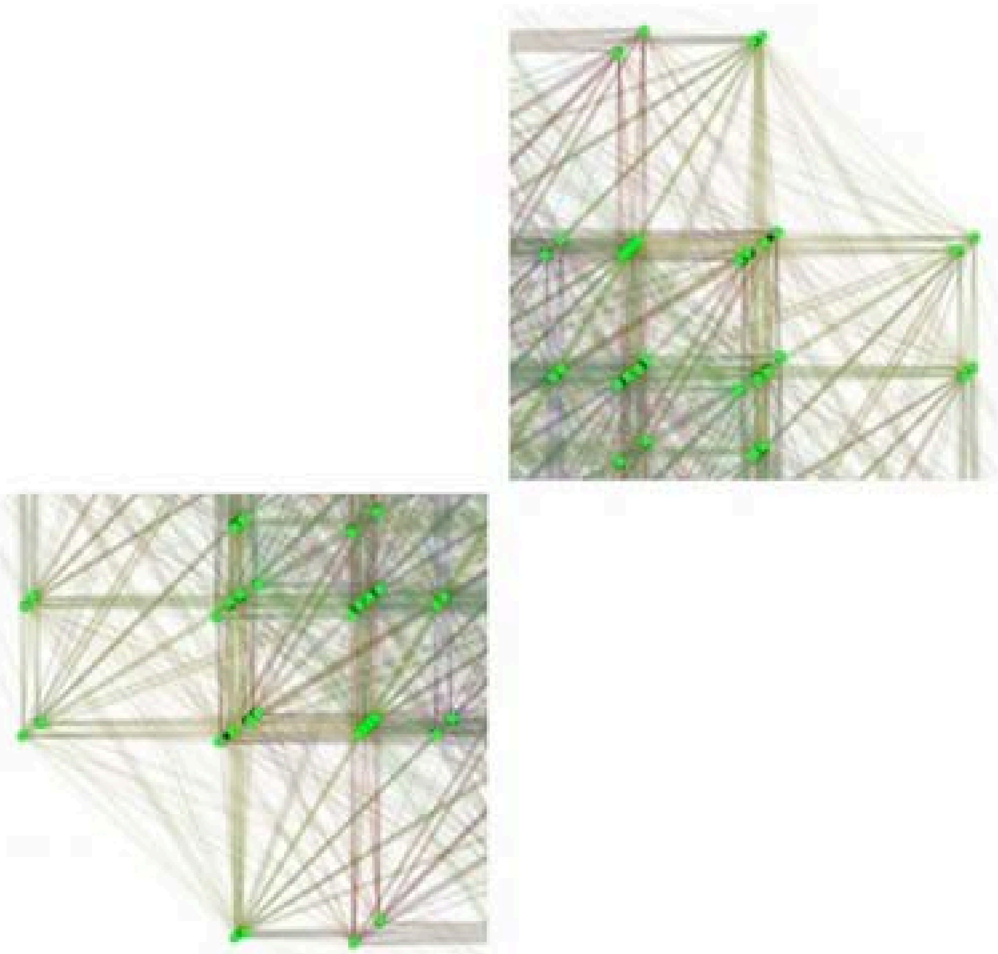


Each cube represents a set of 8 fundamental Fermion Particles:

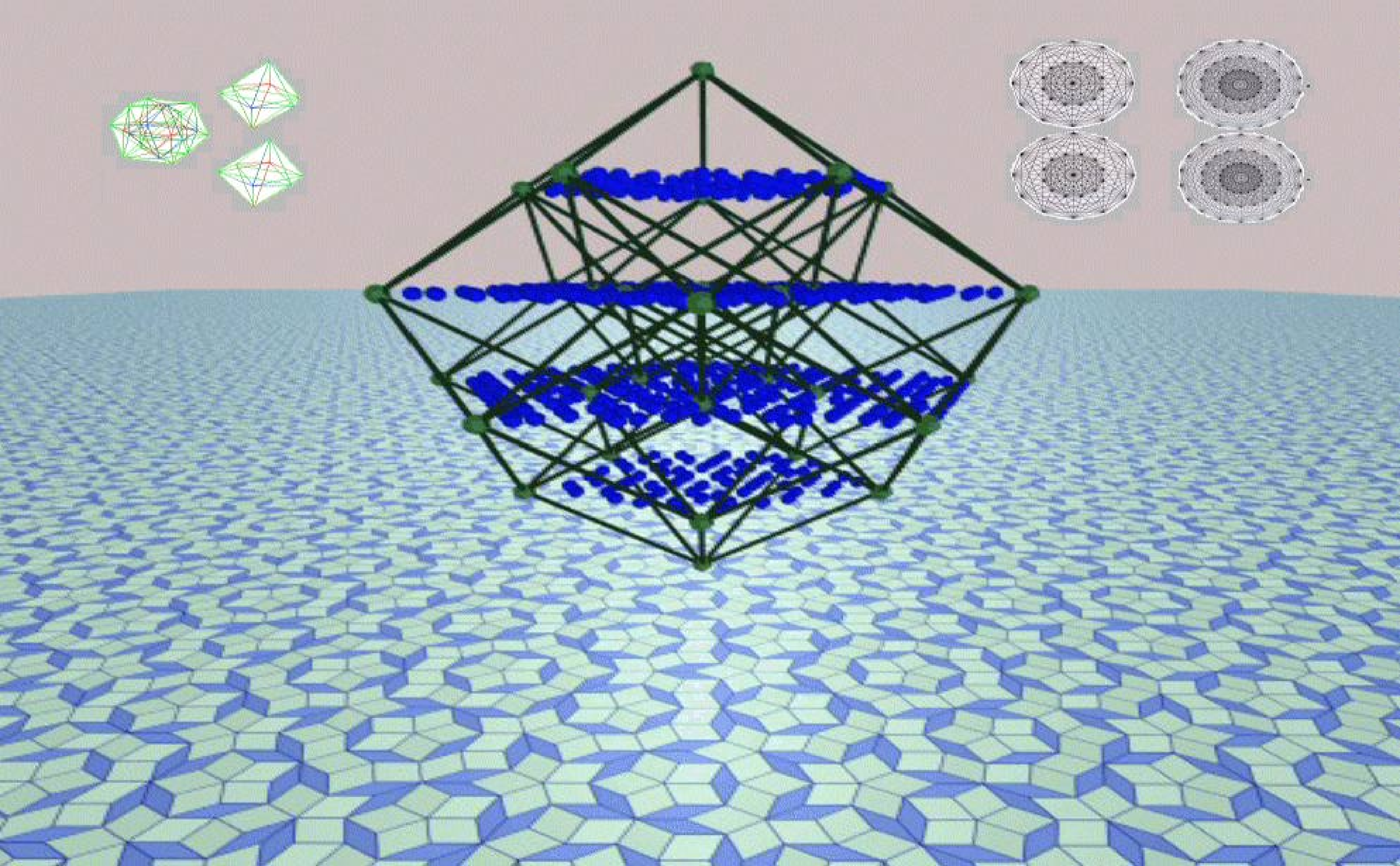


There are 4+4 = 8 cubes, so each cube corresponds to one of the 8 covariant components of its set of 8 fundamental Fermion Particles.

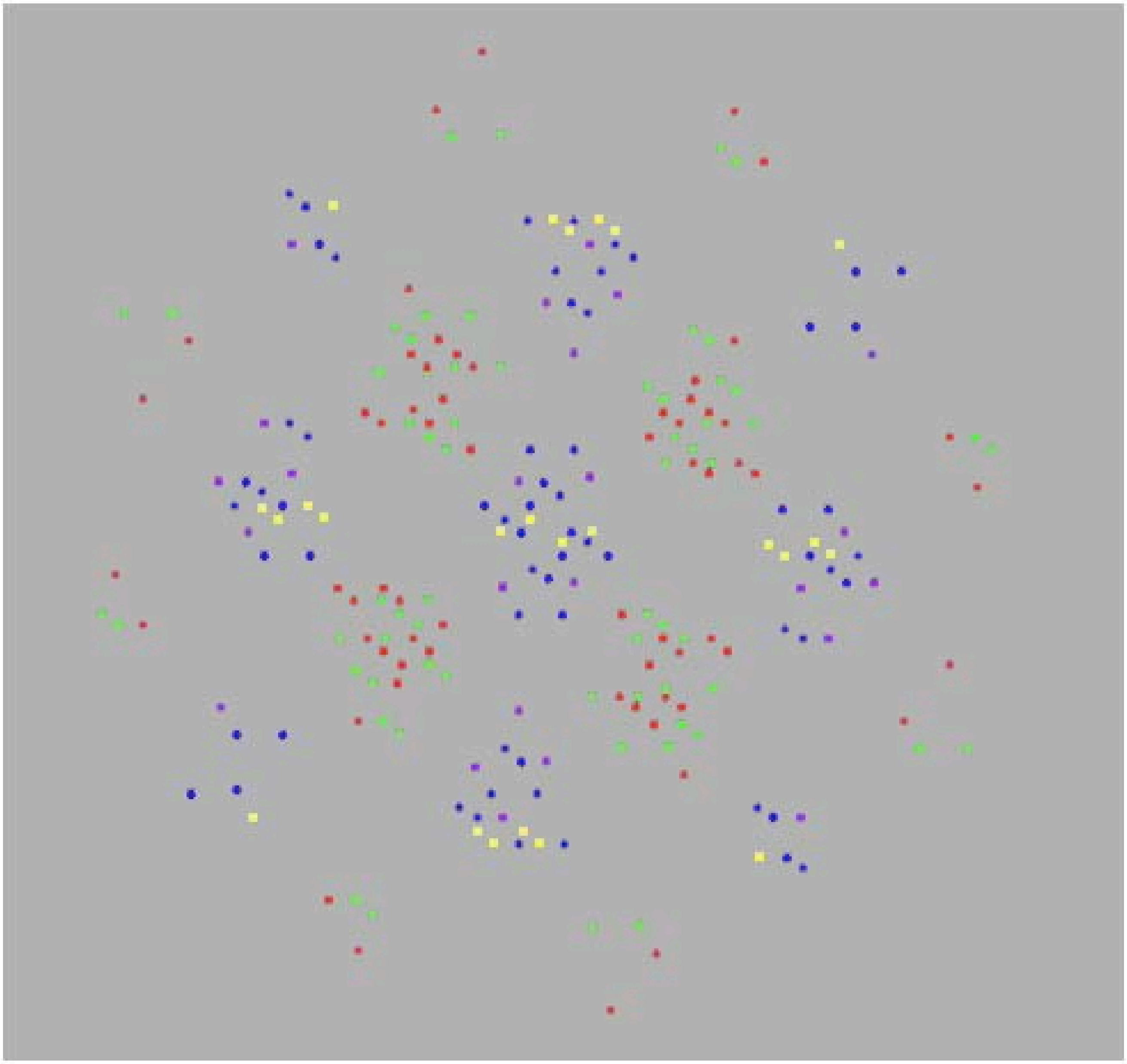
The 8x8 = 64 Green Root Vectors correspond to the 8 covariant components of the 8 fundamental (First-Generation) Fermion AntiParticles



The geometry of the representation of Fermion AntiParticles by the 32+32 = 64 Root Vectors corresponds to that of Fermion Particles described on the preceding two pages.



The 240 root vectors of my E8 physics model can also be projected as in this image made using a root vector rotation web applet by Carl Brannen



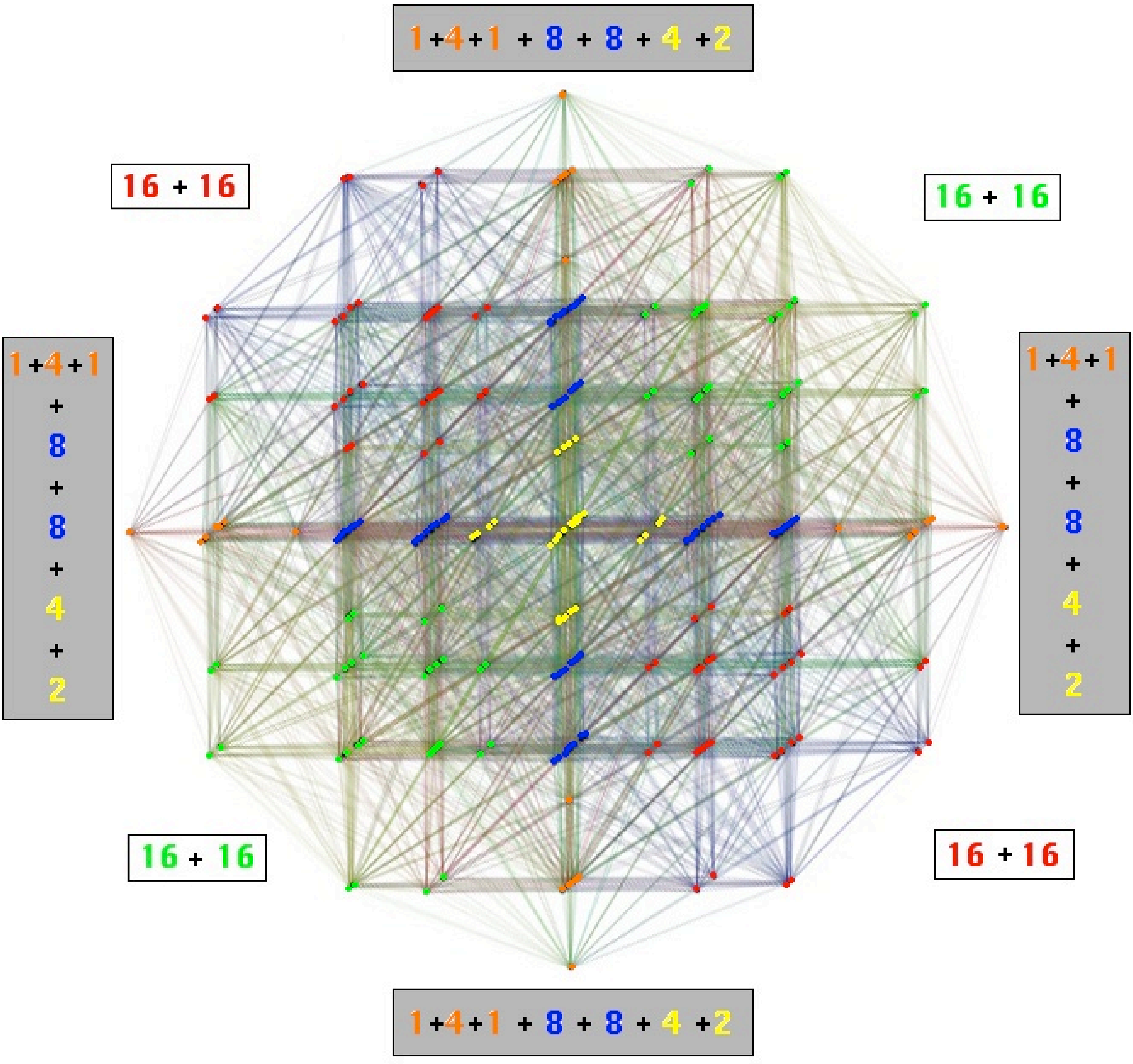
Note that the points are grouped (roughly from left to right) in red-green sets (RG) and blue-purple-yellow sets (BPY) as

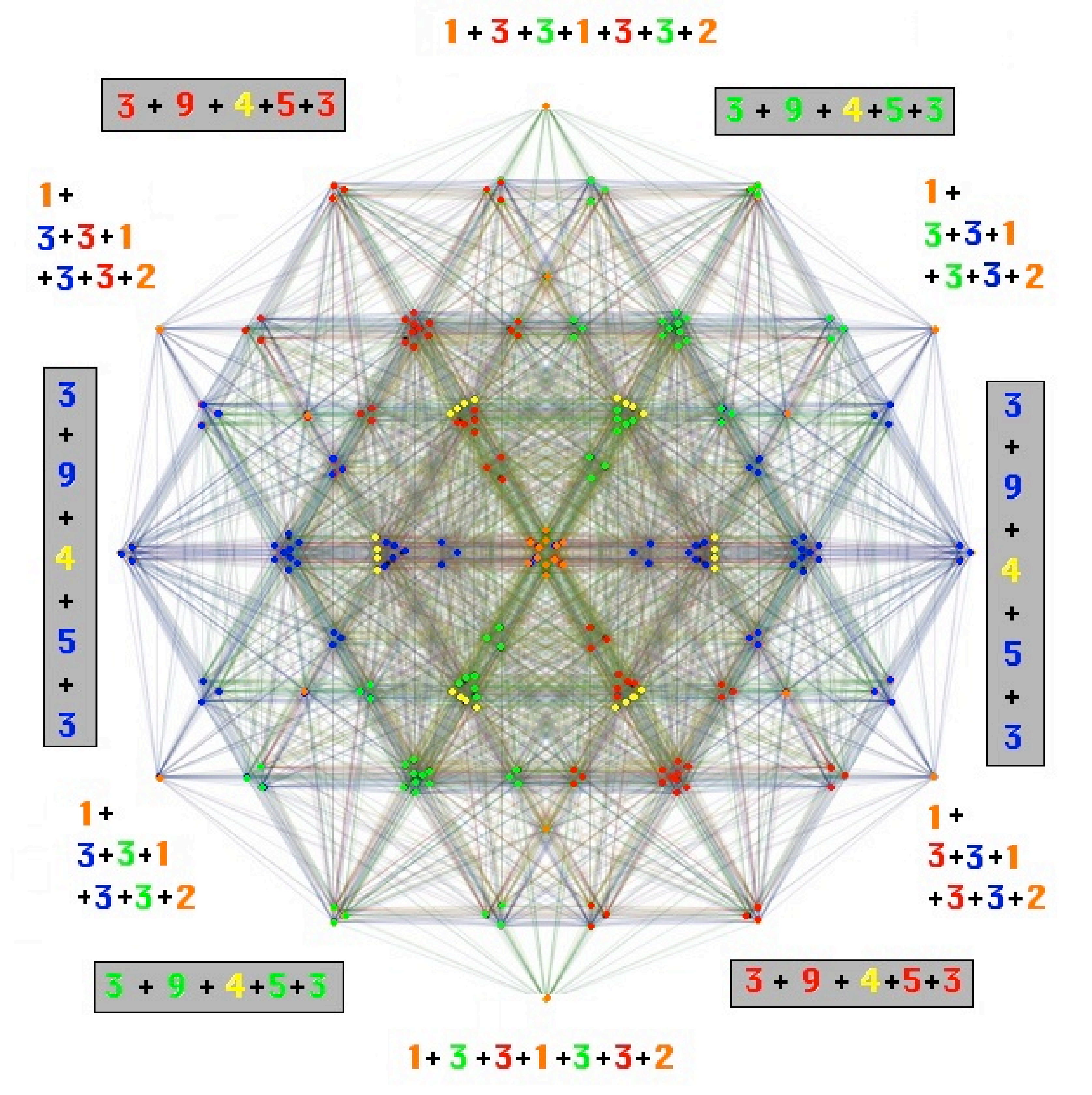
8 RG + 28 BPY + 56 RG + 56 BPY + 56 RG + 28 BPY + 8 RG

that, if you add 8 Cartan elements of E8 to the central 56 blue-purple-green, you get a representation of a 7-grading of E8 described by Tomas Larsson when he said in a post to the spr thread Re: Structures preserved by e_8 : "... e_8 also seems to admit a 7-grading,

g = g_-3 + g_-2 + g_-1 + g_0 + g_1 + g_2 + g_3

[Note that g_0 = 8+56 = 64 = U(8) is in Spin(16) = U(8) plus D4 plus D4]

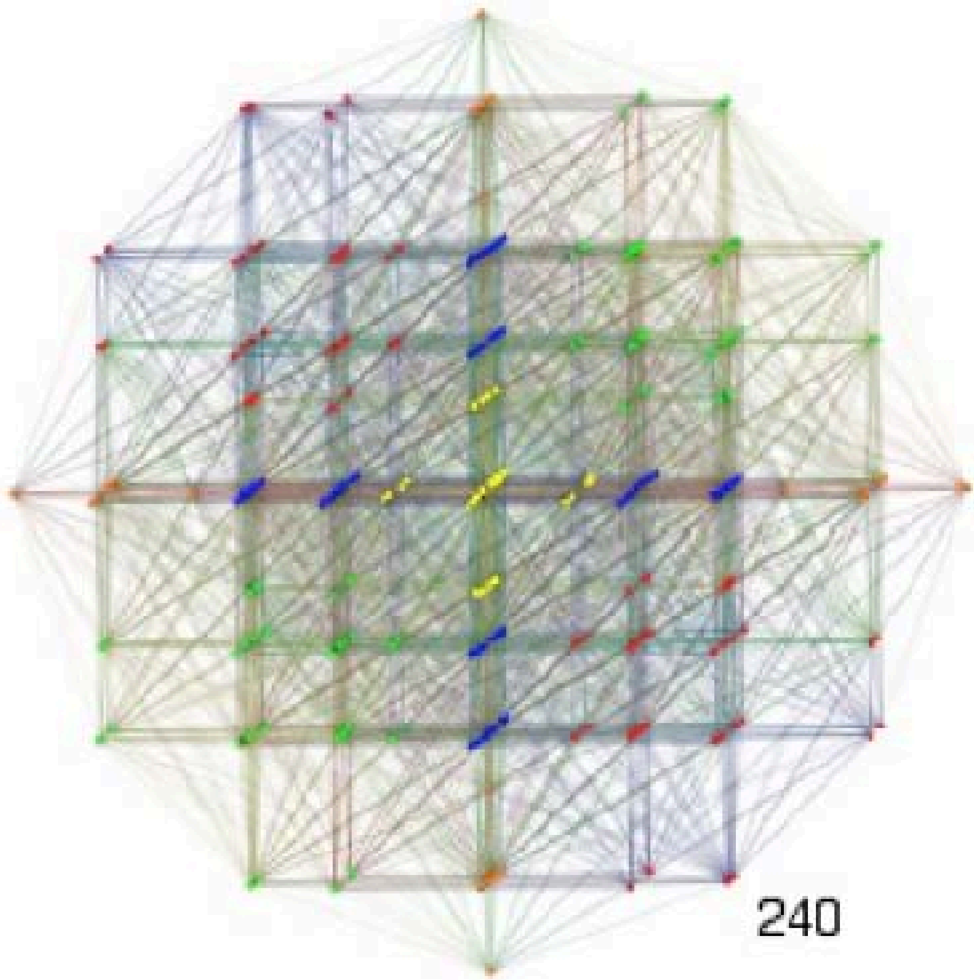

1+4+1 + 8 + 8 + 4 +2
16 + 16
16 + 16
1+4+1 + 8 + 8 + 4 + 2
1+4+1 + 8 + 8 + 4 + 2
16 + 16
16 + 16
1+4+1 + 8 + 8 + 4 +2



1 + 3 + 3 + 1 + 3 + 3 + 2
3 + 9 + 4 + 5 + 3
3 + 9 + 4 + 5 + 3
1 + 3 + 3 + 1 + 3 + 3 + 2
1 + 3 + 3 + 1 + 3 + 3 + 2
3 + 9 + 4 + 5 + 3
3 + 9 + 4 + 5 + 3
1 + 3 + 3 + 1 + 3 + 3 + 2
1 + 3 + 3 + 1 + 3 + 3 + 2
3 + 9 + 4 + 5 + 3
3 + 9 + 4 + 5 + 3
1 + 3 + 3 + 1 + 3 + 3 + 2

E8 Root Vector Physical Interpretations

Here is an explicit enumeration of the E8 Root Vector vertices with coordinates for a specific E8 lattice and my physical interpretation of each with illustrations using a cube-type projection of the 240 E8 Root Vector vertices:



E8 248 generators: 240 Root Vectors + 8 in Cartan Subalgebra

220 generators are used to construct a CG + SM Lagrangian
CG = Conformal Gravity U(2,2)   SM = Standard Model SU(3)xU(2).

All 248 = 28 + 220 are used to construct a Quantum Heisenberg-type algebra that arises from the maximal contraction of E8:

E8 -> SL(8) + h_92

SL(8) is 63-dimensional and h_92 is 92+1+92 = 185-dimensional.
First 92: 64 fermion particle + 16 CG + 12 h92DualSM
Dual 92: 64 fermion antiparticle + 12 SM + 16 h92DualCG

can be constructed:

iE8 = (+/- 1 , +/- 1 , 0 , 0 , 0 , 0 , 0 , 0)
+ (+/- (1 + i) +/- j +/- k +/- e +/- ie +/- je +/- ke) / 2

jE8 = (+/- 1 , +/- 1 , 0 , 0 , 0 , 0 , 0 , 0)
+ (+/- (1 + j) +/- i +/- k +/- e +/- ie +/- je +/- ke) / 2

kE8 = (+/- 1 , +/- 1 , 0 , 0 , 0 , 0 , 0 , 0)
+ (+/- (1 + k) +/- i +/- j +/- e +/- ie +/- je +/- ke) / 2

eE8 = (+/- 1 , +/- 1 , 0 , 0 , 0 , 0 , 0 , 0)
+ (+/- (1 + e) +/- i +/- j +/- k + +/- ie +/- je +/- ke) / 2

ieE8 = (+/- 1 , +/- 1 , 0 , 0 , 0 , 0 , 0 , 0)
+ (+/- (1 + ie) +/- i +/- j +/- k +/- e +/- je +/- ke) / 2

jeE8 = (+/- 1 , +/- 1 , 0 , 0 , 0 , 0 , 0 , 0)
+ (+/- (1 + je) +/- i +/- j +/- k +/- e +/- ie +/- ke) / 2

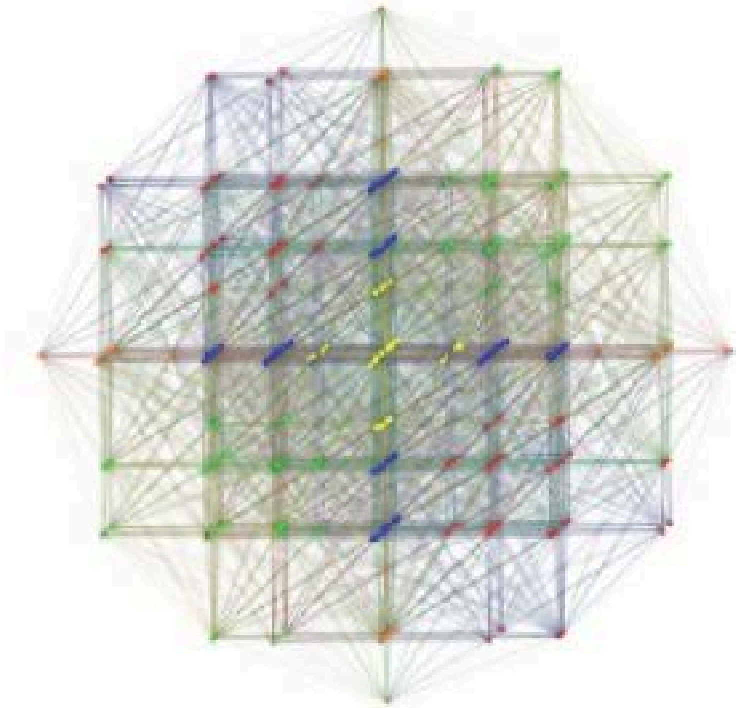
keE8 = (+/- 1 , +/- 1 , 0 , 0 , 0 , 0 , 0 , 0)
+ (+/- (1 + ke) +/- i +/- j +/- k +/- e +/- ie +/- je) / 2

As Conway and Sloane say in "Sphere Packings, Lattices and Groups"
(Third Edition Springer
"... when n = 8 ... we can slide another copy of Dn in between the points of Dn ...
Formally, we define Dn+ = Dn u ([1] + Dn
When n = 8 ... the lattice D8+ ...[is]... known as E8 ...".

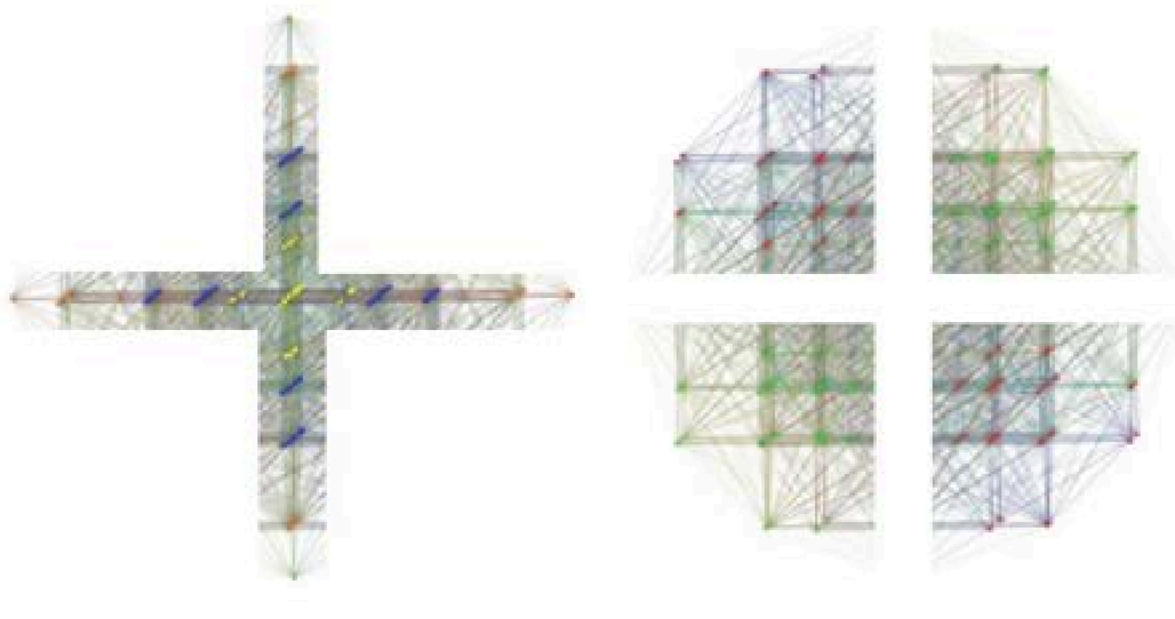
The D8 part of E8 contains the 112 D8 Root Vectors.
The 7 different E8 lattices correspond to 7 different ways to slide
the D8 half-spinor copy of D8 in between the points of the first D8
thus
producing 7 different E8 lattices each with a 112 + 128 = 240 Root Vector polytope.

Since Quasicrystal / Icosadodecahedron / Rhombic Triacontahedron structure is similar
for all the E8 lattices,
it can be discussed based only on the generic first-shell 240 Root Vector vertices
and
discussion of more detailed structure of the various E8 lattices is reserved to the
Appendix of this paper.

Quasicrystal / Icosadodecahedron / Rhombic Triacontahedron structure is similar for all the E8 lattices as it is based on the 240 vertices



that can be described as the **First Shell of an E8 Lattice**
which is made up of **112 D8 Root Vectors** plus **128 D8 half-spinor vertices**:



In "Regular and Semi-Regular Polytopes III" Coxeter describes that shell as

"... The eight-dimensional polytope 4_21 ... in which the 240 vertices are distributed in 8 concentric tricontagons {30} ...

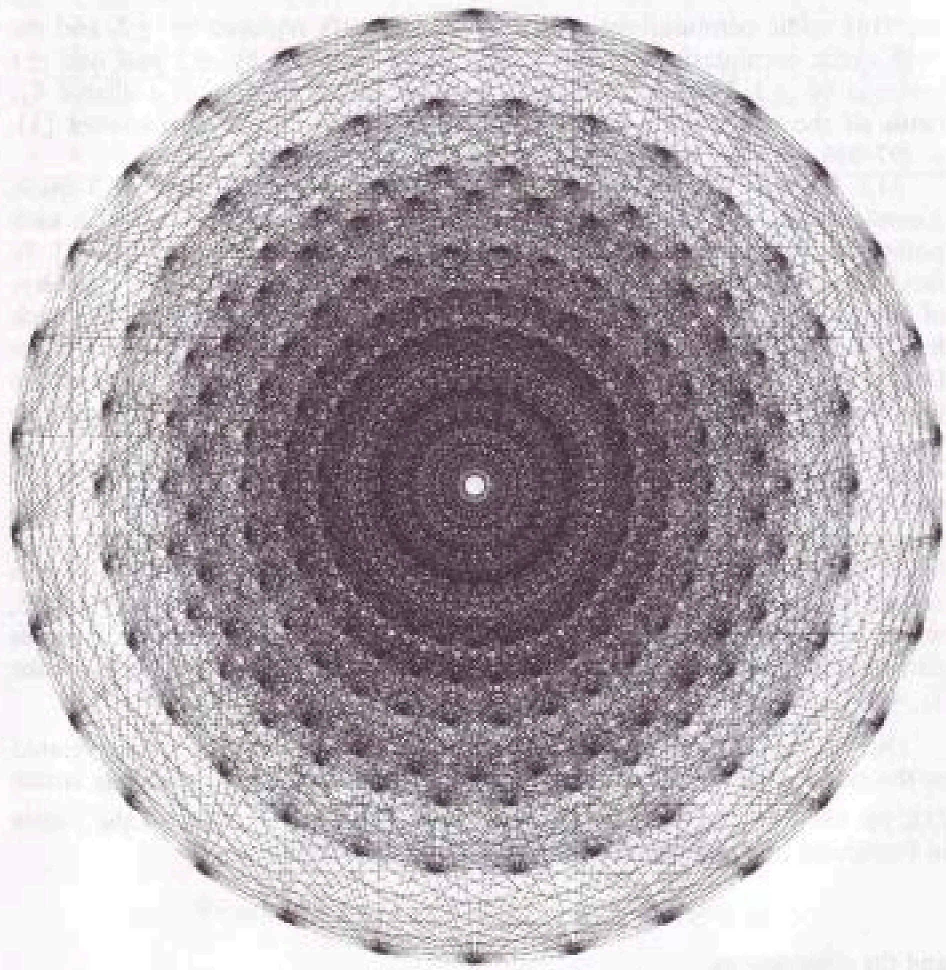
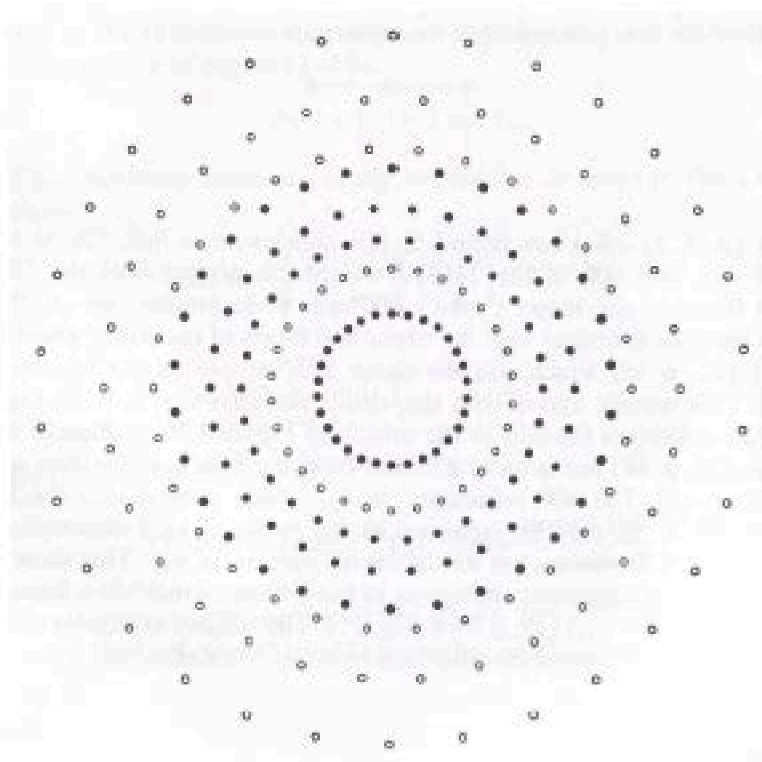


Fig. 3.8e. The eight-dimensional polytope 4_{21}

... The 120+120 vertices of the polytope 4_21 ...



...[are]... the 120+120 jvertices of two homothetic 600-cells {3,3,5}:

one having the coordinates ...[with T being the Golden Ratio]...

the even permutations of (+/- T , +/- 1 , +/- T^(-1) , 0) ,

the permutations of (+/- 2 , 0 , 0 , 0) ,

and (+/- 1 , +/- 1 , +/- 1 , +/- 1)

...[a total of 8x(1/2)x4! + 2x4 + 16x1 = 96+8+16 = 120]...

... while
the other has these same coordinates multiplied by T ...".

One 600-cell represents half of the 240 E8 Root Vector vertices:

56 of D8 vertices =
(12 of D4 + 12 of D4) = 24 vertices from D4xD4 subalgebra of D8
plus
32 = 8x4 vertices from the coset space D8 / D4xD4.

64 of the D8 half-spinor vertices = 32 ++half-half-spinors + 32 --half-half-spinors.

Appendix - E8 Lattices

E8 Lattices are based on Octonions, which have 480 different multiplication products.
E8 Lattices can be combined to form 24-dimensional Leech Lattices and
26-dimensional Bosonic String Theory, which describes E8 Physics when the strings
are physically interpreted as World-Lines. A basic String Theory Cell has as its
automorphism group the Monster Group whose order is
2^46 .3^20 .5^9 .7^6 .11^2 .13^3 .17.19.23.29.31.41.47.59.71 = about 8 x 10^53.

For more about the Leech Lattice and the Monster and E8 Physics,
see viXra 1210.0072 and 1108.0027 .

E8 Root systems and lattices are discussed by Robert A. Wilson in his 2009 paper
"Octonions and the Leech lattice":
"... The (real) octonion algebra is an 8-dimensional (non-division) algebra with an
orthonomal basis { 1=ioo , i0 , i1 , i2 , i3 , i4 , i5 , i6 } labeled
by the projective line PL(7) = { oo } u F7
...
The E8 root system embeds in this algebra ... take the 240 roots to be ...
112 octonions ... +/- it +/- iu for any distinct t,u
... and ...
128 octonions (1/2)(+/- 1 +/- i0 +/- ... +/- i6) ...[with]... an odd number of minus signs.
Denote by L the lattice spanned by these 240 octonions
...
Let s = (1/2)(- 1 + i0 + ... + i6) so s is in L ... write R for Lbar ...
...
(1/2) (1 + i0) L = (1/2) R (1 + i0) is closed under multiplication ... Denote this ...by A
... Writing **B = (1/2) (1 + i0) A (1 + i0)** ...from ... Moufang laws ... we have
L R = 2 B , and ... B L = L and R B = R ...[also]... 2 B = L sbar
...
the roots of B are
[**16 octonions**]... +/- it for t in PL(7)
... together with
[**112 octonions**]... (1/2) (+/- 1 +/- it +/- i(t+1) +/- i(t+3)) ...for t in F7
... and ...
[**112 octonions**]... (1/2) (+/- i(t+2) +/- i(t+4) +/- i(t+5) +/- i(t+6)) ...for t in F7
...
B is not closed under multiplication ... Kirmse's mistake
...[but]... as Coxeter ... pointed out ...
... **there are seven non-associative rings At** = (1/2) (1 + it) B (1 + it) ,
obtained from B by swapping 1 with it ... for t in F7
...
LR = 2B and BL = L ...[which]... appear[s] not to have been noticed before ... some
work ... by Geoffrey Dixon ...".

Geoffrey Dixon says in his book "Division Algebras, Lattices, Physics, Windmill Tilting" using notation {e0,e1,e2,e3,e4,e5,e6,e7} for the Octonion basis elements that Robert A. Wilson denotes by {1=ioo,i0,i1,i2,i3,i4,i5 ,i6} and I sometimes denote by {1,i,j,k,e,ie,je,ke}: "...

$$
\begin{aligned}
\Xi_0 = &\quad \{\pm e_a\}, \\
\Xi_2 = &\quad \{(\pm e_a \pm e_b \pm e_c \pm e_d)/2 : a, b, c, d \text{ distinct}, \\
&\quad e_a(e_b(e_c e_d)) = \pm 1\},
\end{aligned}
$$

$$
\begin{aligned}
\Xi^{even} = &\quad \Xi_0 \cup \Xi_2, \\
\mathcal{E}_8^{even} = &\quad \text{span}\{\Xi^{even}\},
\end{aligned}
$$

$$
\begin{aligned}
\Xi_1 = &\quad \{(\pm e_a \pm e_b)/\sqrt{2} : a, b \text{ distinct}\}, \\
\Xi_3 = &\quad \{(\textstyle\sum_{a=0}^{7} \pm e_a)/\sqrt{8} : \text{ even number of +'s}\},
\end{aligned}
$$

$$
\begin{aligned}
\Xi^{odd} = &\quad \Xi_1 \cup \Xi_3, \\
\mathcal{E}_8^{odd} = &\quad \text{span}\{\Xi^{odd}\}
\end{aligned}
$$

(spans over integers)
Ξeven has 16+224 = 240 elements ... Ξodd has 112+128 = 240 elements ...
E8even does not close with respect to our given octonion multiplication
...[but]...
the set Ξeven[0-a], derived from Ξeven by replacing each occurrence of e0 ... with ea, and vice versa, is multiplicatively closed. ...".

Geoffrey Dixon's Ξeven corresponds to Wilson's B which I denote as 1E8.

Geoffrey Dixon's Ξeven[0-a] correspond to Wilson's seven At
which I denote as iE8, jE8, kE8, eE8, ieE8, jeE8, keE8.

Geoffrey Dixon's Ξodd corresponds to Wilson's L.

My view is that **the E8 domains 1E8 = Ξeven = B is fundamental**
because
E8 domains iE8, jE8, kE8, eE8, ieE8, jeE8, keE = Ξeven[0-a] are derived from 1E8
and L and L s are also derived from 1E8 = Ξeven = B.

Using the notation {1,i,j,k,e,ie,je,ke} for Octonion basis
notice that in E8 Physics introduction of Quaternionic substructure
to produce (4+4)-dim M4 x CP2 Kaluza-Klein SpaceTime
requires breaking Octonionic light-cone elements
(+/- 1 +/- i +/- j +/- k +/- e +/- ie +/- je +/- ke) / 2
into Quaternionic 4-term forms like (+/- A +/- B +/- C +/- D) / 2.

To do that, consider that there are (8l4) = 70 ways to choose 4-term subsets
of the 8 Octonionic basis element terms. Using all of them produces
224 4-term subsets in each of the 7 Octonion Imaginary E8 lattices
iE8,jE8,kE8,eE8,ieE8,jeE8,keE8 each of which also has 16 1-term first-shell vertices.

56 of the 70 4-term subsets appear as 8 in each of the 7 Octonion Imaginary E8 lattices.

The other 70-56 = 14 4-term subsets occur in sets of 3 among 7x6 = 42 4-term subsets
as indicated in the following detailed list of the 7 Octonion Imaginary E8 lattices:

eE8:

```
112 of D8 Root Vectors
16 appear in all 7 of iE8,jE8,kE8,eE8,ieE8,jeE8,keE8
±1, ±i, ±j, ±k, ±e, ±ie, ±je, ±ke
96 appear in 3 of iE8,jE8,kE8,eE8,ieE8,jeE8,keE8
(±1  ±ke ±e  ±k )/2     (±i  ±j  ±ie ±je)/2     kE8  , eE8  , keE8
(±1  ±je ±j  ±e )/2     (±ie ±ke ±k  ±i )/2     jE8  , eE8  , jeE8
(±1  ±e  ±ie ±i )/2     (±ke ±k  ±je ±j )/2     iE8  , eE8  , ieE8

128 of D8 half-spinors appear only in eE8
(±1  ±ie ±je ±ke)/2     (±e  ±i  ±j  ±k )/2
(±1  ±k  ±i  ±je)/2     (±j  ±ie ±ke ±e )/2
(±1  ±i  ±ke ±j )/2     (±k  ±je ±e  ±ie)/2
(±1  ±j  ±k  ±ie)/2     (±je ±e  ±i  ±ke)/2
```

iE8:

```
112 of D8 Root Vectors
16 appear in all 7 of iE8,jE8,kE8,eE8,ieE8,jeE8,keE8
±1, ±i, ±j, ±k, ±e, ±ie, ±je, ±ke
96 appear in 3 of iE8,jE8,kE8,eE8,ieE8,jeE8,keE8
(±1  ±ie ±i  ±e )/2     (±j  ±k  ±je ±ke)/2     iE8  , eE8  , ieE8
(±1  ±ke ±je ±i )/2     (±j  ±k  ±e  ±ie)/2     iE8  , jeE8 , keE8
(±1  ±i  ±k  ±j )/2     (±e  ±ie ±je ±ke)/2     iE8  , jE8  , kE8

128 of D8 half-spinors appear only in iE8
(±1  ±k  ±ke ±ie)/2     (±i  ±j  ±e  ±je)/2
(±1  ±e  ±j  ±ke)/2     (±i  ±k  ±ie ±je)/2
(±1  ±j  ±ie ±je)/2     (±i  ±k  ±e  ±ke)/2
(±1  ±je ±e  ±k )/2     (±i  ±j  ±ie ±ke)/2
```

jE8:

```
112 of D8 Root Vectors
16 appear in all 7 of iE8,jE8,kE8,eE8,ieE8,jeE8,keE8
±1, ±i, ±j, ±k, ±e, ±ie, ±je, ±ke
96 appear in 3 of iE8,jE8,kE8,eE8,ieE8,jeE8,keE8
(±1  ±k  ±j  ±i )/2     (±e  ±ie ±je ±ke)/2     iE8  , jE8  , kE8
(±1  ±ie ±ke ±j )/2     (±i  ±k  ±e  ±je)/2     jE8  , ieE8 , keE8
(±1  ±j  ±e  ±je)/2     (±i  ±k  ±ie ±ke)/2     jE8  , eE8  , jeE8

128 of D8 half-spinors appear only in jE8
(±1  ±e  ±ie ±k )/2     (±i  ±j  ±je ±ke)/2
(±1  ±i  ±je ±ie)/2     (±j  ±k  ±e  ±ke)/2
(±1  ±je ±k  ±ke)/2     (±i  ±j  ±e  ±ie)/2
(±1  ±ke ±i  ±e )/2     (±j  ±k  ±ie ±je)/2
```

kE8:

```
112 of D8 Root Vectors
16 appear in all 7 of iE8,jE8,kE8,eE8,ieE8,jeE8,keE8
±1, ±i, ±j, ±k, ±e, ±ie, ±je, ±ke
96 appear in 3 of iE8,jE8,kE8,eE8,ieE8,jeE8,keE8
(±1  ±je ±k  ±ie)/2     (±i  ±j  ±e  ±ke)/2     kE8  , ieE8 , jeE8
(±1  ±j  ±i  ±k )/2     (±e  ±ie ±je ±ke)/2     iE8  , jE8  , kE8
(±1  ±k  ±ke ±e )/2     (±i  ±j  ±ie ±je)/2     kE8  , eE8  , keE8

128 of D8 half-spinors appear only in kE8
(±1  ±ke ±j  ±je)/2     (±i  ±k  ±e  ±ie)/2
(±1  ±ie ±e  ±j )/2     (±i  ±k  ±je ±ke)/2
(±1  ±e  ±je ±i )/2     (±j  ±k  ±ie ±ke)/2
(±1  ±i  ±ie ±ke)/2     (±j  ±k  ±e  ±je)/2
```

ieE8:

```
112 of D8 Root Vectors
16 appear in all 7 of iE8,jE8,kE8,eE8,ieE8,jeE8,keE8
±1, ±i, ±j, ±k, ±e, ±ie, ±je, ±ke
96 appear in 3 of iE8,jE8,kE8,eE8,ieE8,jeE8,keE8
(±1  ±j  ±ie ±ke)/2     (±i  ±k  ±e  ±je)/2     jE8  , ieE8 , keE8
(±1  ±i  ±e  ±ie)/2     (±j  ±k  ±je ±ke)/2     iE8  , eE8  , ieE8
(±1  ±ie ±je ±k )/2     (±i  ±j  ±e  ±ke)/2     kE8  , ieE8 , jeE8

128 of D8 half-spinors appear only in ieE8
(±1  ±je ±i  ±j )/2     (±k  ±e  ±ie ±ke)/2
(±1  ±ke ±k  ±i )/2     (±j  ±e  ±ie ±je)/2
(±1  ±k  ±j  ±e )/2     (±i  ±ie ±je ±ke)/2
(±1  ±e  ±ke ±je)/2     (±i  ±j  ±k  ±ie)/2
```

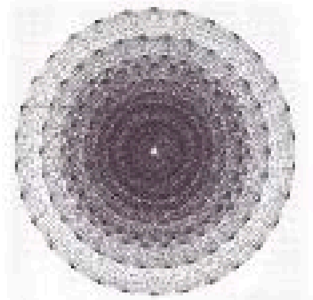
jeE8:

```
112 of D8 Root Vectors
16 appear in all 7 of iE8,jE8,kE8,eE8,ieE8,jeE8,keE8
±1, ±i, ±j, ±k, ±e, ±ie, ±je, ±ke
96 appear in 3 of iE8,jE8,kE8,eE8,ieE8,jeE8,keE8
(±1  ±e  ±je ±j )/2     (±i  ±k  ±ie ±ke)/2     jE8  , eE8  , jeE8
(±1  ±k  ±ie ±je)/2     (±i  ±j  ±e  ±ie)/2     kE8  , ieE8 , jeE8
(±1  ±je ±i  ±ke)/2     (±j  ±k  ±e  ±ie)/2     iE8  , jeE8 , keE8

128 of D8 half-spinors appear only in jeE8
(±1  ±i  ±k  ±e )/2     (±j  ±ie ±je ±ke)/2
(±1  ±j  ±ke ±k )/2     (±i  ±e  ±ie ±je)/2
(±1  ±ke ±e  ±ie)/2     (±i  ±j  ±k  ±je)/2
(±1  ±ie ±j  ±i )/2     (±k  ±e  ±je ±ke)/2
```

keE8:

```
112 of D8 Root Vectors
16 appear in all 7 of iE8,jE8,kE8,eE8,ieE8,jeE8,keE8
±1, ±i, ±j, ±k, ±e, ±ie, ±je, ±ke
96 appear in 3 of iE8,jE8,kE8,eE8,ieE8,jeE8,keE8
(±1  ±i  ±ke ±je)/2     (±j  ±k  ±e  ±ie)/2     iE8  , jeE8 , keE8
(±1  ±e  ±k  ±ke)/2     (±i  ±j  ±ie ±je)/2     kE8  , eE8  , keE8
(±1  ±ke ±j  ±ie)/2     (±i  ±k  ±e  ±je)/2     jE8  , ieE8 , keE8

128 of D8 half-spinors appear only in keE8
(±1  ±j  ±e  ±i )/2     (±k  ±ie ±je ±ke)/2
(±1  ±je ±ie ±e )/2     (±i  ±j  ±k  ±ke)/2
(±1  ±ie ±i  ±k )/2     (±j  ±e  ±je ±ke)/2
(±1  ±k  je  ±j )/2     (±i  ±e  ±ie ±ke)/2
```

Coxeter said in "Integral Cayley Numbers" (Duke Math. J. 13 (1946) 561-578 and
in "Regular and Semi-Regular Polytopes III" (Math. Z. 200 (1988) 3-45):
"... the 240 integral Cayley numbers of norm1 ... are the vertices of 4_21



... ...

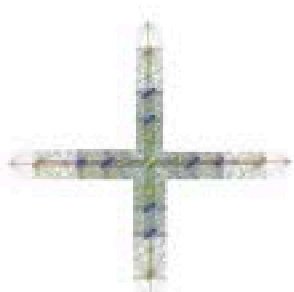
The polytope 4_21 ... has cells of two kinds ...
a seven-dimensional "cross polytope" (or octahedron-analogue) B_7
... there are ... 2160 B_7's ...
and ...
a seven-dimensional regular simplex A_7
... there are 17280 A_7's
...
the 2160 integral Cayley numbers of norm 2 are
the centers of the 2160 B_7's of a 4_21 of edge 2
...
the 17280 integral Cayley numbers of norm 4 (other than the doubles
of those of norm 1) are the centers of the 17280 A_7's of a 4_21 of edge 8/3 ...

[Using notation of {a1,a2,a3,a4,a5,a6,a7,a8} for Octonion basis elements we have]

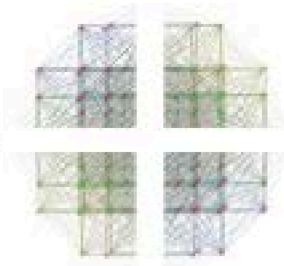
norm 1

112 like (+/- a1 +/- a2)
[which correspond to 112 = 16 + 96 = 16 + 6x16 in each of the 7 E8 lattices]

128 like (1/2) (- a1 + a2 + a3 + ... + a8) with an odd number of minus signs
[which correspond to 128 = 8x16 in each of the 7 E8 lattices]



112



128

norm 2

16 like +/- 2 a1
[which correspond to 16 fo the 112 in each of the 7 E8 lattices]

1120 like +/- a1 +/- a2 +/- a3 +/- a4
[which correspond to 70x16 = (56+14)x16 that appear in the 7 E8 lattices

with each of the 14 appearing in three of the 7 E8 lattices so that
the 14 account for (14/7)x3x16 = 6x16 = 96 in each of the 7 E8 lattices
and for 14x16 = **224 of the 1120**
and
with each of the 56 appearing in only one of the 7 E8 lattices so that
the 56 account for (56/7)x16 = 128 in each of the 7 E8 lattices
and for 56x16 = **896 = 7x128 of the 1120**]

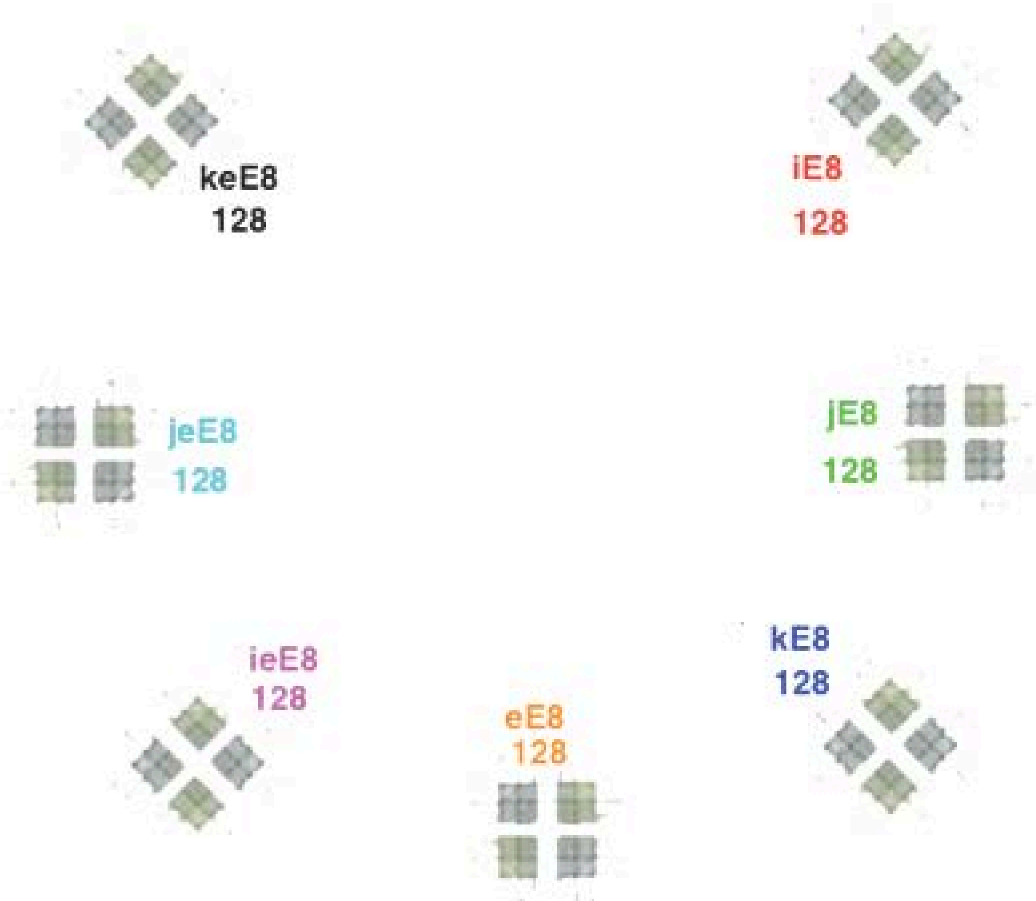
1024 like (1/2)(3a1 + 3a2 + a3 + a4 + ... + a8) with an even number of minus signs
[which correspond to **8x128** = 8 copies of the 128-dim Mirror D8 half-spinors that
are not used in the 7 E8 lattices. ...] ...".

One of the 128-dimensional Mirror D8 half-spinors from the 1024
combines with
the 128 from the 1120 corresponding to the one of the 7 E8 lattices that corresponds
to the central norm 1 240 = 112+128
and
the result is formation of a 128+128 = 256 corresponding to the Clifford Algebra Cl(8)
so that
the norm 2 second layer contains 7 copies of 256-dimensional Cl(8)

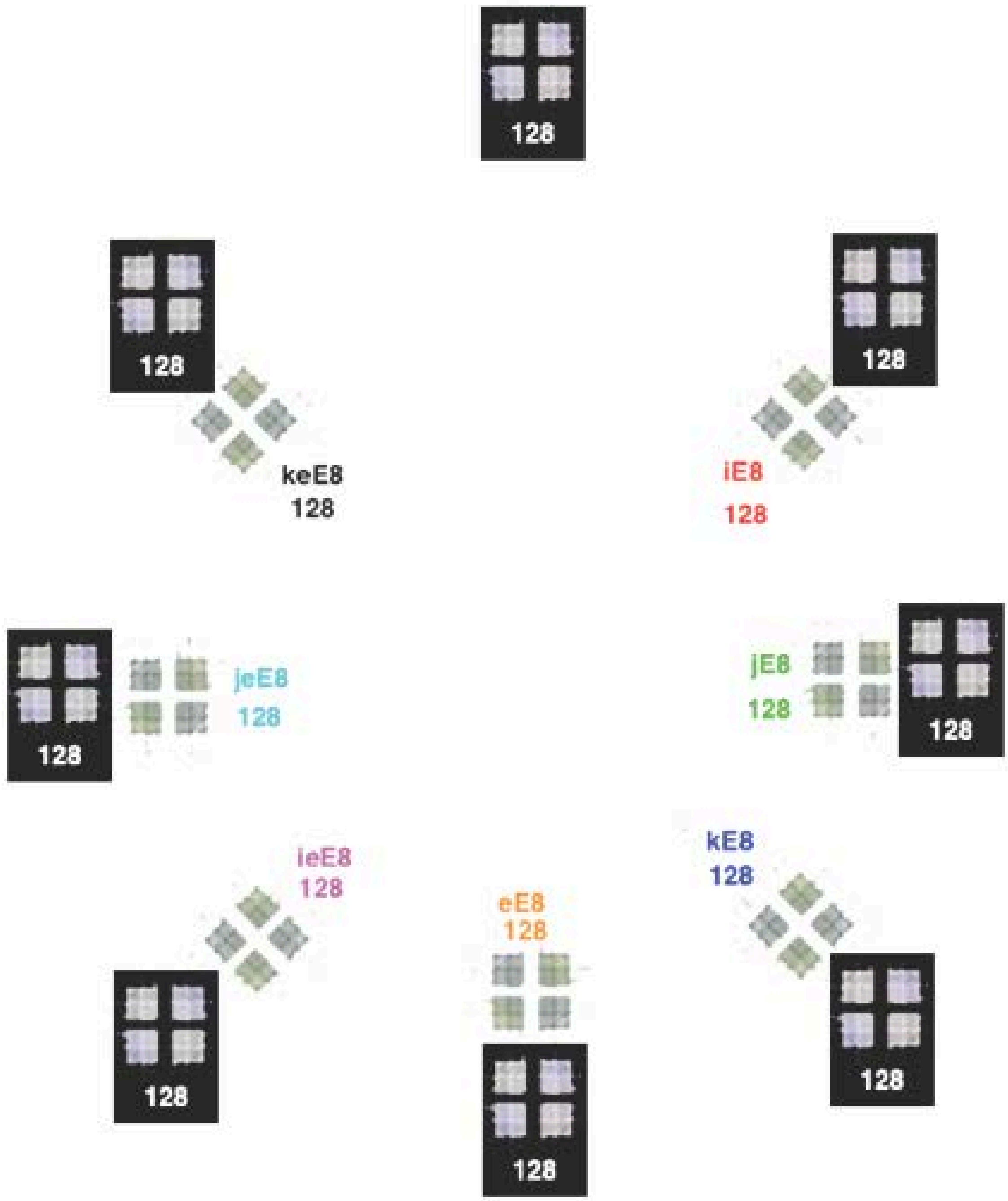
so the 2160 norm 2 vertices can be seen as

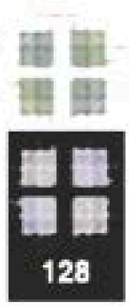
7(128+128) + 128 + 16 + 224 = 2160 vertices.

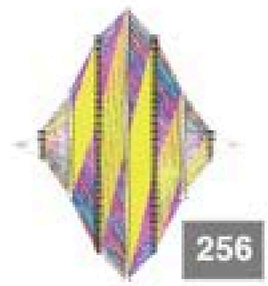
7x128 from the 1120 are the D8 half-spinor vertices
of iE8, jE8, kE8, eE8, ieE8, jeE8, keE8



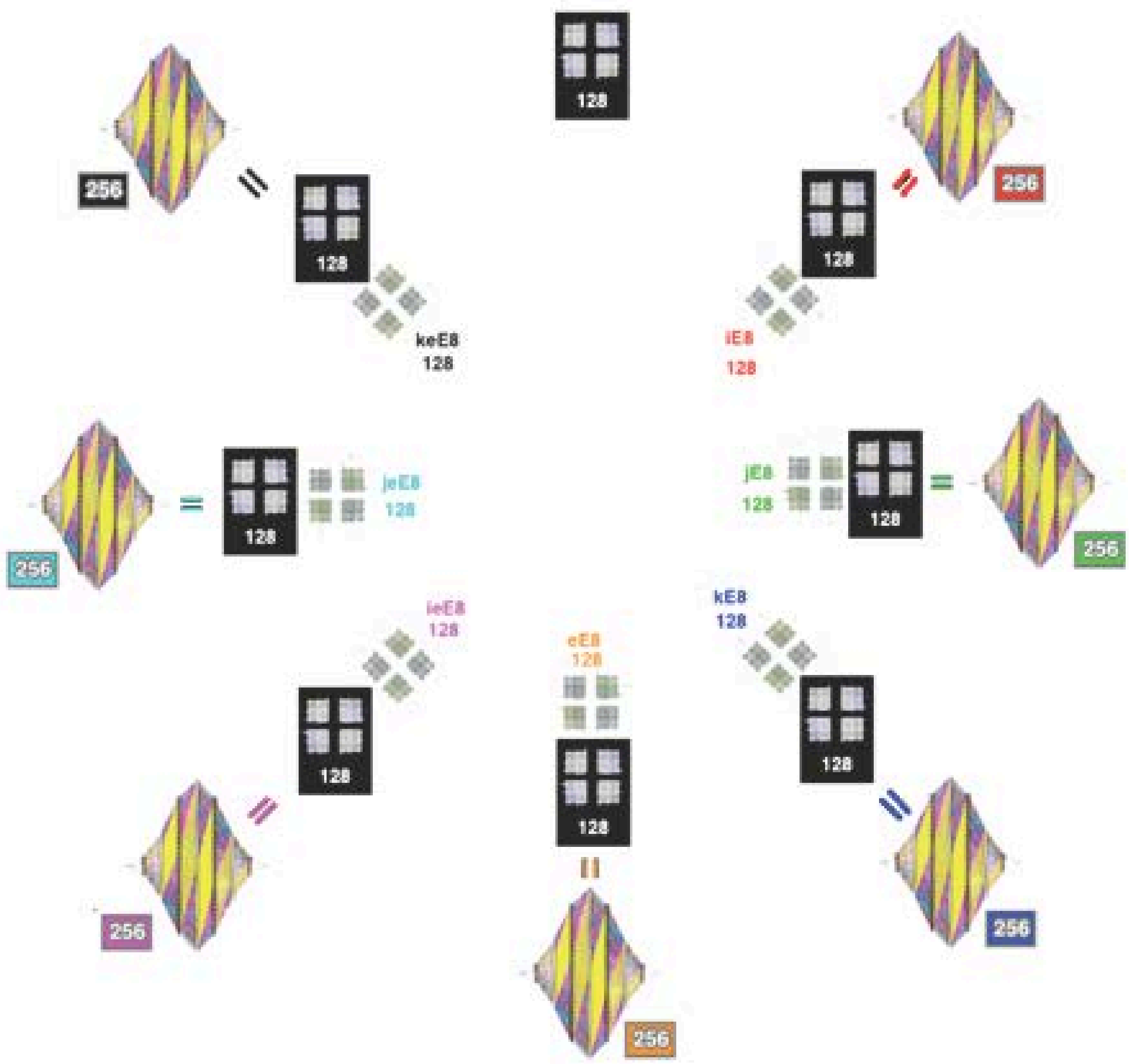
7x128 from the 1024 are Mirror D8 half-spinors that are not vertices of the 7 Imaginary E8 lattices iE8, jE8, kE8, eE8, ieE8, jeE8, keE8.
The 8th 128 is a Mirror D8 half-spinor, also not in the 7 Imaginary E8 lattices.



Each of the 7 pairs of 128 

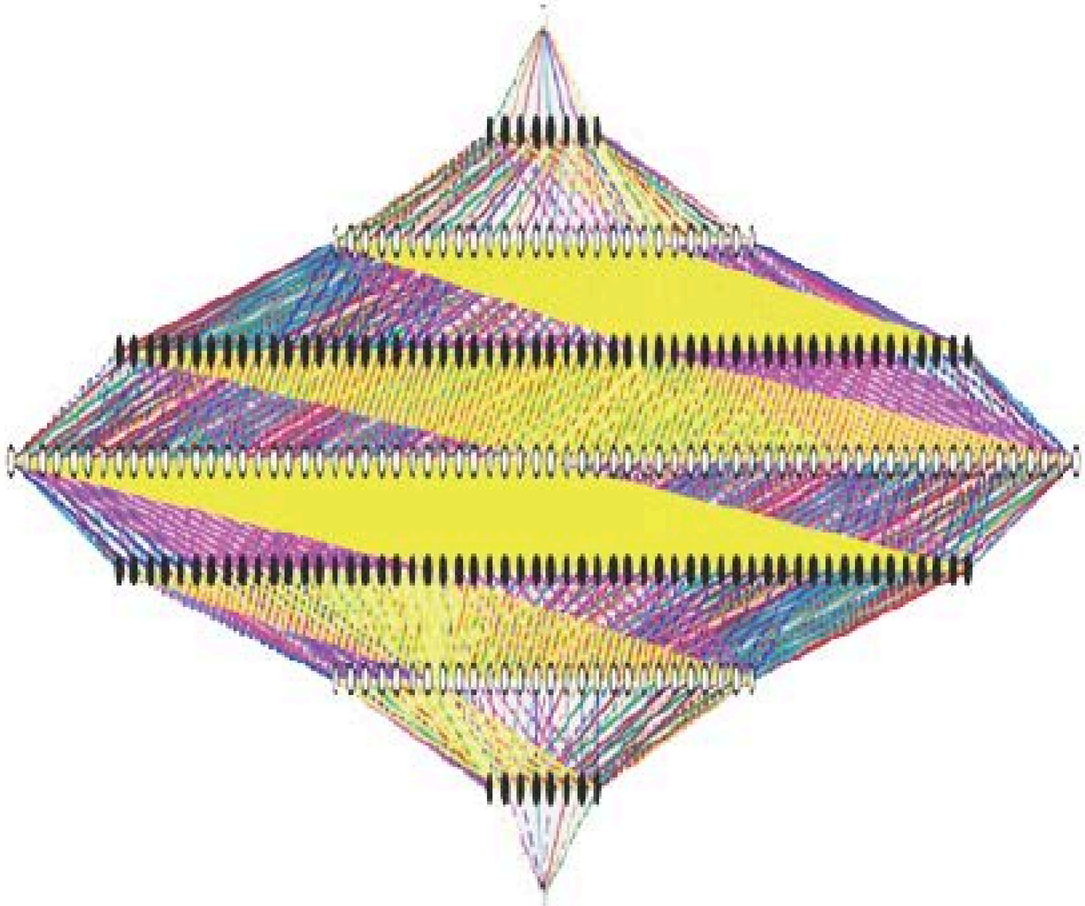
corresponds to 

a 256 Cl(8)



so that the 2160 second layer contains 7 sets of 256 vertices with each set corresponding to the Cl(8) Clifford Algebra and to the 256 vertices of an 8-dimensional light-cone (+/- 1 +/- i +/- j +/- k +/- e +/- ie +/- je +/- ke) / 2

The 256 vertices of each pair 128+128 form an 8-cube with 1024 edges, 1792 square faces, 1792 cubic cells, 1120 tesseract 4-faces, 448 5-cube 5-faces, 112 6-cube 6-faces, and 16 7-cube 7-faces. The image format of African Adinkra for 256 Odu of IFA



shows Cl(8) graded structure 1 + 8 + 28 + 56 + 70 + 56 + 28 + 8 + 1 of 8-cube vertices. Physically they represent **Operators in H92 x Sl(8)** Generalized Heisenberg Algebra that is the **Maximal Contraction of E8**:

Odd-Grade Parts of Cl(8) =
= **128 D8 half-spinors** of one of iE8, jE8, kE8, eE8, ieE8, jeE8, keE8
8+56 grades-1,3 = Fermion Particle 8-Component Creation (AntiParticle Annihilation)
56+8 grades-5,7 = Fermion AntiParticle 8-Component Creation (Particle Annihilation)

Even-Grade Subalgebra of Cl(8) = **128 Mirror D8 half-spinors** =
28 grade-2 = Gauge Boson Creation (16 for Gravity, 12 for Standard Model)
28 grade-6 = Gauge Boson Annihilation (16 for Gravity , 12 for Standard Model)
(each 28 = 24 Root Vectors + 4 of Cartan Subalgebra)
64 of grade-4 = 8-dim Position x Momentum
1+(3+3)+1 grades-0,4,8 = Primitive Idempotent:
(1+3) = Higgs Creation; (3+1) = Higgs Annihilation
= 112 D8 Root Vectors + 8 of E8 Cartan Subalgebra + 8 Higgs Operators

8 of E8 Cartan Subalgebra + 8 Higgs Operators = 2 copies of 4-dim 16-cell

(images from Bathsheba)

The 16-cell has 24 edges, midpoints of which are the 24 vertices of a 24-cell.
The 24-cell has 96 edges, Golden Ratio points of which when added to its 24 vertices,
form the 96+24 = 120 vertices of a 600-cell.

128 vertices of the D8 half-spinors + 112 vertices of D8 Root Vectors = 240 =
= 2 copies of 4-dim {3,3,5} 600-cell (images from Bathsheba)

Each 600-cell lives inside a 16-cell.

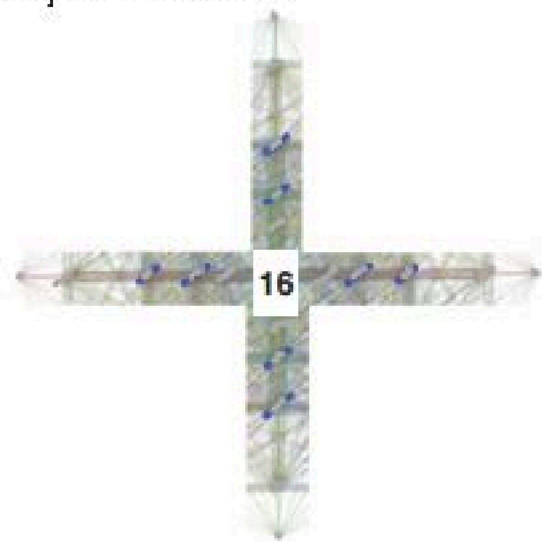
So,
the 256 vertices of **Cl(8)**
(which represents Creation/Annihilation Operators in the Generalized Heisenberg
Algebra H92 x Sl(8) that is the Maximal Contraction of E8)
contain
dual 16-cell structure of E8 Cartan Subalgebra + Cl(8) Primitive Idempotent Higgs
as well as
the dual 600-cell structure of the 240 E8 Root Vector vertices

The 128 Mirror D8 half-spinors correspond to 16 + 112 of the 16 + 224.
That corresondence between
fermionic 128 D8 half-spinors and bosonic 112 D8 adjoint bivectors
is made possible by Triality.

The 16 + 224 corresponds to an 8th set of 240 Root Vector vertices for an 8th E8 lattice denoted 1E8.

It does not close under the Octonion Product used for the 7 Imaginary E8 lattices (that is the basis for Kirmse's mistake) but it does close under another of the 480 Octonion products.

16 live within the 112 D8 adjoint Root Vectors



in all of the 7 E8 lattices iE8, jE8, kE8, eE8, ieE8, jeE8, keE8.

224 = 7 sets of 32 with 3 sets of 32 = 96 within the 112 D8 adjoint Root Vectors

in the 7 E8 lattices iE8, jE8, kE8, eE8, ieE8, jeE8, keE8.

The 112 D8 Root Vector vertices in iE8, jE8, kE8, eE8, ieE8, jeE8, keE8

(+/- 1 , +/- 1 , 0 , 0 , 0 , 0 , 0 , 0)

for all 4 possible +/- signs times all (8|2) = 28 permutations of pairs of basis elements can be written in matrix form with each "4" representing possible signs and with the overall pattern of (1+2+3) + (4x4) + (3+2+1) representing the 28 permutations as

	1	i	j	k	e	ie	je	ke
1	-	4	4	4	4	4	4	4
i			4	4	4	4	4	4
j				4	4	4	4	4
k					4	4	4	4
e						4	4	4
ie							4	4
je								4
ke								-

The 4 x 6 = 24 in the (1,i,j,k) x (1,i,j,k) block corresponding to M4 Physical Spacetime are the Root Vectors of a D4 in D8 in E8 with a U(2,2) subgroup that contains the SU(2,2) = Spin(2,4) Conformal Group of Gravity.

The 4 x 4x4 = 64 in the (1,i,j,k) x (e,ie,je,ke) block represents (4+4)-dim M4 x CP2 Kaluza-Klein Spacetime position and momentum.

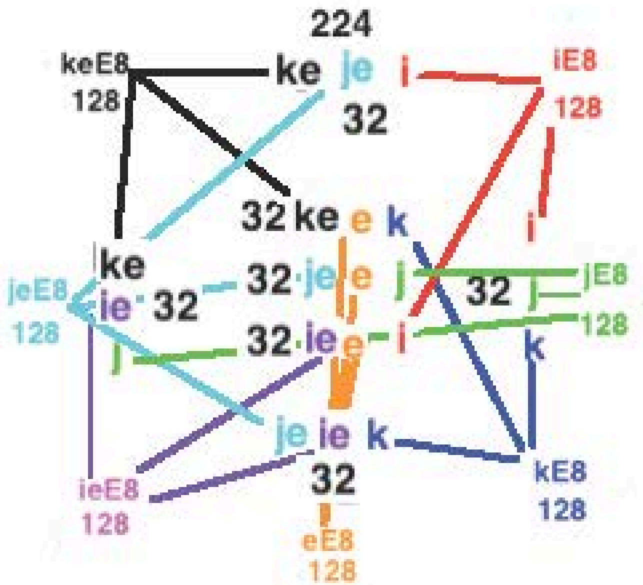
The 4 x 6 = 24 in the (e,ie,je,ke) x (e,ie,je,ke) block corresponding to CP2 Internal Symmetry Space are the Root Vectors of another D4 in D8 in E8 with a U(4) subgroup that contains the SU(3) Color Force Group of the Standard Model.
The coset structure CP2 = SU(3) / U(1)xSU(2) gives the ElectroWeak U(1) and SU(2).

In each of the 7 E8 Root Vector sets for iE8, jE8, kE8, eE8, ieE8, jeE8, keE8
64 of the 128 D8 half-spinor vertices represent 8 components of 8 Fermion Particles
and
64 of the 128 D8 half-spinor vertices represent 8 components of 8 Fermion AntiParticles
where
the 8 fundamental Fermion Particle/AntiParticle types are:

neutrino, red down quark, green down quark, blue down quark;

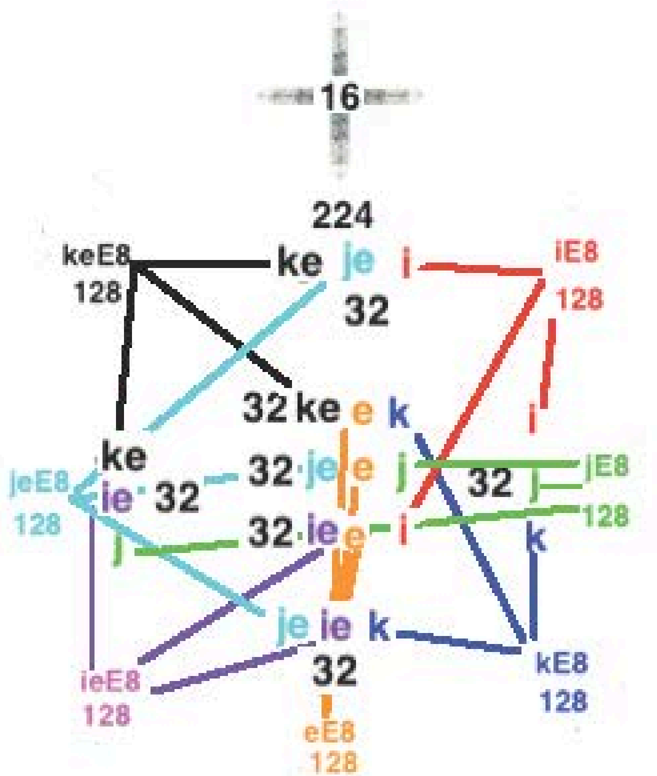
blue up quark, green up quark, red up quark, electron.

The **224** are arranged as

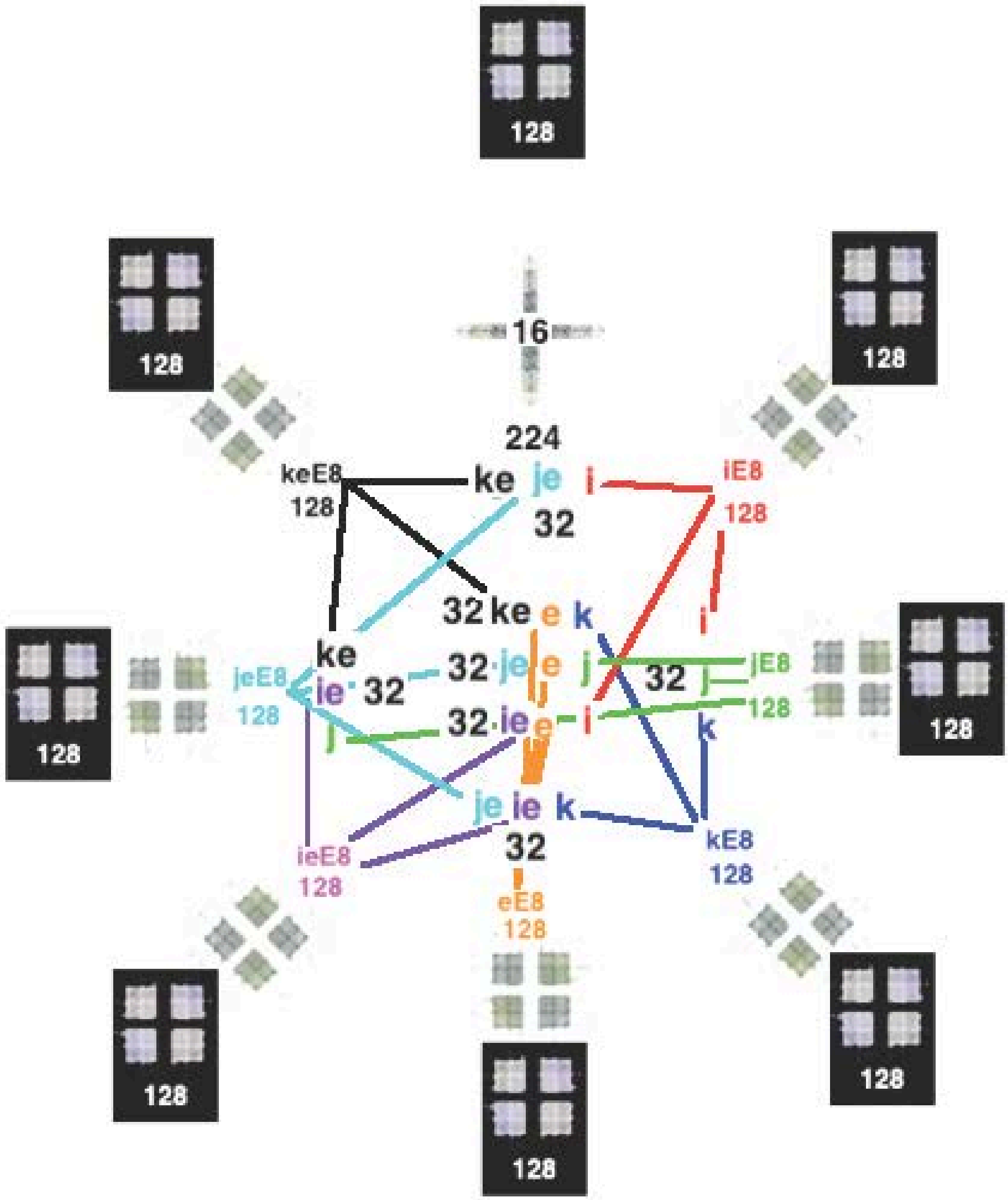


so that each of the sets of 32 connect with 3 of iE8, jE8, kE8, eE8, ieE8, jeE8, keE8 and each of iE8, jE8, kE8, eE8, ieE8, jeE8, keE8 connect with 3 of the sets of 32.

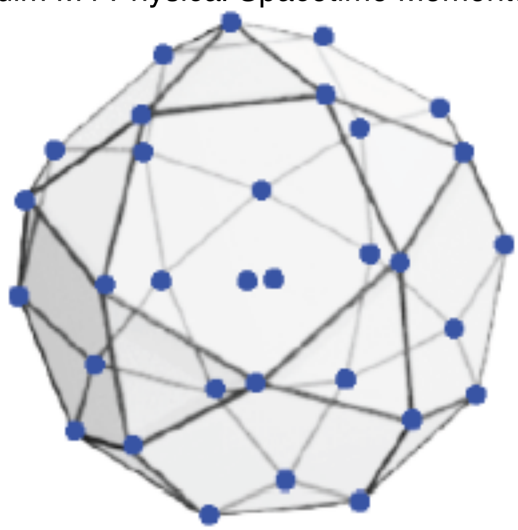
The **224** combined with the **16** give the **240 of 1 E8**



The 7(128+128) + 128 + 16 + 224 structure
of all 2160 second layer E8 vertices
is

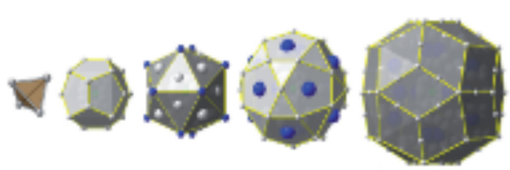


A single Planck-scale Seed Fermion will be at a point of an 8-dim SpaceTime that is a superposition of the 8 E8 Lattices. For each E8 Lattice the point is surrounded by a Witting Polytope (240 vertices and 241,920 Tetrahedral 3-dim cells) made up of two 600-cells (120 vertices each). One 600-cell contains
1 - North Pole = Single Point (projected to center of Equatorial Icosidodecahedron)
30 - Equator = Icosidodecahedron
1 - South Pole = Single Point (projected to center of Equatorial Icosidodecahedron)
with physical interpretation:
8 components of 8-dim Kaluza-Klein M4xCP2 Spacetime Position
times 4 components of 4-dim M4 Physical Spacetime Momentum

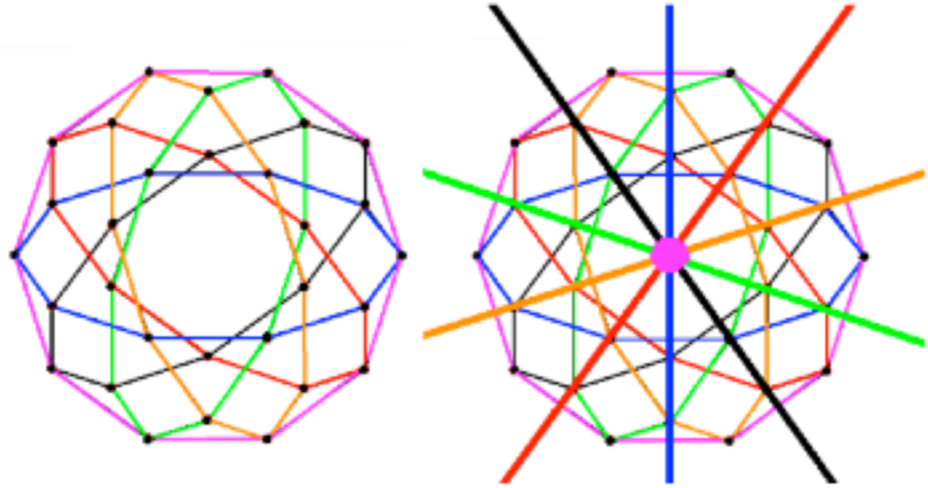


There are 64 - 32 = 32 of the 240 E8 in the half of E8 that did not go to the 600-cell. They correspond to 8 components of Position x 4 components of momentum in CP2. Since the CP2 Internal Symmetry Space is the small compactified part of M4xCP2 momentum in CP2 is substantially irrelevant to our 3-dim space M4 world.

The 30 Icosidodecahedron vertices are at pairwise intersections of 6 Great Circle Decagons. Let each Great Circle represent a generator of a spacetime translation. Then the Icosidodecahedron represents a 6-dim Spin(2,4) Conformal spacetime that acts conformally on 4-dim M4 Minkowski Physical Spacetime that lives inside 8-dim Kaluza-Klein M4xCP2 Spacetime (where CP2 = SU(3) / U(2)).
Physically the 6 Great Circles of the Icosidodecahedron show that the 10-dim space of 26-dim String Theory of Strings as World-Lines reduces to 6-dim Conformal Physical Spacetime plus 4-dim CP2 Internal Symmetry Space.
However,
the Icosidodecahdron is not part of a tiling of 3-dim Space
but rather is in QuasiCrystal structures like Cd Yb (de Boissieu Nature Materials 12 (2013) 692-693)

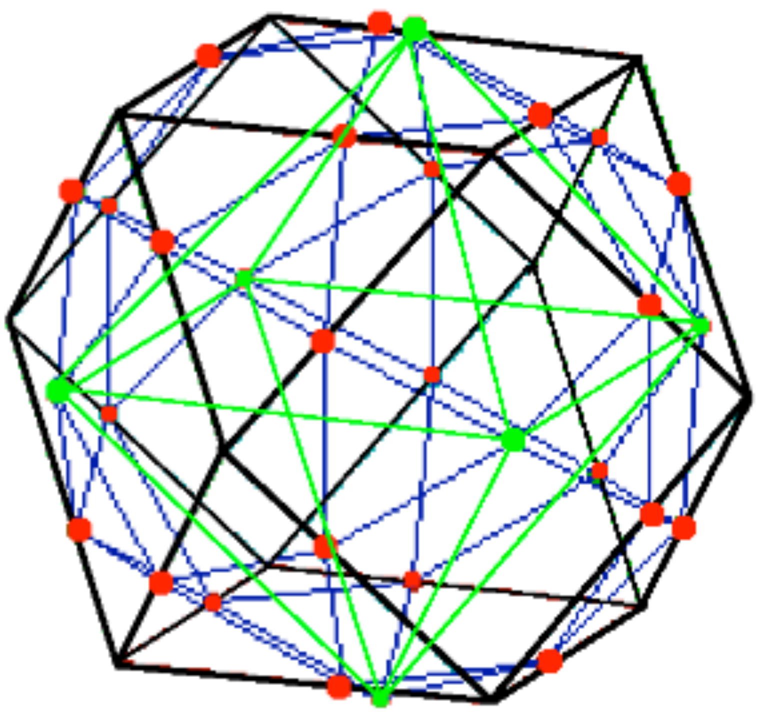


To get a tiling of 3-dim space, go from the 6-dim Linear Conformal Spacetime indicated by the 6 axes perpendicular to the Icosidodecahedron's 6 decagon circles

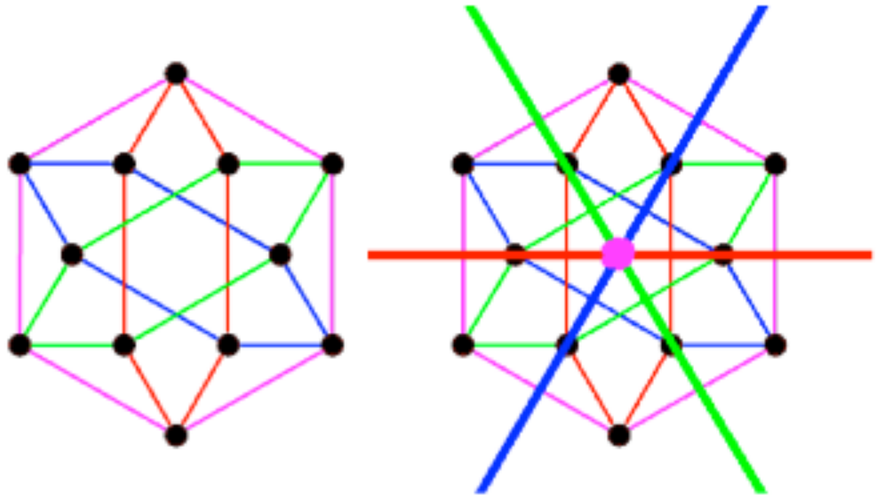


to a 4-dim Physical Spacetime based on a 24-cell with central Cuboctahedron using Jitterbug-like Golden Ratio points on the 24 edges of the Cuboctahedron.

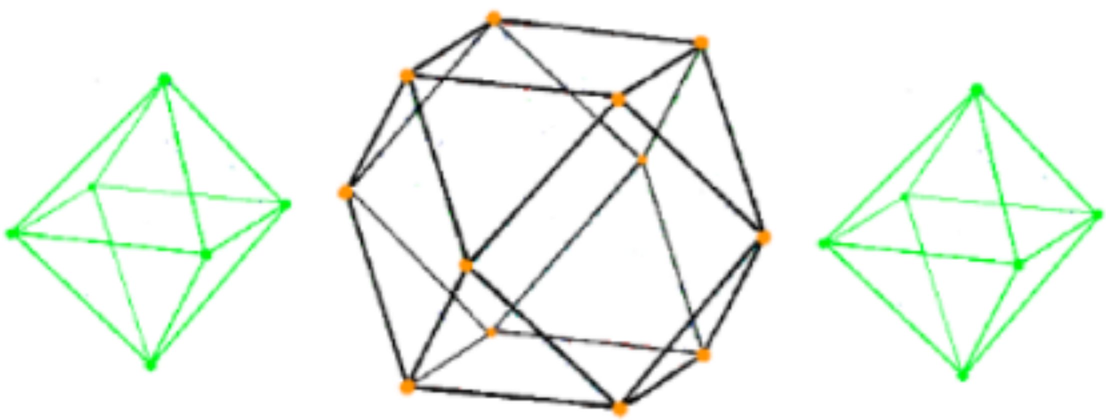
Frans Marcelis says at http://members.home.nl/fg.marcelis/600-cell%20projective.htm
"... the 30 vertices of an icosidodecahedron ... are 24 vertices lying on the edges of a cuboctahedron and ... 6 ... vertices of an octahedron ...".



The Cuboctahedron indicates 4-dim Spacetime by its 4 axes and 4 hexagon circles with Fuller Vector Equilibrium structure that has Jitterbug-type consistent rotation-expansion degrees of freedom that are blocked in the Icosidodecahedron 6-axis system.



The 24-cell (tiles 4-dim space as Quaternionic Integral Domain) is made up of a two Octahedron Slices and a Central Cuboctahedron 3-dim Slice analagous to the Central Icosidodecahedron 3-dim Slice of the 600-cell.



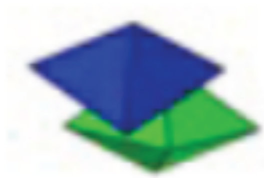
Cuboctahedra and Octahedra together tile flat 3-dim Space
and
are related by Jitterbug to Icosahedra that cannot tile flat 3-dim Space
but can only make
QuasiCrystals with Phason/Empire Structure with incomplete 3-dim Information.

In 3-dim Space QuasiCrystal Tetrahedral Packing is not quite as dense as is Packing with Chen-Engel-Glotzer Clusters of 4N Tetrahedra (arXiv 1001.0586) with Periodicity analagous to 8-Periodicity of Real Clifford Algebras.

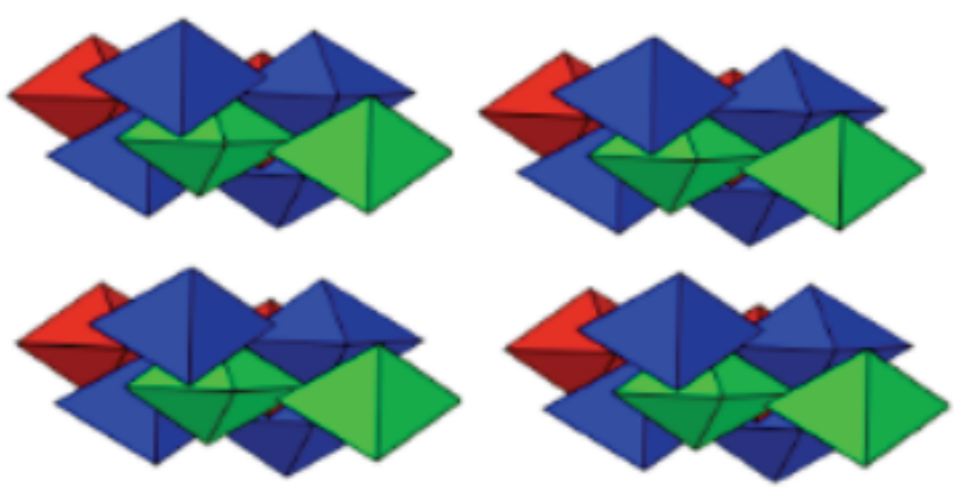
Consider Strings as World-Lines of Particles in Many-Worlds (vixra 1210.0072)
with 8-dim Spacetime (4+4 Kaluza-Klein) as a D8 Brane that is a superposition
of the 7 independent E8 Integral Domain Lattices plus an 8th and
consider what happens when a Planck-scale Fermion seed is planted in Spacetime.

A single Planck-scale Seed Fermion does not remain alone in 8-dim Spacetime because its presence causes all of the 8 E8 Lattices to leave their State of Virtual Superposition and to become Real thus creating 8 particle/antiparticle pairs as neighbors of the Seed Fermion and beginning the formation of its Kerr-Newman Cloud.

Each of the 8 particle/antiparticle pairs corresponds to a Binary Dipole
so that the 8 New Neighbor Pairs correspond to the Cl(8) Real Clifford Algebra
and to a Chen-Engel-Glotzer Cluster of 4 Tetrahedra



They in turn cause more and more Cl(8N) Clifford Algebras
and Chen-Engel-Glotzer 4N Tetra Clusters to emerge and join the Cloud



The process terminates due to the exhaustion of the part of the Monster Group
(automorphism group of one 26-dim String World-Line cell modulo the Leech Lattice)
related to the Leech Lattice, that is 2^(1+24) times the double cover of Co1, producing
a 10^(-24) cm Fermion Kerr-Newman Cloud of 10^27 particle-antiparticle pairs.

h92Duals and Quantum Heisenberg Algebra

E8 Physics consists of two levels:

The first level is **Lagrangian** Classical Action Structure made up of:

Integration over 8-dim Spacetime - 64 E8 Root Vectors

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

of Dirac Fermion term - 128 E8 Root Vectors

```
 (-1             ±ie ±je ±ke )/2    electron          8 components
 (-1    ±j ±k    ±ie         )/2    red up quark      8 components
 (-1 ±i    ±k        ±je     )/2    green up quark    8 components
 (-1 ±i ±j               ±ke )/2    blue up quark     8 components
 (   ±i ±j ±k -e             )/2    neutrino          8 components
 (   ±i       -e     ±je ±ke )/2    red down quark    8 components
 (      ±j    -e ±ie     ±ke )/2    green down quark  8 components
 (         ±k -e ±ie ±je     )/2    blue down quark   8 components
(-1             ±ie ±je ±ke )/2 positron             8 components
(-1    ±j ±k    ±ie         )/2 red up antiquark     8 components
(-1 ±i    ±k        ±je     )/2 green up antiquark   8 components
(-1 ±i ±j               ±ke )/2 blue up antiquark    8 components
(   ±i ±j ±k -e             )/2 antineutrino         8 components
(   ±i       -e     ±je ±ke )/2 red down antiquark   8 components
(      ±j    -e ±ie     ±ke )/2 green down antiquark 8 components
(         ±k -e ±ie ±je     )/2 blue down antiquark  8 components
```

and
of Standard Model Gauge Boson term -
8 Root Vectors + 4 Cartan Subalgebra elements

```
(    +i +j       +ie +je     )/2  W+ boson
(    +i +j       -ie -je     )/2  gluon_rg
(    -i -j       +ie +je     )/2  gluon_cm
(    +i -j       +ie -je     )/2  gluon_gb
(    -i +j       -ie +je     )/2  gluon_my
(    +i -j       -ie +je     )/2  gluon_br
(    -i +j       +ie -je     )/2  gluon_yc
(    -i -j       -ie -je     )/2  W- boson
```

and
of Conformal MacDowell-Mansouri Gravity term -

```
12 Root Vectors + 4 Cartan Subalgebra elements
         (       +j -k        +je -ke )/2    conformal_1
         (       -j +k        -je +ke )/2    conformal_i
         (       +j -k        -je +ke )/2    conformal_j
         (       -j +k        +je -ke )/2    conformal_k
         (       +j +k        -je -ke )/2  conformal_rxy
         (       -j -k        +je +ke )/2  conformal_rxz
         (    +i    +k    -ie     -ke )/2  conformal_btx
         (    -i    -k    +ie     +ke )/2  conformal_bty
         (    +i    -k    +ie     -ke )/2    conformal_e
         (    -i    +k    -ie     +ke )/2   conformal_ie
         (    +i    -k    -ie     +ke )/2   conformal_je
         (    -i    +k    +ie     -ke )/2   conformal_ke
```

The Lagrangian construction uses
64+128+8+4+12+4 = 220 generators of E8
(212 Root Vectors + 8 Cartan Subalgebra elements)

Although the Lagrangian gives nice Standard Model + Gravity
physics results that can be compared with experiments
(and so seen to be realistic)
it is fundamentally a Classical structure (General Relativity of
an Einstein-Hilbert Action plus Standard Model Gauge Theory)
with
Quantum phenomena by ad hoc Sum-Over-Histories Path Integrals.

Fundamental Quantum structure should appear as a natural
Algebraic Quantum Field Theory
which can be derived from real Clifford Algebra periodicity
and embedding of E8 in the real Cl(16) Clifford Algebra
to produce a generalized Hyperfinite II1 von Neumann factor AQFT
that has the structure of a Quantum Heisenberg-type algebra that
arises from the maximal contraction of E8:

E8 -> SL(8) + h_92

where SL(8) is 63-dimensional
and h_92 is 92+1+92 = 185-dimensional.
The 92 sets of creation/annihilation operators
act on the 64 components (in 8-dim spacetime) of 8 fermions
plus 12 Standard Model bosons
plus 16 Conformal Gravity generators.

This second level **Heisenberg Algebra** Quantum structure
is made up of

Position/Momentum Operators -

16 Root Vectors

```
(       +j +k         +je -ke )/2  h92Dual  C1
(       +j +k         -je +ke )/2  h92Dual  Ci
(       +j -k         +je +ke )/2  h92Dual  Cj
(       -j +k         +je -+e )/2  h92Dual  Ck
(       -j -k         -je +ke )/2  h92DualCrxy
(       -j -k         +je -ke )/2  h92DualCrxz
(       -j +k         -je -ke )/2  h92DualCryz
(       +j -k         -je -ke )/2  h92Dual  Cd
(    +i    +k    +ie      -ke )/2  h92Dual  Ce
(    +i    +k    -ie      +ke )/2  h92Dual Cie
(    +i    -k    +ie      +ke )/2  h92Dual Cje
(    -i    +k    +ie      +ke )/2  h92Dual Cke
(    -i    -k    -ie      +ke )/2  h92DualCbtx
(    -i    -k    +ie      -ke )/2  h92DualCbty
(    -i    +k    -ie      -ke )/2  h92DualCbtz
(    +i    -k    -ie      -ke )/2  h92DualPrPh
```

and

Creation Operators -

12 Root Vectors

```
(       +j +k         +je +ke )/2  h92Dualgamma
(    +i    +k    +ie      +ke )/2  h92DualGlrgb
(    +i +j       +ie -je      )/2  h92Dual   W+
(    +i +j       -ie +je      )/2  h92Dual Glrg
(    +i -j       +ie +je      )/2  h92Dual Glcm
(    -i +j       +ie +je      )/2  h92Dual Glgm
(    -i -j       -ie +je      )/2  h92Dual   W-
(    -i -j       +ie -je      )/2  h92Dual Glmy
(    -i +j       -ie -je      )/2  h92Dual Glbr
(    +i -j       -ie -je      )/2  h92Dual Glyc
(       -j -k         -je -ke )/2  h92Dual   W0
(    -i    -k    -ie      -ke )/2  h92DualGlcmy
```

The Heisenberg construction uses all 248 E8 generators including the 16+12 = 28 not used in Lagrangian construction.

A Single Cell of E8 26-dimensional Bosonic String Theory, in which Strings are physically interpreted as World-Lines, can be described by taking the quotient of its 24-dimensional O+, O-, Ov subspace modulo the 24-dimensional Leech lattice.
Its automorphism group is the largest finite sporadic group, the Monster Group, whose order is
8080, 17424, 79451, 28758, 86459, 90496, 17107, 57005, 75436, 80000, 00000
=
2^46 .3^20 .5^9 .7^6 .11^2 .13^3 .17.19.23.29.31.41.47.59.71
or about 8 x 10^53.

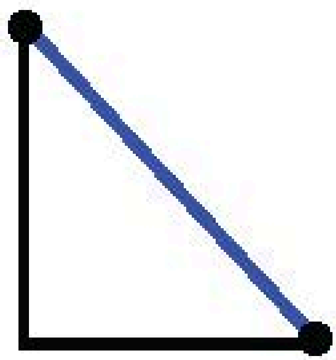
Robert A. Wilson in his 2009 paper said "Octonions and the Leech lattice" said:
"... The (real) octonion algebra is an 8-dimensional (non-division) algebra with an orthonomal basis { 1=ioo , i0 , i1 , i2 , i3 , i4 , i5 , i6 } labeled by the projective line PL(7) = { oo } u F7 ...
The E8 root system embeds in this algebra ... take the 240 roots to be ...
112 octonions ... +/- it +/- iu for any distinct t,u
... and ...
128 octonions (1/2)(+/- 1 +/- i0 +/- ... +/- i6) which have an odd number of minus signs.
Denote by L the lattice spanned by these 240 octonions
... Let s = (1/2)(- 1 + i0 + ... + i6) so s is in L ... write R for Lbar ...
(1/2) (1 + i0) L = (1/2) R (1 + i0) is closed under multiplication ... Denote this ...by A
... Writing B = (1/2) (1 + i0) A (1 + i0) ...from ... Moufang laws ... we have
L R = 2 B , and ... B L = L and R B = R ...[also]... 2 B = L sbar ...
the roots of B are
[16 octonions]... +/- it for t in PL(7)
... together with
[112 octonions]... (1/2) (+/- 1 +/- it +/- i(t+1) +/- i(t+3)) ...for t in F7
... and ...
[112 octonions]... (1/2) (+/- i(t+2) +/- i(t+4) +/- i(t+5) +/- i(t+6)) ...for t in F7
...
the octonionic Leech lattice ... contains 196560 vectors of norm 4 .
Ignoring factors like 2 , j , k , and +/-1 the Leech lattice structure is

(L , 0 , 0)	**Number: 3x240 = 720**
(B , B , 0)	**Number: 3x240 x 16 = 11520**
(L s , L , L)	**Number: 3x240 x 16 x 16 = 184320**

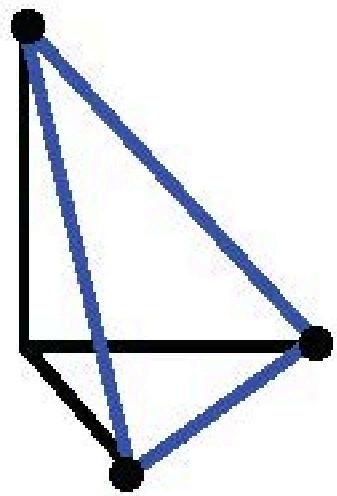
Simplex Superpositions

Frank Dodd (Tony) Smith, Jr. - 2012

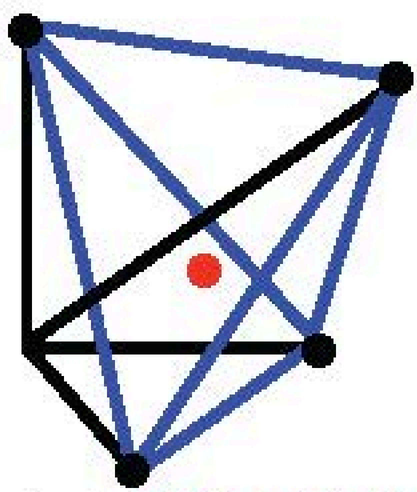
In E8 Physics Quantum Creation and Annihilation Operators come from the Maximal Contraction of E8 (semi-direct product of Sl(8) and H92 where H92 is a Heisenberg Algebra with graded structure 28+64+1+64+28). Superpositions of Quantum Operators can be described: With square/cubic tilings of 2-space and 3-space, there is no Superposition Vertex that corresponds to Superposition of any of the Basis Vertex States.



+1, +i



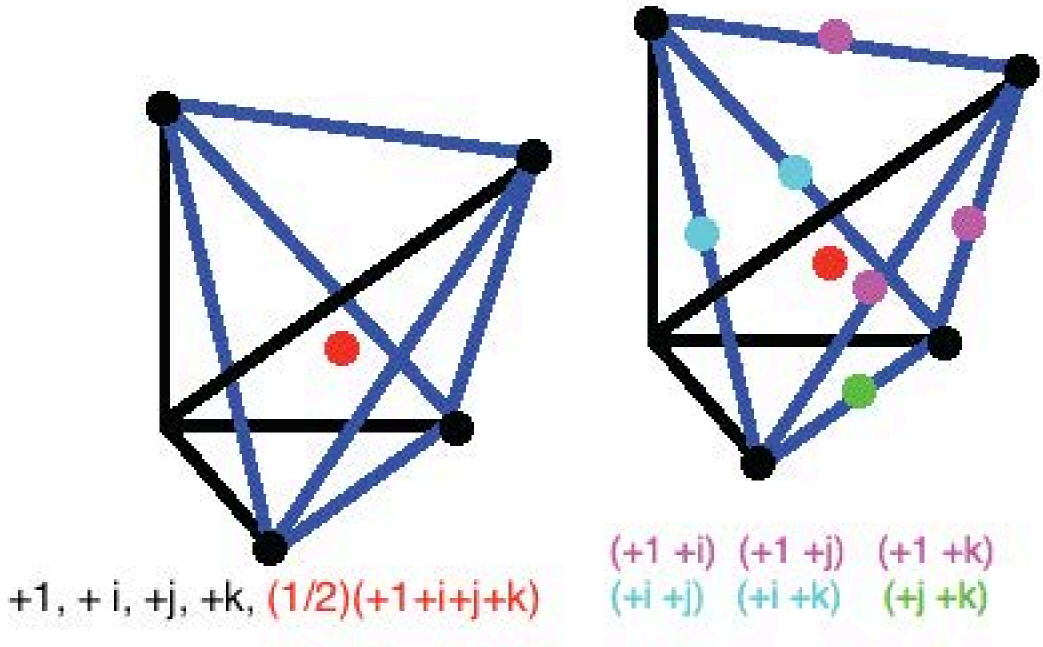
+1, +i, +j



+1, + i, +j, +k, (1/2)(+1+i+j+k)

Superposition Vertices begin at Quaternions and the 24-cell D4 tiling of 4-space.

A Dual 24-cell gives a new Superposition Vertex at each edge of the Simplex/Tetrahedron.



The Initial 24-cell Quantum Operators act with respect to 4-dim Physical Spacetime.
For example,
(1/2)(+1+i+j+k) represents Creation of the 4-dimensional space of the SU(2,2) = Spin(2,4) Conformal Group of Gravity of 4-dimensional Physical Spacetime
with {1,i,j,k} representing time and 3 space coordinates.

The Dual 24-cell Quantum Operators act with respect to 4-dim CP2 Internal Symmetry Space.
For example, bearing in mind that CP2 = SU(3)/SU(2)xU(1),
(+1 +i) (+1 +j) (+1 +k) are permuted by S3 to form the Weyl Group of the Color Force SU(3),
(+i +j) (+i +k) are permuted by S2 to form the Weyl Group of the Weak Force SU(2),
(+j +k) is permuted by S1 to form the Weyl Group of the Electromagnetic Force U(1).

The 4+4 dimensional Kaluza-Klein structure of the Initial 24-cell plus the Dual 24-cell of 4-dim Physical Spacetime plus 4-dim CP2 Internal Symmetry Space is inherited from the Octonionic 8-dimensional structure of E8 lattices.

An Octonionic E8 lattice structure has 8 representative 8-vertex Simplex Basis Vertices

```
+1,  +i,  +j,  +k,  +e,  +ie,  +je,  +ke
```

plus 14 Superposition Vertices.

6 of the Superposition Vertices

```
(+1 +ke +e  +k)/2            (+i  +j  +ie  +je)/2
(+1 +je +j  +e)/2            (+ie +ke +k   +i)/2
(+1 +e  +ie +i)/2            (+ke +k  +je  +j)/2
```

project to (+1 +i) (+1 +j) (+1 +k) (+i +j) (+i +k) (+j +k) of CP2 Internal Symmetry Space.

8 of the Superposition Vertices

```
(+1 +ie +je +ke)/2           (+e  +i  +j  +k)/2
(+1 +k  +i  +je)/2           (+j  +ie +ke +e)/2
(+1 +i  +ke +j)/2            (+k  +je +e  +ie)/2
(+1 +j  +k  +ie)/2           (+je +e  +i  +ke)/2
```

project to (1/2)(+1+i+j+k) of 4-dim Physical Spacetime.

When you consider all 7 of the E8 lattices, you get 8 additional Superposition Vertices

```
(+1 +i +j  +k)/2             (+e +ie +je +ke)/2
(+1 +i +je +ke)/2            (+j +k  +e  +ie)/2
(+1 +j +ie +ke)/2            (+i +k  +e  +je)/2
(+1 +k +ie +je)/2            (+i +j  +e  +ke)/2
```

that also project to (1/2)(+1+i+j+k) of 4-dim Physical Spacetime,
and
the 8+8 = 16 E8-type vertices represent the 16 generators of U(2,2)
which contains the Conformal Group SU(2,2) = Spin(2,4).

As to the 8-vertex Simplex Basis Vertices

```
+1,  +i,  +j,  +k,  +e,  +ie,  +je,  +ke
```

they represent Quantum Creation Operators for the 8 fundamental fermion particles
neutrino; red down quark, green down quark, blue down quark;
electron; red up quark, green up quark, blue up quark

or, equivalently by Triality,
for the corresponding 8 fundamental fermion antiparticles
or
for the 8 dimensions of 8-dim spacetime.

Therefore, the 4-dim Simplex Basis Vertices to which they project can represent
4 dimensions of 4-dim Physical Spacetime or 4 dimensions of CP2 Internal Symmetry Space
or a lepton plus 3 quark subset of fermion particles or antiparticles.

Robert A.Wilson in his 2009 paper "Octonions and the Leech lattice" said:

"... **B is not closed under multiplication** ... Kirmse's mistake

...[but]... as Coxeter ... pointed out ...

... there are seven non-associative rings At = (1/2) (1 + it) B (1 + it) ,

obtained from B by swapping 1 with it ... for t in F7 ...".

One of Wilson's seven At (using Octonionic coordinates {1,i,j,k,e,ie,je,ke})
is what I call 7E8 and is shown below with physical interpretation color-coded as

8-dim Spacetime Coordinates x 8-dim Momentum Dirac Gammas
Gravity SU(2,2)=Spin(2,4) in a D4 + Standard Model SU(3)xU(2) in a D4
8 First-Generation Fermion Particles x 8 Coordinate Components
8 First-Generation Fermion AntiParticles x 8 Coordinate Components

```
112 = (16+48=64) + (24+24=48) Root Vectors corresponding to D8:

±1, ±i, ±j, ±k, ±e, ±ie, ±je, ±ke,

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

(       ±j  ±k           ±je  ±ke  )/2
(   ±i      ±k      ±ie       ±ke  )/2
(   ±i  ±j          ±ie  ±je       )/2

128 = 64 + 64 Root Vectors corresponding to half-spinor of D8:

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

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

If you replace the structural B with 7E8 the Leech lattice structure becomes

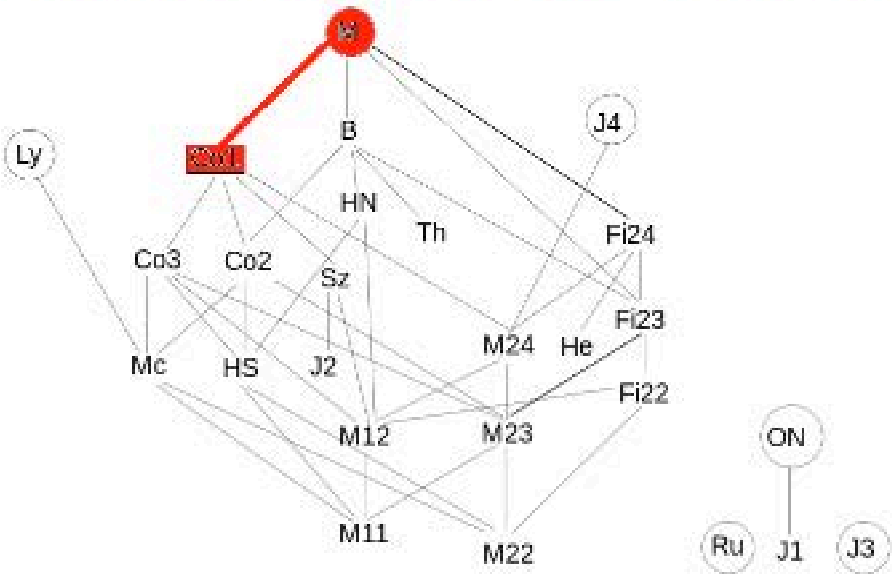
(L , 0 , 0)	**Number: 3x240 = 720**
(7E8 , 7E8 , 0)	**Number: 3x240 x 16 = 11520**
(L s , L , L)	**Number: 3x240 x 16 x 16 = 184320**

The Leech lattice of E8 26-dim String Theory is the Superposition of 8 Leech lattices based on each of { B , 1E8 , 2E8 , 3E8 , 4E8 , 5E8 , 6E8, 7E8 } just as the D8 branes of E8 26-dim String Theory are each the Superposition of the 8 domains { B , 1E8 , 2E8 , 3E8 , 4E8 , 5E8 , 6E8, 7E8 } .

What happens to a Fundamental Fermion Particle whose World-Line string intersects a Single Cell ?
The Fundamental Fermion Particle does not remain a single Planck-scale entity.
Tachyons create a cloud of particles/antiparticles (hep-th/9908021)

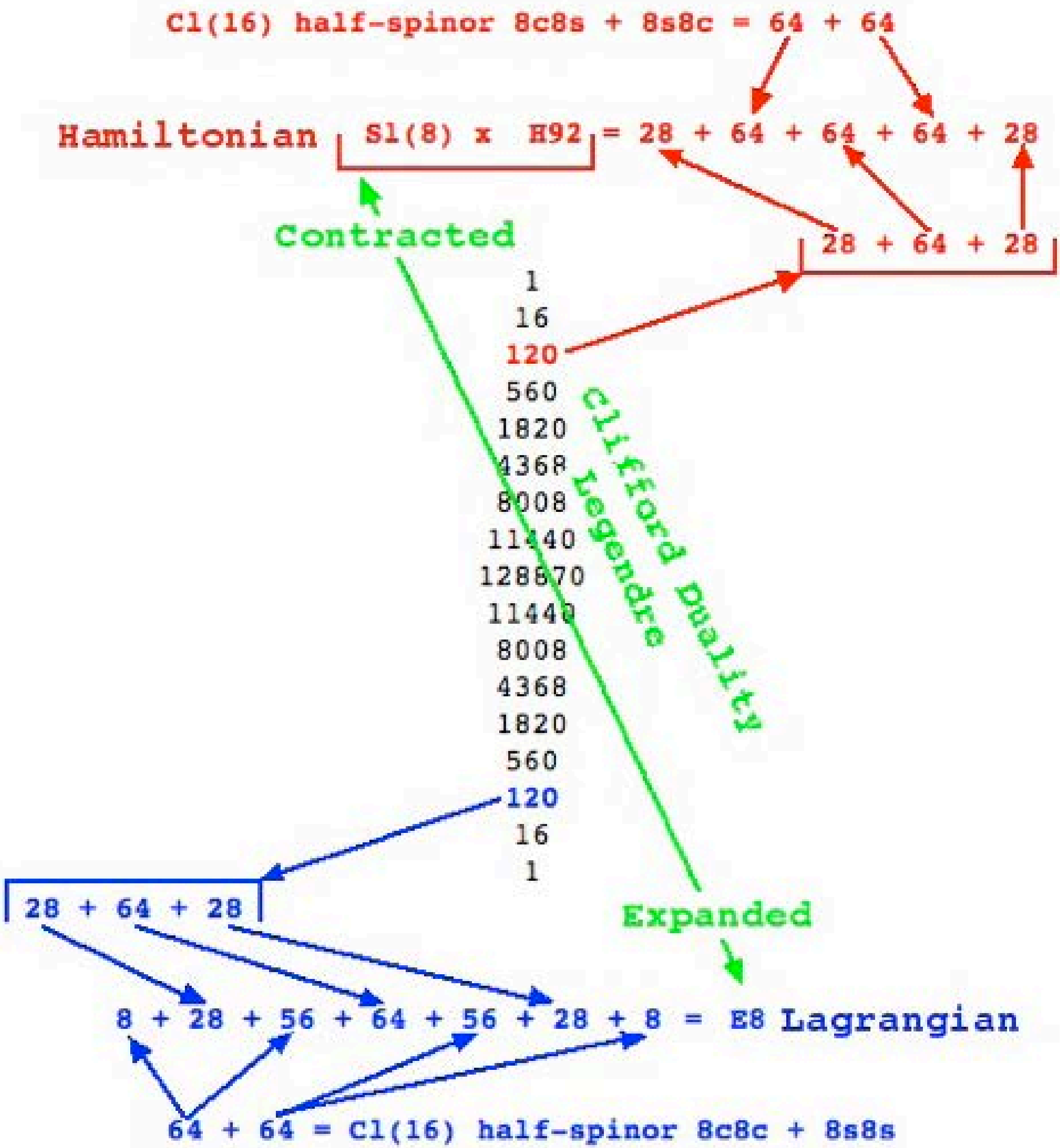
What is the structural form of the Fundamental Fermion Cloud ?
"Kerr-Newman [Black Hole] solution as a Dirac particle" (hep-th/0210103)

What is the size of the Fundamental Fermion Kerr-Newman Cloud ?
The FFKN Cloud is one Planck-scale Fundamental Fermion Valence Particle plus an effectively neutral cloud of particle/antiparticle pairs. The symmetry of the cloud is governed by the 24-dimensional Leech lattice by which the Single Cell was formed.



2.Co1 is the Automorphism group of the Leech Lattice of the Single Cell.
The E8 26-dim String Theory Leech Lattice is a superposition of 8 Leech Lattices.
8 x 2^(1+24).Co1 describes the structure of the FFKN Cloud.
The volume of the FFKN Cloud is roughly 10^27 x (Planck scale=1.6x10^(-33)cm).
The FFKN Cloud has on the order of 10^27 particle/antiparticle pairs.
The FFKN Cloud size is roughly 10^(27/3) x Planck = 10^(-24) cm.

```
Cl(16) = Cl(8)xCl(8) = 256x256 = 65,536
Cl(8) spinor = 8s half-spinor + 8c half-spinor
Cl(16) spinor = 8s8s + 8s8c + 8c8s + 8c8c = 256
```



Cl(16) contains E8

$Cl(16) = 1 + 16 + 120 + 560 + 1820 + \ldots + 16 + 1 =$

$= ((64{+}{+} + 64{-}{-}) + (64{+}{-} + 64{-}{+})) \times 256$

$Cl(16) = Cl(8)_1 \times Cl(8)_2$ where $Cl(8)_1$ contains $F4_1$ and $Cl(8)_2$ contains $F4_2$

(8of$F4_1$ x 8of$F4_2$) + 28of$F4_1$x1of$Cl(8)_2$ + 28of$F4_2$x1of$Cl(8)_1$ = 64 + 28 + 28 = 120ofE8

(8+of$F4_1$ + 8-of$F4_1$) x (8+of$F4_2$ + 8-of$F4_2$) gives (64++ + 64--)ofE8

(because the terms (64+- + 64-+) are rejected as unphysical mixed helicity)

(The notation -> denotes a Maximal Contraction)

E8 = 120 + (64++ + 64--)

E8 -> A7 = SU(8) part of U(8) for 8 position x 8 momentum = 64 generators

- semidirect product with -

28 + 64 + 1 + 64 + 28 Heisenberg Algebra H92 for

28 gauge bosons for A2xA1xA0 = SU(3)xSU(2)xU(1) plus

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

and for

64 = 8x8 of 8 components of 8 Fermions

E7.5 ->E7 - semidirect product with - 28+1+28 Heisenberg Algebra H28

28 = Quaternionic Jordan Algebra J4(Q) =(bijection)= D4

D4 = Spin(8) = (Standard Model + Gravity) Gauge Bosons

E7 -> E6 - semidirect product with - 27+1+27 Heisenberg Algebra H27

27 has 3 diagonal generators of Quaternion SU(2) + (8 + 8) Fermions) + 8 Spacetime vectors

27 = Octonionic Jordan Algebra J3(O) =(bijection)= J4(Q)o

E6 -> D5 = Spin(10) - semidirect product with - 16+1+16 Heisenberg Algebra H16

16 = (26-10)-dim Fermion part of J3(O)o

E6 = F4 + J3(O)o 26-dim traceless part of 27-dim Jordan Algebra J3(O)

F4 = 8 + 28 + (8+ + 8-)

F4 -> B3 = (Spin(6) + S6) - semidirect product with - 15+1+15 Heisenberg Algebra H15

for 15 D3 = Spin(2,4) Conformal Gauge Bosons

6-dim Conformal Spacetime reduces to M4 Physical Spacetime

Cl(8) = 1 + 8 + 28 + 56 + 70 + 56 + 28 + 8 + 1 = (8+ + 8-) x 16

Indra's Net = AQFT = Borges Aleph

Pearl = E8QC = Facet

Since **E8QC = 28 + 64 + (SL(8,R) + 1) + 64 + 28**
expands to form **E8**

E8 = Compact Version of Indra's Pearl and Borges Aleph Facet

The Third Grothendieck Universe:
Clifford Algebra Cl(16) E8 AQFT

Frank Dodd (Tony) Smith Jr. - 2012

Realistic Physics/Math can be described using Three Grothendieck universes:

1 - Empty Set - the seed from which everything grows.

2 - Hereditarily Finite Sets - computer programs, discrete lattices,
discrete Clifford algebras, cellular automata,
Feynman Checkerboards.

3 - Completion of Union of all tensor products of Cl(16) real Clifford algebra -
a generalized hyperfinite II1 von Neumann factor algebra
that, through its Cl(16) structure, contains such useful Physics/Math objects as:

- Spinor Spaces
- Vector Spaces
- BiVector Lie Algebras and Lie Groups
  - Symmetric Spaces
  - Complex Domains, their Shilov boundaries, and Harmonic Analysis
  - E8 Lie Algebra
  - Sl(8)xH92 Algebra (Contraction of E8)
- Classical Physics Lagrangian structures
  - Base Manifold
  - Spinor Fermion term
  - Standard Model Gauge Boson term
  - MacDowell-Mansouri Gravity term
- Quantum Physics Hamiltonian/Heisenberg Algebra
  - Position/Momentum Spaces
  - Gravity + SM boson Creation/Annihilation Operators
  - Fermion Creation/Annihilation Operators

You can take U_0 as the empty set
and
U_1 as hereditarily finite sets
(which can be constructed from the power set
and which give you computer programs, discrete lattices,
discrete Clifford algebras, cellular automata, Feynman checkerboards, etc).

I would like to construct U_2 by noticing that the power set structure of U_1
is inherent in the basic construction of real Clifford algebras
which have the concrete structure of 8-periodicity
which allows you (since Cl(16) = Cl(8)xCl(8)) to construct
the completion of the union of all tensor products of Cl(16)
which seems to have algebraic structure that is
similar to the hyperfinite II1 von Neumann factor
and therefore to be a nice candidate for a realistic AQFT.

Of course, you can go beyond U_2 as far as you want to go,
but if you can build a realistic AQFT World from U_2
then my guess is that going beyond U_2 describes the Many-Worlds
of Many-Worlds Quantum Theory which gets you to
evolution of the Many-Worlds Multiverse by Quantum Game Theory
which in turn can be described by Clifford Algebra as in
http://arxiv.org/abs/1008.4689 by Chappell, Iqbal, and Abbott.

That, in turn, leads to the AQFT geometry of EPR phenomena
as described by Joy Christian at http://arxiv.org/abs/1201.0775

You might say that Fate has 3 Forks:

to a Bad Basin of Attraction of the Quantum Potential Landscape;

to Delay, Sit on the Fence, and stay on the Boundary Between Basins;

to a Good Basin of Attraction.

```
          BASIN OF                                  BASIN OF
         ATTRACTION                                ATTRACTION
                              |
                              |
                              |
       NUCLEAR                |                    GALACTIC
   SELF-DESTRUCTION           |                   UNIFICATION
                              |
              about 1950 - Berlin, Roswell?
                             /|\
                            / | \
                           /  |  \
                          /   |   \
                         /    |    \
                        /     |     \
                       /      |      \
          Berlin Airlift      |  Contact with Roswell Spacecraft
        causes Nuclear War    |    of Galactic Civilization
                              |
                              |
               about 1973 - Israel, GRBs?
                             /|\
                            / | \
                           /  |  \
                          /   |   \
                         /    |    \
                        /     |     \
                       /      |      \
      1973 Arab-Israeli War   |  Decoding of Gamma Ray Burst
          goes Nuclear        |       Messages from
                              |    Galactic Civilization
                              |
         on to other Forking Paths in the Future
                              |
                              |
```

With respect to a World in a Good Basin, your mission is a success.

With respect to a World in a Bad Basin, your mission is a failure.

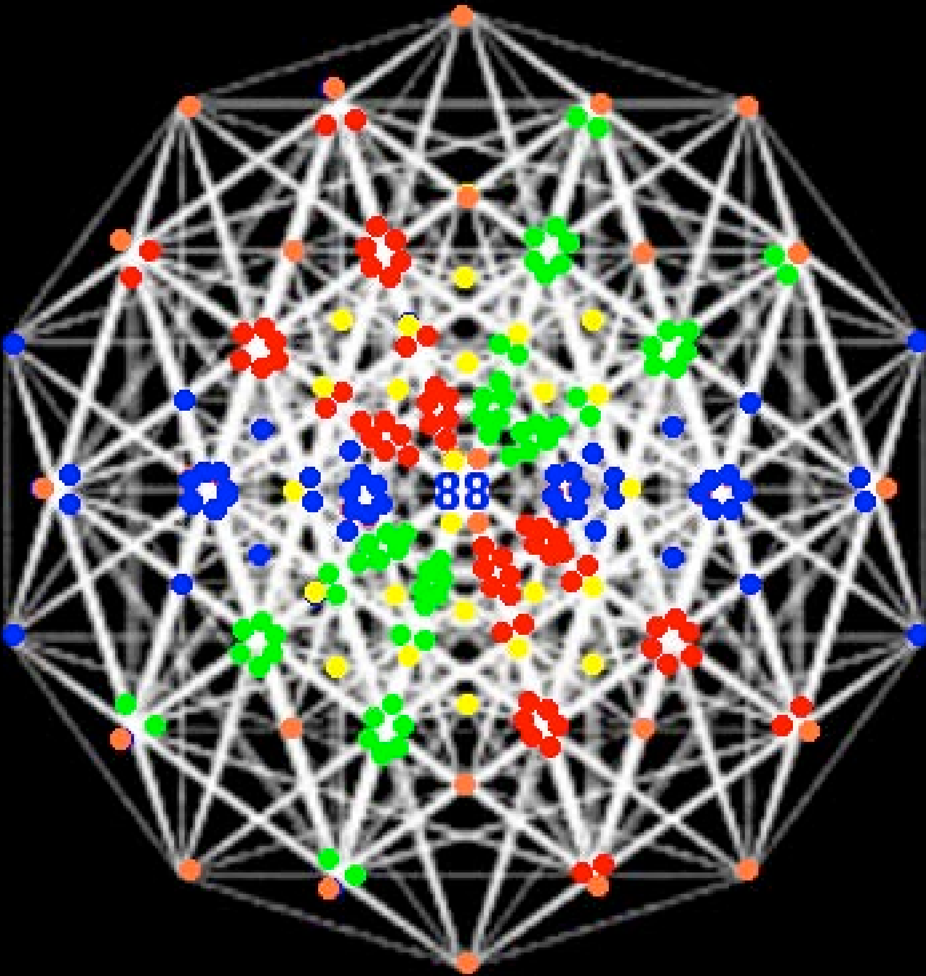
With respect to a World that is on the Boundary Between Basins, you still have work to do and a mission to carry out.

With respect to the Sum of All Worlds, your work is over for the Worlds that have already gone to the Good or Bad Basins, but is actively ongoing for the Worlds on the Boundary Between Basins.

Therefore, if your perception is of the World that demands most of your attention, and your attention, through the Quantum Zeno Effect and the Quantum Anti-Zeno Effect, chooses the World of the Many-Worlds to which you are paying attention, then

your perception is most likely to be that you live in a World on the Boundary Between Basins.

Resonant Connections in MacroSpace would allow you to interact with other things, including Other Consciousnesses, in using the Quantum Zeno Effect and the Quantum Anti-Zeno Effect to choose the World of the Many-Worlds.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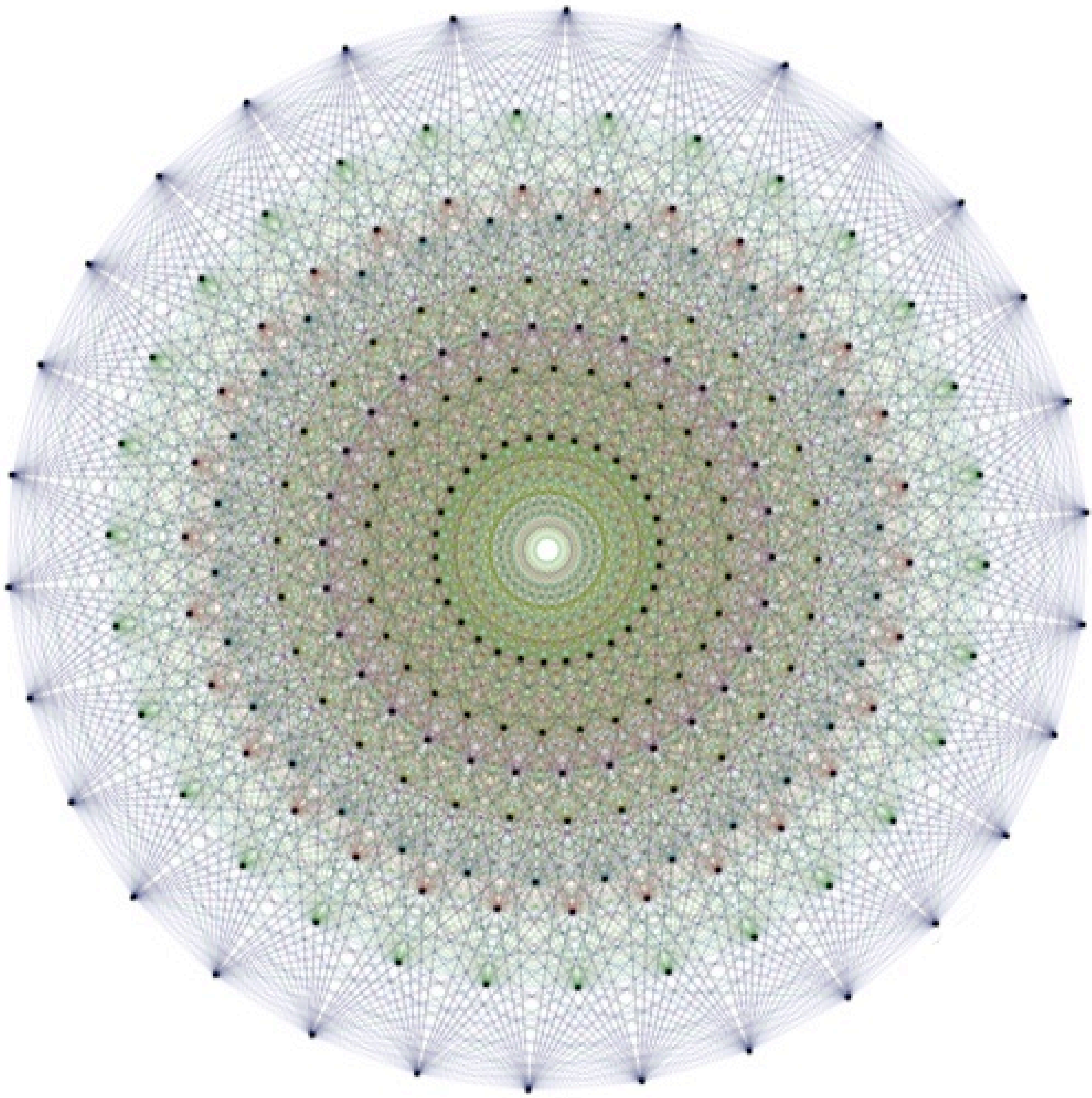
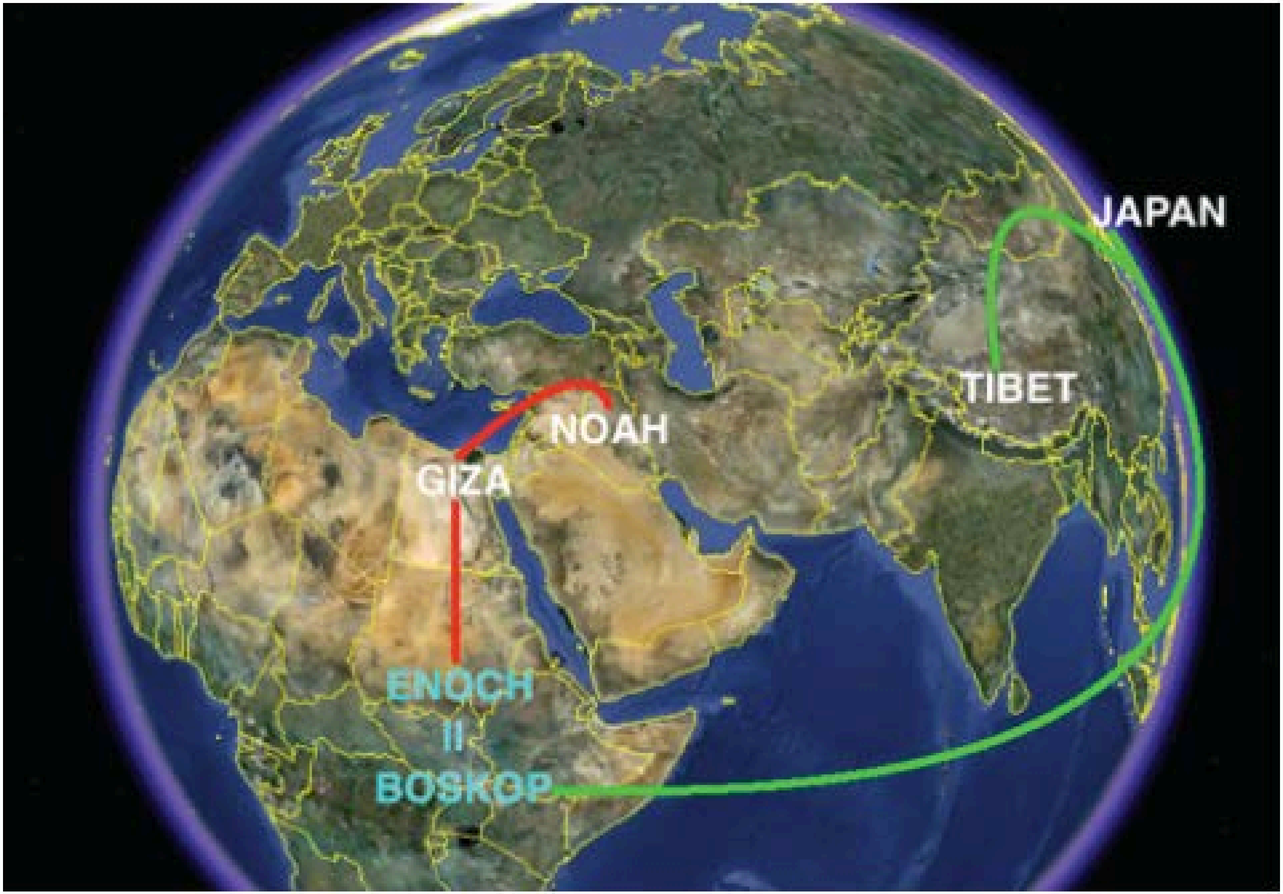



Boskop
Nile
Tibet
Danube
Japan
Rhine
Britain

50,000 years ago - Africa Emigration/Trade to Japan and Tibet

36,000 to 12,000 years ago - Boskop/Enoch emerged, built Giza Pyramids, went away



12,000 years ago - Noah (normal descendant of Enoch) and the Flood

12,000 years ago - Flood takes Noah to Africa
Nile takes Moses from Abraham to Giza
Moses from Giza to Sinai
Solomon builds Temple
Temple lost to Babylon

After Babylon:
Return to Temple or Expand to Radhanite/Khazar

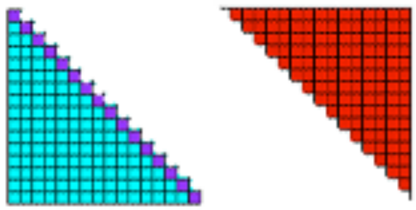
After Hitler:
Return to Temple or Expand to New York

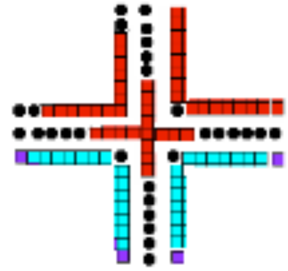
12,000 years ago, Africans developed IFA Oracle divination based on the square of 16 = 16x16 = 256 = = 2^8 corresponding to the vertices of an 8-dimensional hypercube and to the binary 2-choice Clifford algebra Cl(8) and so to related ones such as Cl(8)xCl(8) = Cl(16). Since the number of sub-hypercubes in an 8-dimensional hypercube is 6,561 = 81x81 = 3^8, the IFA Oracle has N=8 ternary 3-structure as well as binary 2-structure:

N	2^N	3^N
0	1	
1	2	3
2	4 =2x2	9 = 3x3
3	8	27
4	16 = 4x4	81 = 9x9
5	32	243
6	64 = 8x8	729 = 27x27
7	128	2187
8	256 = 16x16	6561 = 81x81

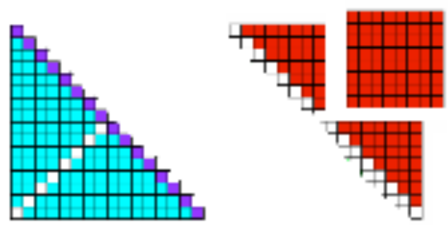

Palma de Mallorca
Shinto 128
I Ching 64
Ilm Al Raml 16
Rig Veda 240
IFA 256

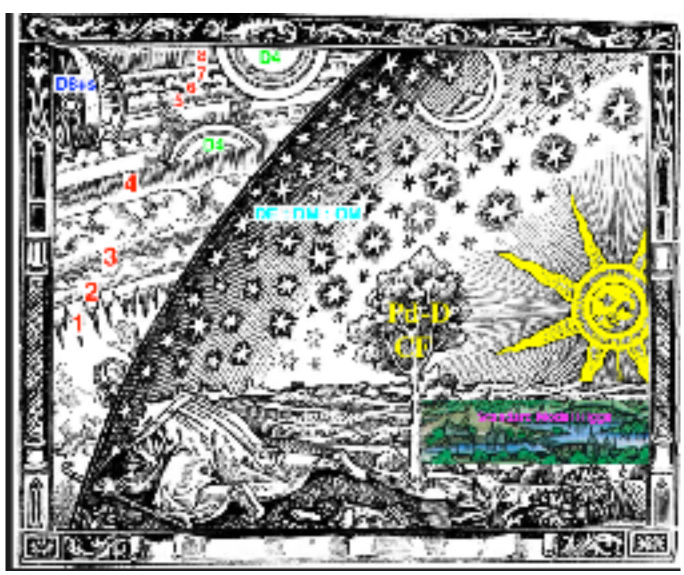
African IFA to RigVeda-Pachisi





to Tarot to Llull to E8 Physics

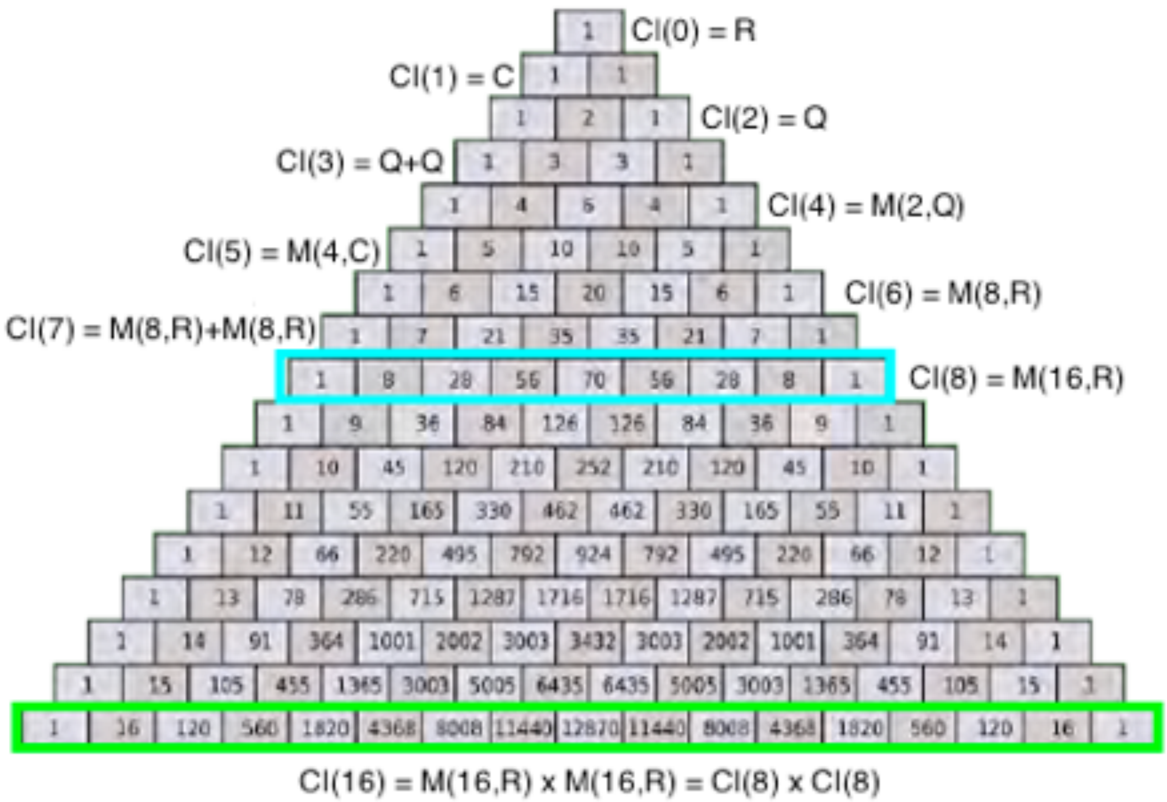




Nagari is the name for the Sanskrit script ... the ancient Ethiopic and Sanskrit writing are one and the same ... the name Nagari for Sanskrit betrays the Ethiopia origin of this form of writing. In Geez, the term nagar means ‘speech, to speak’. ...".

Feuerstein, Kak, and Frawley, in their book In Search of the Cradle of Civilization (Quest 1995), say "... The principal and, taken in its totality, the oldest of the four Vedic hymnbodies is the Rig-Veda. ... The Sanskrit word ric, which for euphonic reasons is changed to rig, means literally "praise". ... The Sanskrit word veda means literally "knowledge" or "wisdom". ... **The Rig-Veda is** the oldest book in the Sanskrit language ... More than that, if we are correct, it is **the oldest book in the world** ...".

The Indian National Science Academy web site insaindia.org says
"... The Vedic Civilization ... evolved around ... the Vedas ... Vedic meters ... permutations and combinations of long and short sounds ... led ... to discover[y of] the Meru Prastara ...



now known as Pascal's Triangle ...".

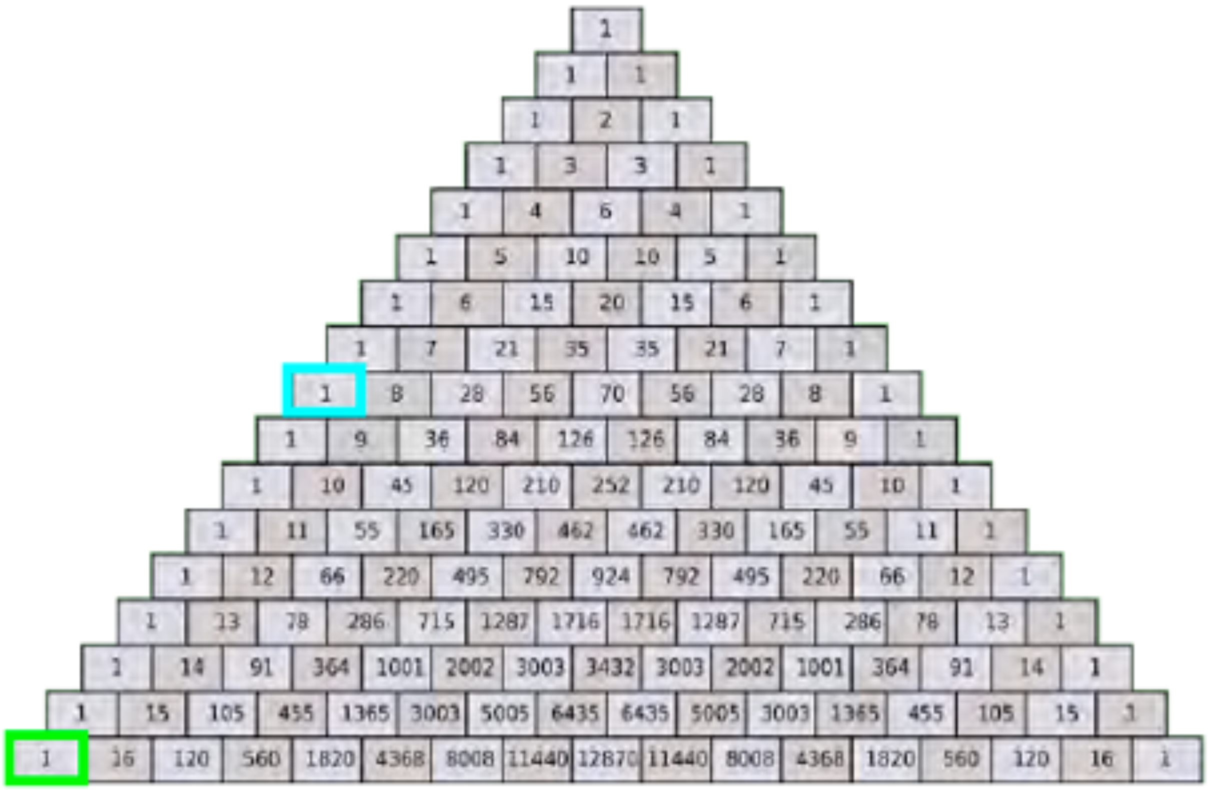
The row I have outlined in cyan contains the 1+8+28+56+70+56+28+8+1 = 256 = 16x16 elements of the Cl(8) Real Clifford Algebra of African IFA divination.
The other rows contain the 2^N elements of Cl(N) where N is the second number from the left in each row, so that the Meru Prastara describes all Real Clifford Algebras Cl(N), with the figure above showing Cl(0) through Cl(16) which I have outlined in green.

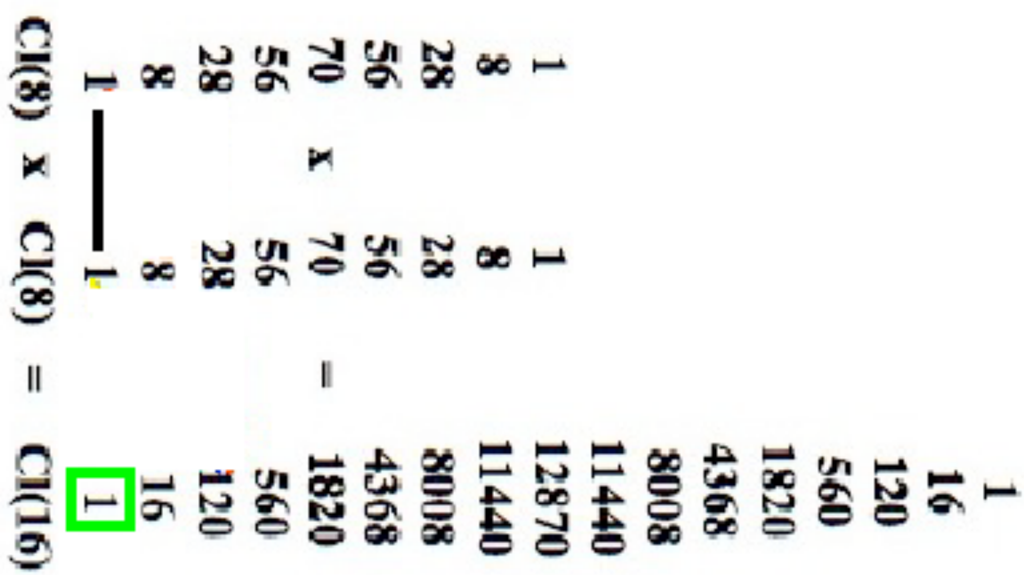
8-Periodicity of Real Clifford Algebras is shown by the Division Algebra sequence
R for Cl(0)
C for Cl(1) Q for Cl(2) Q+Q for Cl(3) Q for Cl(4)
C for Cl(5) R for Cl(6) R+R for Cl(7)   R for Cl(8) = M(16,R)
so that
Cl(16) = tensor product Cl(8) x Cl(8) is the case N = 2
of Cl(8N) = Cl(8) x ...(N times tensor product)... x Cl(8).
The case Cl(16) = Cl(8) x Cl(8) graded structure is

				1
				16
				120
				560
				1820
				4368
				8008
				11440
1		1		12870
8		8		11440
28		28		8008
56		56		4368
70	x	70	=	1820
56		56		560
28		28		120
8		8		16
1		1		1
Cl(8)	x	Cl(8)	=	Cl(16)

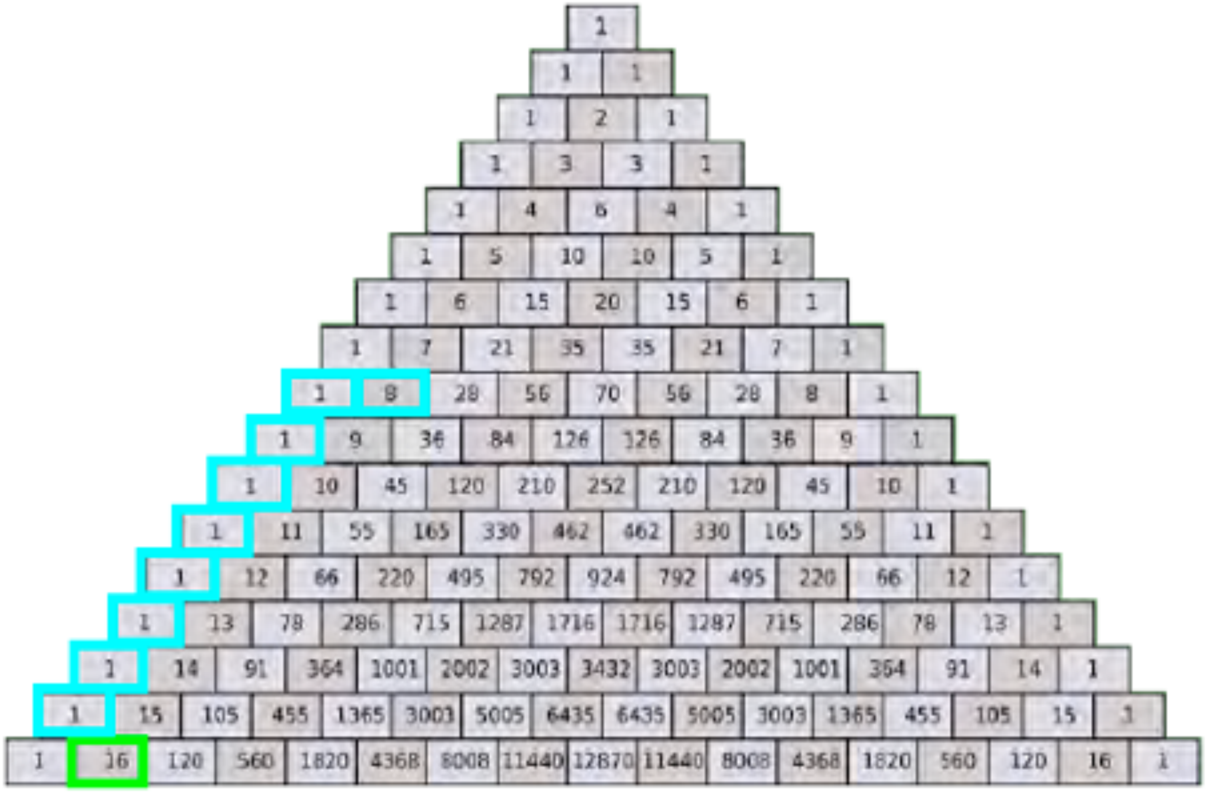
with grade 0 at the bottom, grade 16 of the top of Cl(16),
and grade 8 at the middle of Cl16) and the top of the Cl(8).
Here are more details for some illustrative examples:

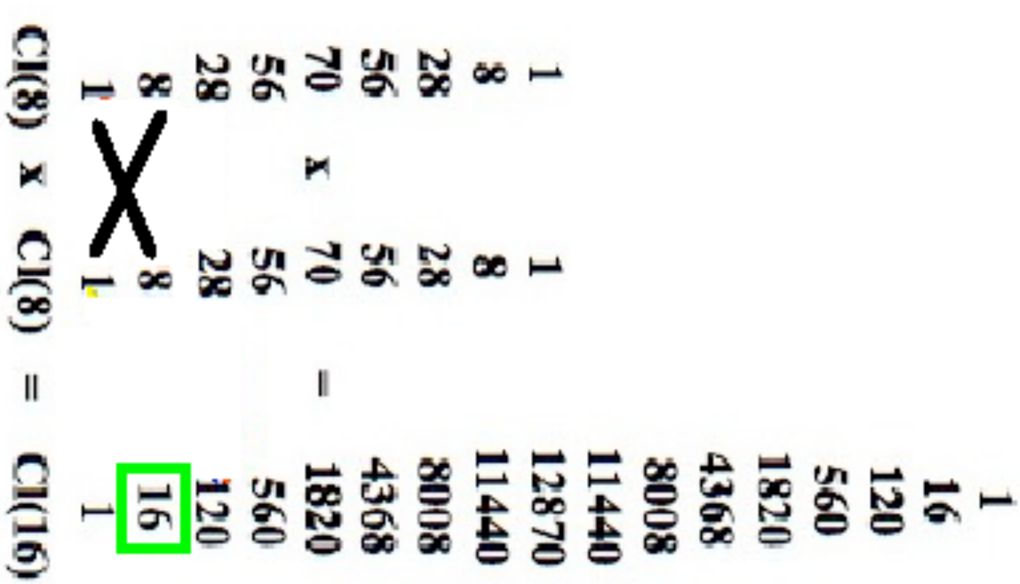
Cl(16) Grade 0 has dimension 1 = 1x1



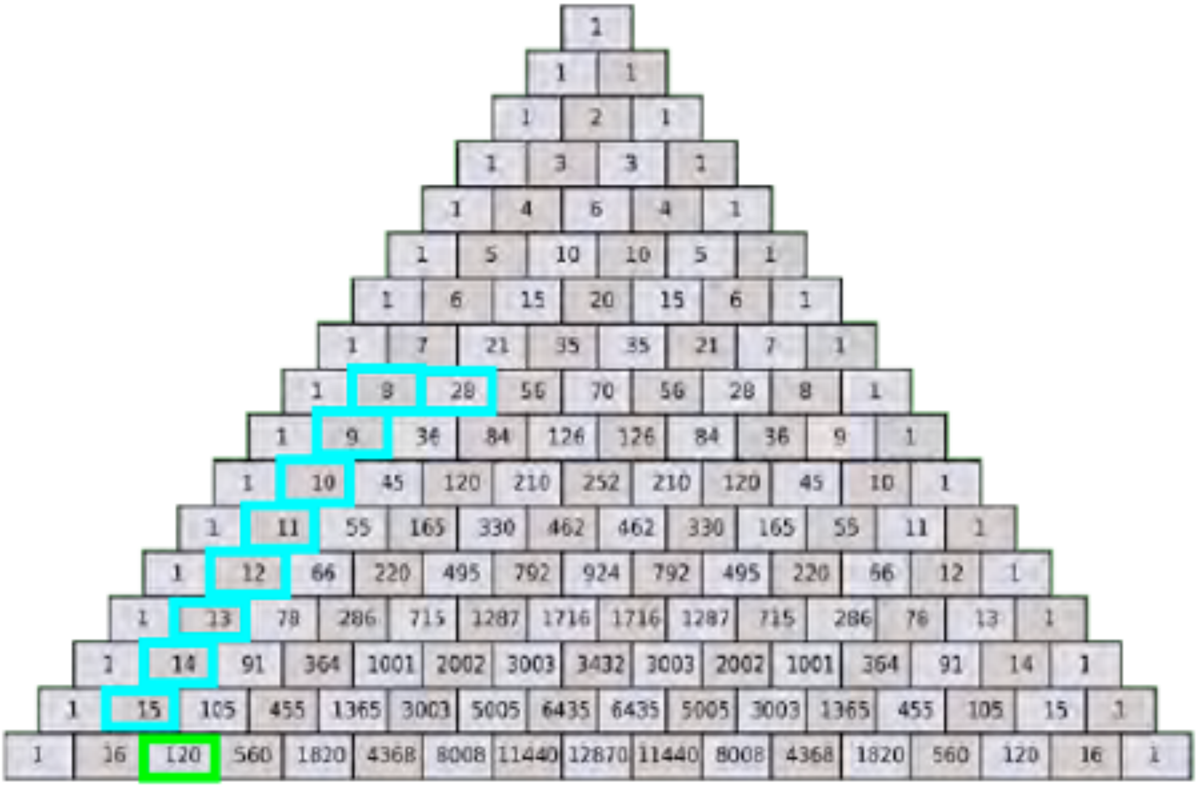


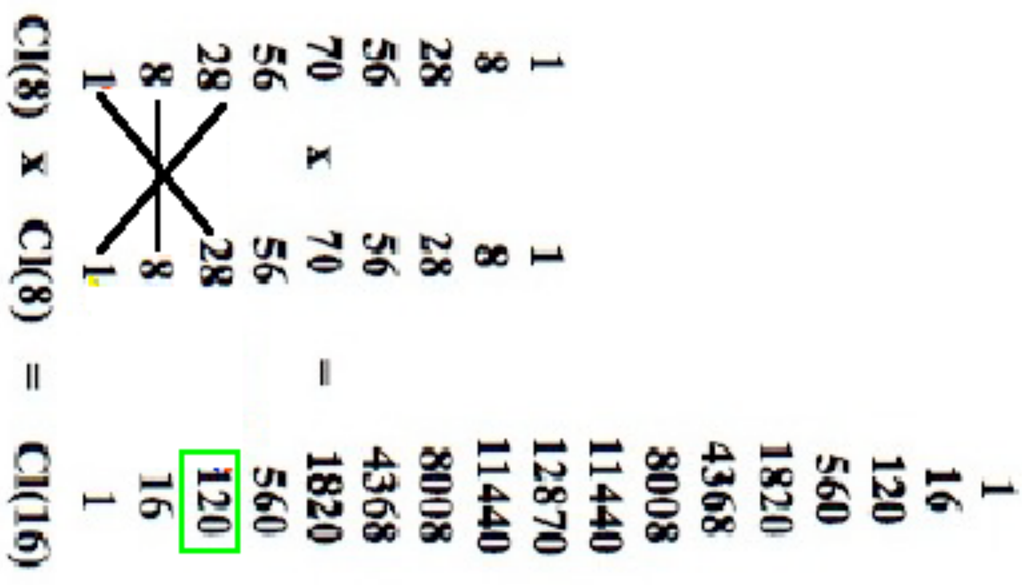
Cl(16) Grade 1 has dimension 16 = 8x1 + 1x8





Cl(16) Grade 2 has dimension 120 = 8x8 + 1x28 + 28x1

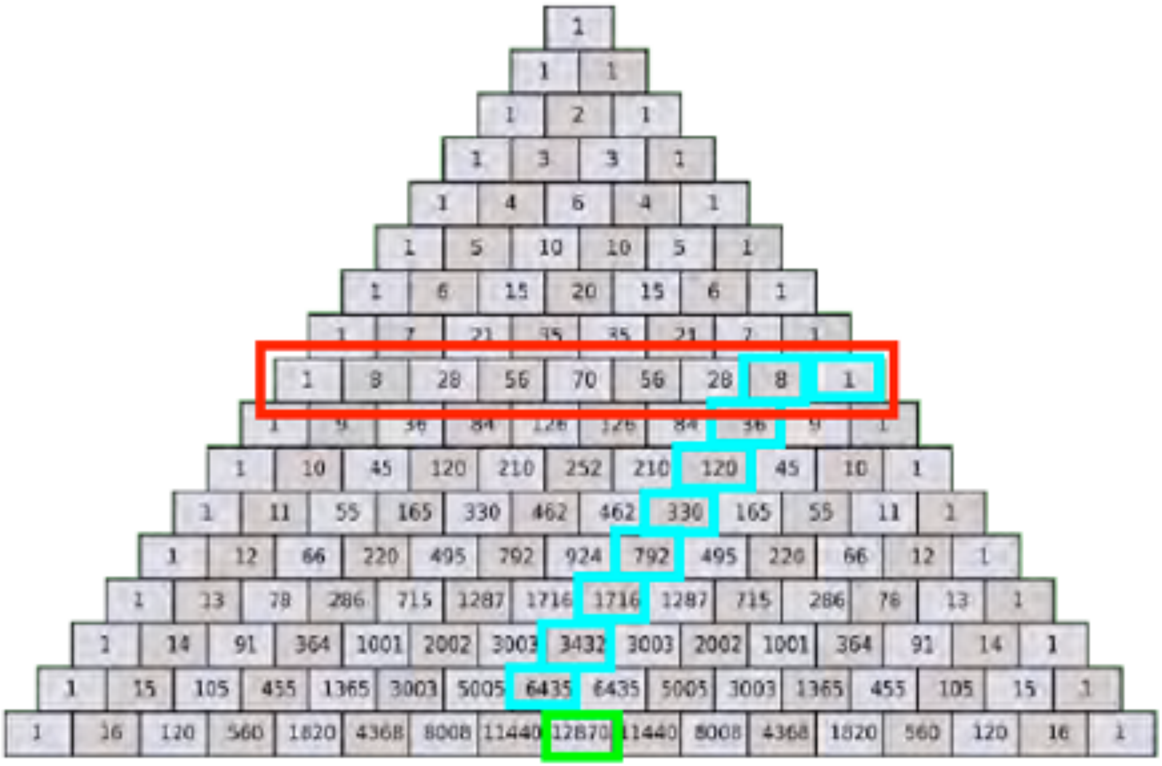


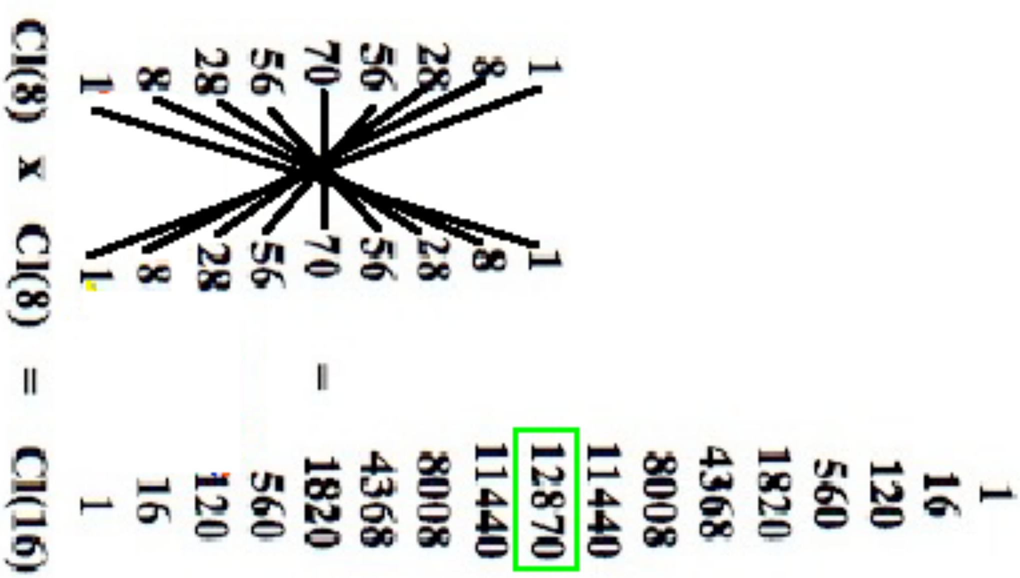


Cl(16) Grade 8 (its middle grade) has dimension

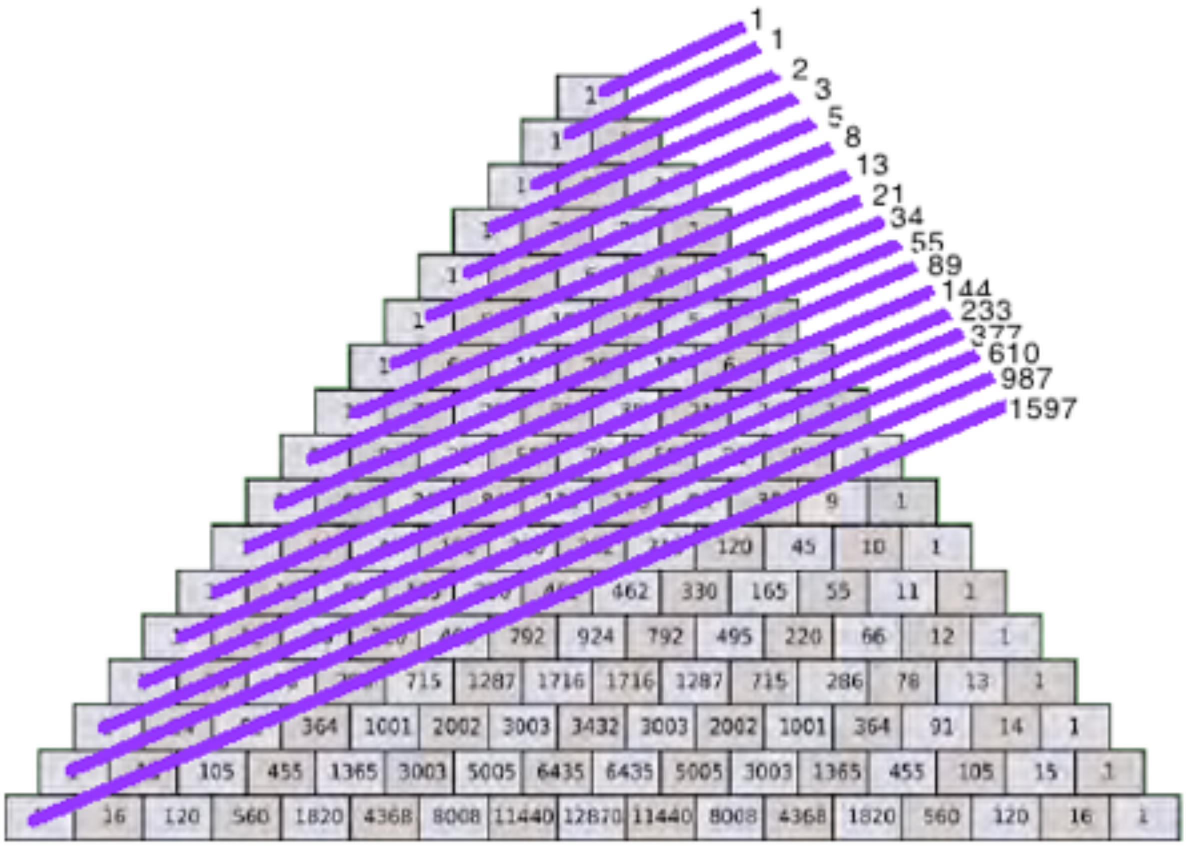
12,870 = 1x1 + 8x8 + 28x28 + 56x56 + 70x70 + 56x56 + 28x28 + 8x8 + 1x1

which is the sum of the squares of the grades of Cl(8)





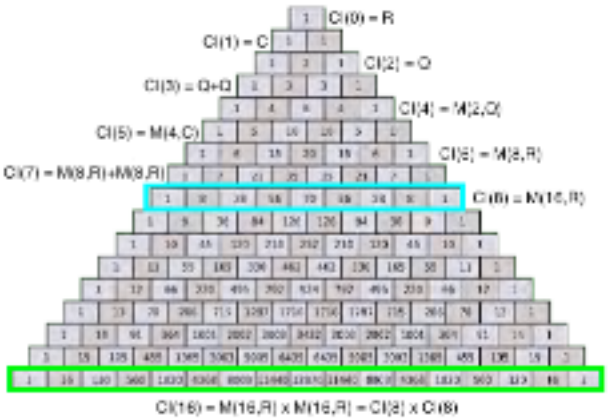
The Meru Prastara also encodes Fibonacci numbers and therefore related processes:



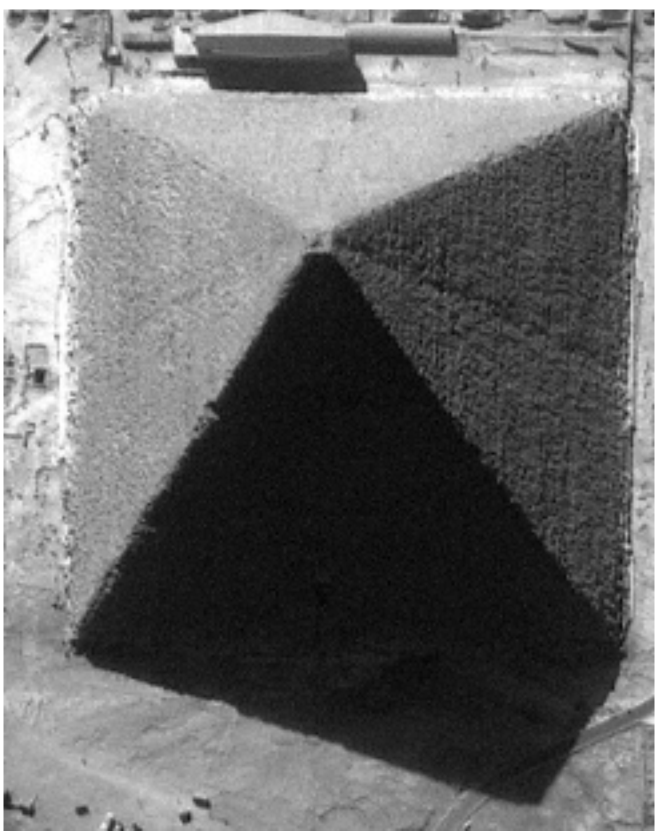
According to Wikipedia:
Prime Fibonacci numbers shown above are 1, 2, 3, 5, 13, 89, 233, and 1597.
Starting with 5, every second Fibonacci number is the length of the hypotenuse of a right triangle with integer sides, or in other words, the largest number in a Pythagorean triple. The length of the longer leg of this triangle is equal to the sum of the three sides of the preceding triangle in this series of triangles, and the shorter leg is equal to the difference between the preceding bypassed Fibonacci number and the shorter leg of the preceding triangle. The first triangle in this series has sides of length 5, 4, and 3. Skipping 8, the next triangle has sides of length 13, 12 (5 + 4 + 3), and 5 (8 – 3). Skipping 21, the next triangle has sides of length 34, 30 (13 + 12 + 5), and 16 (21 – 5).
The Fibonacci numbers occur as the ratio of successive convergents of the continued fraction for the Golden Ratio ϕ

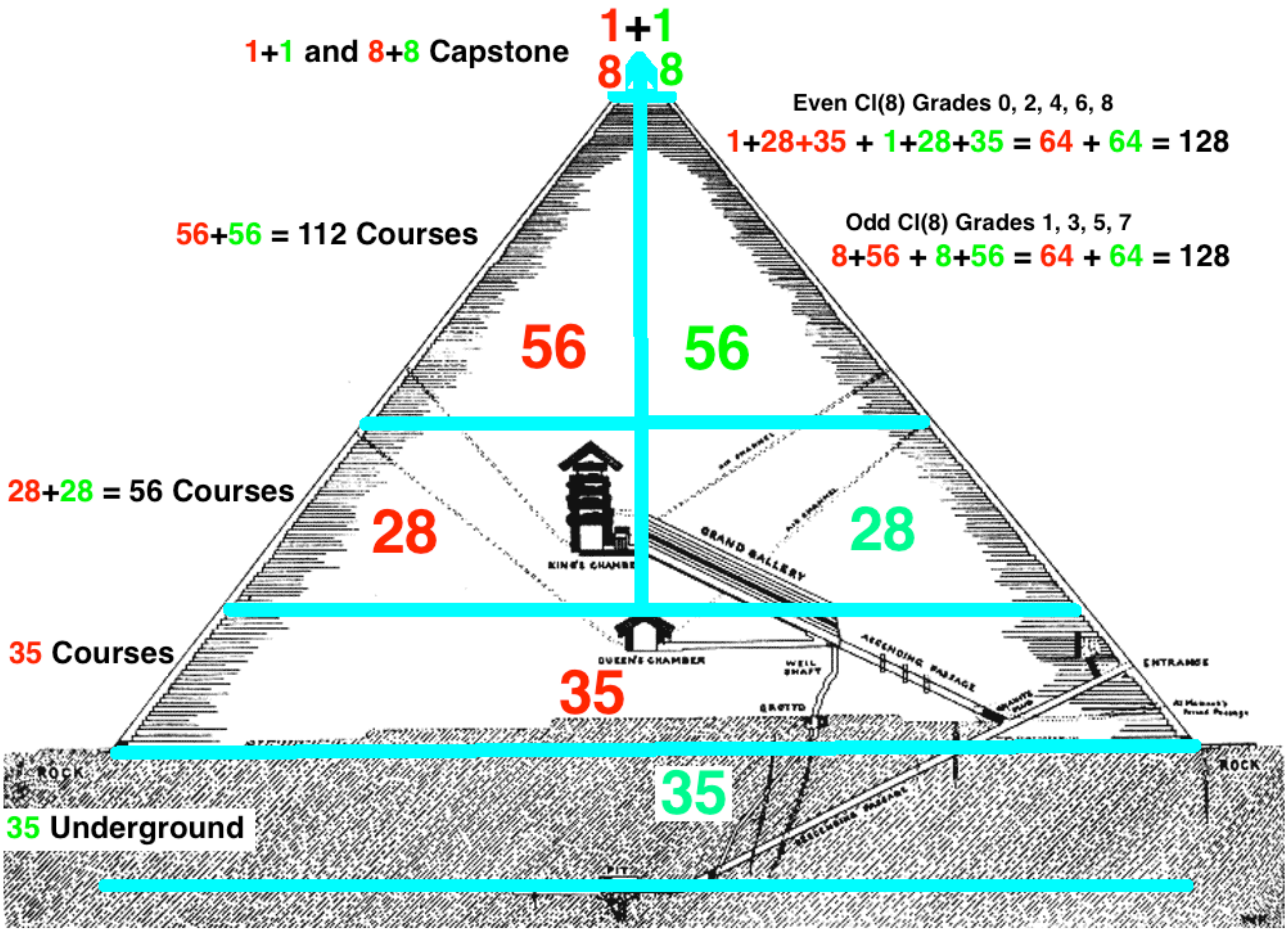
$$\varphi = 1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \ddots}}}$$

The Golden Ratio structure and pyramidal shape show that the representation of Ancient African IFA by the Meru Prastara of African Migrants to India 50,000 years ago

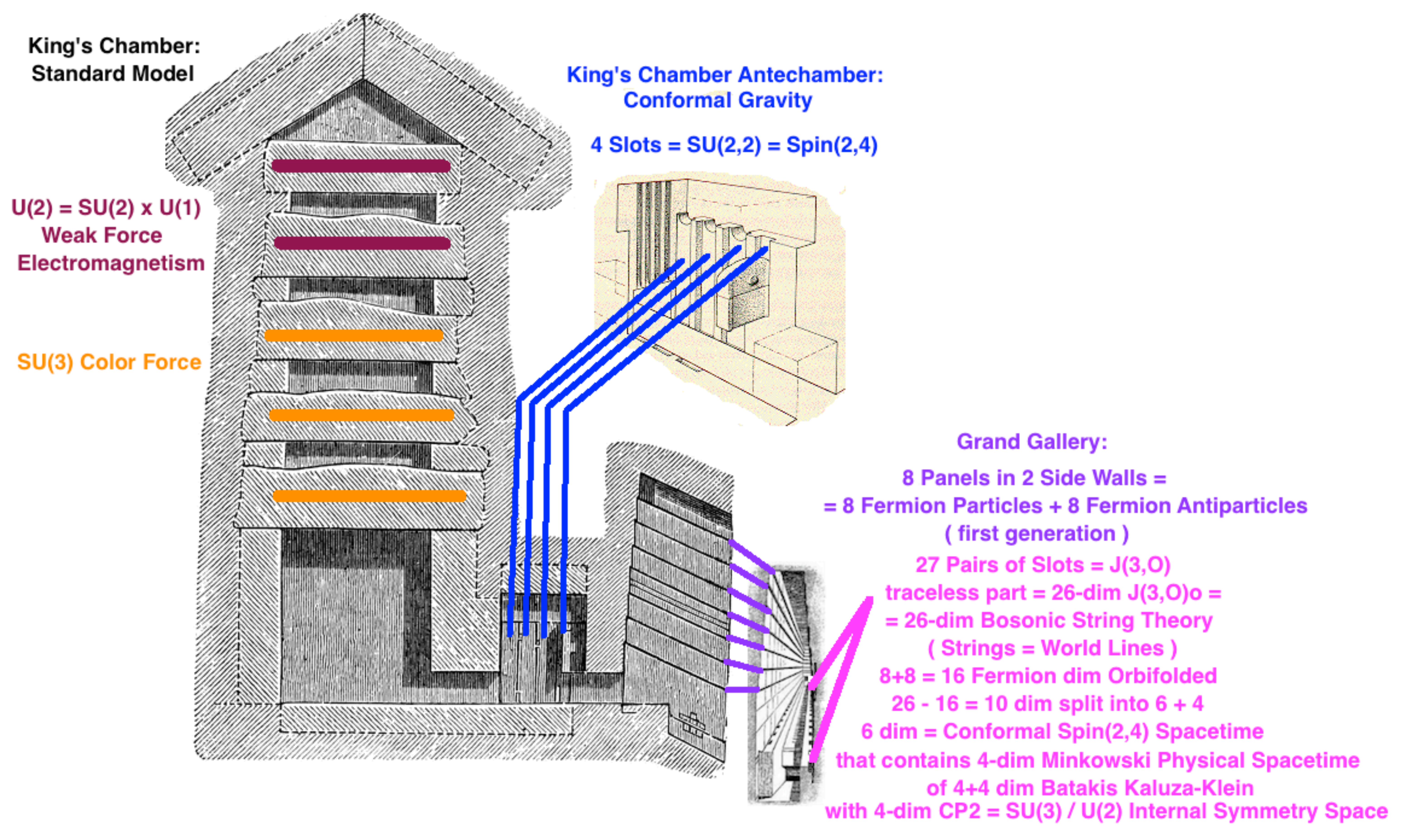


corresponds to its representation
by the Great Pyramid of Giza of African Nile Migrants of 40,000 years ago

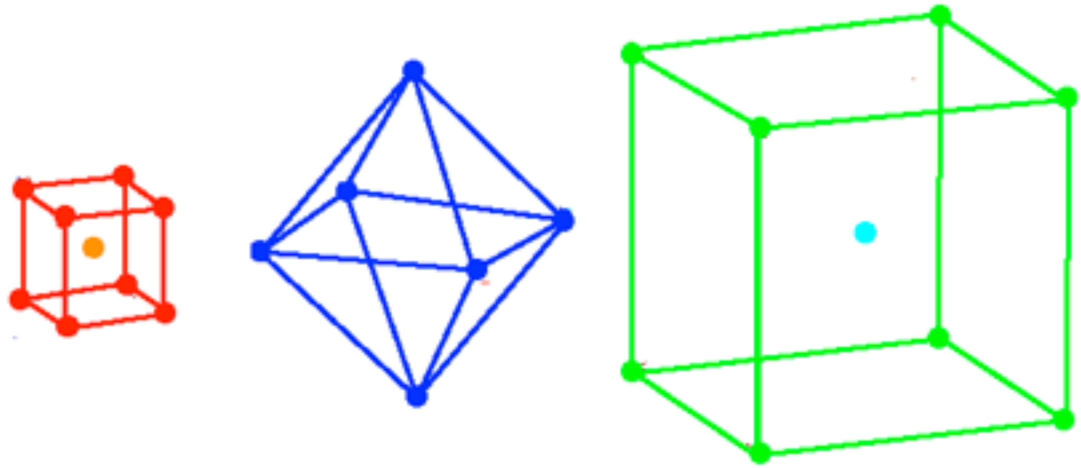




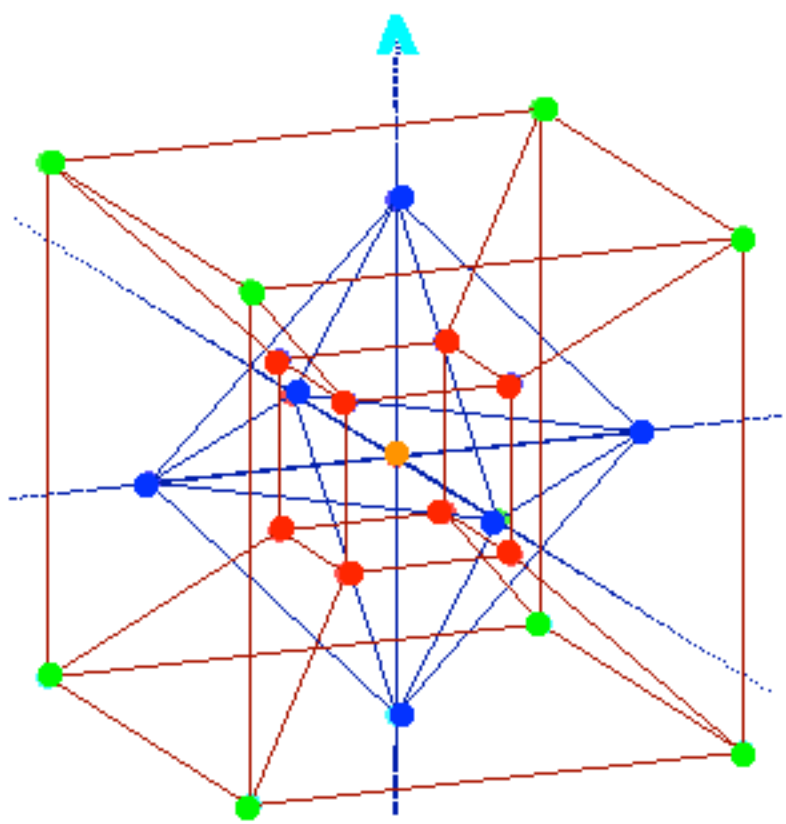
$$1 + 8 + 28 + 56 + (35 + 35) + 56 + 28 + 8 + 1$$


King's Chamber:
Standard Model
U(2) = SU(2) x U(1)
Weak Force
Electromagnetism
SU(3) Color Force
King's Chamber Antechamber:
Conformal Gravity
4 Slots = SU(2,2) = Spin(2,4)
Grand Gallery:
8 Panels in 2 Side Walls =
= 8 Fermion Particles + 8 Fermion Antiparticles
(first generation)
27 Pairs of Slots = J(3,O)
traceless part = 26-dim J(3,O)o =
= 26-dim Bosonic String Theory
(Strings = World Lines)
8+8 = 16 Fermion dim Orbifolded
26 - 16 = 10 dim split into 6 + 4
6 dim = Conformal Spin(2,4) Spacetime
that contains 4-dim Minkowski Physical Spacetime
of 4+4 dim Batakis Kaluza-Klein
with 4-dim CP2 = SU(3) / U(2) Internal Symmetry Space

The Capstone 8 + 8 and 1 + 1
combined with
the 5 vertices of the Great Pyramid
plus a 6th underground vertex antipodal to the Capstone



form a 24-cell (image with one vertex at infinity)



(image adapted from Frans Marcelis members.home.nl/fg.marcelis/)

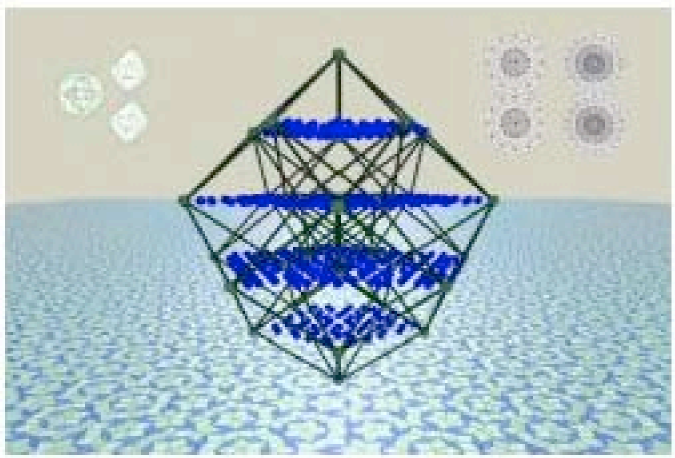
Rig Veda begins with 1 Madala, 1 Astaka, 1 Adhyaya, Sukta 1:

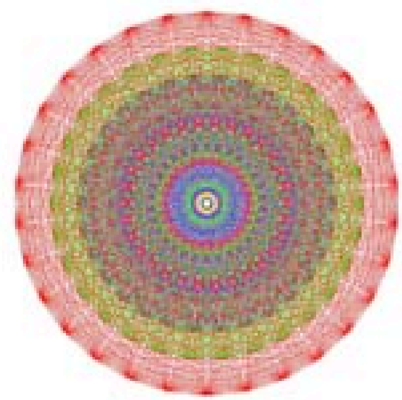
ॐ अग्निमीळे पुरोहितं यज्ञस्य देवमृत्विजम् । होतारं रत्नधातमम् ‖ 1 ‖
अग्निः पूर्वेभिर्ऋषिभिरीड्यो नूतनैरुत । स देवाँ एह वक्षति ‖ 2 ‖
अग्निना रयिमश्नवत्पोषमेव दिवेदिवे । यशसं वीरवत्तमम् ‖ 3 ‖
अग्ने यं यज्ञमध्वरं विश्वतः परिभूरसि । स इद्देवेषु गच्छति ‖ 4 ‖
अग्निर्होता कविक्रतुः सत्यश्चित्रश्रवस्तमः । देवो देवेभिरा गमत् ‖ 5 ‖
यदङ्ग दाशुषे त्वमग्ने भद्रं करिष्यसि । तवेत्तत्सत्यमङ्गिरः ‖ 6 ‖
उप त्वाग्ने दिवेदिवे दोषावस्तर्धिया वयम् । नमो भरन्त एमसि ‖ 7 ‖
राजन्तमध्वराणां गोपामृतस्य दीदिविम् । वर्धमानं स्वे दमे ‖ 8 ‖
स नः पितेव सूनवेऽग्ने सूपायनो भव । सचस्वा नः स्वस्तये ‖ 9 ‖

Note the structure of 1 first line, followed by 8 lines, each with 8+8 = 16 Sanskrit syllables left of the | line and 8 Sanskrit syllables right of the | line, for a total of 24 Sanskrit syllables per line.

- the first richa of the first sukt has 24 syllables plus 24 gaps (if you include a silent gap at the beginning/end to close the first sukt into a circle) and
- those 24 gaps are made relevant by being elaborated by the following 8 richas of the first sukt, which have 192 syllables

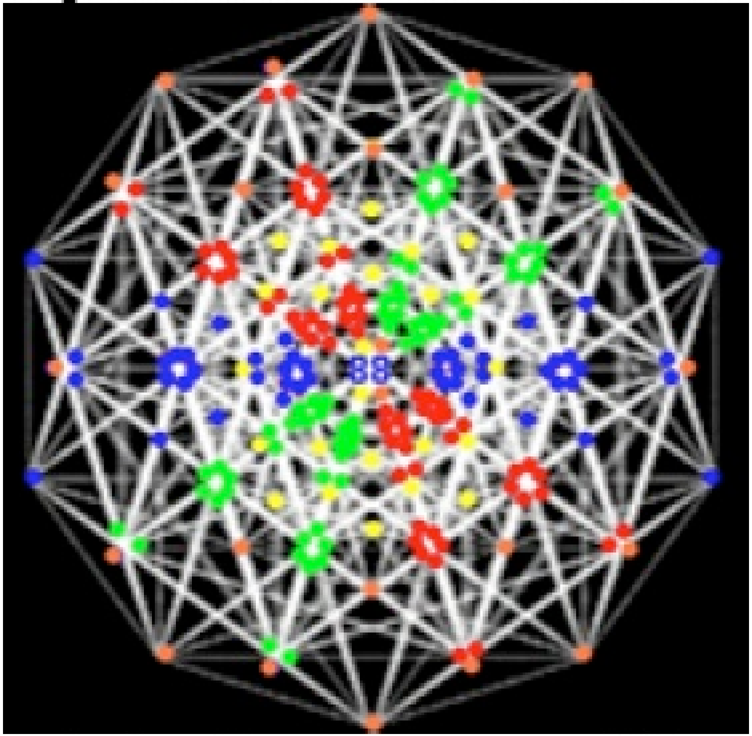
so that **the total number of relevant entities in the first sukt is 24+24+192 = 240**, which is the number of vertices of



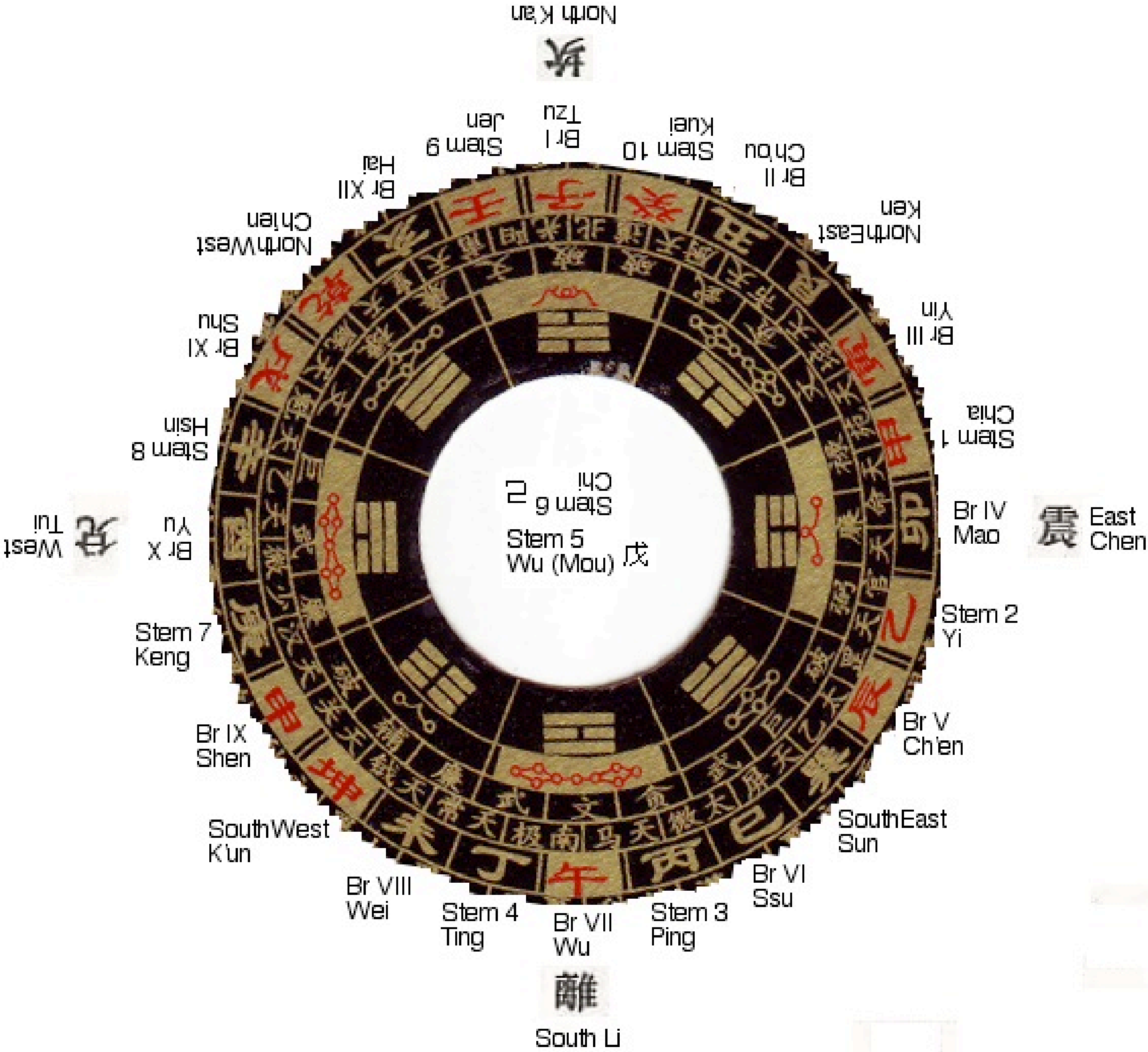


the root vector polytope of [the E8 Lie algebra](). it has dimension 240+8 = 248, and [Cl(8) = E8 + 8-dimensional vector space]().

India used the 240 parts of the Rig Veda's first sukt.
The 240 corresponds to the 240 Root Vectors



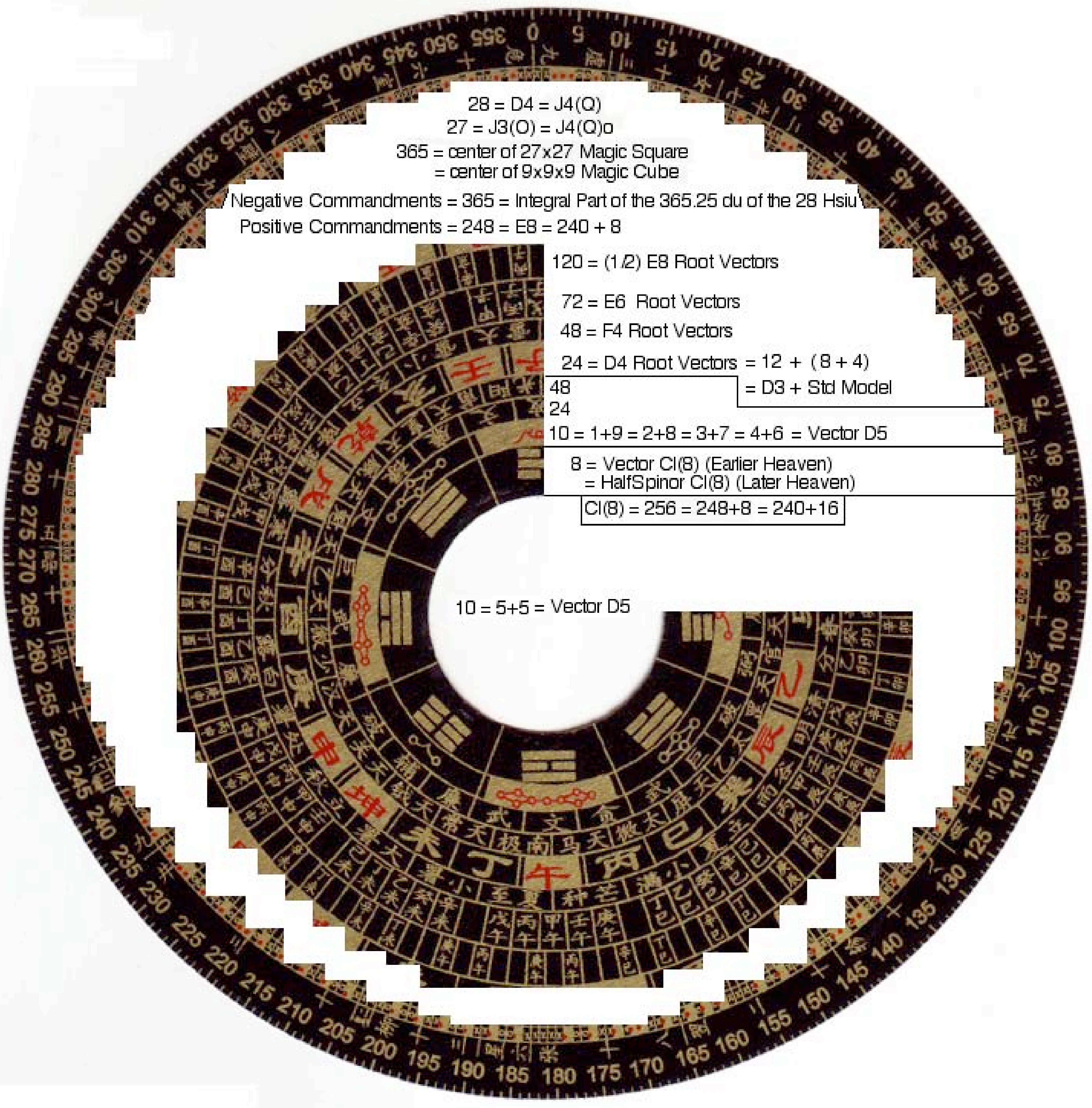
of the E8 Lie algebra that is constructed from Cl(8)xCl(8) = Cl(16).



North K'an
坎
Br I
Tzu
Stem 10
Kuei
Br II
Ch'ou
NorthEast
Ken
Br III
Yin
Stem 1
Chia
Br IV
Mao
震
East
Chen
Stem 2
Yi
Br V
Ch'en
SouthEast
Sun
Br VI
Ssu
Stem 3
Ping
Br VII
Wu
離
South Li
Stem 4
Ting
Br VIII
Wei
SouthWest
K'un
Br IX
Shen
Stem 7
Keng
Br X
Yu
兌
West
Tui
Stem 8
Hsin
Br XI
Shu
NorthWest
Ch'ien
Br XII
Hai
Stem 9
Jen
Stem 6
Chi
己
Stem 5
Wu (Mou)
戊

China used the 64 possibilities of the binary I Ching and the 81 possibilities of the ternary Tai Hsuan Ching, effectively cutting off the binary 2-structure at N= 6 and the ternary structure at N= 4

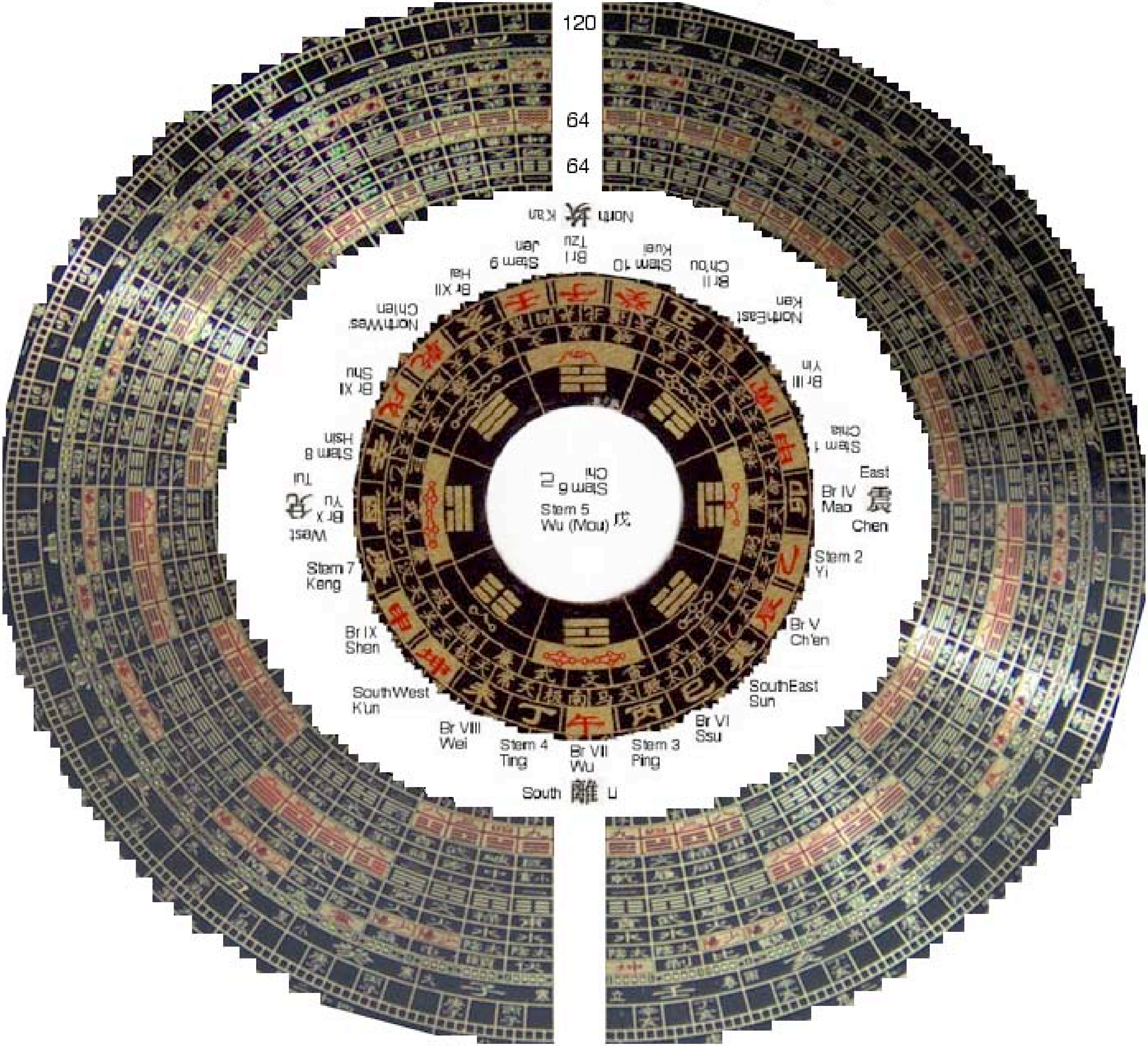
```
N        2^N                      3^N
0                      1
1                    2   3
2                  4       9 = 3x3
3                8           27
4             16               81 = 9x9
5           32
6         64
```

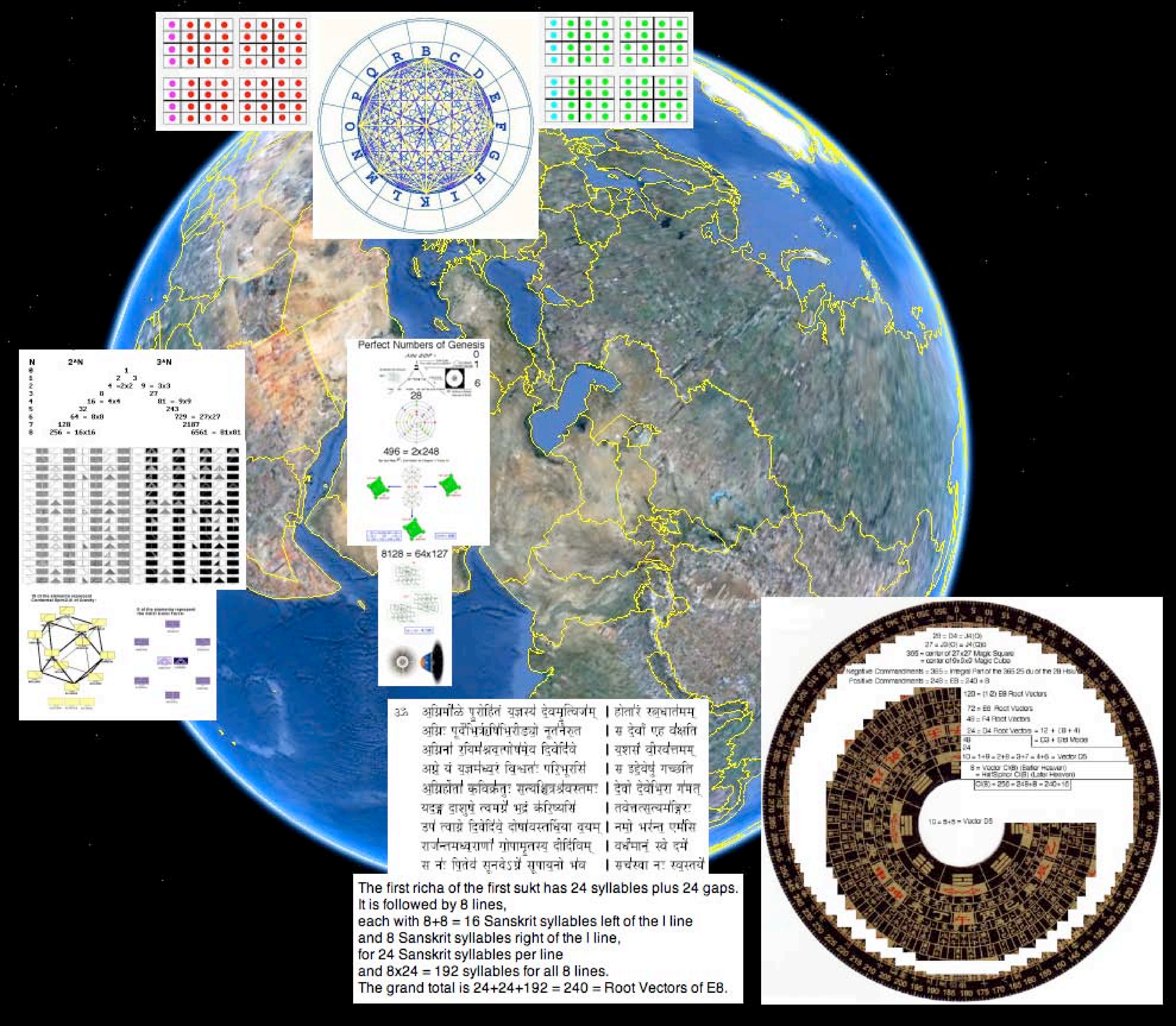

28 = D4 = J4(Q)
27 = J3(O) = J4(Q)o
365 = center of 27x27 Magic Square
= center of 9x9x9 Magic Cube
Negative Commandments = 365 = Integral Part of the 365.25 du of the 28 Hsiu
Positive Commandments = 248 = E8 = 240 + 8
120 = (1/2) E8 Root Vectors
72 = E6 Root Vectors
48 = F4 Root Vectors
24 = D4 Root Vectors = 12 + (8 + 4)
48
24
= D3 + Std Model
10 = 1+9 = 2+8 = 3+7 = 4+6 = Vector D5
8 = Vector Cl(8) (Earlier Heaven)
= HalfSpinor Cl(8) (Later Heaven)
Cl(8) = 256 = 248+8 = 240+16
10 = 5+5 = Vector D5

Japan used the 128 possibilities of Shinto Futomani Divination and the Triad: Jewel-Mirror-Sword, effectively cutting off the binary 2-structure at N = 7 and the ternary 3-structure at N=1

```
N        2^N                        3^N
0                          1
1                        2   3
2                      4
3                    8
4                 16
5               32
6             64
7           128
```

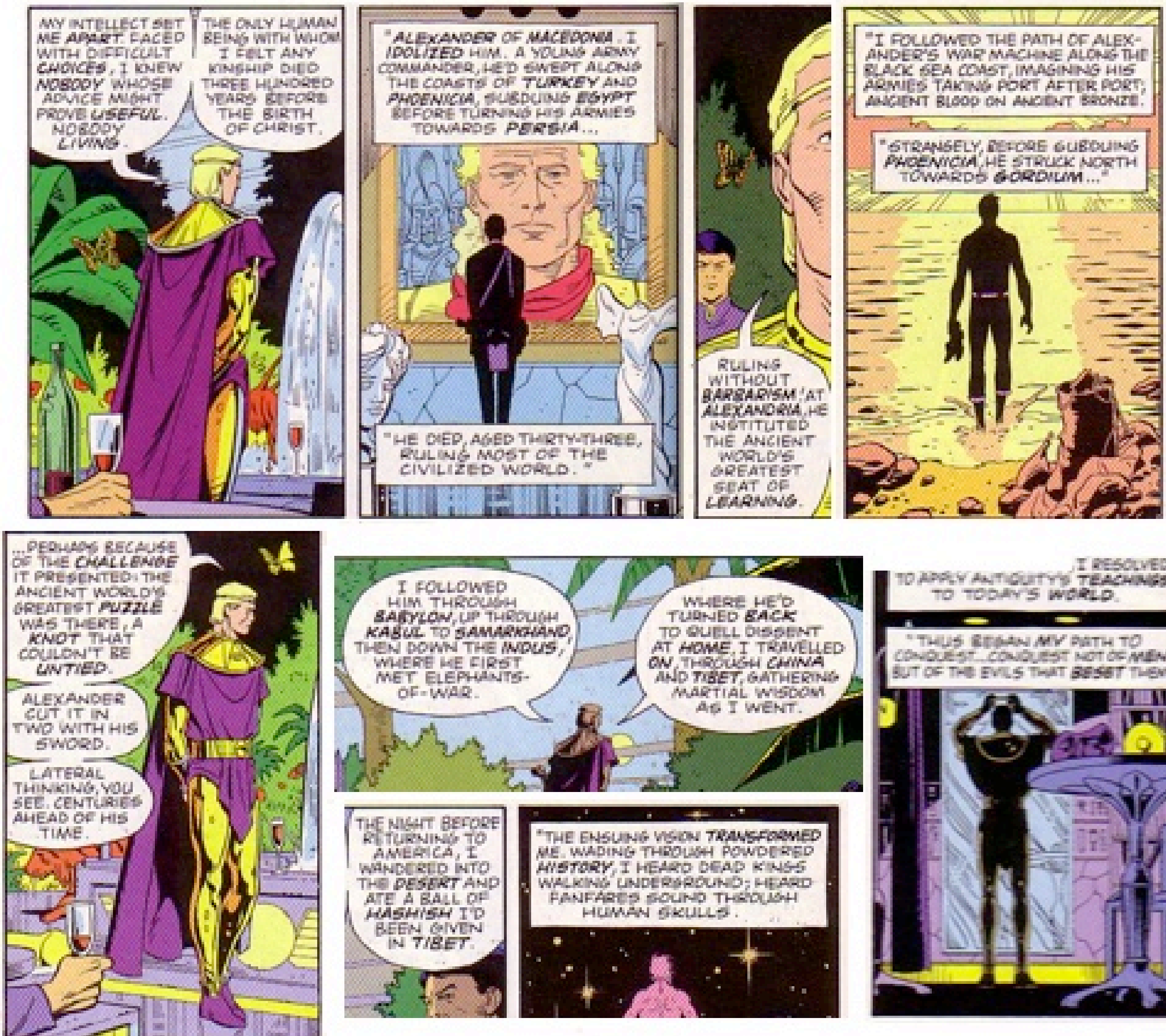
E8 = 248 = D8 + HalfSpinor D8 = 120 + 128 = 120 + (64+64)

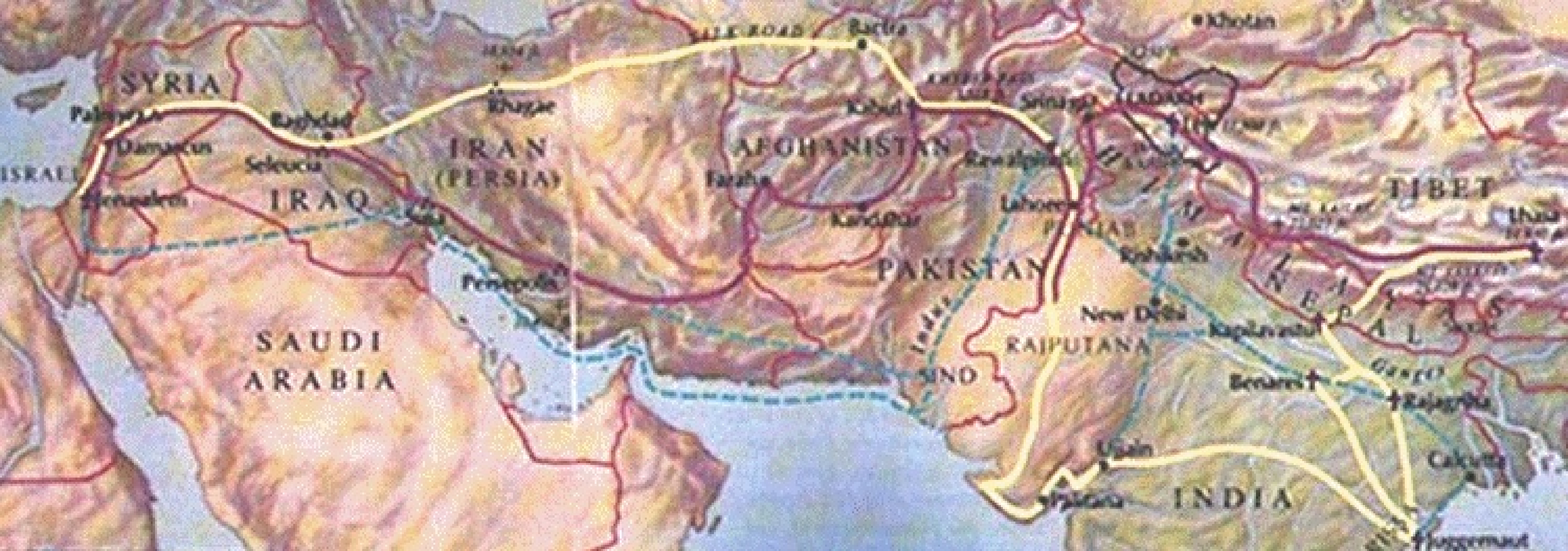



B C D E F G H I K L M N O P Q R
N 2^N 3^N
0 1
1 2 3
2 4 = 2x2 9 = 3x3
3 8 27
4 16 = 4x4 81 = 9x9
5 32 243
6 64 = 8x8 729 = 27x27
7 128 2187
8 256 = 16x16 6561 = 81x81
Perfect Numbers of Genesis
0
1
6
28
496 = 2x248
8128 = 64x127
28 = D4 = J4(O)
27 = J3(O) = J4(O)o
365 = center of 27x27 Magic Square
= center of 9x9x9 Magic Cube
Negative Commandments = 365 = Integral Part of the 365.25 du of the 28 Hsiu
Positive Commandments = 248 = E8 = 240 + 8
120 = (1/2) E8 Root Vectors
72 = E6 Root Vectors
48 = F4 Root Vectors
24 = D4 Root Vectors = 12 + (8 + 4)
= D3 + Std Model
10 = 1+9 = 2+8 = 3+7 = 4+6 = Vector D5
8 = Vector Cl(8) (Earlier Heaven)
= Half Spinor Cl(8) (Later Heaven)
Cl(8) = 256 = 248+8 = 240+16
10 = 5+5 = Vector D5
ॐ अग्निमीळे पुरोहितं यज्ञस्य देवमृत्विजम् | होतारं रत्नधातमम्
अग्निः पूर्वेभिर्ऋषिभिरीड्यो नूतनैरुत | स देवाँ एह वक्षति
अग्निना रयिमश्नवत्पोषमेव दिवेदिवे | यशसं वीरवत्तमम्
अग्ने यं यज्ञमध्वरं विश्वतः परिभूरसि | स इद्देवेषु गच्छति
अग्निर्होता कविक्रतुः सत्यश्चित्रश्रवस्तमः | देवो देवेभिरा गमत्
यदङ्ग दाशुषे त्वमग्ने भद्रं करिष्यसि | तवेत्तत्सत्यमङ्गिरः
उप त्वाग्ने दिवेदिवे दोषावस्तर्धिया वयम् | नमो भरन्त एमसि
राजन्तमध्वराणां गोपामृतस्य दीदिविम् | वर्धमानं स्वे दमे
स नः पितेव सूनवेऽग्ने सूपायनो भव | सचस्वा नः स्वस्तये
The first richa of the first sukt has 24 syllables plus 24 gaps.
It is followed by 8 lines,
each with 8+8 = 16 Sanskrit syllables left of the I line
and 8 Sanskrit syllables right of the I line,
for 24 Sanskrit syllables per line
and 8x24 = 192 syllables for all 8 lines.
The grand total is 24+24+192 = 240 = Root Vectors of E8.

Plato, to construct a musical scale, used the full N=8 binary 2-structure but only N=5 of the ternary 3-structure

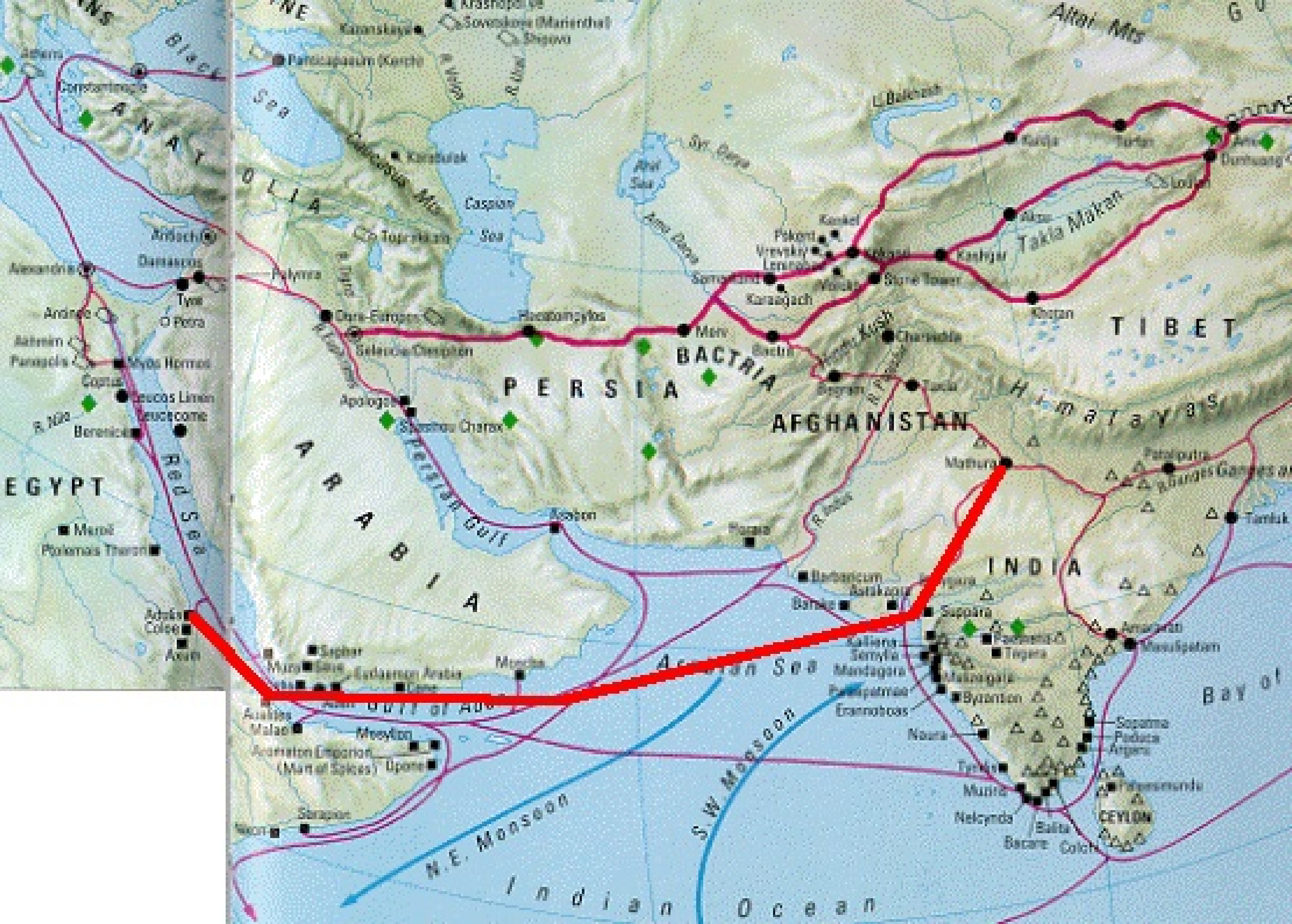
N	2^N	3^N
0	1	1
1	2	3 = 2 + 1
2	4	9 = 4 + 4+1
3	8	27 = 8 + 12+6+1
4	16	81 = 16 + 32+24+8+1
5	32	243=32+80+80+40+10+1
6	64	
7	128	
8	256	


MY INTELLECT SET ME APART. FACED WITH DIFFICULT CHOICES, I KNEW NOBODY WHOSE ADVICE MIGHT PROVE USEFUL. NOBODY LIVING.
THE ONLY HUMAN BEING WITH WHOM I FELT ANY KINSHIP DIED THREE HUNDRED YEARS BEFORE THE BIRTH OF CHRIST.
"ALEXANDER OF MACEDONIA. I IDOLIZED HIM. A YOUNG ARMY COMMANDER, HE'D SWEPT ALONG THE COASTS OF TURKEY AND PHOENICIA, SUBDUING EGYPT BEFORE TURNING HIS ARMIES TOWARDS PERSIA...
"HE DIED, AGED THIRTY-THREE, RULING MOST OF THE CIVILIZED WORLD."
RULING WITHOUT BARBARISM; AT ALEXANDRIA, HE INSTITUTED THE ANCIENT WORLD'S GREATEST SEAT OF LEARNING.
"I FOLLOWED THE PATH OF ALEXANDER'S WAR MACHINE ALONG THE BLACK SEA COAST, IMAGINING HIS ARMIES TAKING PORT AFTER PORT; ANCIENT BLOOD ON ANCIENT BRONZE.
"STRANGELY, BEFORE SUBDUING PHOENICIA, HE STRUCK NORTH TOWARDS GORDIUM..."
...PERHAPS BECAUSE OF THE CHALLENGE IT PRESENTED: THE ANCIENT WORLD'S GREATEST PUZZLE WAS THERE, A KNOT THAT COULDN'T BE UNTIED.
ALEXANDER CUT IT IN TWO WITH HIS SWORD.
LATERAL THINKING, YOU SEE. CENTURIES AHEAD OF HIS TIME.
I FOLLOWED HIM THROUGH BABYLON, UP THROUGH KABUL TO SAMARKHAND, THEN DOWN THE INDUS, WHERE HE FIRST MET ELEPHANTS-OF-WAR.
WHERE HE'D TURNED BACK, TO QUELL DISSENT AT HOME, I TRAVELLED ON, THROUGH CHINA AND TIBET, GATHERING MARTIAL WISDOM AS I WENT.
THE NIGHT BEFORE RETURNING TO AMERICA, I WANDERED INTO THE DESERT AND ATE A BALL OF HASHISH I'D BEEN GIVEN IN TIBET.
"THE ENSUING VISION TRANSFORMED ME. WADING THROUGH POWDERED HISTORY, I HEARD DEAD KINGS WALKING UNDERGROUND; HEARD FANFARES SOUND THROUGH HUMAN SKULLS.
, I RESOLVED TO APPLY ANTIQUITY'S TEACHINGS TO TODAY'S WORLD.
"THUS BEGAN MY PATH TO CONQUEST... CONQUEST NOT OF MEN, BUT OF THE EVILS THAT BESET THEM."



SILK ROAD
Bactria
Khotan
SYRIA
Palmyra
Damascus
Baghdad
Seleucia
IRAN
(PERSIA)
IRAQ
Persepolis
AFGHANISTAN
Kabul
Kandahar
Rawalpindi
Srinagar
LADAKH
Lahore
TIBET
PAKISTAN
Indus
SIND
RAJPUTANA
New Delhi
N E P A L
Kapilavastu
Ganges
Benares
Rajagriha
Ujjain
Calcutta
INDIA
SAUDI
ARABIA

Massawa
Biskia
Sabderat
Archipelago
Kamaran
At Tawilah
As Salif
Asmara
Decamere
Barentu
Adi Ugri
Adi Kaie
Dukambia
Adi Quala
Marsa Fatma
Al Hudaydah
(Hodeida)
Thio
Bayt al Faqih
Sittona
Adigrat
Adaliu
Zabid
Aksum
Aduwa
Hauzien
Edd
Zuqar
Ayayai
Danakil
Depression
Kabir
Hanish
Bay
Abi Addi
Agula
Barassoli
Masfinto
Adi Arkai
Makale
Ras Dashan
Samre
Sereba
Beilul
Assab
Gondar
Fenaroa
Forodou
Assab Bay
Dabat
Mai Chio
Rahaita
Didhav
Sakota
Quoram
Gorgora
Kobbo
Lalibala
Waldia
Sarda
Tandaho
Aisaita
Bethor
Mandala
Mahdara Maryam
FRENCH
SOMALILAND
Djibo
Daddato
Sagallu


Altai Mts
Black Sea
Constantinople
Panticapaeum (Kerch)
L. Balkhash
Aral Sea
Caspian Sea
Caucasus Mts
Antioch
Alexandria
Damascus
Tyre
Petra
Palmyra
Dura-Europos
Seleucia-Ctesiphon
Hecatompylos
Merv
Samarkand
Bactra
Kashgar
Turfan
Dunhuang
Loulan
Kucha
Aksu
Takla Makan
Khotan
Stone Tower
TIBET
BACTRIA
PERSIA
AFGHANISTAN
Himalayas
Taxila
Mathura
Pataliputra
Tamluk
INDIA
ARABIA
EGYPT
Red Sea
Persian Gulf
Myos Hormos
Coptos
Leuce Come
Berenice
R. Nile
Meroë
Ptolemais Theron
Adulis
Coloe
Axum
Apologos
Spasinou Charax
Gerrha
Barbaricum
Barygaza
Suppara
Kalliena
Semylla
Mandagora
Byzantion
Muziris
Nelcynda
Bacare
Colchi
Sopatma
Poduca
Arikamedu
Masulipatam
CEYLON
Eudaemon Arabia
Cane
Moscha
Gulf of Aden
Arabian Sea
Aromaton Emporion (Mart of Spices)
Opone
Sarapion
N.E. Monsoon
S.W. Monsoon
Indian Ocean
Bay of Bengal

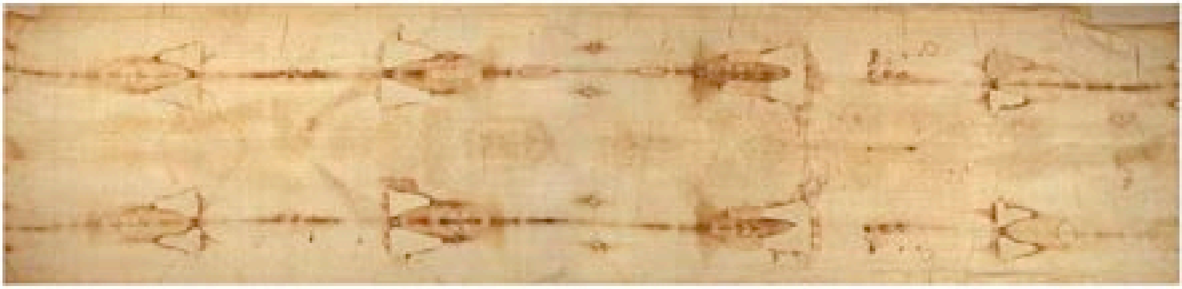

IN MEMORY OF

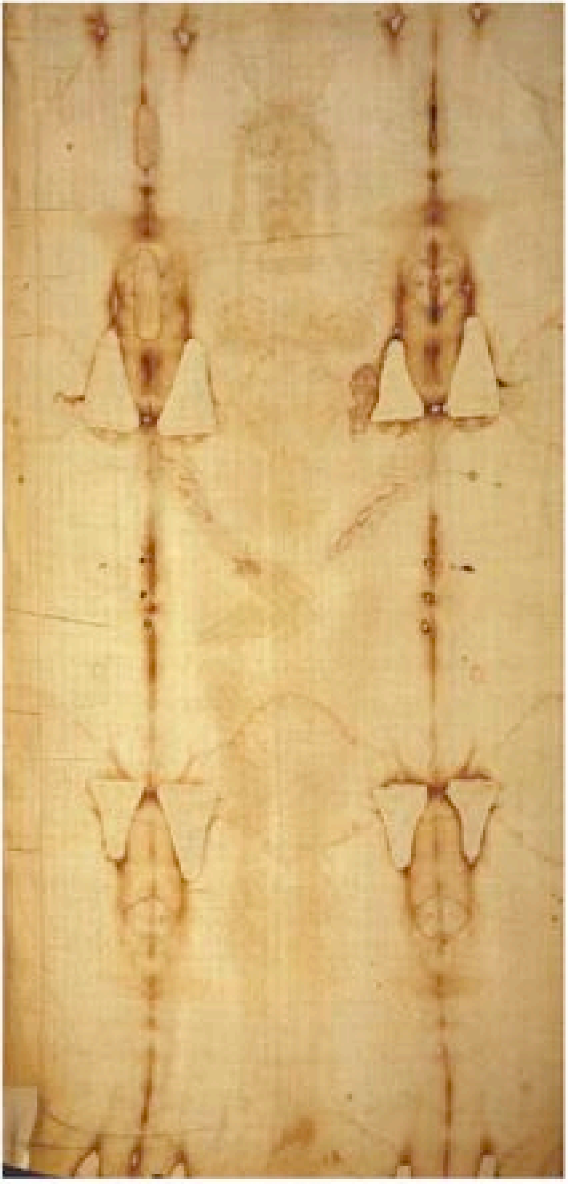
Judaism used the 248 positive Commandments plus the 365 negative Commandments given to Moses during the 50 days from Egypt to Sinai.
The 248 correspond to the 248-dim E8 Lie algebra that is constructed from Cl(8)xCl(8) = Cl(16).
The 365 is constructed by looking at one of the 1792 = 7x256 sub-hypercubes of 6-dim in the 8-dim hypercube, effectively cutting off the ternary 3-structure at N= 6

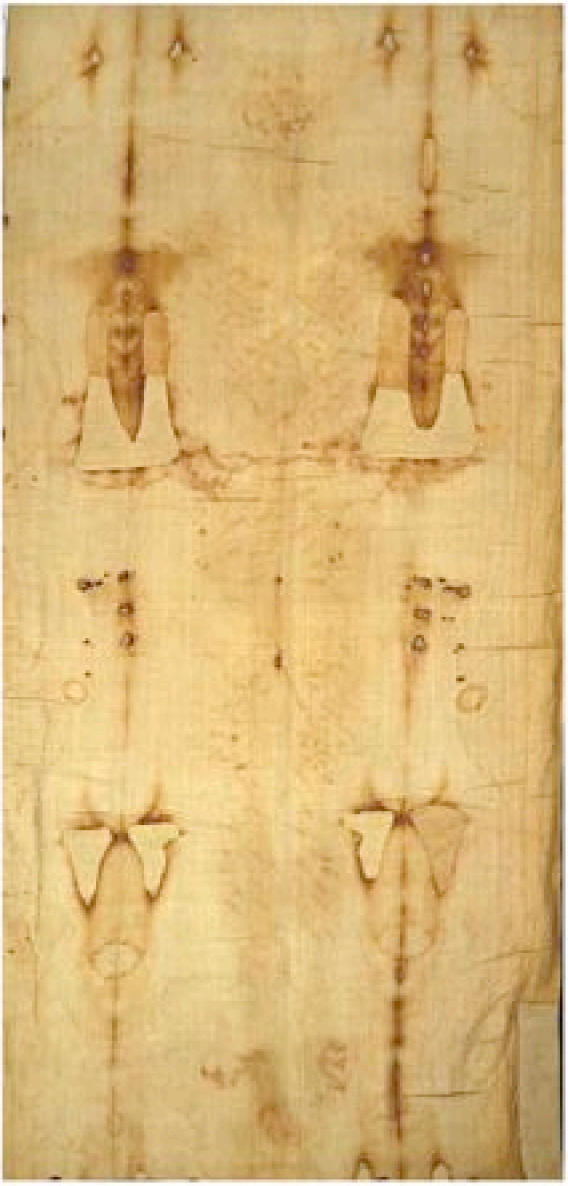
```
N       2^N                       3^N
0                      1
1                    2   3
2                  4       9 = 3x3
3                8           27
4             16               81 = 9x9
5           32                   243
6         64                       729 = 27x27
7      128
8    256
```

and then making a 27x27 Magic Square with (729+1)/2 = 365 as its its central Magic Square number.


1510





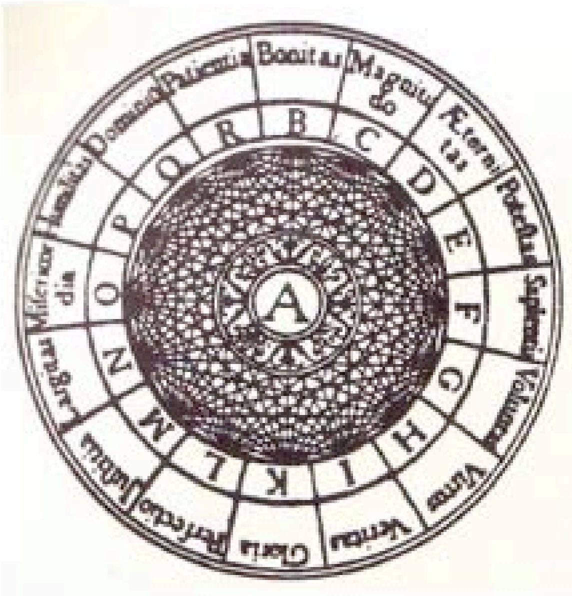


OCEANVS ORIENTALIS
OCEANVS SEPTENTRIONALIS
OCEANVS MERIDIONALIS
OCEANVS OCCIDENTALIS
PERSIA
PARTHIA
MESOPOTAMIA
SYRIA
ARABIA
ARMENIA
SCYTHIA
SARMATAE
MARE RVBRVM

Mediterranean Africa used the 16 possibilities of the Ilm al Raml, effectively cutting off the binary 2-structures at N = 4 and eliminating the ternary 3-structures

N	2^N	3^N
0	1	
1	2	
2	4	
3	8	
4	16	

According to the book Sufism and Taoism, by Toshihiko Izutsu (California 1983): "…Ibn Arabi says that … the world in its entirety ... transforms itself kaleidoscopically from moment to moment ... 'new creation' (al-khalq al-jadid) ... ordinary people are not aware of the process … If a man happens to obtain the true knowldege of qadar, the knowledge surely brings him a perfect peace of mind and an intolerable pain at the same time.
The unusual peace of mind arises from the consciousness that everything in the world occurs as it has been determined from eternity. ... Instead of struggling in vain for obtaining what is not in his capacity, he will be happy … He must be tormented, on the other hand, by an intense pain at the sight of all the so-called 'injustices', 'evils', and 'sufferings' that reign rampant around him,



Ramon Llull (ca 1232 to 1315) developed his A-wheel with 16 Elements by studying Arabic language and culture.

The Arabic Divination system Ilm al Raml is based on 16 Elements.

Llull showed 120 lines connecting distinct Pairs of the 16 Elements, so Llull was looking at Pairs of the 16 Elements.

There are in all 16x16 = 256 Pairs of 16 Elements.

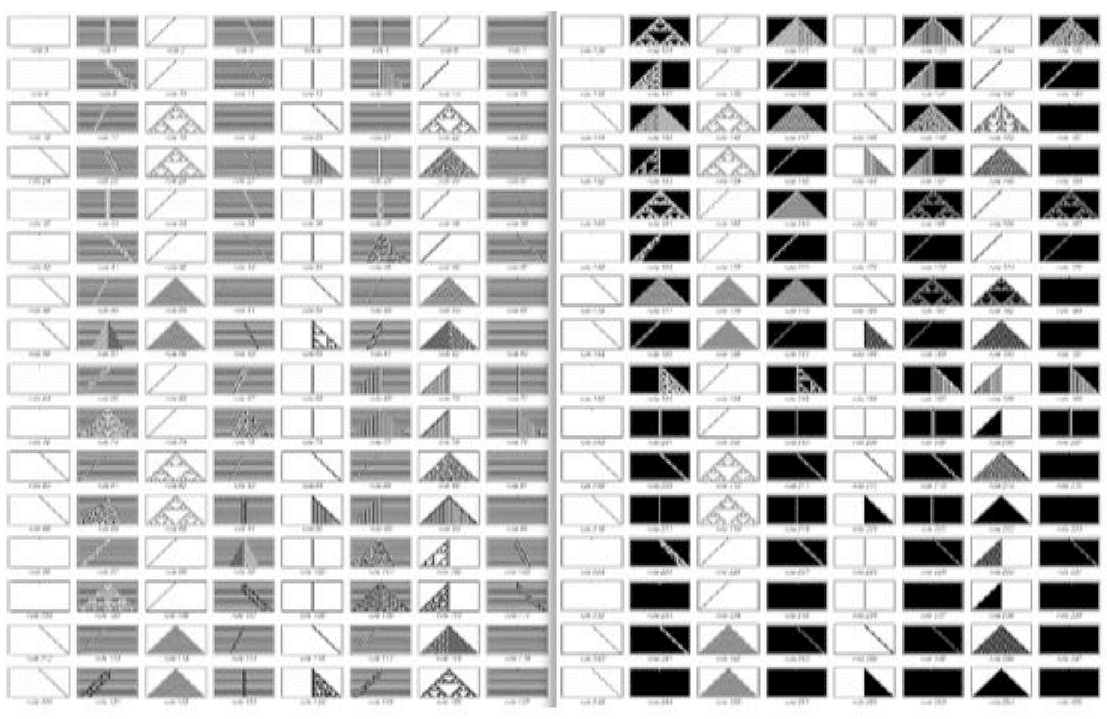
African Origins

Africans developed IFA Oracle divination based on the square of 16 = 16x16 = 256 = 2^8 corresponding to the vertices of an 8-dimensional hypercube and to the binary 2-choice Clifford algebra Cl(8) and so to related ones such as Cl(8)xCl(8) = Cl(16).

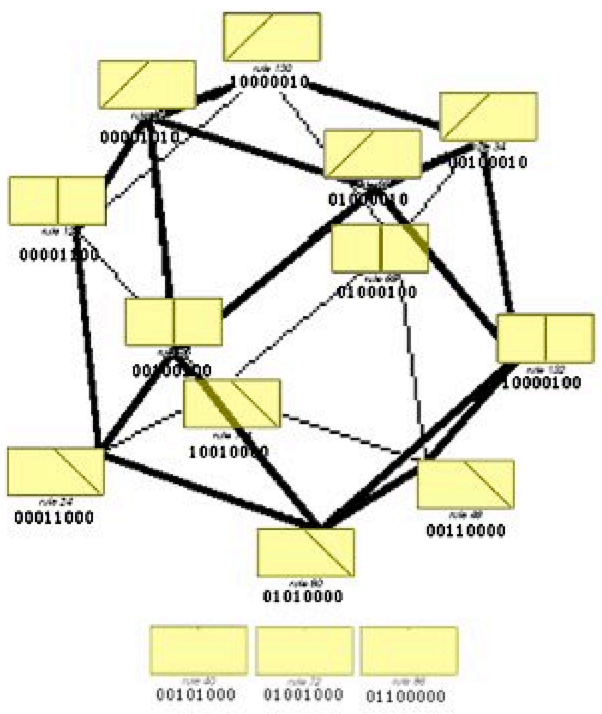
Since the number of sub-hypercubes in an 8-dimensional hypercube is 6,561 = 81x81 = 3^8, the IFA Oracle has N=8 ternary 3-structure as well as binary 2-structure:

N	2^N	3^N
0	1	1
1	2	3
2	4 = 2x2	9 = 3x3
3	8	27
4	16 = 4x4	81 = 9x9
5	32	243
6	64 = 8x8	729 = 27x27
7	128	2187
8	256 = 16x16	6561 = 81x81

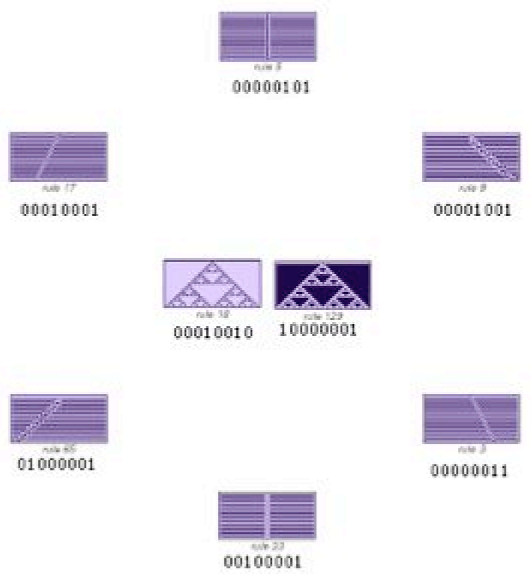
As ancient African games such as Owari show, binary 2-structure corresponds to static states and ternary 3-structure corresponds to dynamic states. Mathematically, using binary 2-choice static states to define dynamics on 3 ternary neighbor states produces the 256 Elementary Cellular Automata:



15 of the elements represent Conformal Spin(2,4) of Gravity:

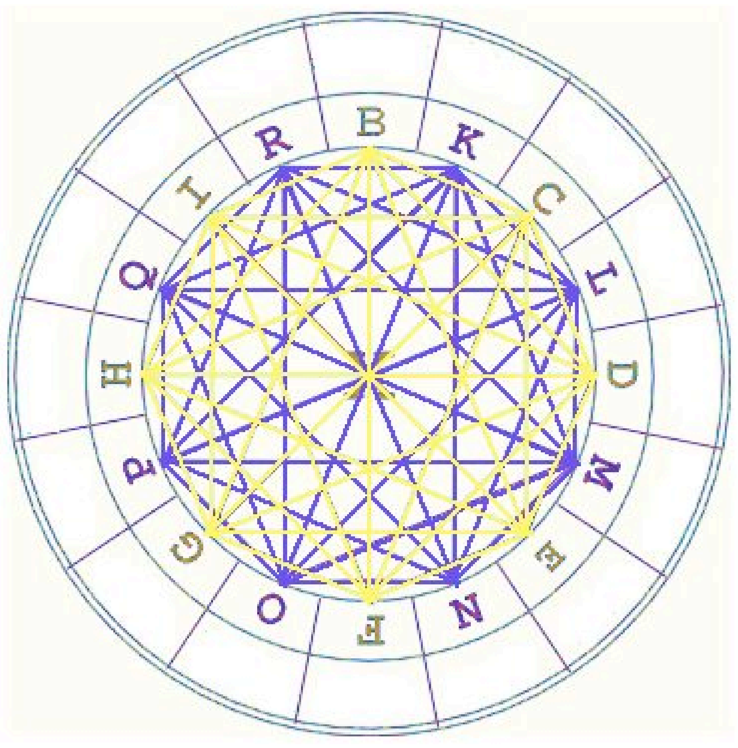


8 of the elements represent the SU(3) Color Force:

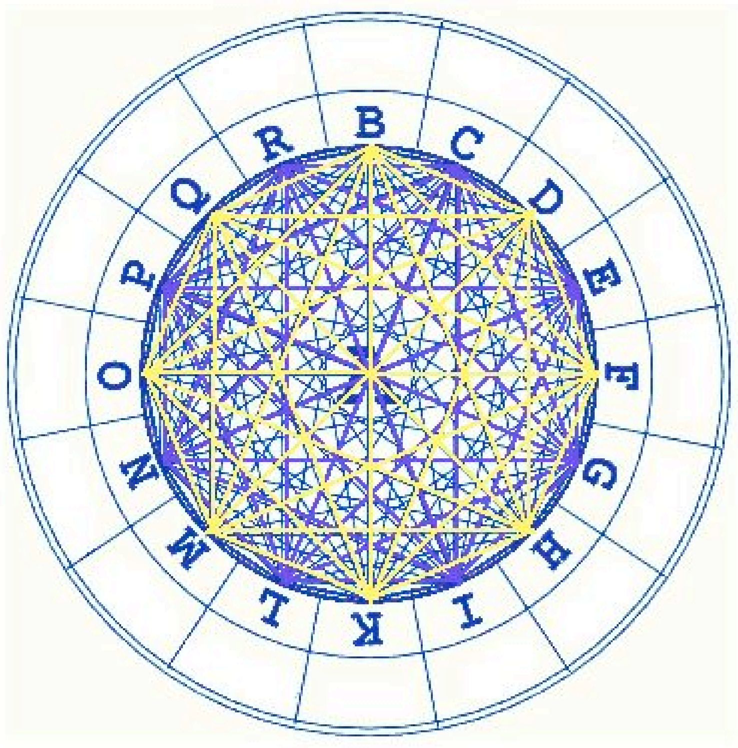


Hispanic Development

Ramon Llull (1232-1316) of Mallorca studied the 16 possibilities of the Ilm al Raml, which are derived from 16 of the 16x16 = 256-element African IFA divination system, and found a structure that he summarized in Wheel Diagrams with 16 vertices connected to each other by lines and in Cubic 4x4x4 = square 8x8 = 64-element Elemental Figures (images adapted from lullianarts.net web site):

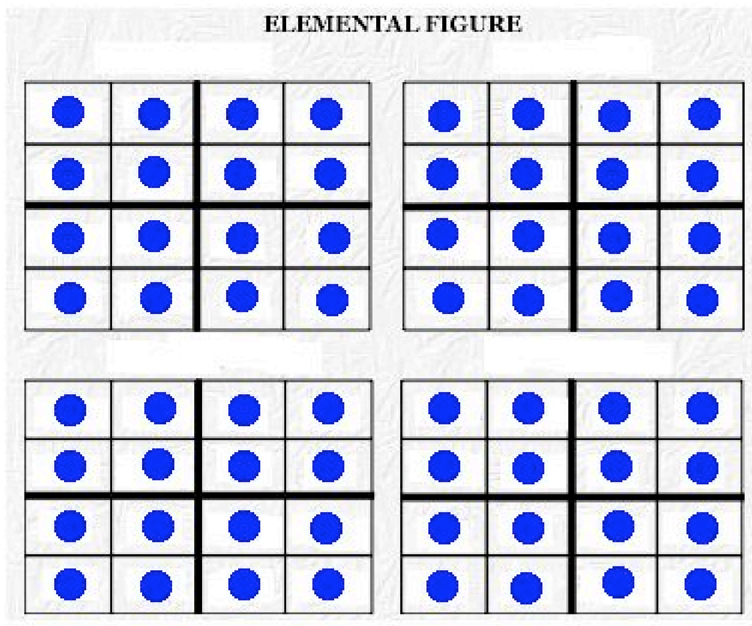


The 28 gold lines (gold 8-HyperCube points) represent Gravity and the 28 purple lines (purple 8-HyperCube points) represent the Standard Model.



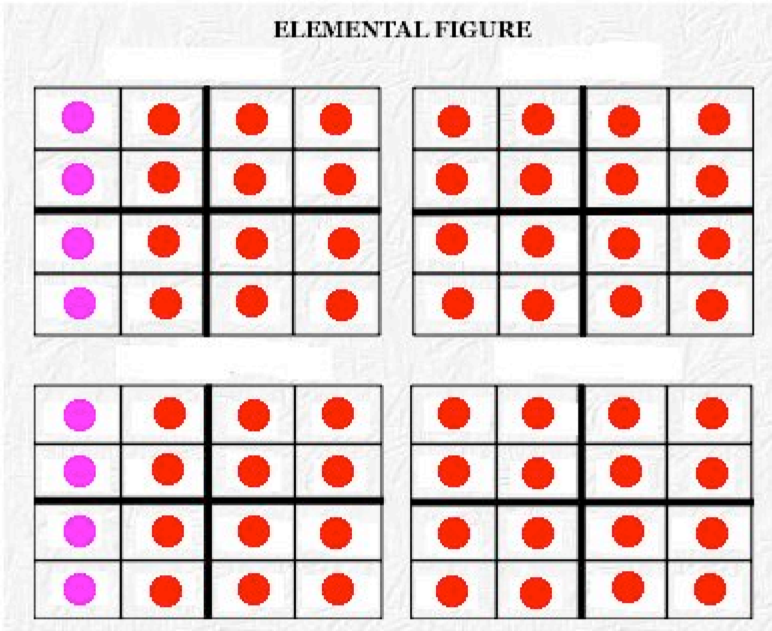
Adding in 64 blue lines (blue 8-HyperCube points without white dots) gives 120 lines that represent the Spin(16) BiVector Lie Algebra of the Clifford Algebra Cl(16) = Cl(8) x Cl(8):

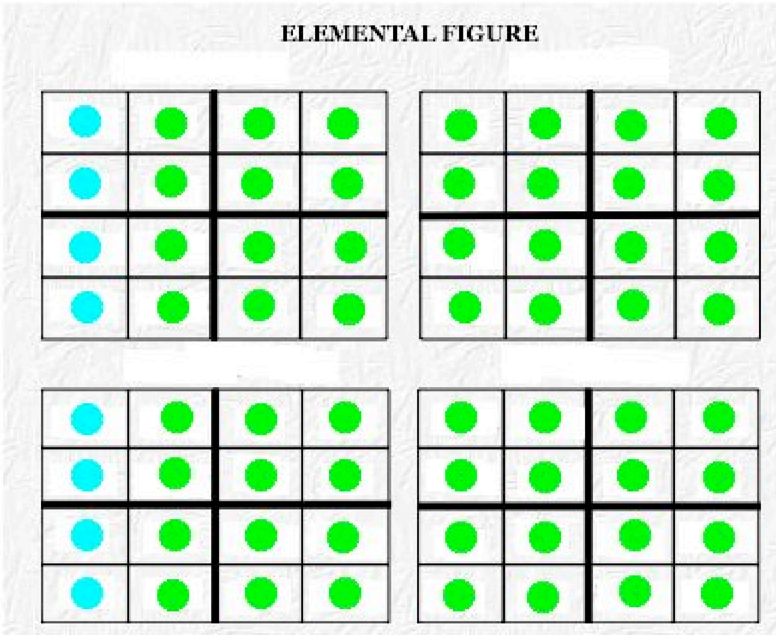
The 64 blue lines, and the 64 pure blue 8-HyperCube points, represent 8-dimensional Kaluza-Klein Vector SpaceTime and can be shown as a 64-element Elemental Figure.



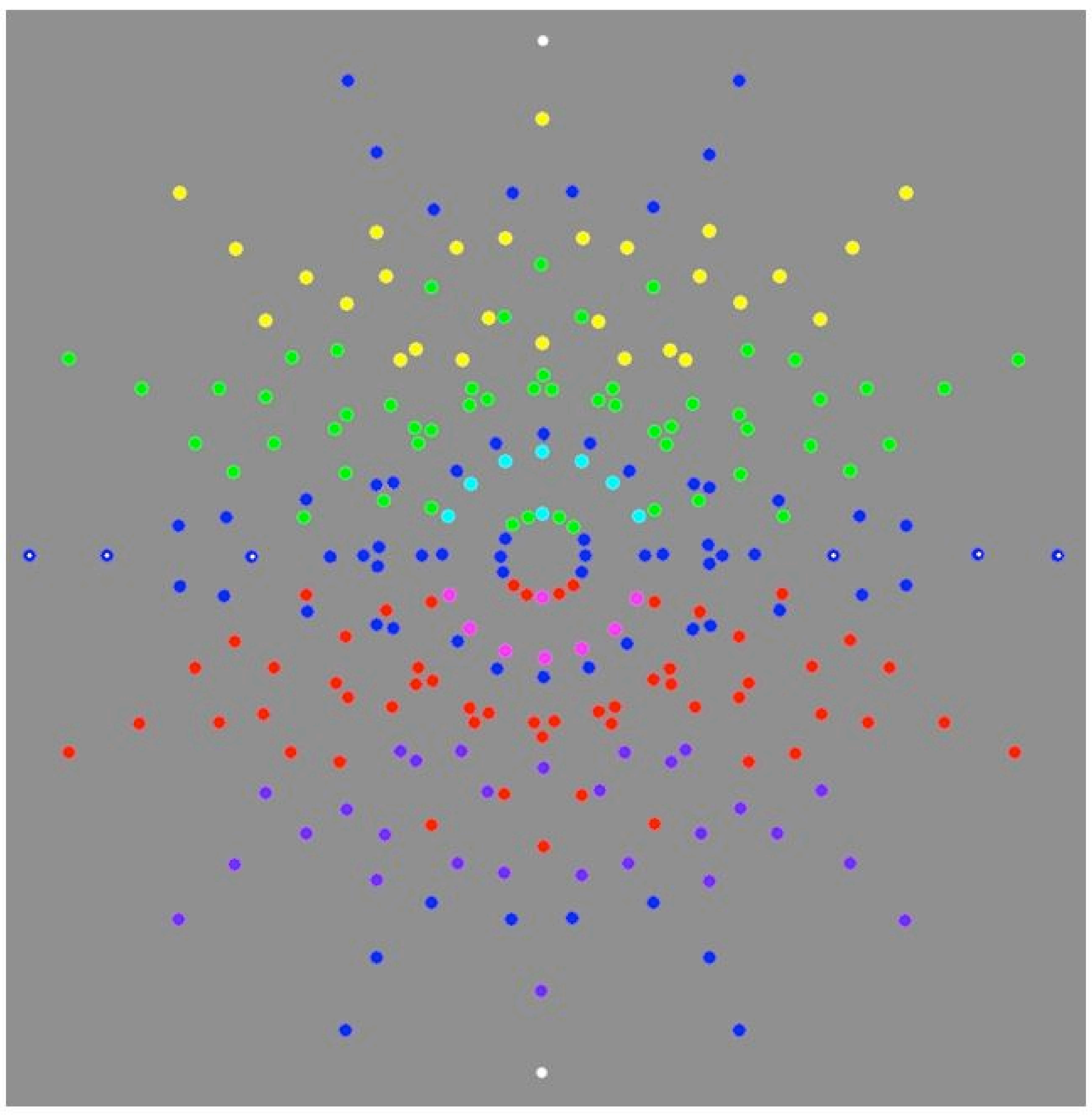
By Triality Automorphisms, the 8+56 = 64-element magenta and red 8-HyperCube points that represent 8 Fermion Particles can also be shown as a 64-element Elemental Figure and the 8+56 = 64-element cyan and green 8-HyperCube points that represent 8 Fermion AntiParticles can also be shown as a 64-element Elemental Figure.

The 64 red-magenta Fermion Particle elements plus the 64 green-cyan Fermion AntiParticle elements form the 128 elements of one Half-Spinor representation of Spin(16).

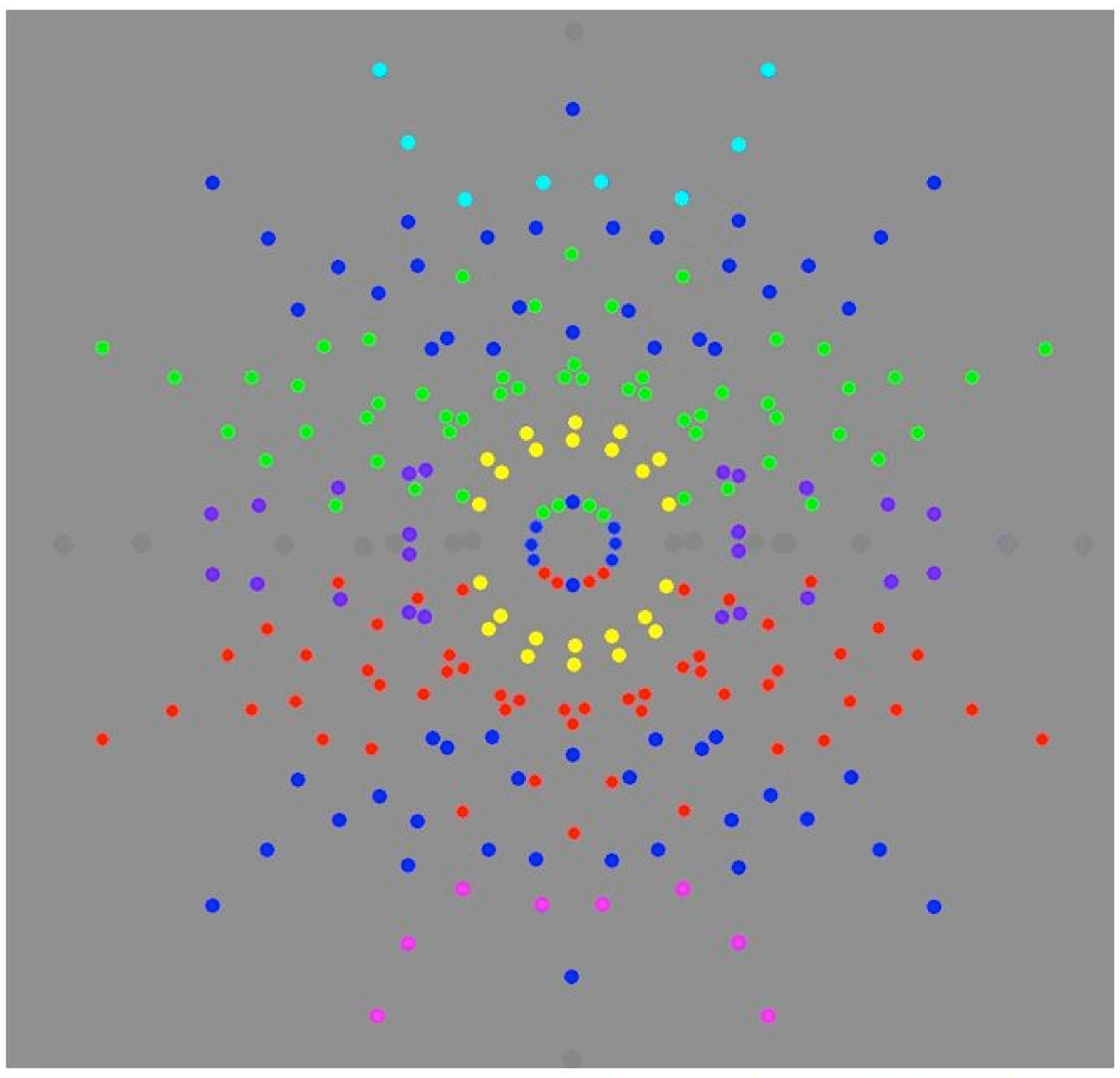




The 120 elements of the Spin(16) BiVector Lie Algebra plus the 128 elements of a Half-Spinor representation of Spin(16), both of which live in the Clifford Algebra Cl(16) = Cl(8) x Cl(8), combine to form the 120+128 = 248-dimensional E8 Lie Algebra:



8-HyperCube = 256 vertices = 1 + 8 + 28 + 56 + (8+48+8+(3+3)) + 56 + 28 + 8 + 1



E8 Lie Algebra = 120+128 = 248 vertices = 8 + 28 + 56 + (28+8+28) + 56 + 28 + 8

E8 Physics

The resulting E8 Physics Model has:

EPR structure similar to that of Joy Christian;

E8 structure modified from that of Garrett Lisi;

Cl(16) = Cl(8)xCl(8) Clifford Algebra structure anticipated by Ramon Llull;

Higgs mechanism produced by formation of M4 x CP2 spacetime as shown by work of Meinhard Mayer;

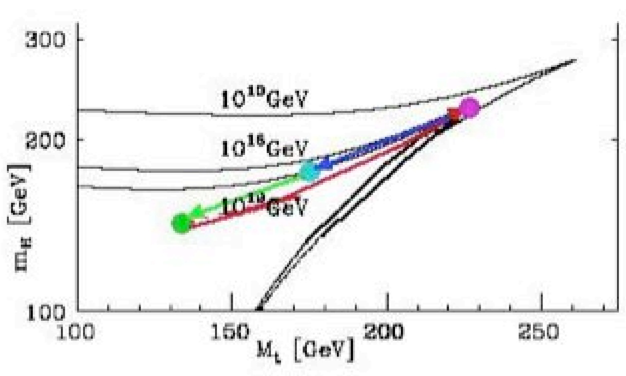
Standard Model Gauge Groups produced therein as shown by work of N. A. Batakis;

Conformal Gravity produced as in the MacDowell-Mansouri mechanism;

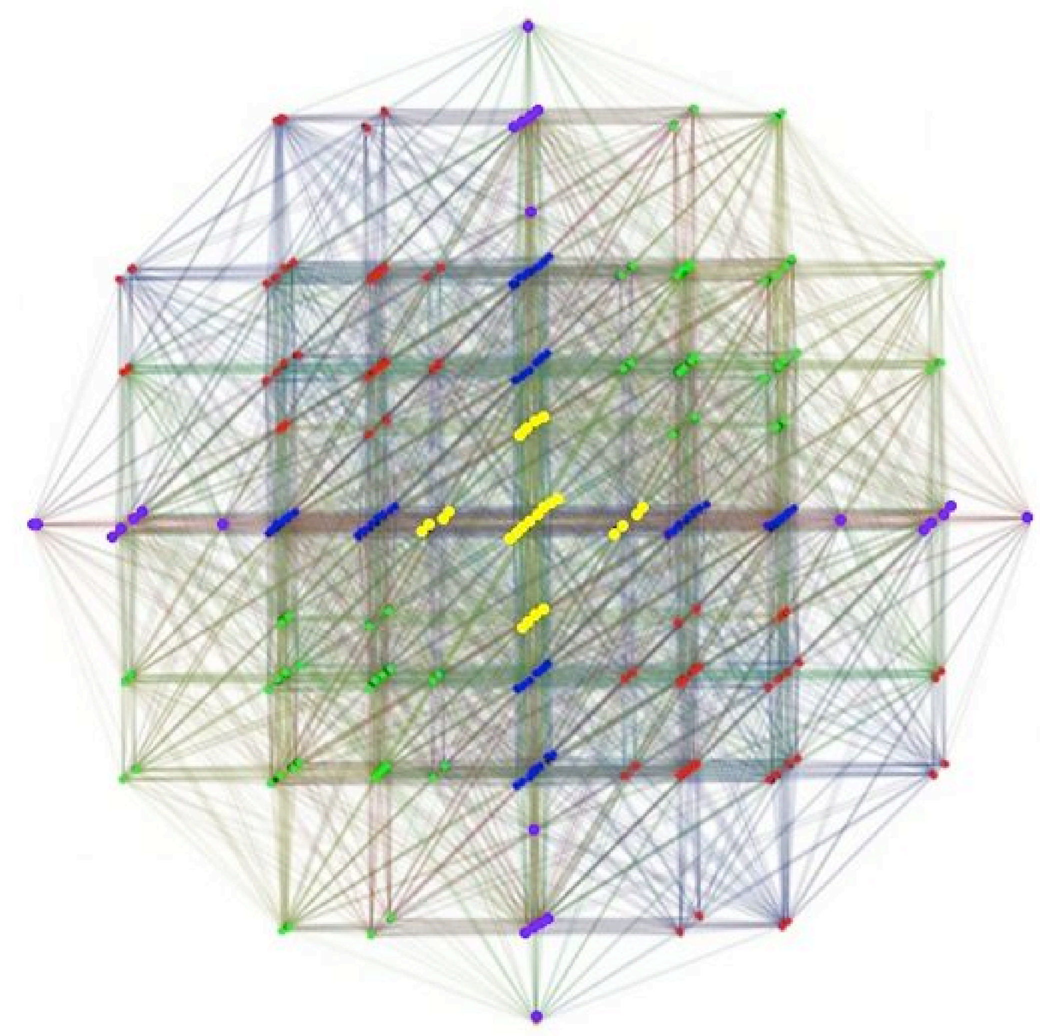
Dark Energy : Dark Matter : Ordinary Matter ratio 75 : 21 : 4 produced by conformal structures similar to those of Irving Ezra Segal;

Force Strength and Particle Mass calculations done using the Work of Hua Luogeng, particularly work on the Geometry of Complex Domains;

T-quark composite Higgs model based on the work of Yamawaki et al, resulting in a 3-state T-quark - Higgs system;



and Algebraic Quantum Field Theory (AQFT) constructed from a Clifford Real-Periodicity-8 hyperfinite II1 von Neumann algebra factor.



E8 Root Vectors = 112+128 = 240 = 8 + 28 + 56 + (24+8+24) + 56 + 28 + 8

[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

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[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Llull showed in his X-wheel with two sets of 8 Elements each.

Here one set of 8 Elements and their Pair-lines is shown in Green

and the othe set of 8 Elements and their Pair-lines is shown in Black.

To connect the Ancient Wisdom shown in Llull's wheels with 21st Century Science means that it must be interpreted in terms of the Language used by 21st Century Science, which is Mathematics.

Llull's X-wheel shows that Llull's 16 Element Structure (call it Llull(16)), factors into two independent 8 Element Structures (call each of them Llull(8)), so that by his X-wheel Llull is saying, in Mathematical Language:

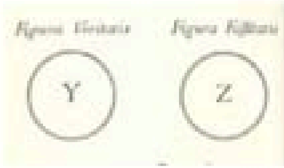
Llull(16) = Llull(8) (x) Llull(8)

If you follow Llull's idea to its logical conclusion, go from 16 = 8 times 2 to 8 times N for any (maybe very large) number N and get the factoring

Llull(8N) = Llull(8) (x) ...(N times)... (x) Llull(8)

There is a Mathematical Structure with that factoring property

that is based on the Binary Choice of Llull's wheels Y and Z



Real Clifford Algebras with 8-Fold Periodicity Factoring.

So, changing notation from Llull(16) to Cl(16) etc, because mathematicians mostly use the term Clifford Algebra, named for William Kingdon Clifford, who, over 100 years ago, wrote about such Algebras, the factoring is

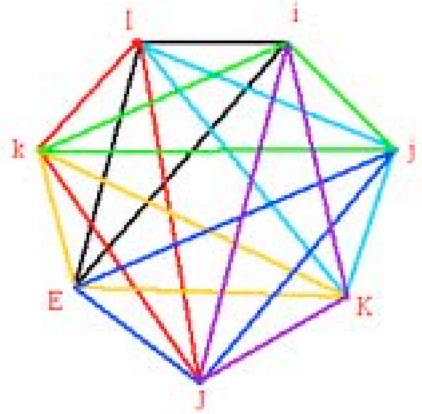
Cl(8N) = Cl(8) ... (x) ...(N times tensor product)... (x) ... Cl(8)

you can take the completion of the union of all the tensor products

to get what might be called a generalized Hyperfinite II1 von Neumann Algebra factor

that represents a realistic Unified Physics Model including Gravity and the Standard Model,

The points in the 8-dimensional Octonion Space can be multiplied with each other

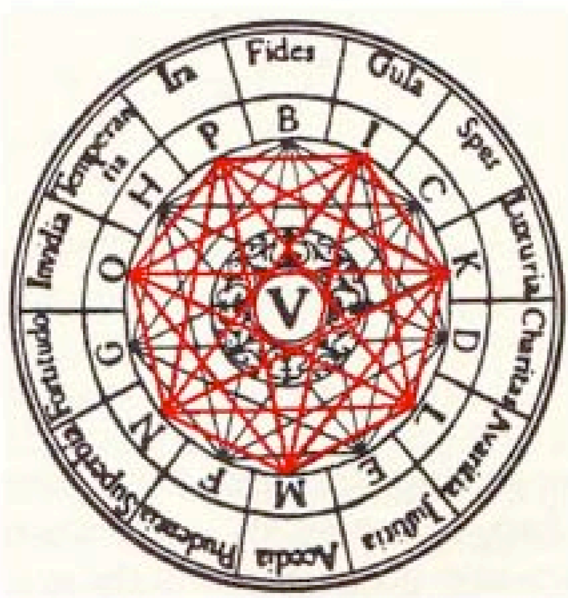


and the Octonion Multiplication Rules can be seen in terms of Pair-lines between the 7 Octonion Imaginary Elements

as shown by Llull in his V-wheel with two sets of 7 Elements and their Pair-lines.

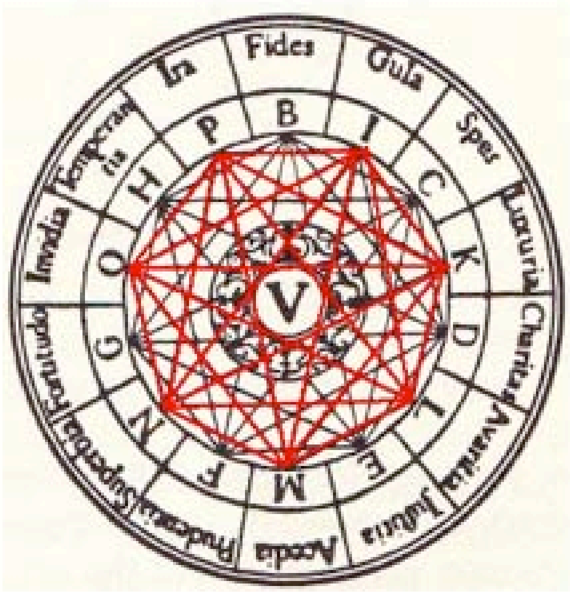
Here one set of 7 Octonion Imaginary Elements and their Pair-lines is shown in Red

and the other set of 7 Octonion Imaginary Elements and their Pair-lines is shown in Black.



Here one set of 7 Octonion Imaginary Elements and their Pair-lines is shown in Red

and the other set of 7 Octonion Imaginary Elements and their Pair-lines is shown in Black.



The Simplest Geometric Objects of the Clifford Algebra Cl(8) are all Flat.

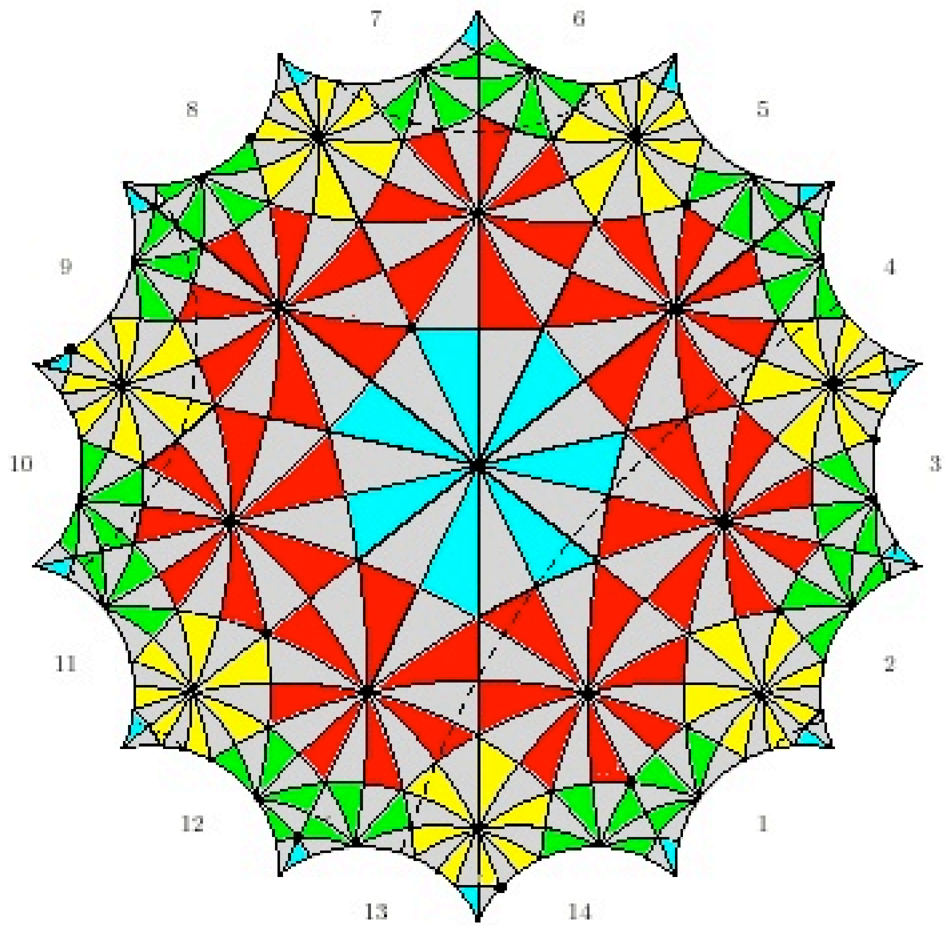
If you go beyond Flat to look at Curved things,

the Simplest Curved Geometric Objects in the 8-dimensional Octonion Space are:

- **Circles, which are 1-dimensional Spheres S1**
- **2-dimensional Spheres S2**
- **3-dimensional Spheres S3**
- **4-dimensional Spheres S4**
- **5-dimensional Spheres S5**
- **6-dimensional Spheres S6**
- **7-dimensional Spheres S7**

The Maximal Sphere in 8-dimensional Octonion Space is the 7-sphere S7.

Llull's 14-vertex V-wheel corresponds to the 168-element Klein Quartic

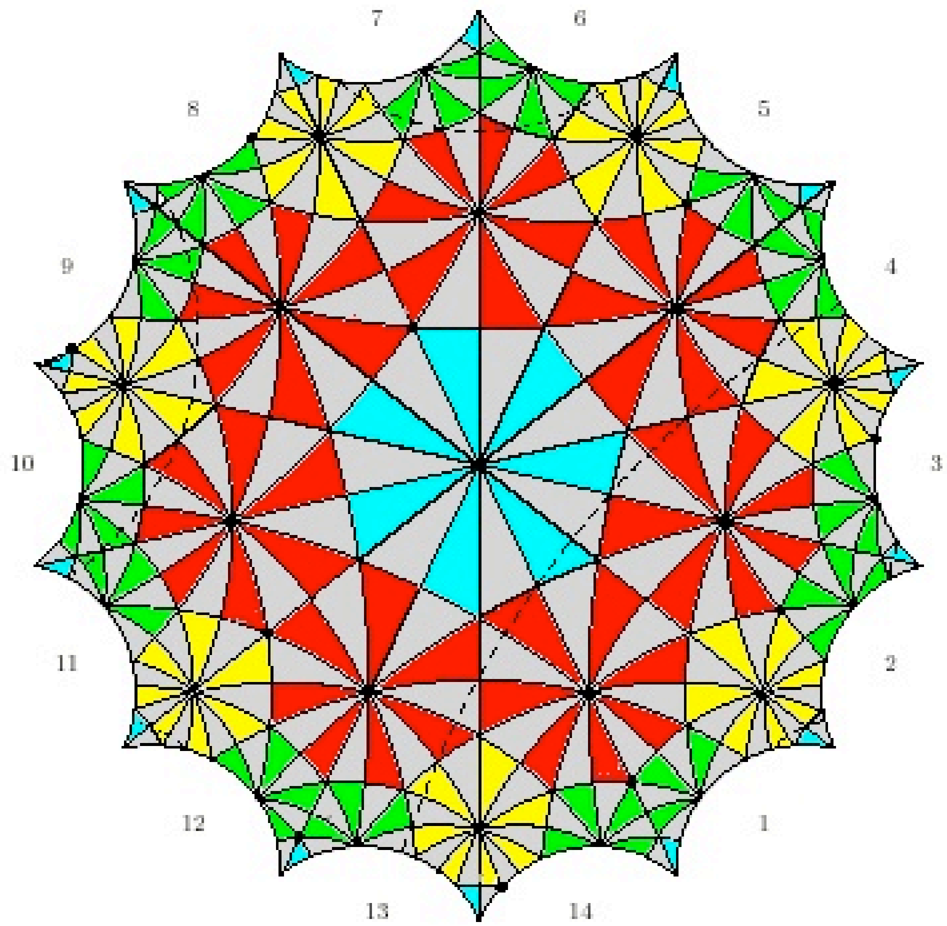


whose 336-element double cover is SL(2,7).

The 48-element binary octahedral group <4,3,2> is a subgroup of index 7 in SL(2,7).

Physically, those 48 elements correspond to:

- **8 first-generation Fermion Particles**
- **8 first-generation Fermion Antiparticles**
- **8 dimensions of a Spacetime that looks like S1 x S7**
- **24 generators (the root vector polytope vertices) of a Spin(8) Gauge Group**



In the E6 String Physics model (CERN preprint CERN-CDS-EXT-2004-031):

- **Each Planck-scale E8 lattice D8 brane is a superposition / intersection / coincidence of eight E8 lattices.**
- **7 of the 8 lattices are independent E8 lattices, each corresponding to one of the 7 imaginary octionion basis elements i, j, k, E, I, J, K.**
- **The 8th E8 lattice is dependent on the 7, and can be thought of as corresponding to the real octonion basis element 1.**

The 7 coset spaces of SL(2,7) / <4,3,2> correspond to the 7 imaginary octonion basis elements and

to the 7 independent E8 lattices making up each Planck-scale D8 brane in the E6 String Physics model.

Since 8-dimensional E8 lattices can be formed by 240-vertex Witting polytopes, and 4-dimensional space can be filled by 24-cells, the D8 brane structure is consistent with a generalized Feynman Checkerboard Physics Model in 8 dimensions,

reducible to 4 dimensions (see CERN preprint CERN-CDS-2004-030).

A Single Cell of the physically realistic 26-dimensional Lattice Bosonic String Theory,

in which Strings are physically interpreted as World-Lines,

can be described by taking the quotient of its 24-dimensional O+, O-, Ov subspace modulo the 24-dimensional Leech lattice, and

its automorphism group is the largest finite sporadic group, the Monster Group M, whose order is

8080, 17424, 79451, 28758, 86459, 90496, 17107, 57005, 75436, 80000, 00000

=

2^46 .3^20 .5^9 .7^6 .11^2 .13^3 .17.19.23.29.31.41.47.59.71

or about 8 x 10^53.

If you use positronium (electron-positron bound state of the two lowest-nonzero-mass Dirac fermions) as a unit of mass Mep = 1 MeV, then it is interesting that the product of the squares of the Planck mass Mpl = 1.2 x 10^22 MeV and W-boson mass Mw = 80,000 MeV gives ((Mpl/Mep)(Mw/Mep))^2 = = 9 x 10^53 which is roughly the Monster order.

The Mpl part of M may be related to Aut(Leech Lattice) = double cover of Co1.

The order of Co1 is 2^21.3^9.5^4.7^2.11.13.23 or about 4 x 10^18.

The Mw part of M may be related to Aut(Golay Code) = M24.

The order of M24 is 2^10.3^3.5.7.11.23 or about 2.4 x 10^8.

If you look at the physically realistic superposition of 8 such Cells, you get 8 copies of the Monster of total order about 6.4 x 10^54, which is roughly the product of the Planck mass and Higgs VEV squared:

(1.22 x 10^22)^2 x (2.5 x 10^5)^2 = 9 x 10^54

The full 26-dimensional Lattice Bosonic String Theory can be regarded as an infinite-dimensional Affinization of the Theory of that Single Cell.

James Lepowsky said in math.QA/0706.4072:

"... **the Fischer-Griess Monster M ... was constructed by Griess as a symmetry group (of order about 10^54) of a remarkable new commutative but very, very highly nonassociative, seemingly ad-hoc, algebra B of dimension 196,883**. The "structure constants" of the Griess algebra B were "forced" by expected properties of the conjectured-to-exist Monster. It was proved by J. Tits that M is actually the full symmetry group of B. ...

At this point, using the A-wheel, X-wheel, and V-wheel

Llull has described the basic ingredients for a high-energy (around Planck Energy) physics model with:

Clifford Algebra Cl(8) = 16x16 Real Matrix Algebra

8 Cl(8) +half-Spinors representing the first-generation Fermion Particles

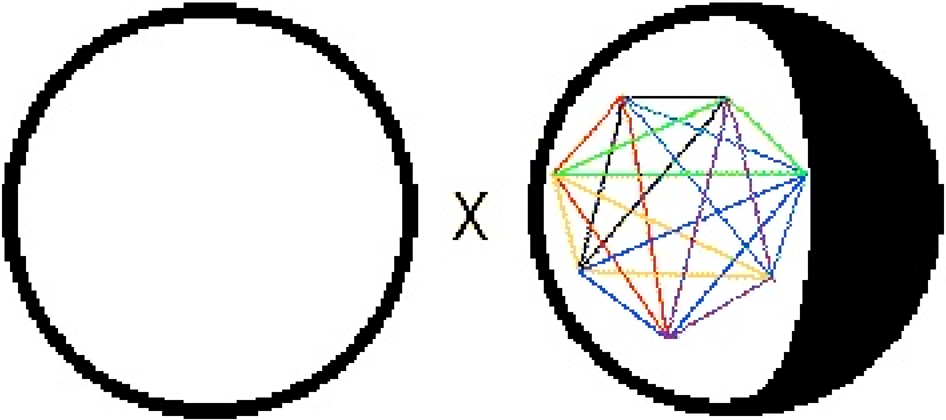
8 Cl(8) -half-Spinors representing the first-generation Fermion Antiparticles

8 Cl(8) Vectors representing the 8-dimensional spacetime that looks like S1 x S7

28 Spin(8) Pair-line Elements representing 28 Gauge Bosons

The half-Spinor parts of the Llull Model already look realistic, by the correspondences:

- 1 = Neutrino
- i = Red Up Quark
- j = Green Up Quark
- k = Blue Up Quark
- E = Electron
- I = Red Down Quark
- J = Green Down Quark
- K = Blue Down Quark

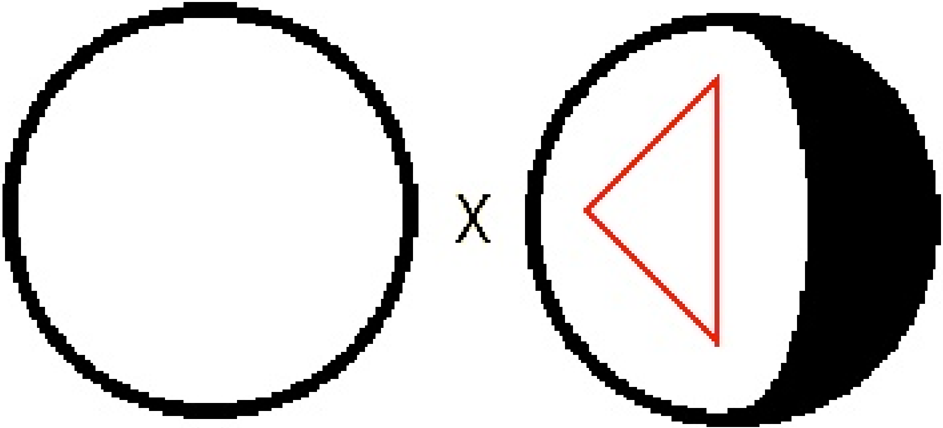

X

Llull's S-wheel has a central S-square whose 4 corners represent { 1, i, j, k, }, which are 4 of the 8 Cl(8) basis Elements.

{ 1, i, j, k } are basis Elements for a 4-dimensional Quaternionic Subspace that Freezes Out of high-energy 8-dimensional spacetime at lower (with respect to Planck Energy) energies.

That 4-dimensional Quaternionic Subspace is our 4-dimensional Physical Spacetime that looks like S1 x S3. The other 4 of 8 dimensions become a CP2 Internal Symmetry Space.

When that Quaternionic Structure is introduced, the 16x16 Real Matrix Algebra of Cl(8) is transformed into the 8x8 Quaternionic Matrix Algebra of Cl(2,6).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Since the 28-dimensional gauge group Spin(8) no longer has a unified 8-dimensional Spacetime on which to act, its 28 generators break down into 28 generators capable of acting on

4-dimensional Physical Spacetime and 4-dimensional CP2 Internal Symmetry Space

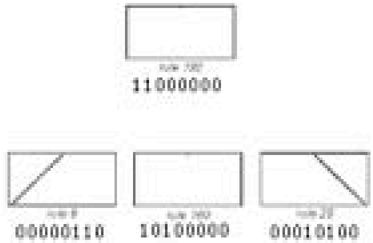
and on the Fermion Particles and Antiparticles, which now come in 3 types, or generations:

- **1 - living in S1xS3 Physical Spacetime**
- **2 - living in S1xS3 Physical Spacetime and CP2 Internal Symmetry Space**
- **3 - living in CP2 Internal Symmetry Space**

the U(1) propagator phase that is defined with respect to the fixed Quaternionic 4-dimensional spacetime subspace corresponding to the S-square of Lull's S-wheel

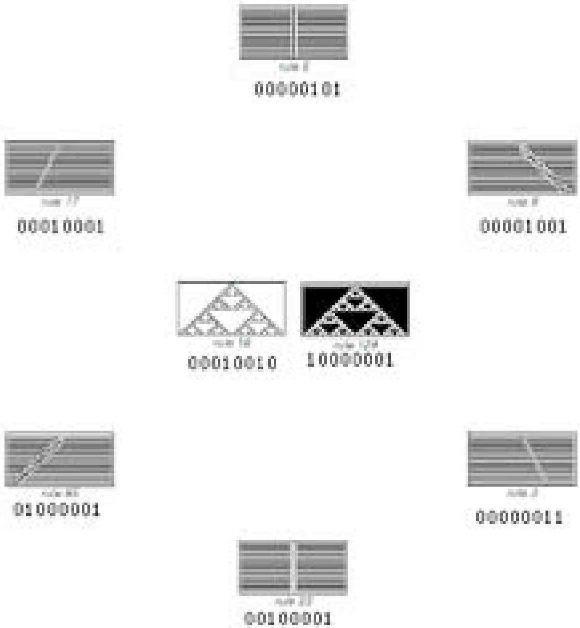
the 4 U(2) ElectroWeak Gauge Bosons (U(2) = SU(2) x U(1) for 3 Weak Bosons and 1 Electromagnetic Photon) are represented by the 4 corners of one of the three back squares of Llull's S-wheel

the 8 SU(3) Color Gluon Gauge Bosons are represented by the 8 corners of the two remaining back squares of Llull's S-wheel.



: correspond 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.

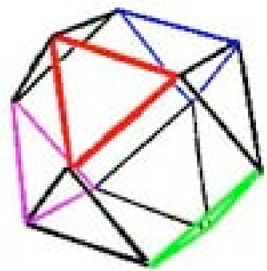


Since each gluon links 4-dim spacetime to color internal symmetry space, the gauge group SU(3) acts globally on CP2 Internal Symmetry Space, as can be seen by the fibration CP2 = SU(3) / U(2)

To see the Gravity and its 15 Gauge Bosons, look at Llull's T-wheel.

The 3 corners of the front T-triangle in Llull's T-wheel represent a 3-dimensional Cartan subalgebra of the 15-dimensional Conformal Group SU(2,2) = Spin(2,4).

The 12 corners of the other 4 triangles in Llull's T-wheel represent the 12 vertices of the Cuboctahedron



Root Vector Polytope of the Conformal Group SU(2,2) = Spin(2,4)

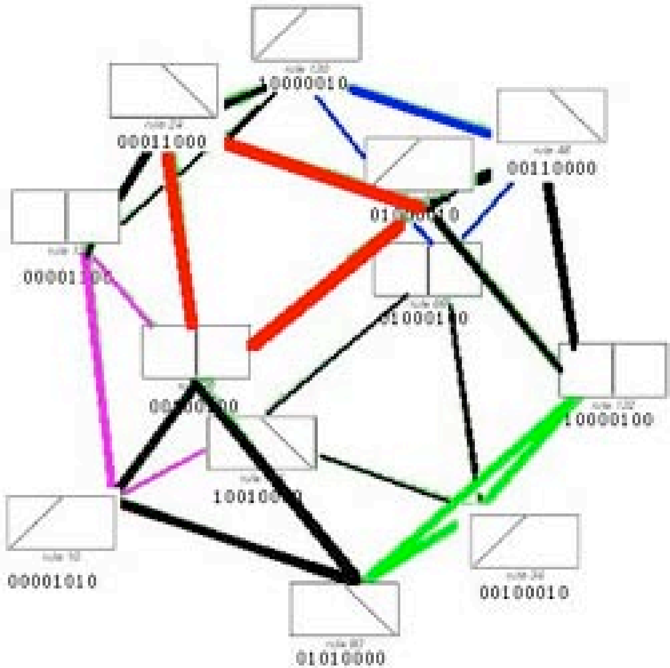
The 3+12 = 15 SU(2,2) = Spin(2,4) Conformal Group GraviPhoton Gauge Bosons act on 4-dimensional Physical Spacetime by:

- **4 Translations,**
- **6 Lorentz Transformations,**
- **4 Special Conformal Transformations and**
- **1 Dilation.**

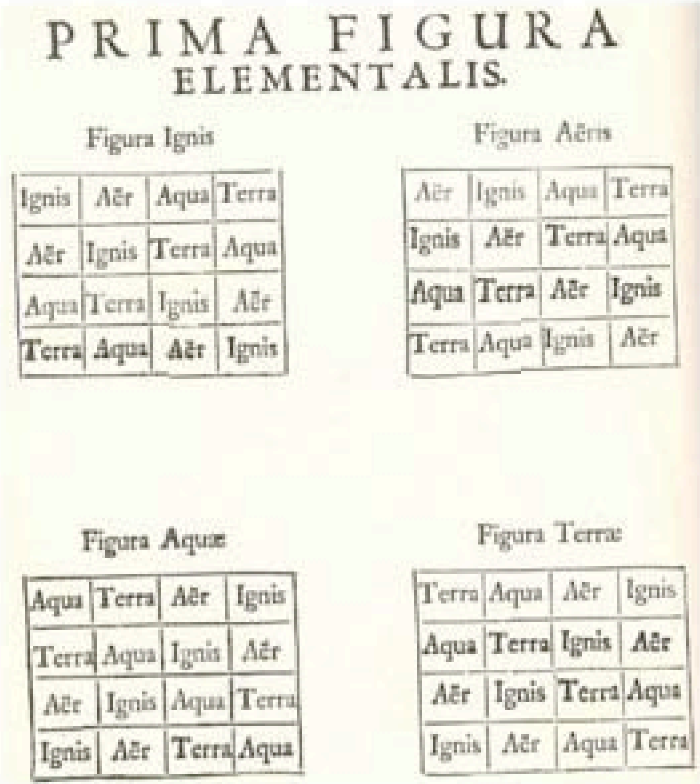
They produce Gravity through a generalized MacDowell-Mansouri mechanism.

The 3 vertices of the T-triangle in Llull's T-wheel correspond to a 3-dimensional Cartan subalgebra of the 15-dimensional Conformal Group SU(2,2) = Spin(2,4) and 3 Quaternionic Real (blank) Cellular Automata.

The other 4 triangles in Llull's T-wheel correspond to 4 sets of associative triples (/ | \ ) of Cellular Automata and to the 12 vertices of the Cuboctahedron Root Vector Polytope of the Conformal Group SU(2,2) = Spin(2,4)



The Elemental Figure



PRIMA FIGURA ELEMENTALIS.

Figura Ignis

Ignis	Aēr	Aqua	Terra
Aēr	Ignis	Terra	Aqua
Aqua	Terra	Ignis	Aēr
Terra	Aqua	Aēr	Ignis

Figura Aēris

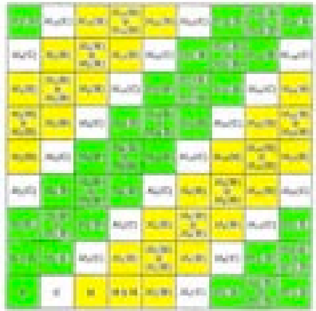
Aēr	Ignis	Aqua	Terra
Ignis	Aēr	Terra	Aqua
Aqua	Terra	Aēr	Ignis
Terra	Aqua	Ignis	Aēr

Figura Aquæ

Aqua	Terra	Aēr	Ignis
Terra	Aqua	Ignis	Aēr
Aēr	Ignis	Aqua	Terra
Ignis	Aēr	Terra	Aqua

Figura Terræ

Terra	Aqua	Aēr	Ignis
Aqua	Terra	Ignis	Aēr
Aēr	Ignis	Terra	Aqua
Ignis	Aēr	Aqua	Terra



is a set of four 4x4 Matrices with 4x4x4 = 64 dimensions, and so corresponds to the 4x4 Quaternionic Matrix Algebra M(4,Q) = Cl(2,4) and describes the Cosmology of our Universe.

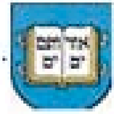
If the entries Ignis etc were considered to be Quaternionic, then it would be the 256-dimensional 8x8 Quaternionic Matrix Algebra M(8,Q) = Cl(2,6), and Cl(2,4) would be half of its Even Subalgebra.

Here is a 78-card Tarot Spread corresponding to E6 physics model:

(s=swords, w=wands, p=pentacles, c= cups and k=knave(page), j=Knight(Jack), K=King, Q=Queen, and

0=Fool, 1=Magician, 2=Popess, 3=Empress, 4=Emperor, 5=Pope, 6=Lovers, 7=Chariot, 8=Justice, 9=Hermit, 10=WheelofFate, 11=Strength, 12=HangedMan, 13=Death, 14=Temperance, 15=Devil, 16=Tower, 17=Star, 18=Moon, 19=Sun, 20=Judgment, 21=World)

8s, 8w, 8c, 8p, (neutrinos) and 0 and Qp (complexifications) are the E6 Cartan subalgebra elements.

The other 72 correspond to the 72 letters on the Urim v'Tumim breastplate. 

```
                      Qp
                   jp   9p
                 jc       9c
               jw     Qc    9w
             js    21   Qw    9s
             kp  20       Qs  10p
             kc 19     15   Kp 10c
             kw 18  10   14  Kc 10w
             ks 17 9       13 Kw 10s
    1s         16 8   6   12 Ks          1c
  2s  3s          7 3   5 11          2c  3c
4s      5s          2   4           4c      5c
  6s  7s              1               6c  7c
    8s      1w                  1p      8c
          2w  3w              2p  3p
        4w      5w          4p      5p
          6w  7w              6p  7p
            8w                  8p
                      0
```

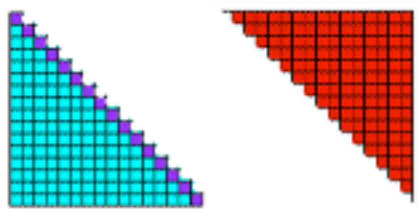
- The magenta 28 are the 28 Spin(8) adjoint bivectors of Cl(8).
- The 16 blue are the 8 vectors of Spin(8) and Cl(8) and their 8 dual/conjugates.
- The 32 red are the 16 spinors (8 +halfspinors and 8 -halfspinors) of Spin(8) and Cl(8) and their 16 dual/conjugates.
- The 2 black are diagonal degrees of freedom in 26-dim traceless J3(O)o part of J3(O) Jordan algebra.

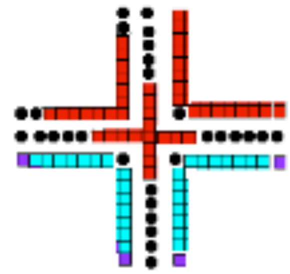
Sufi Ideas of Ibn Arabi:

The One (ahadiyah) or Absolute Unity which needs no Names	the empty set
Oneness (wahidiyah) or Absolute possessing characteristics which are the Divine Names	binary separation into opposites described by all real Clifford Algebras Cl(N)
thabita are archetypes or fixed prototypes	structures of Cl(8) = Cl(1,7) that are fundamental components of all Cl(8N) Cl(8N) = Cl(1,7) x...(Ntensors)...x Cl(1,7) The 256 elements of Cl(8) correspond to the 256 Odu. The structures of Cl(8) include +/- half-spinor fermion particles and antiparticles vector spacetime bivector gauge bosons The 256 elements of Cl(8) correspond to the 256 Odu
mumkinat are possible things	possible configurations of archetypes forming quantum possibilities i.e., worlds of the Many-Worlds and Bohmian beables
qada is a decisive judgment	dechoherence of a quantum superpostion of possibilities, i.e., choice of which World of the Many-Worlds at an event, or choice made by Bohm Guiding Potential
qadar is the outcome of qada	the World or State that is seen to come into physical existence at an event
al-khalq al-jadid is the new world that is created at the occurrence of every event	the branching of the Worlds of the Many-Worlds at each event
himmah is the spirtual power of an arif, or knower	quantum consciousness resonant connection
taskhir bi-al-iradah is constraining by will whereby a higher order constrains a lower, taskhir bi-al-hal is constraining by the state or situation in which a lower order constrains a higher, and both together form a cycle	Sarfatti post-Bohm Quantum Back-Reaction
wujudiyah is the cyclic ontology of Divine self-manifestations by new world creations	Quantum Game of Many Fates

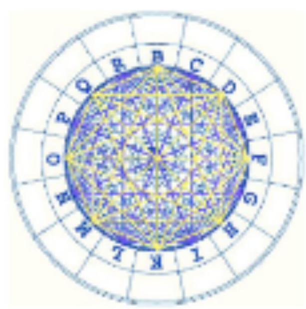

Leipzig
Tarot
Palma de Mallorca
Murcia

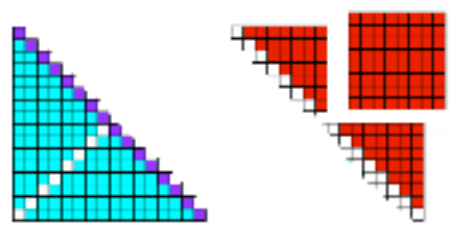
African IFA to RigVeda-Pachisi

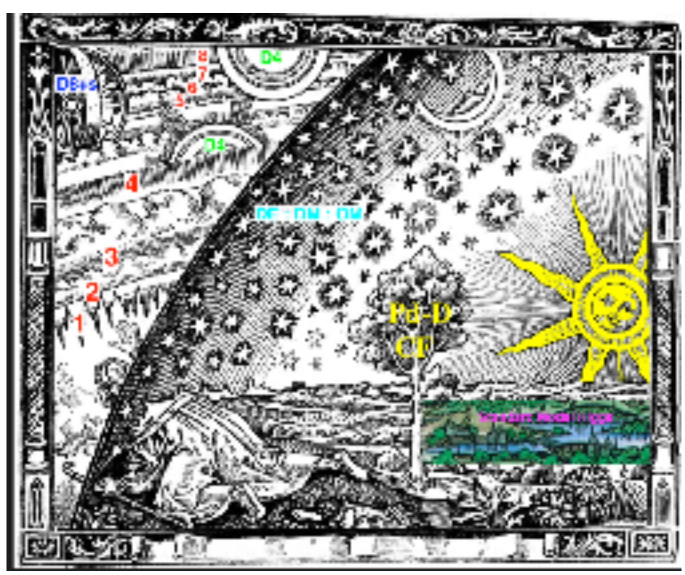


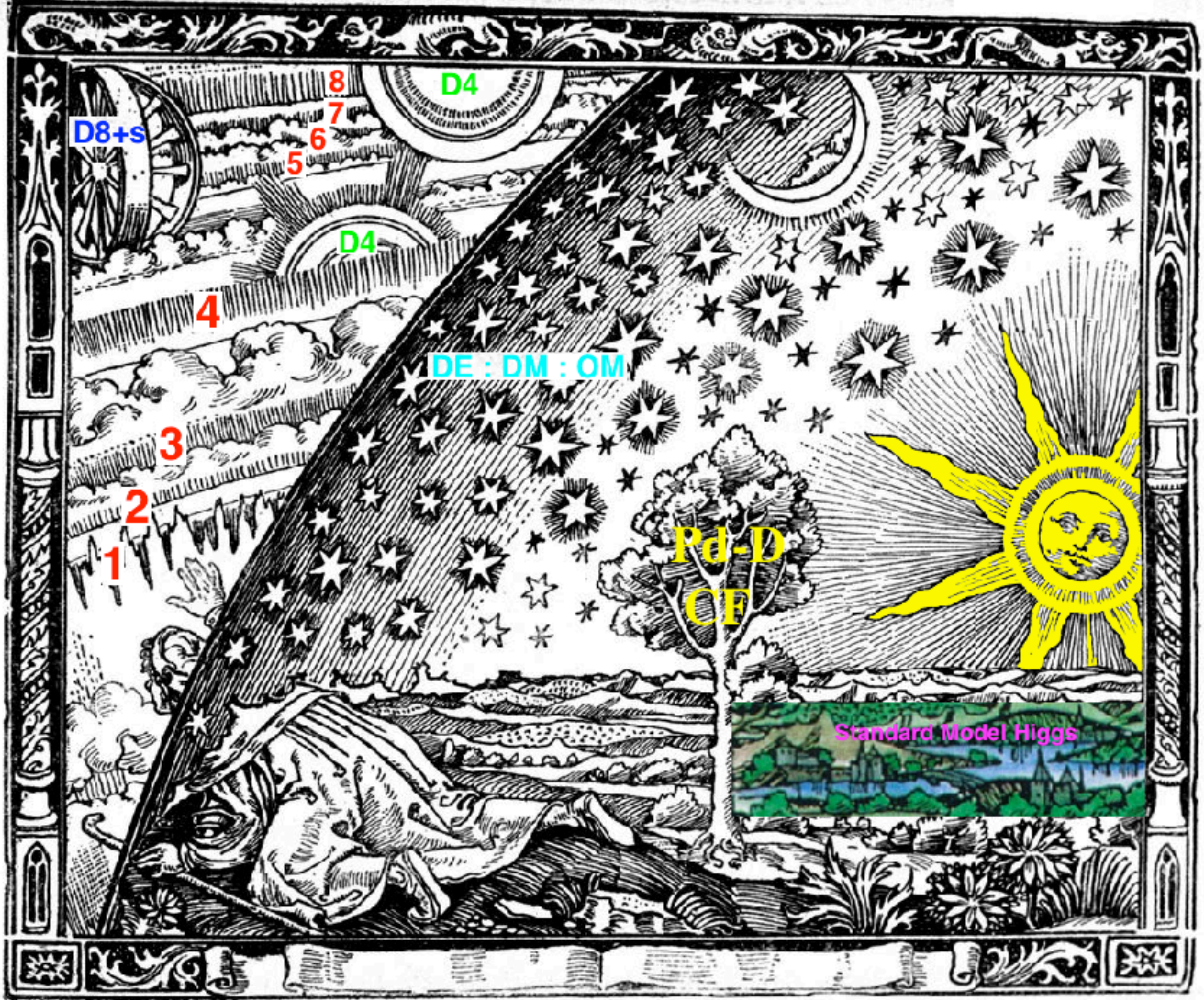


to Tarot to Llull to E8 Physics

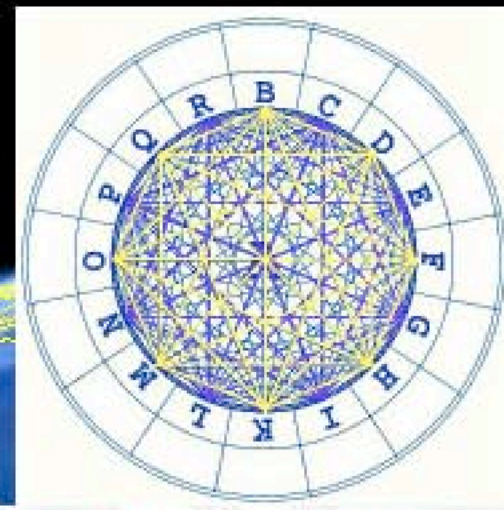


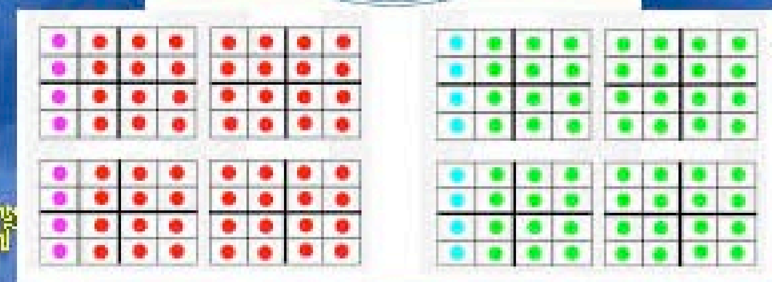


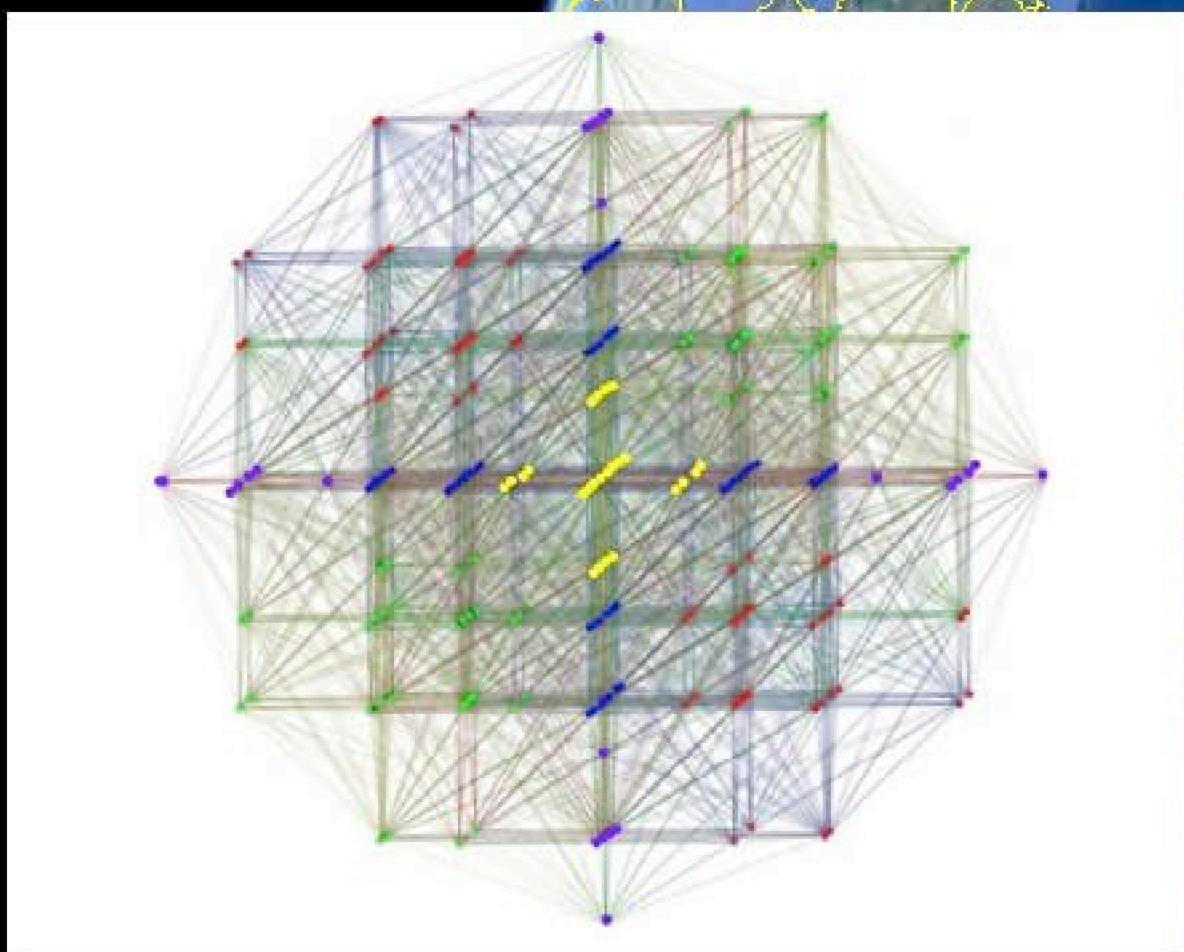




D8+s
8
7
6
5
D4
D4
4
DE : DM : OM
3
2
1
Pd-D
CF
Standard Model Higgs







E8 Root Vectors = 112+128 = 240 = 8 + 28 + 56 + (24+8+24) + 56 + 28 + 8

The resulting E8 Physics Model has:

EPR structure similar to that of Joy Christian;

E8 structure modified from that of Garrett Lisi;

Cl(16) = Cl(8)xCl(8) Clifford Algebra structure anticipated by Ramon Llull;

Higgs mechanism produced by formation of M4 x CP2 spacetime as shown by work of Meinhard Mayer;

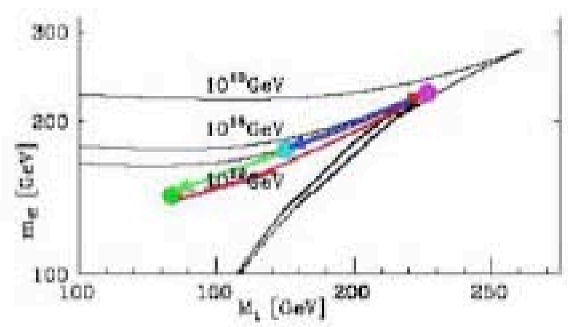
Standard Model Gauge Groups produced therein as shown by work of N. A. Batakis;

Conformal Gravity produced as in the MacDowell-Mansouri mechanism;

Dark Energy : Dark Matter : Ordinary Matter ratio 75 : 21 : 4
produced by conformal structures similar to those of Irving Ezra Segal;

Force Strength and Particle Mass calculations done using the Work of Hua Luogeng, particularly work on the Geometry of Complex Domains;

T-quark composite Higgs model based on the work of Yamawaki et al,
resulting in a 3-state T-quark - Higgs system;



and
Algebraic Quantum Field Theory (AQFT) constructed
from a Clifford Real-Periodicity-8 hyperfinite II1 von Neumann algebra factor.

Sadoc and Mosseri in their book "Geometric Frustration" (Cambridge 2006) Fig. A51 illustrate the shell structure of the 120 vertices of a 600-cell:

250 *A5 Polytope {3, 3, 5}*

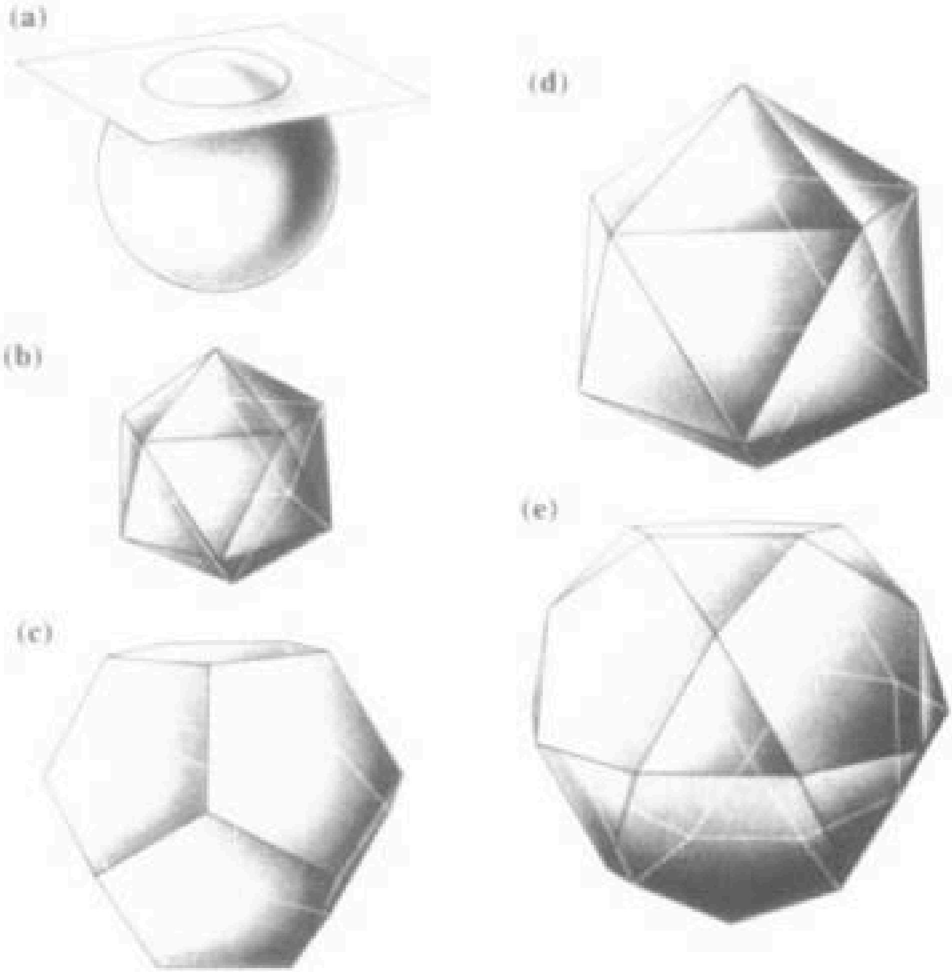
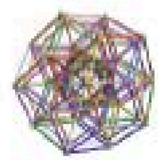
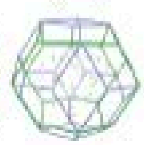


Fig. A5.1. The {3, 3, 5} polytope. Different flat sections in S^3 (with one site on top) give the following successive shells; (a) an icosahedral shell formed by the first 12 neighbours, (b) a dodecahedral shell, (c) a second and larger icosahedral shell, (d) an icosidodecahedral shell on the equatorial sphere. Then other shells are symmetrically disposed in the second 'south' hemi-hypersphere, relative to the equatorial sphere (e).

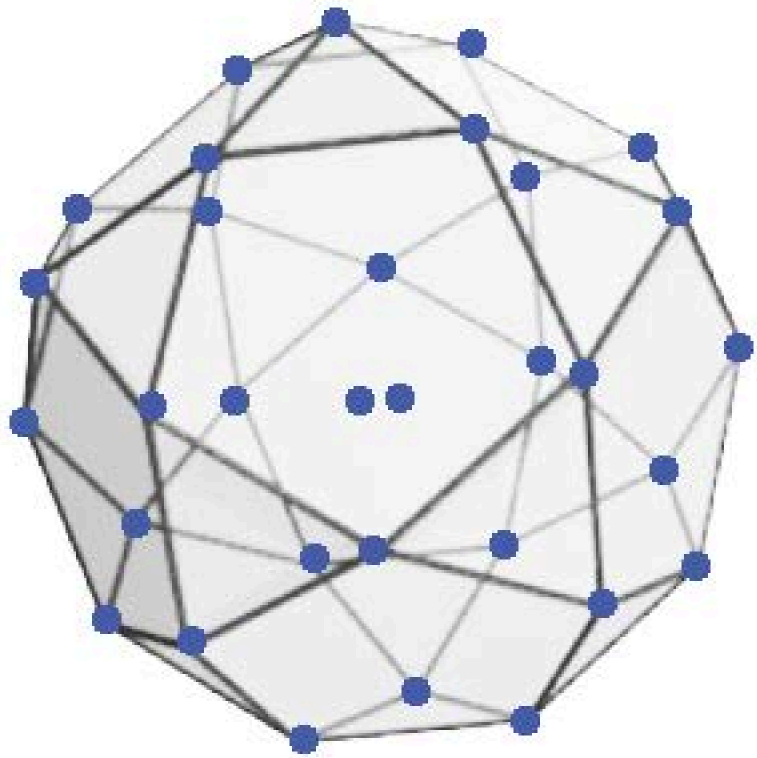
The 30-vertex Icosidodecahedron (e) cannot tile flat 3-dim space. Its dual, the 32-vertex Rhombic Triacontahedron, is a combination of the 12-vertex Icosahedron (d) and the 20-vertex Dodecahedron (c). It "forms the convex hull of ... orthographic





projection ... using the Golden ratio in the basis vectors ... of a 6-cube to 3 dimensions." (Wikipedia).

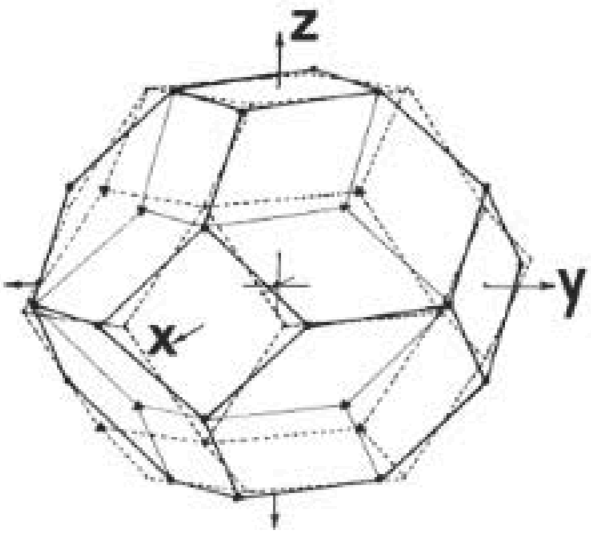
Physical Interpretation of
1 - North Pole - Single Point (projected to center of Equatorial Icosidodecahedron)
30 - Equator - Icosidodecahedron
1 - South Pole - Single Point (projected to center of Equatorial Icosidodecahedron)
is
8 components of 8-dim Kaluza-Klein M4xCP2 Spacetime Position
times
4 components of 4-dim M4 Physical Spacetime Momentum

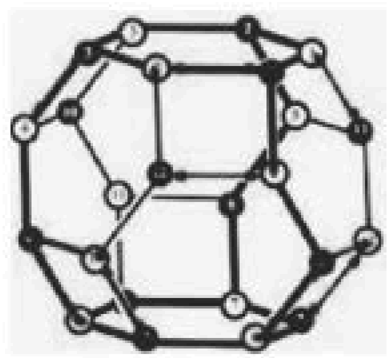


There are 64 - 32 = 32 of the 240 E8 in the half of E8 that did not go to the 600-cell. They correspond to 8 components of Position x 4 components of momentum in CP2. Since the CP2 Internal Symmetry Space is the small compactified part of M4xCP2 momentum in CP2 is substantially irrelevant to our 3-dim space M4 world.

The 30 Icosadodecahedron vertices are at pairwise intersections of 6 Great Circle Decagons. Let each Great Circle represent a generator of a spacetime translation. Then the Icosadodecahedron represents a 6-dim Spin(2,4) Conformal spacetime that acts conformally on 4-dim M4 Minkowski Physical Spacetime that lives inside 8-dim Kaluza-Klein M4xCP2 Spacetime (where CP2 = SU(3) / U(2)). Physically the 6 Great Circles of the Icosadodecahedron show that the 10-dim space of 26-dim String Theory of Strings as World-Lines reduces to 6-dim Conformal Physical Spacetime plus 4-dim CP2 Internal Symmetry Space.

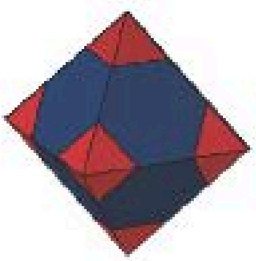
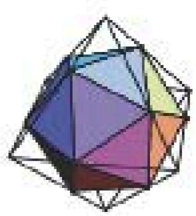
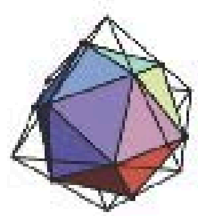
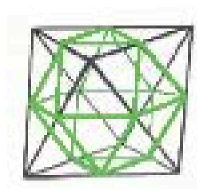
The 32-vertex Rhombic Triacontahedron does not itself tile 3-dim space
but it is important in 3-dim QuasiCrystal tiling.
Mackay (J. Mic. 146 (1987) 233-243) said "... the basic cluster, to be observed everywhere in the three-dimensional ... Penrose ... tiling ...[is]... a rhombic triacontahedron (RTH) ... The 3-D tiling can be regarded as an assembly of such RTH, party overlapping
...
a rhombic triacontahedron (RTH) ... can be deformed to ... a truncated octahedron ... [which is] the space-filling polyhedron for body-centered cubic close packing ...





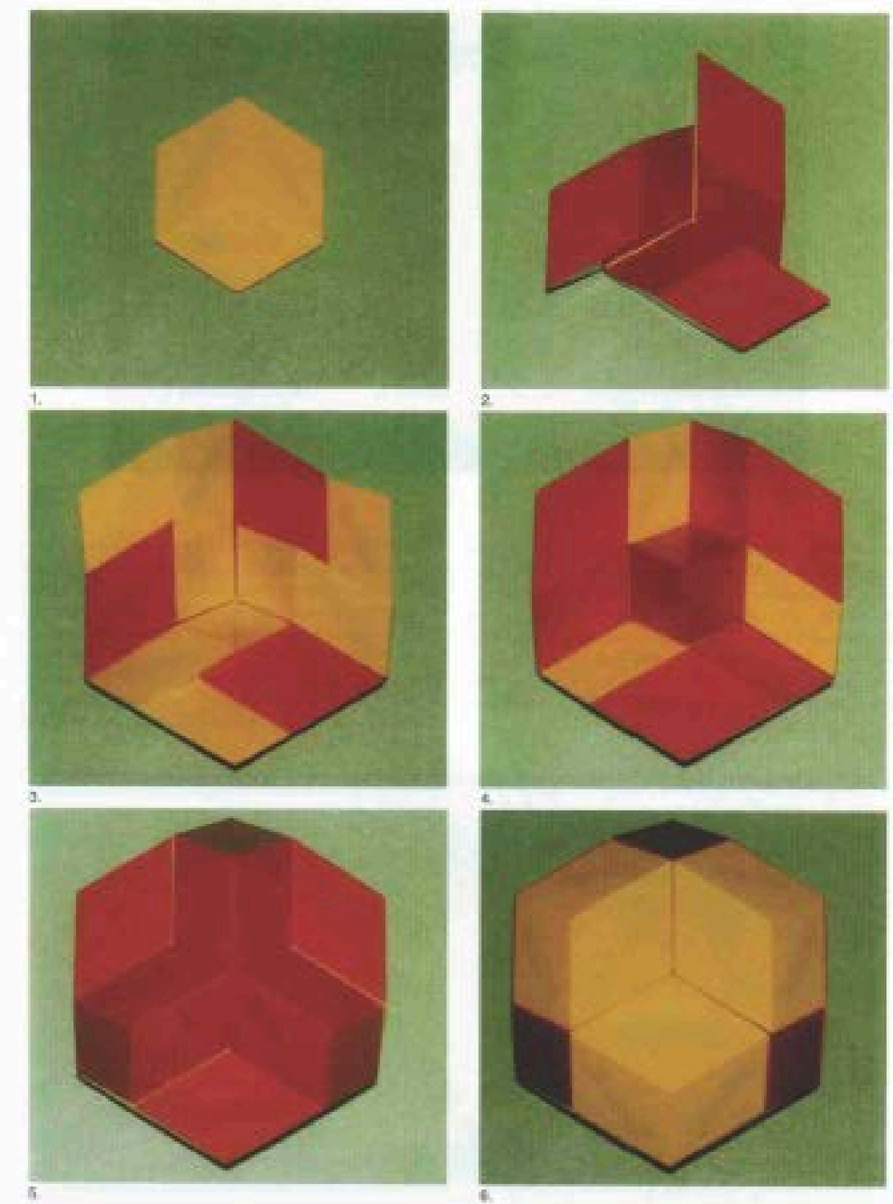
By a similar process ... a cuboctahedr[on]... can be deformed to an icosahedron ...".

In the latter process, the Jitterbug, sets of points on the edges of an Octahedron correspond to the vertices of the Truncated Octahedron (1/3 and 2/3),
a pair of Icosahedra (Golden Ratio Points), and the Cuboctahedron (Mid-Point).

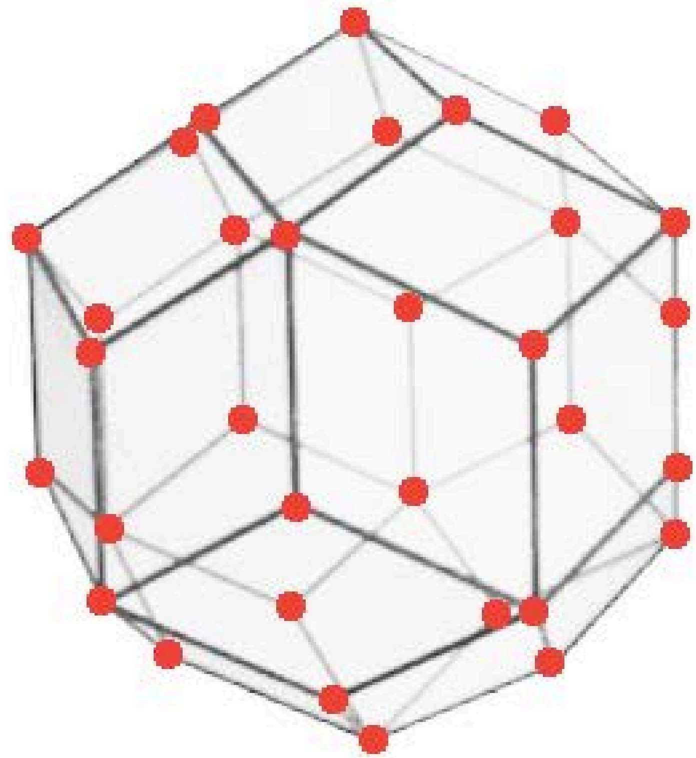
but the Rhombic Triacontahedron deformation process involves moving its vertices somewhat off the exact edges of the Octahedron and in adding to the 24 vertices of the Truncated Octahedron 8 more vertices corresponding to centers of its hexagonal faces and making 3 rhombohedral faces from each of its hexagonal faces.

Construction of Left-Handed and Right-Handed Rhombic Triacontahedra
is described by Michael S. Longuet-Higgins in " Nested Triacontahedral Shells
Or How to Grow a Quasi-crystal" (Mathematical Intelligencer 25 (Spring 2003) 25-43):
"... start with a flat rhombohedron,
placing on it three sharp rhombohedra in a left-handed symmetric way
and building up the rest of the ball maintaining always a three-fold axis of rotational symmetry ...



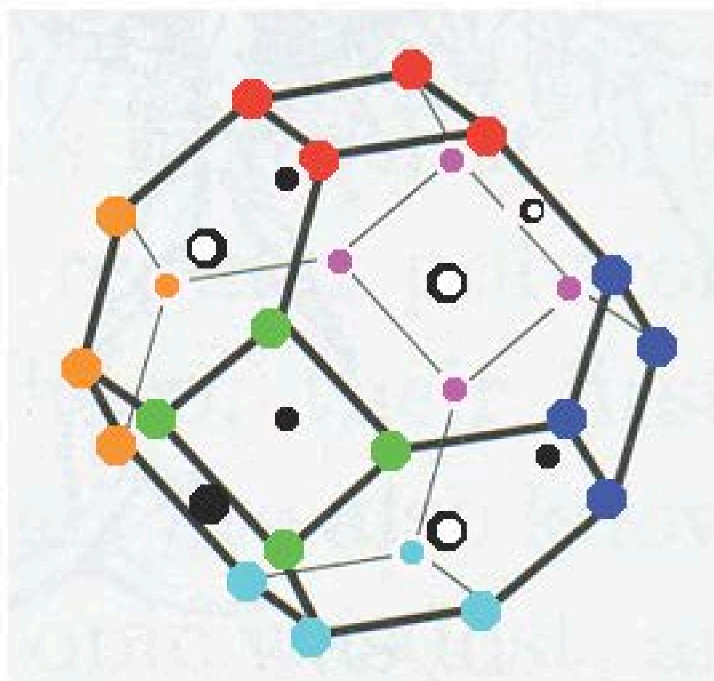
... (We could also start with right-handed symmetry, producing the mirror image.) ...".

Physical Interpretation of
20 - North Temperate Zone - Dodecahedron part of Rhombic Triacontahedron
12 - Tropic of Cancer - Icosahedron part of Rhombic Triacontahedron
is
8 fundamental first-generation fermion particles
times
4 covariant components of 4-dim M4 Physical Spacetime Momentum



Left-Handed Rhombic Triacontahedron Kepler Ball.

As to which vertices correspond to which Fermion Particles or Antiparticles the Truncated Octahedron point of view with 6 sets of 4 vertices for quarks and 2 sets of 4 hexagon-centers for leptons, showing the 4 covariant components with respect to M4 Physical Spacetime for each Fermion, is useful:



neutrino, red down quark, green down quark, blue down quark;

blue up quark, greem up quark , red up quark, electron

(orange, magenta, cyan, black are used for blue, green, red up quarks and electron)

Physical Interpretation of

12 - Tropic of Capricorn - Icosahedron part of Rhombic Triacontahedron

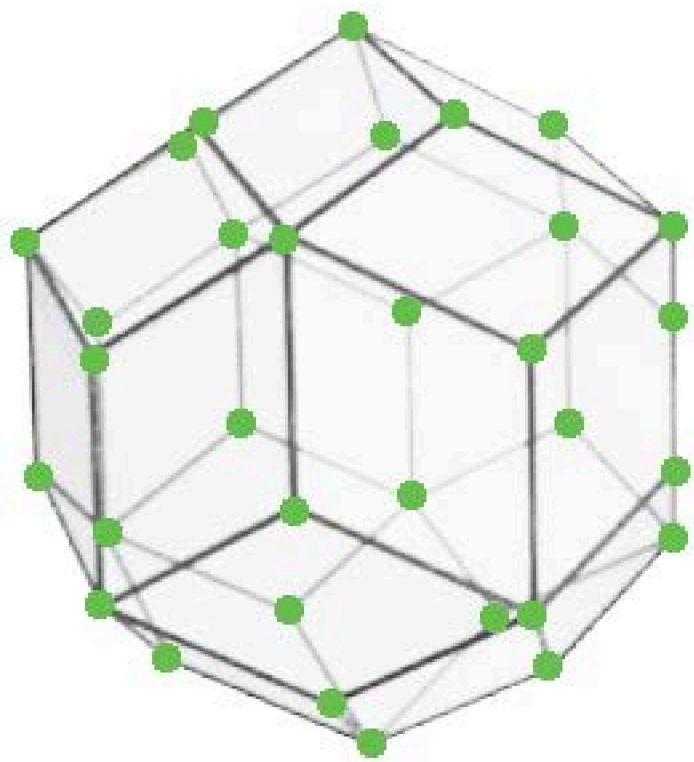
20 - South Temperate Zone - Dodecahedron part of Rhombic Triacontahedron

is

8 fundamental first-generation fermion antiparticles

times

4 covariant components of 4-dim M4 Physical Spacetime Momentum

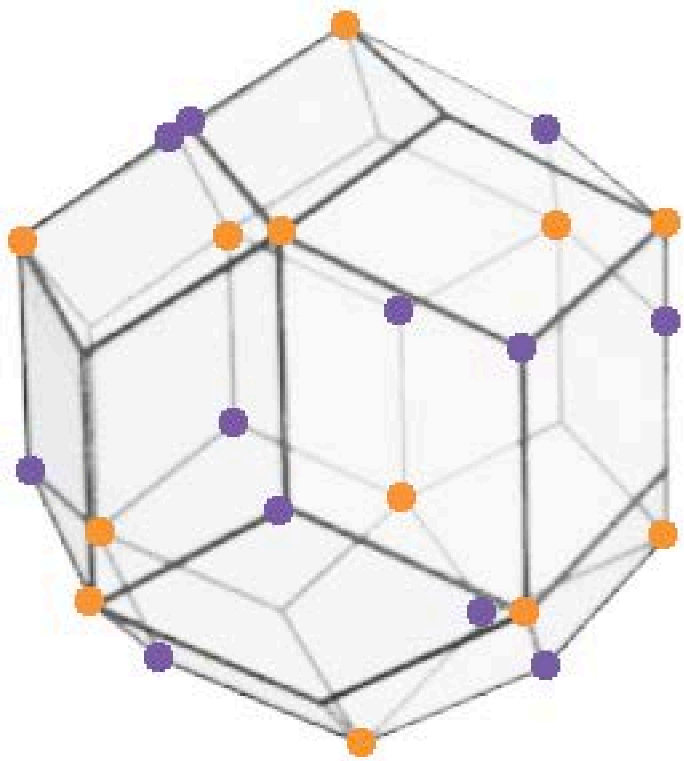


Right-Handed Rhombic Triacontahedron Kepler Ball.

Physical interpretation of the Rhombic Triacontahedra also includes

12 - Arctic Circle - Icosahedron - half of 24 Root Vectors of one of the E8 D4
and
12 - Antarctic Circle - Icosahedron - half of 24 Root Vectors of another E8 D4

which are interpreted as Gauge Bosons for Gravity and the Standard Model, respectively.

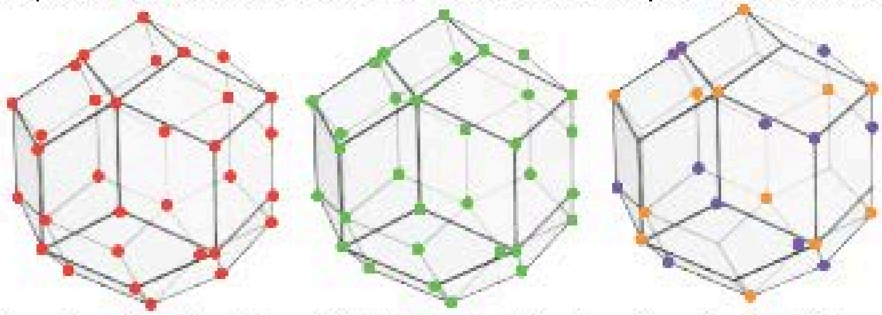


Rhombic Triacontahedron Kepler Ball with no handedness.

12 of the 20 3-edge vertices are 12 D4 Root Vectors for the Standard Model that combine with 4 of the 8 E8 Cartan SubAlgebra generators to form 12+4 = 16-dim U(4) that contains the Batakis Color Force SU(3) that gives the Standard Model through CP2 = SU(3) / U(1)xSU(2).
The 20-12 = 8 3-edge vertices that are not used correspond to the centers of the hexagonal faces of the Truncated Octahedron related to the Kepler Ball.

3-space tiled by Deformation or QuasiCrystal

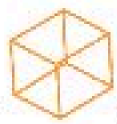
For tiling of 3-space the basic Rhombic Triacontahedra Kepler Ball should contain all 3:

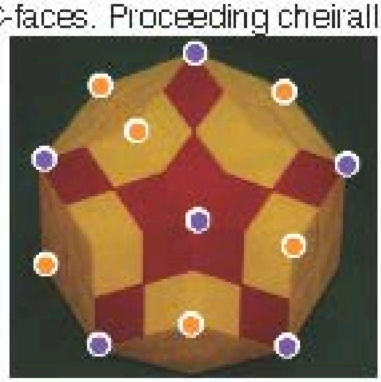


Left-Handed for Fermion Particles, Right-Handed for Fermion Antiparticles,
and no handedness for Gauge Bosons of Gravity and the Standard Model.

To construct such a 3-type Rhombic Triacontahedron Kepler Ball:

Start with a Left-Handed Kepler Ball for Fermion Particles and denote it by K(1).
Then, using K(1) as a nucleus, construct a K(2) Kepler Ball by adding to the K(1)

sharp "S"  and flat "F"  golden rhombohedra with dihedral angles
2 pi / 5 or 3 pi / 5 for S and pi / 5 or 4 pi / 5 for F as described in
" Nested Triacontahedral Shells Or How to Grow a Quasi-crystal"
by Michael S. Longuet-Higgins (Mathematical Intelligencer 25 (Spring 2003) 25-43):
"... To construct a K(2) ... label the thirty faces of a K(1) as follows: call
the five faces surrounding a given pentagonal vertex A's; the five adjoining faces B's;
the next ten adjoining faces (which are all parallell to the pentagonal axis) C's;
the next five D's; and the last five E's.
Taking the K(1), leave the A-faces bare and lay one F on each B-face.
Next lay an S on each of the C-faces. Proceeding cheirally ... we ... arrive ... at a K(2) ...



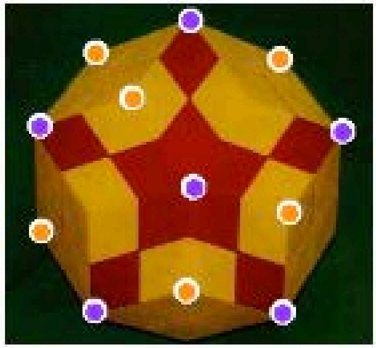
[I have added purple and orange indicators for K(2) vertices representing some of
the Root Vectors of U(2,2) for Conformal Gravity and of U(4) for the Standard Model.]
The view from the opposite end is similar ...
there is a second K(1), coaxial with the first, along the pentagonal axis ...".

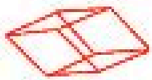
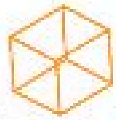
K(1) is for Fermion Particles, second K(1) is for Fermion Antiparticles,
and K(2) is for Gauge Bosons of Gravity and the Standard Model.
K(2), containing Particle-Antiparticle Pairs, is the Basic Tiling Kepler Ball.

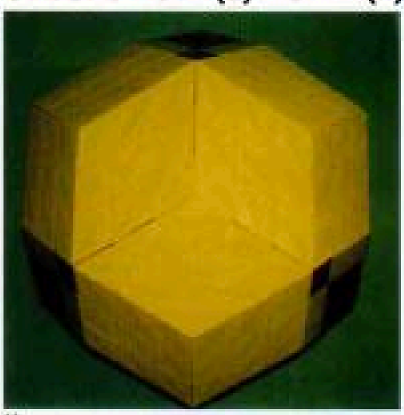
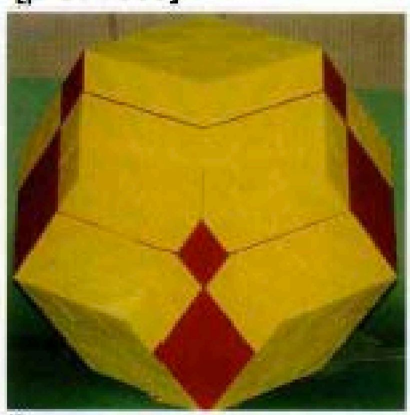
3-dim QuasiCrystal of Rhombic Triacontaheda

Start with the

Basic Tiling Kepler Ball K(2) containing a Particle-Antiparticle pair of K(1)s



Then adding to the K(2) sharp "S"  and flat "F"  golden rhombohedra
" Nested Triacontahedral Shells Or How to Grow a Quasi-crystal"
by Michael S. Longuet-Higgins (Mathematical Intelligencer 25 (Spring 2003) 25-43):
"... **it is possible ...to derive a Kepler Ball K(n+1) of side n+1 from a K(n)** ...
... the outer shell is [not] cheiral ...
... [such a] **construction of K(3) from K(2) ...[produces]...**

... in many respects the particular arrangements described here are not unique.
For example, in places where a triacontahedron occurs locally, ...[it]... may be replaced by a ... [triacontahedron of a different type] ... **the method of assembly**

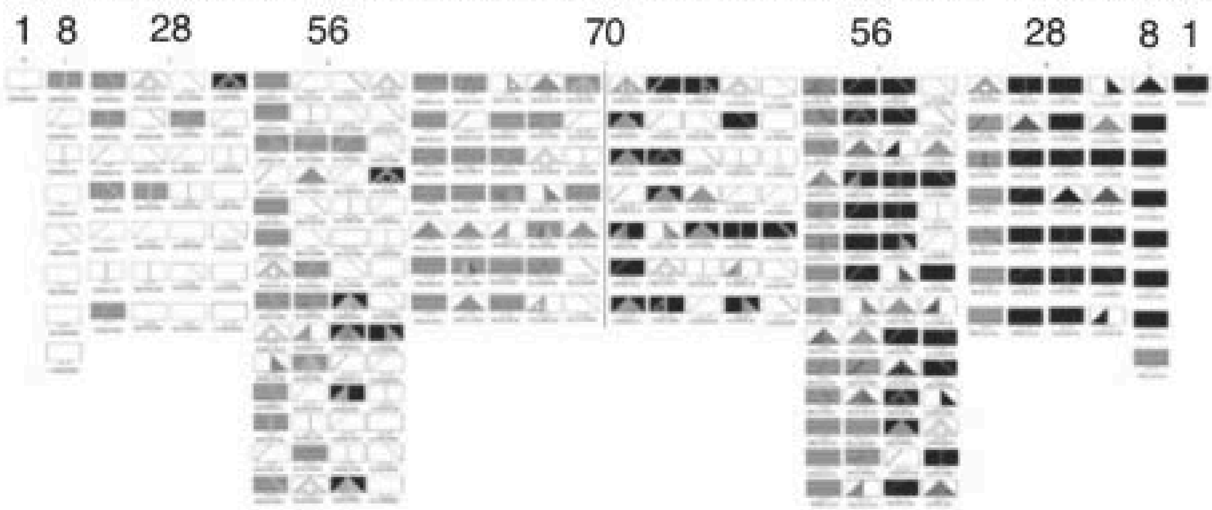
...

does not require the existence of such long-range forces as would be needed to assemble an Ammann tiling ... ".

2 - Deform the Rhombic Triacontahedra to Truncated Octahedra and tile 3-space with the Truncated Octahedra

Mackay (J. Mic. 146 (1987) 233-243) said "...a rhombic triacontahedron (RTH) ... can be deformed to ... a **truncated octahedron** ...
[which is] the **space-filling polyhedron for body-centered cubic close packing** ...".
Such a lattice of Truncated Octahedra (image from real wireless)

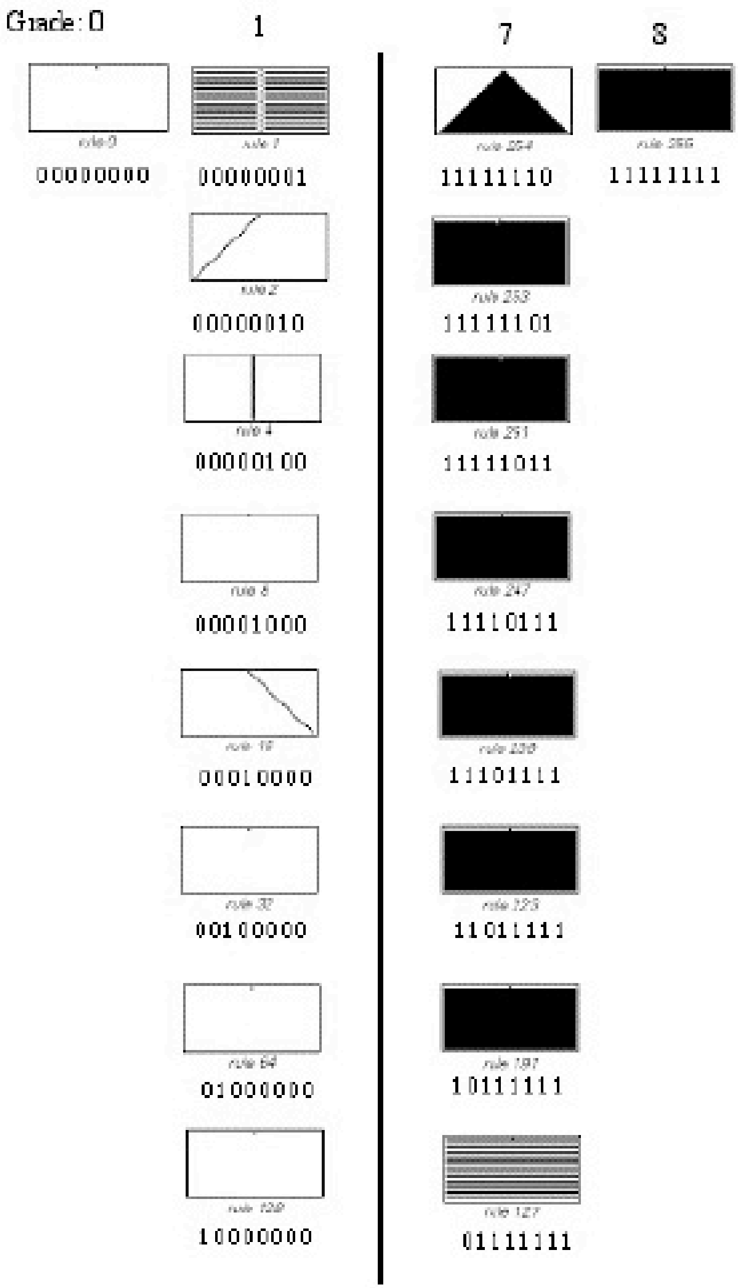
can form the basis for the spatial part of a 4-dim Feynman Checkerboard representation of the E8 Physics Model,
with the Feynman Checkerboard Rules being related to the 256 Cellular Automata corresponding to the 256 elements of the Cl(8) Clifford Algebra of the E8 Physics Model



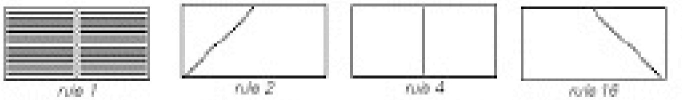
256 Cellular Automata

1 8 28 56 70 56 28 8 1

(images from "A New Kind of Science" by Stephen Wolfram (Wolfram 2002))



the grade-1 vectors 1, 2, 4, 16 (the subset sequence 2^0 = 1, 2^1 = 2, 2^2 = 4, 2^4 = 16 related to Fermat primes)

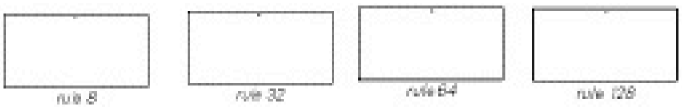


00000001 00000010 00000100 00010000

correspond to the 4 dimensions of physical spacetime;

- 1 gives a succession of bands, the procession of time;
- 2 gives a slope to the left, one of three space dimensions;
- 4 gives a vertical slope, a second of three space dimensions;
- 16 gives a slope to the right, the third of three space dimensions;

the grade-1 vectors 8, 32, 64, 128 (all giving all white)

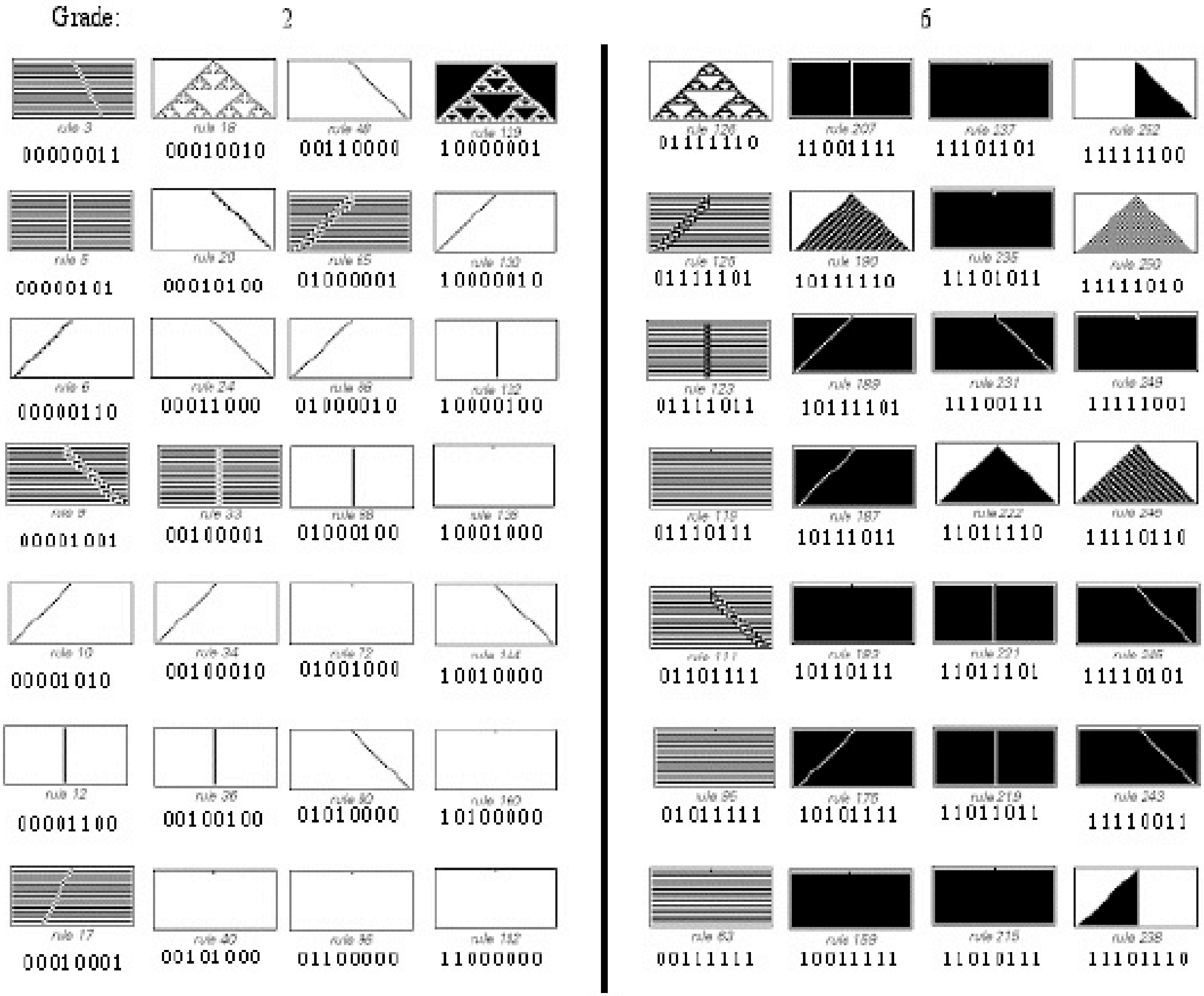


00001000 00100000 01000000 10000000

correspond to the 4 dimensions of internal symmetry space;

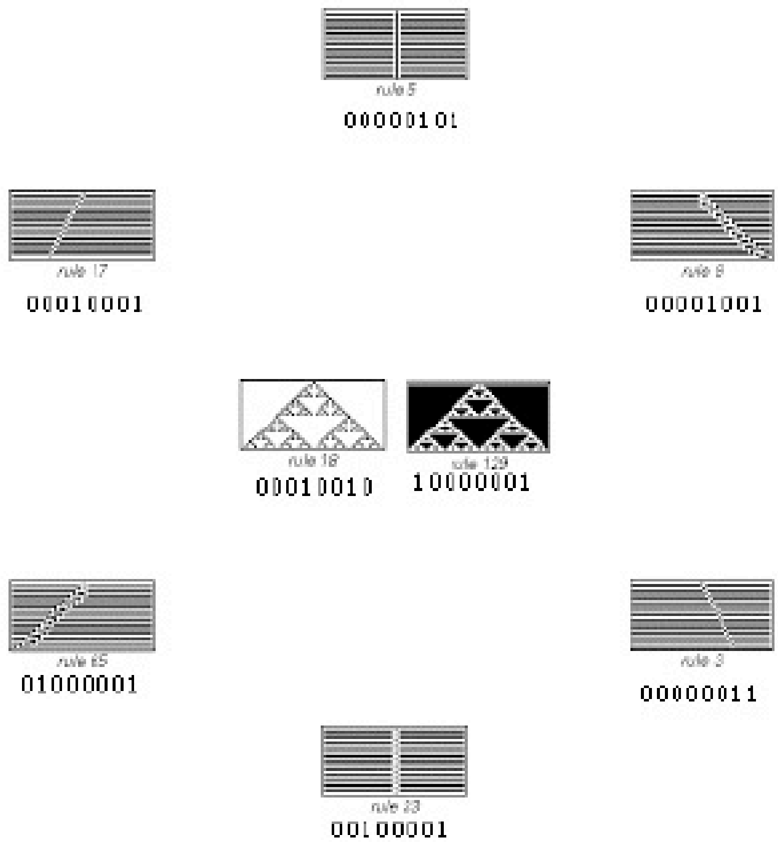
- rule 18 = 00010010 is the first rule to include both 16 = 00010000 with right slope and 2 = 00000010 with left slope and is the first rule with traingular self-similar fractal structure;
- rule 30 = 00011110 is the first rule to include 16, 8, 4, and 2 and is in the self-dual grade-4 and is the first rule with triangular chaotic behavior.

Here are all 28 rules for each of grades 2 and 6.



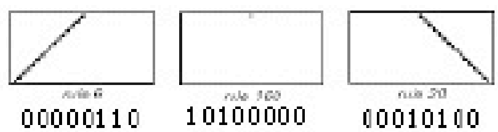
all 28 grade-2 bivectors correspond to the 28 generators of the Spin(8) Lie algebra;

8 of the grade-2 bivectors,



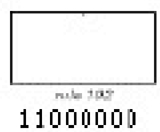
after dimensional reduction to 4-dimensional physical spacetime, correspond to the 8 generators of color force SU(3), whose root vector diagram is illustrated above;

3 of the grade-2 bivectors,



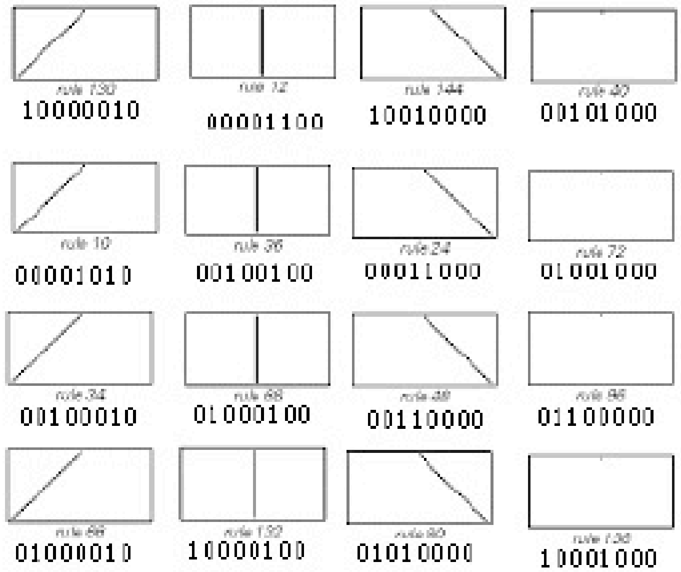
after dimensional reduction to 4-dimensional physical spacetime, correspond to the 3 generators of weak force SU(2);

1 of the grade-2 bivectors,

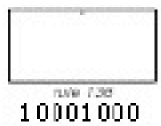


after dimensional reduction to 4-dimensional physical spacetime, correspond to the 1 generator of electromagnetic U(1);

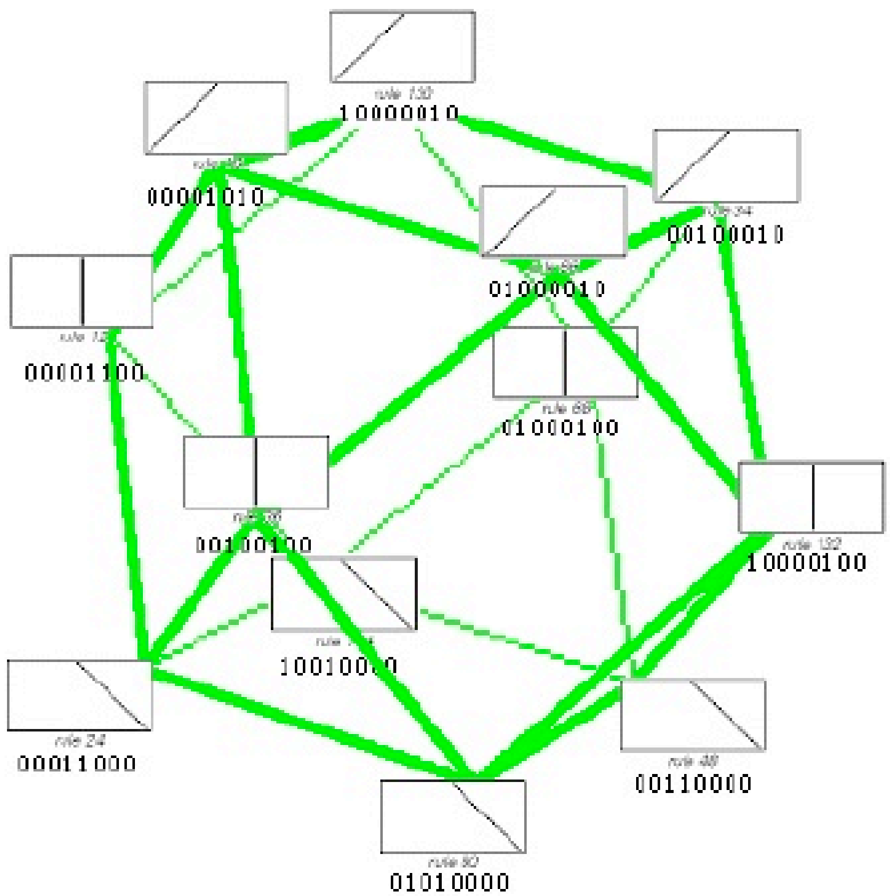
16 of the grade-2 bivectors,

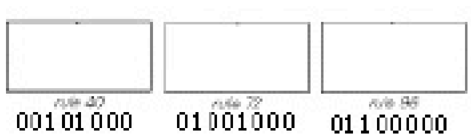


after dimensional reduction to 4-dimensional physical spacetime, correspond to the 16 generators of Gravity/Higgs/phase U(2,2). One of them



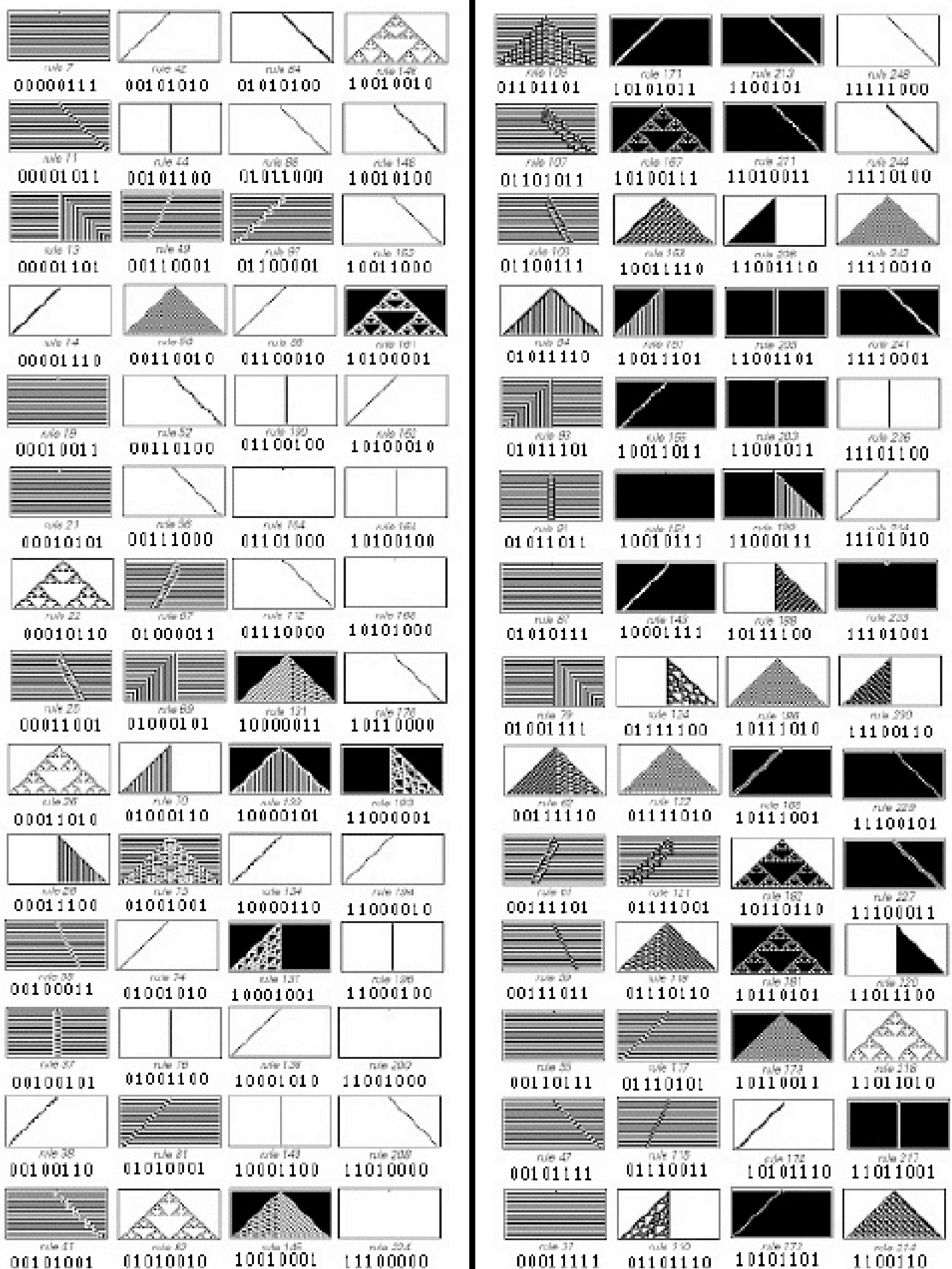
corresponds to the propagator phase U(1) while the other 15 correspond to the Conformal Group SU(2,2) = Spin(2,4) whose root vector diagram





is a 12-vertex cuboctahedron (the other 3 bivectors corresponding to the 3 generators of the Cartan Subalgebra).

Grade: 3 5


00000111
00101010
01010100
10010010
00001011
00101100
01011000
10010100
00001101
00110001
01100001
10011000
00001110
00110010
01100010
10100001
00010011
00110100
01100100
10100010
00010101
00111000
01101000
10100100
00010110
01000011
01110000
10101000
00011001
01000101
10000011
10110000
00011010
01000110
10000101
11000001
00011100
01001001
10000110
11000010
00100011
01001010
10001001
11000100
00100101
01001100
10001010
11001000
00100110
01010001
10001100
11010000
00101001
01010010
10010001
11100000
01101101
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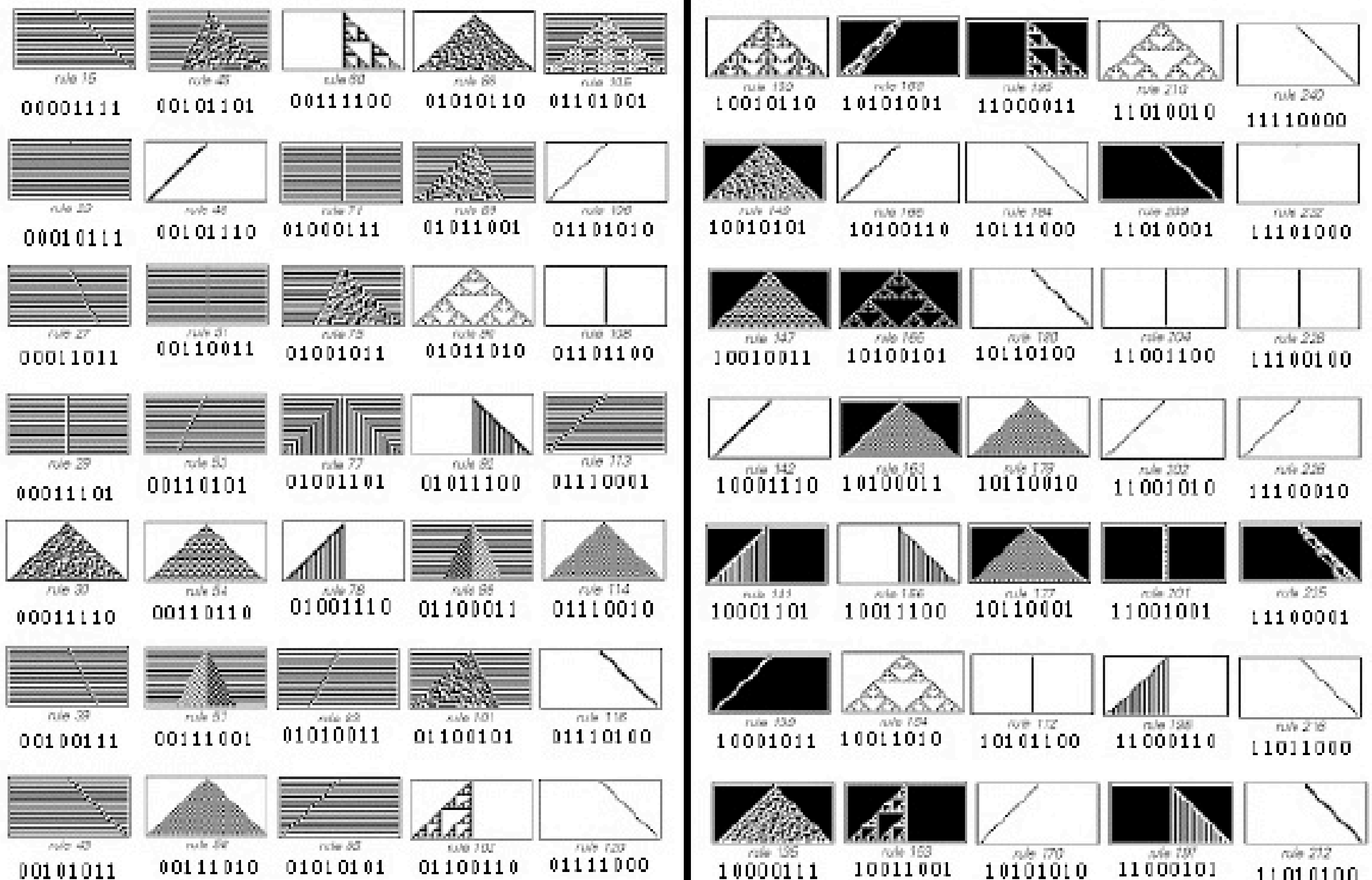
Grade:

4


rule 15
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rule 60
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rule 204
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rule 178
10110010
rule 202
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rule 226
11100010
rule 141
10001101
rule 156
10011100
rule 177
10110001
rule 201
11001001
rule 225
11100001
rule 139
10001011
rule 154
10011010
rule 172
10101100
rule 198
11000110
rule 216
11011000
rule 135
10000111
rule 153
10011001
rule 170
10101010
rule 197
11000101
rule 212
11010100

the 16 terms in the Cl(8) primitive idempotent

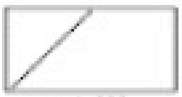
$$f = (1/2)(1 + e\_1248) (1/2)(1 + e\_2358) (1/2)(1 + e\_3468) (1/2)(1 + e\_4578) =$$

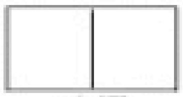
$$=(1/16)(1 + e\_1248 + e\_2358 + e\_3468 + e\_4578 + e\_5618 + e\_6728 + e\_7138 - e\_3567 - e\_4671 - e\_5712 - e\_6123 - e\_7234 - e\_1345 - e\_2456 + e\_J)$$

correspond to 16 of the 256 Cellular Automata


rule 255

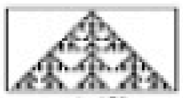
- + e_12345678 11111111

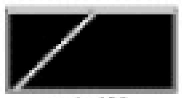

rule 226

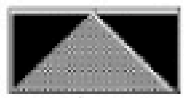

rule 172

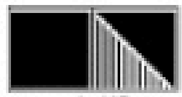

rule 216

- + e_6728 + e_3468 + e_4578 to 11100010 10101100 11011000

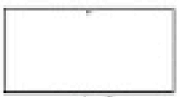

rule 150


rule 139

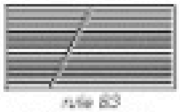

rule 177

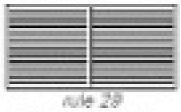

rule 197

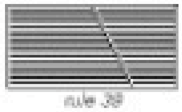
- + e_2358 + e_1248 + e_5618 + e_7138 10010110 10001011 10110001 11000101


rule 0

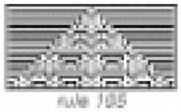
- + 1 to 00000000

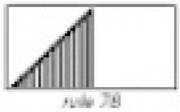

rule 83

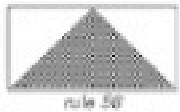

rule 29

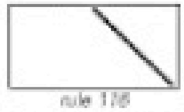

rule 39

- - e_5712 - e_1345 - e_6123 01010011 00011101 00100111


rule 105


rule 78

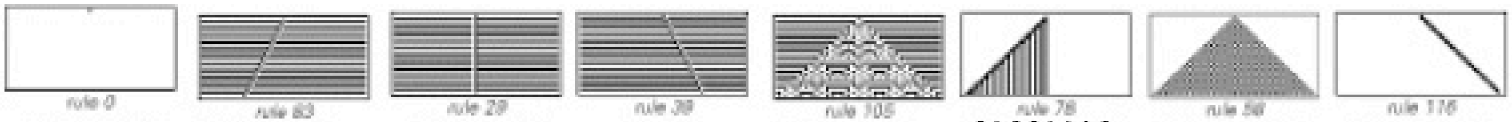

rule 58


rule 116

- - e_4671 - e_7234 - e_2456 - e_3567 01101001 01001110 00111010 01110100

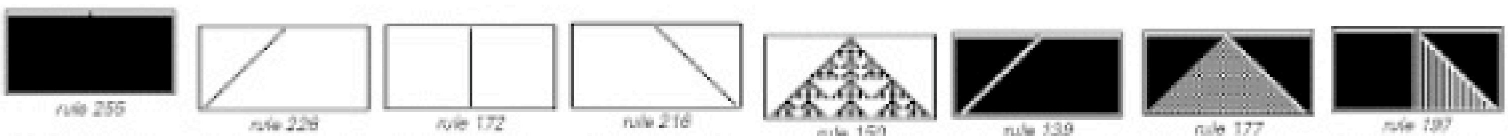
Note the Cl(0,8) = Cl(1,7) triality correspondences among:

- the 8 +half-spinors



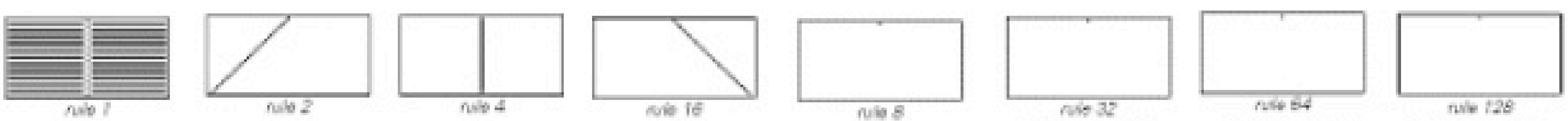
00000000 01010011 00011101 00100111 01101001 01001110 00111010 01110100

- the 8 -half-spinors



11111111 11100010 10101100 11011000 10010110 10001011 10110001 11000101

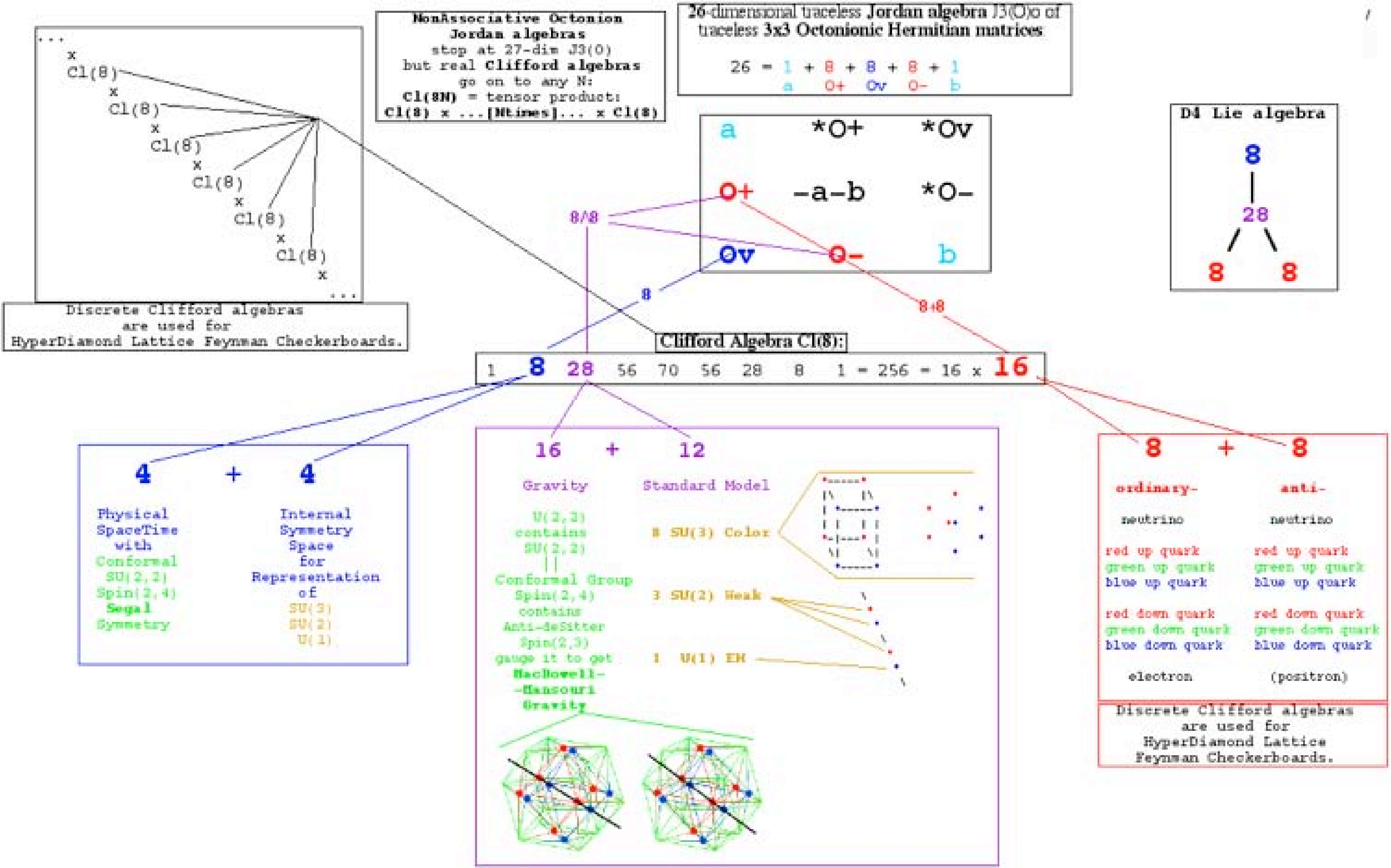
- the 8 vectors



00000001 00000010 00000100 00010000 00001000 00100000 01000000 10000000

Physical Interpretation of --- 26 Dimensions of String Theory:

Frank D. (Tony) Smith, Jr.
February 2001



EPR (Christian) => E8 (Lisi) + Cl(16) (Llull)

(Mayer) => M4xCP2 (Batakis) + Higgs + Standard Model

(MacDowell-Mansouri) => Conformal Gravity

(Segal) => Dark Energy : DM : OM

(HUA) => Force Strengths + Particle Masses = EXPERIMENTAL TESTS

Feynman:

The whole purpose of physics is to find a number, with decimal points, etc!

Otherwise you haven't done anything.

(Segal-Connes) => Clifford Real-Periodic HyperFinite Factor AQFT

Construction of my E8 Physics Model starts with real Clifford algebra Cl(16) and proceed to interpret it in terms of Geoffrey Dixon's C x H x O :

In the 64-dim division algebra structure C x H x O of Geoffrey Dixon
now being studied by Cohl Furey 1002.1497 at Perimeter
let
the basis for C= Complex numbers correspond to
{ 1 , E } = { neutrino-up quark states , electron-down quark states }
and
the basis for H = Quaternions correspond to
{ 1 , i , j , k } = { lepton , red quark , green quark , blue quark }
and
the basis for O = Octonions correspond to
{ 1 , i , j , k , E , I , J , K } = { t , x1 , x2 , x3 , x4 , y1 , y2 , y3 , y4 }
where
t corresponds to 1 time dimension in 8-dim spacetime
xi and yi correspond to 7 spatial dimensions in 8-dim spacetime
and,
after freezing out a preferred quaternionic spacetime subspace at low energies
where we do our experiments, thus creating 8-dim M4 x CP2 Kaluza-Klein,
{ t , x1 , x2 , x3 , x4 } = 4-dim M4 Minkowski physical spacetime
{ y1 , y2 , y3 , y4 } = 4-dim CP2 = SU(3)/U(2) Batakis Internal Symmetry Space

The real Clifford algebra Cl(16) has 120 bivectors
and 256 spinors = 128 +half-spinors plus 128 -half-spinors.

The two 128-dim half-spinors are physically interpreted as
one 128-dim for one generations fermion particles and antiparticles
and
the other 128-dim for one antigeneration of fermion particles and antiparticles.

248-dim E8 is constructed by
combining the 120-dim bivector and the 128-dim generation of fermions
and
rejecting the 128-dim antigeneration of fermions.

The 128 fermion generation contains
64 for fermion particles and 64 for fermion antiparticles.

In terms of the 64-dim division algebra structure C x H x O of Geoffrey Dixon

the 64 fermion particles are represented in this way:

From the basis elements of the C x H part of C x H x O:

```
1 x 1 = neutrino
1 x i = red up quark
1 x j = green up quark
1 x k = blue up quark
E x 1 = electron
E x i = red down quark
E x j = green down quark
E x k = blue down quark
```

Adding the O part of C x H x O gives each Particle 8 Octonionic components representing
each Particle's 8 covariant components in 8-dim Kaluza-Klein M4xCP2 spacetime.

The 64 fermion antiparticles are represented similarly.

As to the 120 bivectors of Cl(16) they decompose under the 8-periodicity tensor product Cl(16) = Cl(8) x Cl(8) as
120 = 1x28 + 8x8 + 28x1 = 28 + 64 + 28

The bivector 64 is related by Triality
to the fermion paticle 64 and the fermion antiparticle 64,
so
bivector 64 = 8x8 = 2x4x8
where in terms of C x H x O:
8 = Octonionic basis elements for 8-dim spacetime
4 = Quaternionic { 1 , i , j , k } = 4 basis elements for 4-dim M4 and for 4-dim CP2
2 = Complex { 1 , E } = 2 basis elements to distinguish between M4 and CP2

Note that with respect to 120 = 1x28 + 8x8 + 28x1

the 8 elements 8 of O and one of the 28 come from one Cl(8) factor of Cl(16)
and
the 8 elements 2x4 of CxH and the second of the 28 come from the second Cl(8) factor of Cl(16)
So,
the first 28 bivector generators represent a D4 Lie algebra that acts geometrically on the Octonion 8 that represents 8-dim Octonion spacetime.
After quaternionic subspace freezing to M4xCP2 Kaluza-Klein,
D4 is seen to contain the Conformal subalgebra U(2,2) = Spin(2,4)xU(1)
which produces Gravity by a generalized MacDowell Mansouri mechanism
and
the second 28 bivector generators represent a D4 Lie algebra that acts
on the 8-dim CxH space corresponding to M4 x CP2
and contains a 15-dim SU(4) subalgebra that includes
the 8-dim SU(3) color force of CP2 = SU(3) / SU(2) x U(1)
A generalized Batakis mechanism produces the 12 = 8+3+1 generators of the Standard Model Lie algebras:
SU(3 for color force, SU(2) for weak force, and U(1) for electromagnetism.

When the 8-dim spacetime is broken to M4 x CP2 Kaluza-Klein,
that geometric process produces the Higgs by a Mayer-Trautman mechanism
and also produces the second and third generations of fermions.
Neutrino masses occur by processes beyond tree level,
and
by seeing the Higgs as corresponding to a Tquark condensate you can predict some states that I think are consistent with experimental observations.

Note that the only generators in my E8 Physics Model that are not given
physical interpretation directly corresponding to Standard Model + Gravity are:

28 - 16 = 12 generators of the first 28 D4 used for Gravity
and
28 - 12 = 16 generators of the second 28 D4 used for the Standard Model.

My opinion is that
the 12 extra Gravity generators serve as links to the 12 Standard Model generators
and
the 16 extra Standard Model generators serve as links to the 16 Gravity generators.

The resulting **Structure of my E8 Physics model** is:

E8 = 120-dim bivector D8 of Cl(16) + 128-dim half-spinor of Cl(16)

By periodicity, Cl(16) = tensor product Cl(8) x Cl(8)
Cl(8) graded structure is 1 8 28 56 70 56 28 8 1
Cl(16) bivectors are 120 which decomposes under that tensor product as
120 = (1 8 28 ...) x (1 8 28 ...) = 1x28 + 8x8 + 28x1

Each 28 was a D4 bivector Lie algebra in Cl(8),
and so preserves that structure in the 120 of Cl(16).
Each 28 D4 acts, at the Cl(8) level, on the vector 8 of Cl(8) in a way
that is effectively 28-dim rotations of 8-dim spacetime.

The 8x8 is tensor product of two vectorial 8 in the two Cl(8),
and so each 8 has the same octonionic spacetime character as
the 8 vectors acted on by the D4 = Spin(8) from bivectors of Cl(8).

The 128 half-spinor of Cl(16) decomposes as:
64+64 of the Cl(14) subalgebra
Each of the 64 then decomposes as

C: (32+32) of the Cl(12) subalgebra, which in turn decomposes as
H: (16+16+16+16) of the Cl(10) subalgebra, which in turn decomposes as
O: (8+8+8+8+8+8+8+8) of the Cl(8) where each 8 has the structure of
a half-spinor of Spin(8) and Cl(8)

By Cl(8) Spin(8) Triality,
the vector 8 is isomorphic to each of the two half-spinor 8,
and
those isomorphisms extends in the E8 Cl(16) structure to a Triality whereby
bivector 64 isomorphic to each of the two 64 in the 128 of E8 and Cl(16).

Note that, in addition to Lattice and Lie Algebra structures, Lie Group Manifold
structures are needed to calculate force strengths, particle masses, etc. using
the geometric point of view of Armand Wyler and L. K. Hua,
and that on the Lie Group Manifold level:
E8 / D8 = 128-dim rank 8 symmetric space (OxO)P2
D8 / D4xD4 = 64-dim rank 8 symmetric space set of RP7 in RP15
D4 / U(4) = 12-dim rank 2 set of fibrations S1 -> RP7 -> CP3 = SU(4) / U(3)

AQFT:

Since the E8 classical Lagrangian is Local, it is necessary to patch together Local Lagrangian Regions to form a Global Structure describing a Global E8 Algebraic Quantum Field Theory (AQFT).
Mathematically, this is done by using Clifford Algebras (others now using Clifford algebras in related ways include Carlos Castro and David Finkelstein) to embed E8 into Cl(16) and using a copy of Cl(16) to represent each Local Lagrangian Region. A Global Structure is then formed by taking the tensor products of the copies of Cl(16). Due to Real Clifford Algebra 8-periodicity, Cl(16) = Cl(8)xCl(8) and 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). Just as the completion of the union of all tensor products of 2x2 complex Clifford algebra matrices produces the usual Hyperfinite II1 von Neumann factor that describes creation and annihilation operators on the fermionic Fock space over C^(2n) (see John Baez's Week 175), we can take the completion of the union of all tensor products of Cl(16) = Cl(8)xCl(8) to produce a generalized Hyperfinite II1 von Neumann factor that gives a natural Algebraic Quantum Field Theory structure to the E8 model.

EPR Entanglement:

For the E8 model AQFT to be realistic, it must be consistent with EPR entanglement relations. Joy Christian in arXiv 0904.4259 "Disproofs of Bell, GHZ, and Hardy Type Theorems and the Illusion of Entanglement" said: "… a [geometrically] correct local-realistic framework … provides exact, deterministic, and local underpinnings for at least the Bell, GHZ-3, GHZ-4, and Hardy states. … The alleged non-localities of these states … result from misidentified [geometries] of the EPR elements of reality. … The correlations are … the classical correlations among the points of a 3 or 7-sphere … S3 and S7 … are … parallelizable …
The correlations … can be seen most transparently in the elegant language of Clifford algebra …". The E8 model AQFT is based on the parallelizable Lie group E8 and related Clifford algebras,
so the E8 model seems consistent with EPR.

Quaternionic M4 x CP2 Kaluza-Klein:

E8 physics in 8-dim spacetime differs from
conventional Gravity plus Standard Model in four respects:
1 - 8-dimensional spacetime
2 – two Spin(8) gauge groups from the two D4 in 112
3 - no Higgs
4 - 1 generation of fermions

These differences can be reconciled as follows:

Introduce (freezing out at lower-than-Planck energies) a preferred Quaternionic 4-dim subspace of the original (high-energy) 8-dim spacetime,
thus forming an 8-dim Kaluza-Klein spacetime M4xCP2
where M4 is 4-dim physical spacetime and CP2 is a 4-dim intrernal symmetry space.

Let the first Spin(8) gauge group act on the M4 physical spacetime through the SU(3) subgroup of its U(4) subgroup. As Meinhard E. Mayer said (Hadronic Journal 4 (1981) 108-152): "… each point of … the … fibre bundle … E consists of a four-dimensional spacetime point x [in M4] to which is attached the homogeneous space G / H [SU(3) / U(2) = CP2] … the components of the curvature lying in the homogeneous space G / H [= SU(3) / U(2)] could be reinterpreted as Higgs scalars (with respect to spacetime [M4])
…
the Yang-Mills action reduces to a Yang-Mills action for the h-components [U(2) components] of the curvature over M [M4]
and
a quartic functional for the "Higgs scalars", which not only reproduces the Ginzburg-Landau potential, but also gives the correct relative sign of the constants, required for the BEHK … Brout-Englert-Higgs-Kibble … mechanism to work. …".

So, freezing out of a Kaluza-Klein M4xCP2 spacetime plus internal symmetry space produces a classical Lagrangian for the SU(3)xU(2) = SU(3)xSU(2)xU(1) Standard Model including a BEHK Higgs mechanism.

Let the second Spin(8) gauge group act on the M4 physical spacetime through its Conformal Subgroup U(2,2) = Spin(2,4). As Rabindra Mohapatra said (section 14.6 of Unification and Supersymmetry, 2nd edition, Springer-Verlag 1992): "… gravitational theory can emerge from the gauging of conformal symmetry … we start with a Lagrangian invariant under full local conformal symmetry and fix conformal and scale gauge to obtain the usual action for gravity. …".
At this stage, we have reconciled the first 3 of the 4 differences between our E8 Physics Model and conventional Gravity plus the Standard Model.
As to the fourth, the existence of 3 generations of fermions, note that the 8 first generation fermion particles and the 8 first generation antiparticles can each be represented by the 8 basis elements of the Octonions O, and that the second and third generations can be represented by
Pairs of Octonions OxO and
Triples of Octonions OxOxO, respectively.
When the unitary Octonionic 8-dim spacetime is reduced to the Kaluza-Klein M4 x CP2, there are 3 possibilities for a fermion propagator from point A to point B:
1 – A and B are both in M4, so its path can be represented by the single O;
2 – Either A or B, but not both, is in CP2, so its path must be augmented by one projection from CP2 to M4, which projection can be represented by a second O, giving a second generation OxO;
3 – Both A and B are in CP2, so its path must be augmented by two projections from CP2 to M4, which projections can be represented by a second O and a third O, giving a third generation OxOxO.

Therefore, all four differences have been reconciled, and
our classical Lagrangian E8 Physics Model describes Gravity as well as the Standard Model with a BEHK Higgs mechanism.

E8 Physics Fermions: 3 Conformal Generations

Frank Dodd (Tony) Smith, Jr. - 2012

viXra 1212.0046

The E8 Lie Algebra of the E8 Physics Model contains two D4 Lie subalgebras:
248-dim E8 = 120-dim D8 + 128-dim half-spinor of D8
120-dim D8 = 28-dim D4 + 28-dim D4 + 64-dim D8 / D4xD4

One of the D4 contains an A2 = SU(3) Lie subalgebra that represents the Color Force of the Standard Model.
The Weak and Electromagnetic Forces are produces by a Batakis mechanism (see Class. Quantum Grav. 3 (1986) L99-L105 by N. A. Batakis) in which spacetime is 8-dimensional Kaluza-Klein M4 x CP2.
Color Force SU(3) acts globally on CP2 = SU(3) / SU(2)xU(1) and, due to Kaluza-Klein structure, acts as local gauge group on M4 Minkowski spacetime.
Local gauge group action of Weak SU(2) and Electromagnetic U(1) Forces comes from their being local isotropy groups of the symmetric space CP2.

Casimir Operators describe some physical properties of the Standard Model Forces:

A0 Lie algebra U(1) has trivial Weyl Group 1
and trivial Casimir of degree 1
so that the Photon carries no charge.

A1 Lie algebra SU(2) has Weyl Group S2 of order 2! = 2
and quadratic Casimir of degree 2 representing isospin
so that SU(2) Weak Bosons can carry Electromagnetic Charge.

A2 Lie algebra SU(3) has Weyl Group S3 of order 3! = 6
and two Casimir Operators of degrees 2 and 3:
a quadratic Casimir representing 2 { + , - } isospin charge states and
a cubic Casimir representing 3 { red, green, blue } colors
so that SU(3) Gluons can carry Electromagnetic Charge and Color Charge.

The other D4 contains an A3 = D3 Conformal Lie subalgebra that represents Gravity by a generalized MacDowell-Mansouri mechanism (see section 14.6 of Rabindra Mohapatra's book "Unification and Supersymmetry", 2nd edition, Springer-Verlag 1992).
The Conformal Group in the form SU(2,2) = Spin(2,4) is described by Robert Gilmore in his books "Lie Groups, Lie Algebras, and Some of Their Applications", Wiley 1974, and "Lie Groups, Physics, and Geometry", Cambridge 2008.

The Conformal Group has a Weyl Group of 2^2 x 3! = 24 elements
and has 3 Casimir Operators of degrees 2 and 4 and 6/2 = 3.

The Conformal degree 3 Casimir represents the 3 Generations of Fermions
(instead of the 3 colors as in the case of the Standard Model D4 of E8).

In its D3 Spin(2,4) form the Conformal Lie algebra can be represented as a 6x6 antisymmetric real matrix:

0	J1	J2	M1	A1	G1
-J1	0	J3	M2	A2	G2
-J2	-J3	0	M3	A3	G3
-M1	-M2	-M3	0	A4	G4
-A1	-A2	-A3	-A4	0	G5
-G1	-G2	-G3	-G4	-G5	0

{J1,J2,J3} form a Spin(0,3) subalgebra of Spin(2,4) and produce a quadratic Casimir Operator that represents an Angular Momentum Operator.

Adding {M1,M2,M3} forms a Spin(1,3) subalgebra of Spin(2,4) and produces a second quadratic Casimir Operator that represents a Laplace-Runge-Lenz Operator.

Adding {A1,A2,A3} and {A4} forms a Spin(2,3) AntiDeSitter subalgebra of Spin(2,4) with a quartic Casimir Operator that is a combination of {M1,M2,M3} and {A1,A2,A3}. {A1,A2,A3} represent Momentum and {A4} represents Energy/Mass of Poincare Gravity and its Dark Matter Primordial Black Holes.

Adding {G1,G2,G3} and {G4} and {G5} forms the full Spin(2,4) and produces a cubic Casimir Operator for representation of 3 Generations of Fermions. The {G1,G2,G3} represent 3 Higgs components giving mass to 3 Weak Bosons. and {G4} represents massive Higgs Scalar as Fermion Condensate. As Special Conformal and Scale degrees of freedom they also represent the Momentum of Expansion of the Universe and its Dark Energy.

Adding {G5} represents HIggs/Fermion mass of Ordinary Matter.

The Higgs as a Fermionic Condensate gives mass to Fermions. The fundamental Fermion Particles are those of the First Generation:

{neutrino, red down quark, green down quark, blue down quark;
electron , red up quark , green up quark , blue up quark}

They can be represented as basis elements {1,i,j,k,E,I,J,K} of Octonions O.

Each of {A4} and {G4} and {G5} can represent the mass of Fundamental Fermions.

The {A4} Conformal substructure

0	A4
-A4	0

represents First Generation Fermion Particles as Octonion basis elements O.

The {A4} plus {G5} Conformal substructure

0	A4	
-A4	0	G5
	-G5	0

represents Second Generation Fermion Particles as Octonion Pairs OxO.

The {A4} and {G5} plus {G4} Conformal substructure

0	A4	G4
-A4	0	G5
-G4	-G5	0

represents Third Generation Fermion Particles as Octonion Triples OxOxO.

Fermion AntiParticles are represented in a similar way.

Combinatorics of O and OxO and OxOxO produce realistic Fermion masses,
as calculated in detail in viXra 1108.0027
The Third Generation Truth Quark (Tquark) is by far the most massive Fermion
so the Higgs as a Fermionic Condensate is effectively a Tquark Condensate.

Note:
E8 has 8 Casimir Operators of degrees 2, 8, 12, 14, 18, 20, 24, 30
The Conformal quadratic 2 is in E8, the Conformal quartic 4 is in the 8 of E8,
and the Conformal cubic 6/2 = 3 is in the 12 of E8.
D8 has 8 Casimir Operators of degrees 2, 4, 6, 8, 10, 12, 14, 8
The Conformal quadratic 2 and quartic 4 are in D8 and the Conformal cubic 6/2 = 3 is in the 6 of D8.
D4 has 4 Casimir Operators of degrees 2, 4, 6, 4
The Conformal quadratic 2 and quartic 4 are in D4 and the Conformal cubic 6/2 = 3 is in the 6 of D4.

SUMMARY:

The Conformal Group in the form SU(2,2) = Spin(2,4) is described by Robert Gilmore in his book "Lie Groups, Physics, and Geometry", Cambridge 2008:
"... 8x8 matrices acting on the four coordinates and the four momenta ... satisfy an antisymmetric ... symplectic metric ... preserve[d by the] ... group ... Sp(8:R) ...[and a]...
symmetric metric ... with signature (+4,-4) ... preserve[d by the] ... group ... SO(4,4) ...

$$Sp(8;\mathbb{R}) \cap SO(4,4) = SU(2,2) \simeq SO(4,2)$$

... The fifteen-dimensional Lie algebra for the Dirac equation is ... summarized by the 6x6 matrix

$$\left[\begin{array}{cccc|cc} 0 & \boxed{J_3} & \boxed{-J_2} & \boxed{M_1} & \boxed{A_1} & \boxed{\Gamma_1} \\ -J_3 & 0 & \boxed{J_1} & \boxed{M_2} & \boxed{A_2} & \boxed{\Gamma_2} \\ J_2 & -J_1 & 0 & \boxed{M_3} & \boxed{A_3} & \boxed{\Gamma_3} \\ -M_1 & -M_2 & -M_3 & 0 & \boxed{A_4} & \boxed{\Gamma_4} \\ \hline A_1 & A_2 & A_3 & A_4 & 0 & \boxed{\Gamma_5} \\ \Gamma_1 & \Gamma_2 & \Gamma_3 & \Gamma_4 & -\Gamma_5 & 0 \end{array}\right] \begin{array}{c} + \\ + \\ + \\ + \\ - \\ - \end{array}$$

... three ... operators A4 , G4 , G5 close under commutation and span ... so(2,1) ...
The Casimir operator for this [sub]algebra is C^2 = G5^2 - G4^2 - A4^2 ...[It can be]... used to determine eigenstates and energy eigenvalues ...".

{J1,J2,J3} represent Angular Momentum. {M1,M2,M3} represent LaPlace-Runge-Lenz.
{A1,A2,A3} represent Momentum.
{G1,G2,G3} represent Higgs for W-Bosons and Momentum of Universe Expansion.
{A4} and {G4} and {G5} represent Energy/Mass including Higgs mass for Fermions.

The {A4} Conformal substructure

0	A4
-A4	0

represents First Generation Fermion Particles as Octonion basis elements O.

The {A4} plus {G5} Conformal substructure

0	A4	
-A4	0	G5
	-G5	0

represents Second Generation Fermion Particles as Octonion Pairs OxO.

The {A4} plus {G5} plus {G4} Conformal substructure

0	A4	G4
-A4	0	G5
-G4	-G5	0

represents Third Generation Fermion Particles as Octonion Triples OxOxO.

Dark Energy - Dark Mattter - Ordinary Matter:

The Lorentz Group is represented by 6 generators

0	J1	J2	M1
-J1	0	J3	M2
-J2	-J3	0	M3
-M1	-M2	-M3	0

There are two ways to extend the Lorentz Group
(see arXiv gr-qc/9809061 by Aldrovandi and Peireira):

To the **Poincare Group with No Cosmological Constant** by adding 4 generators

0	J1	J2	M1	A1
-J1	0	J3	M2	A2
-J2	-J3	0	M3	A3
-M1	-M2	-M3	0	A4
-A1	-A2	-A3	-A4	0

{A1,A2,A3} represent Momentum and {A4} represents Energy/Mass of Poincare Gravity and its Dark Matter Primordial Black Holes.

and to the semidirect product of Lorentz and 4 Special Conformal generators
to get a **Non-Zero Cosmological Constant for Universe Expansion**

0	J1	J2	M1		G1
-J1	0	J3	M2		G2
-J2	-J3	0	M3		G3
-M1	-M2	-M3	0		G4
-G1	-G2	-G3	-G4		0

so that {G1,G2,G3} represent 3 Higgs components giving mass to 3 Weak Bosons
and {G4} represents massive Higgs Scalar as Fermion Condensate.
As Special Conformal and Scale Conformal degrees of freedom they also represent the Momentum of Expansion of the Universe and its Dark Energy.

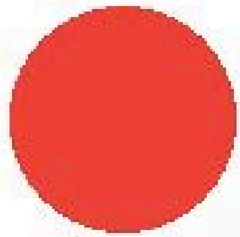
One additional generator {G5} represents HIggs/Fermion mass of Ordinary Matter.

All 15 generators combine to make the full Conformal Lie Algebra SU(2,2) = Spin(2,4)

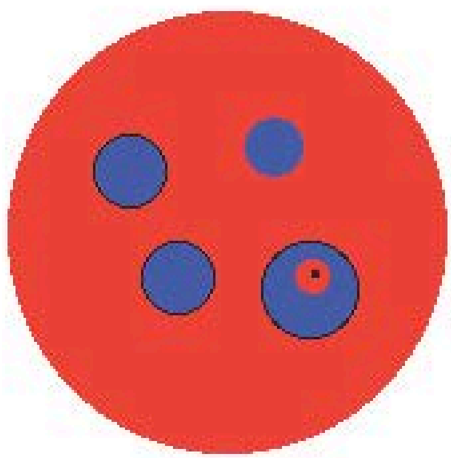
0	J1	J2	M1	A1	G1
-J1	0	J3	M2	A2	G2
-J2	-J3	0	M3	A3	G3
-M1	-M2	-M3	0	A4	G4
-A1	-A2	-A3	-A4	0	G5
-G1	-G2	-G3	-G4	-G5	0

Dark Energy - Dark Mattter - Ordinary Matter:

In E8 Physics, our 4-dimensional Physical SpaceTime Universe begins as a relatively small spatial volume in which all 15 generators of Conformal SU(2,2) = Spin(2,4) including all 4 Special Conformal and Scale Conformal generators are fully effective.



Rabindra Mohapatra (in section 14.6 of "Unification and Supersymmetry," 2nd edition, Springer-Verlag 1992) said: "... we start with a Lagrangian invariant under full local conformal symmetry and fix its conformal and scale gauge to obtain the usual action for gravity ... the conformal d'Alembartian contains ... curvature ... R, which for constant ... scalar field ... PHI, leads to gravity. We may call PHI the auxiliary field ...". I view PHI as corresponding to the Higgs 3 Special Conformal generators {G1,G2,G3} that are frozen fixed during expansion in some regions of our Universe to become Gravitationally Bound Domains (such as Galaxies) like icebergs in an ocean of water.

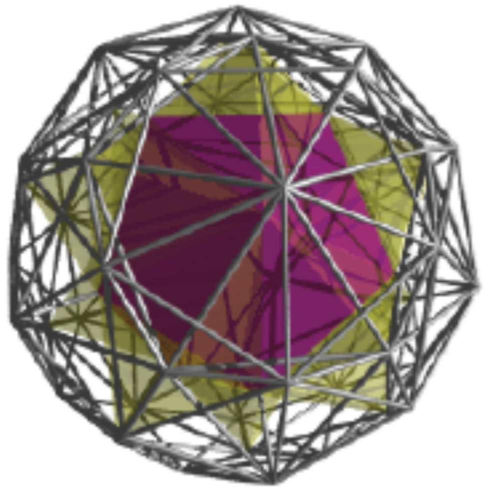


Since the Gravitationally Bound Domains (such as our Inner Solar System) have no Expansion Momentum we only see there the Poincare Part of Conformal Gravity plus the Higgs effects of {G4} and {G5} and the ElectroWeak Broken Symmetry caused by freezing-out fixing {G1,G2,G3}:

0	J1	J2	M1	A1	-
-J1	0	J3	M2	A2	-
-J2	-J3	0	M3	A3	-
-M1	-M2	-M3	0	A4	G4
-A1	-A2	-A3	-A4	0	G5
-	-	-	-G4	-G5	0

720 edges make a 4-dimensional 600-cell

(image from Wikipedia)

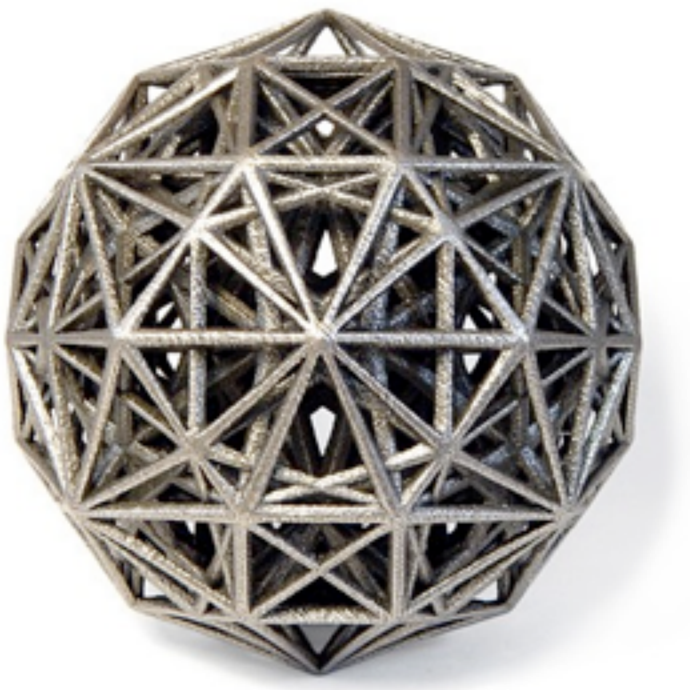


At each vertex 20 Tetrahedral faces meet forming an Icosahedron which is exact because the 600-cell lives on a curved 3-shere in 4-space. It has 600 Tetrahedral 3-dim faces and 120 vertices

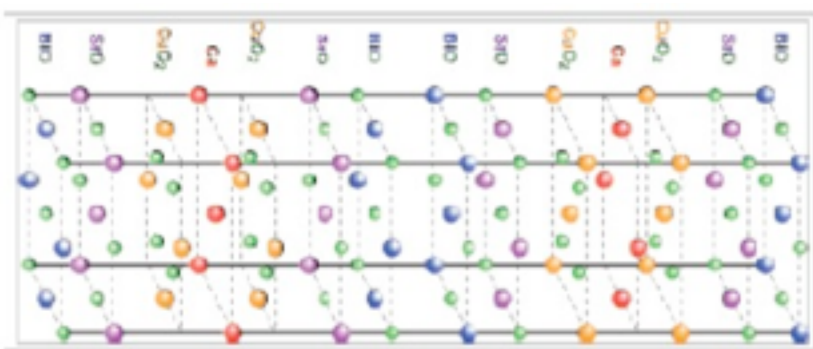
Could a 600 approximate-Tetrahedra configuration of 720 BSCCO JJ approximating projection of a 600-cell into 3-space
tap into Dark Energy so that the Dark Energy might regularize
the configuration to exact Tetrahedra and an exact 600-cell
and so curve/warp spacetime from flat 3-space to curved 3-space ?

The basic idea of Dark Energy from BSCCO Josephson Junctions is based on the 600-cell as follows: Consider 3-dim models of 600-cell such as metal sculpture from Bathsheba Grossman who says:

"… for it I used an orthogonal projection rather than the Schlegel diagrams of the other polytopes I build.
… In this projection all cells are identical, as there is no perspective distortion. …".



For the Dark Energy experiment each of the 720 lines would be made of a single BSCCO crystal



whose layers act naturally to make the BSCCO crystal an intrinsic Josepson Junction. (see Wikipedia and arXiv 0911.5371)

Each of the 600 tetrahedral cells of the 600-cell
has 6 BSCCO crystal JJ edges.
Since the 600-cell is in flat 3D space the tetrahedra are distorted.

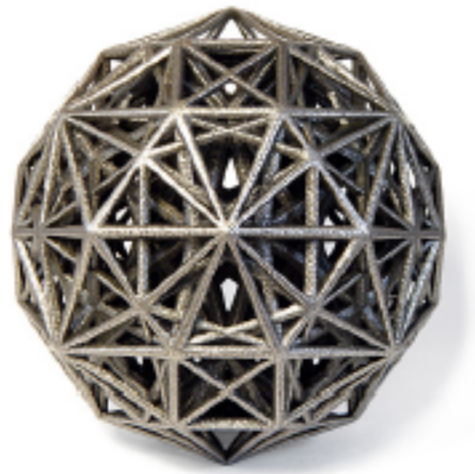
According to the ideas of Beck and Mackey (astro--ph/0703364) and of Clovis Jacinto de Matos (arXiv 0707.1797) the superconducting Josephson Junction layers of the 720 BSCCO crystals will bond with Dark Energy GraviPhotons that are pushing our Universe to expand.

My idea is that the Dark Energy GraviPhotons will not like being configured as edges of tetrahedra that are distorted in our flat 3D space and
they will use their Dark Energy to make all 600 tetrahedra to be exact and regular by curving our flat space (and space-time).

My view is that the Dark Energy Graviphotons will have enough strength to do that because their strength will NOT be weakened by
the (1 / M_Planck)^2 factor that makes ordinary gravity so weak.

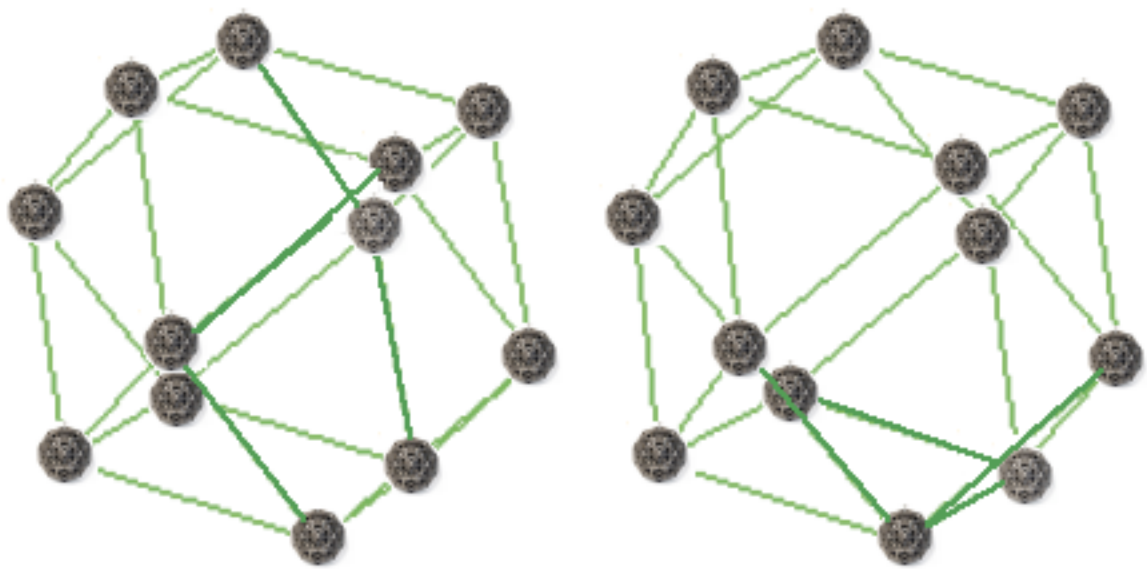
It seems to me to be a clearly designed experiment that will either
1- not work and show my ideas to be wrong or
2 - work and open the door for humans to work with Dark Energy.

Consider BSCCO JJ 600-cells

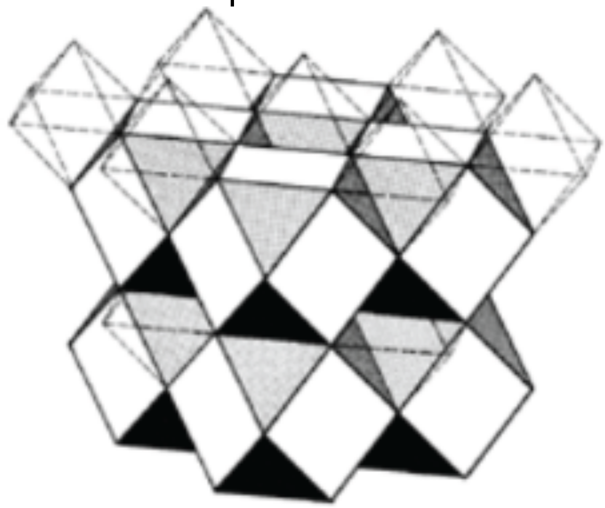


in this configuration:

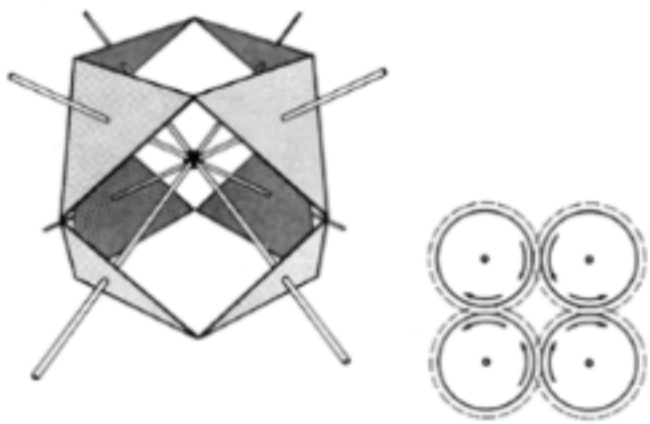
First put 12 of the BSCCO JJ 600-cells at the vertices of a cuboctahedron shown here as a 3D stereo pair:



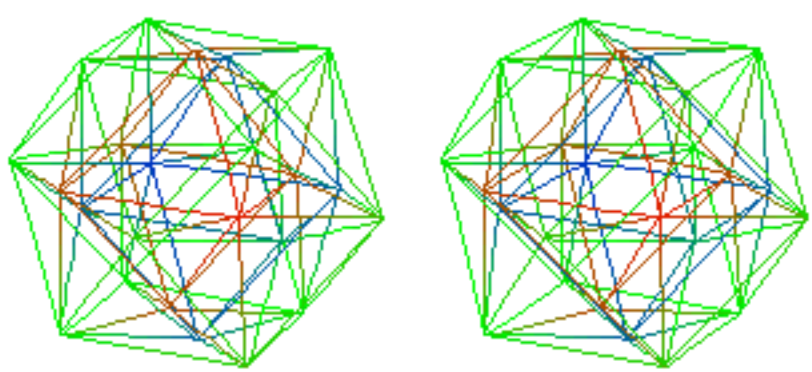
Cuboctahedra do not tile 3D flat space without interstitial octahedra



but BSCCO JJ 600-cell cuboctahedra can be put together
square-face-to-square-face in flat 3D configurations including flat sheets.
As Buckminster Fuller described, the 8 triangle faces of a cuboctahedron



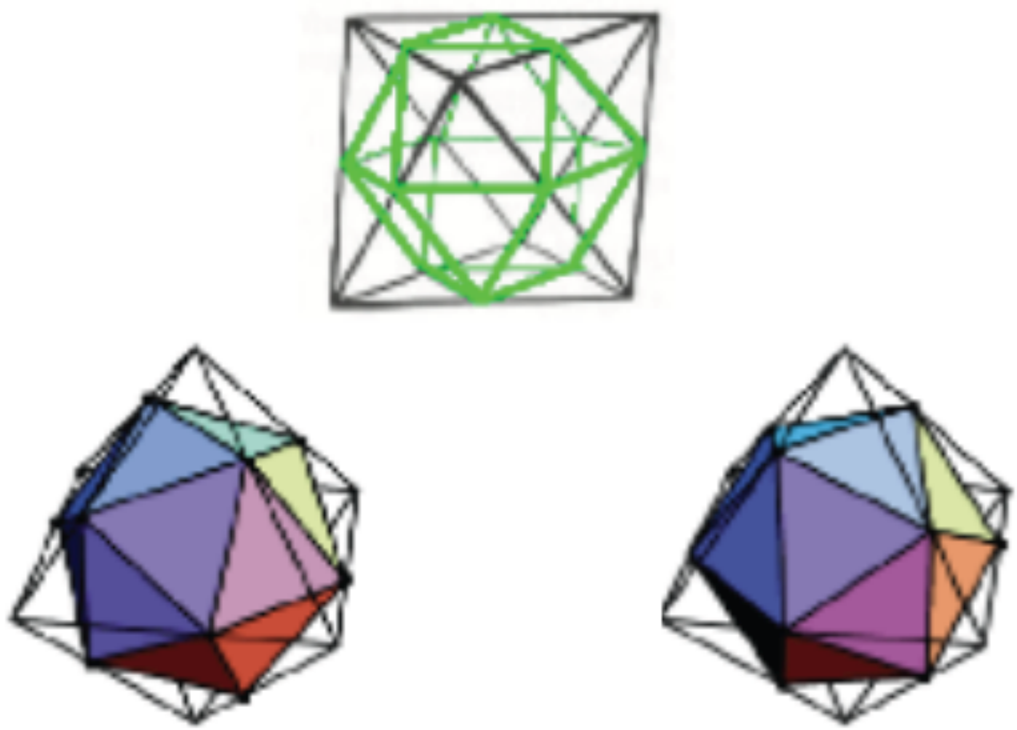
give it an inherently 4D structure consistent with the green cuboctahedron



central figure of a 24-cell (3D stereo 4thD blue-green-red color)
that tiles flat Euclidean 4D space.

So, cuboctahedral BSCCO JJ 600-cell structure likes flat 3D and 4D space but
if BSCCO JJ Dark Energy act to transform flat space into curved space
like a 720-edge 600-cell with 600 regular tetrahedra
then
Dark Energy should transform cuboctahedral BSCCO JJ 600-cell structure into
a 720-edge BSCCO JJ 600-cell structure that likes curved space.

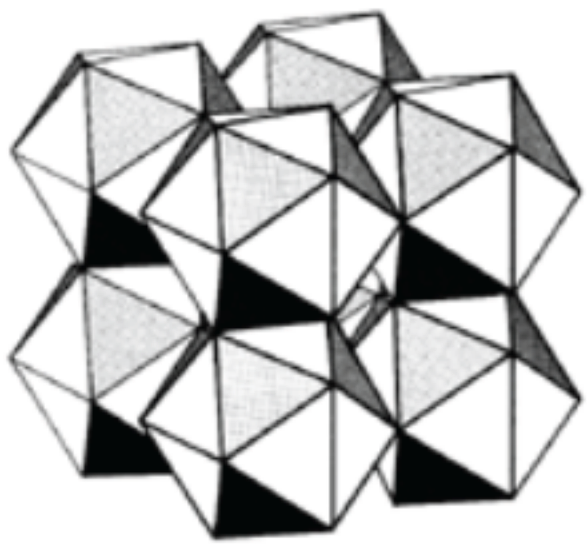
There is a direct JItterbug transformation of
the 12-vertex cuboctahedron to the 12-vertex icosahedron



whereby the 12 cuboctahedron vertices as midpoints of octahedral edges are mapped to
12 icosahedron vertices as Golden Ratio points of octahedral edges.
There are two ways to map a midpoint to a Golden Ratio point.
For the Dark Energy experiment the same choice of mapping
should be made consistently throughout the BSCCO JJ 600-cell structure.

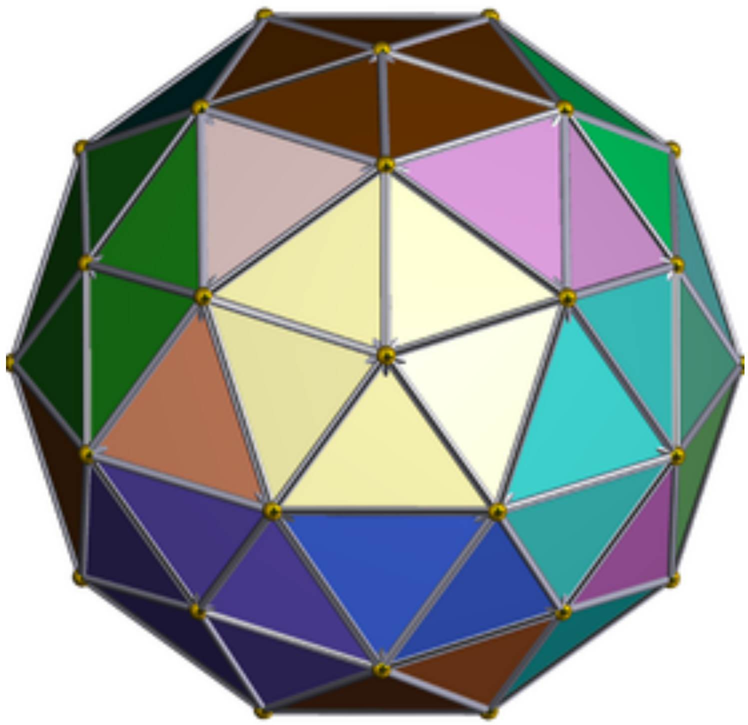
The result of the Jitterbug mapping is that
each cuboctahedron in the BSCCO JJ 600-cell structure
with its 12 little BSCCO JJ 600-cells at its 12 vertices
is mapped to
an icosahedron with 12 little BSCCO JJ 600-cells at its 2 vertices:

and the overall cuboctahedral BSCCO JJ 600-cell structure
is transformed into
an overall icosahedral BSCCO JJ 600-cell structure



does not fit in flat 3D space in a naturally characteristic way
(This is why icosahedral QuasiCrystal structures do not extend as simply throughout flat 3D space as do cuboctahedral structures).

However,
the BSCCO JJ 600-cell structure JItterbug icosahedra
do live happily in 3-sphere curved space within the icosahedral 120-cell
(see Wikipedia)



which has the same 720-edge arrangement as the 600-cell.

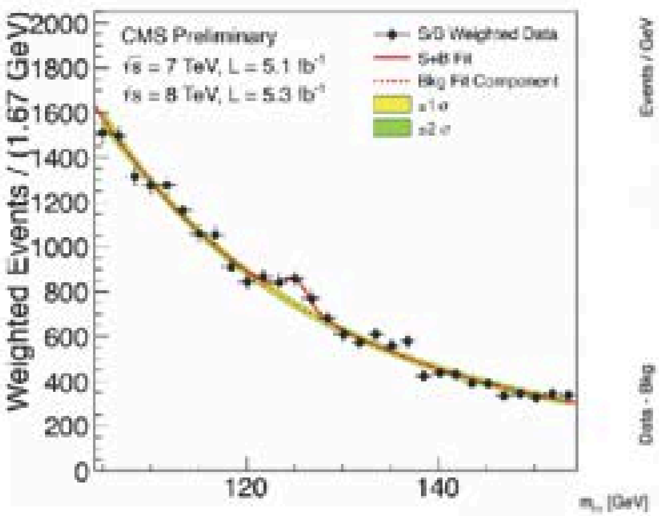
The icosahedral 120-cell is constructed by 5 icosahedra around each edge.
It has:

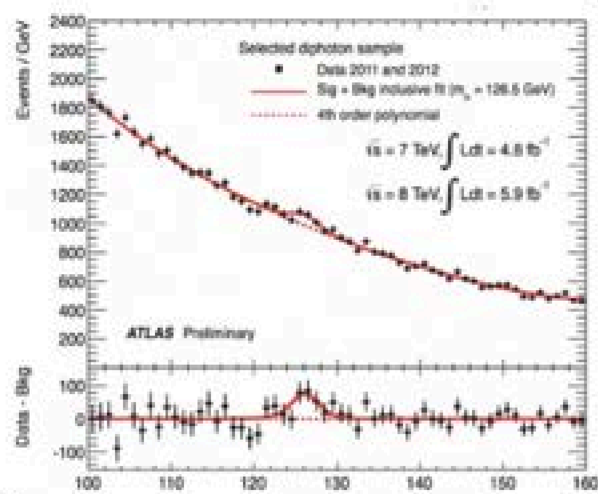
cells - 120 {3,5}
faces - 1200 {3}
edges - 720
vertices - 120
vertex figure - {5,5/2}
symmetry group H4,[3,3,5]
dual - small stellated 120-cell

Sgr A* and Higgs = Tquark-Tantiquark Condensate:

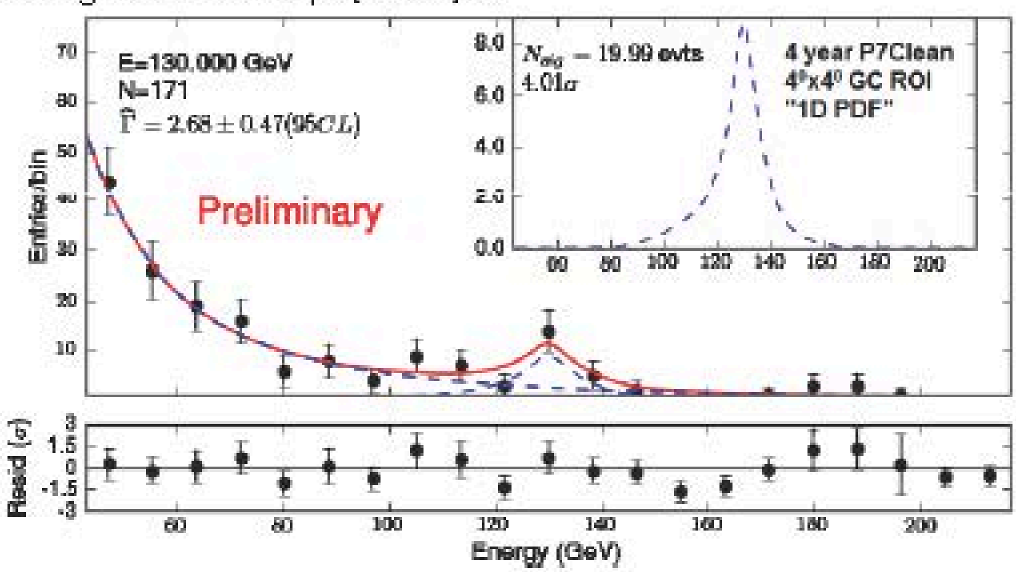
Sagittarius A* (Sgr A*) is a very massive black hole in the center of our Galaxy into which large amounts of Hydrogen fall. As the Hydrogen approaches Sgr A* it increases in energy, ionizing into protons and electrons, and eventually producing a fairly dense cloud of infalling energetic protons whose collisions with ambient protons are at energies similar to the proton-proton collisions at the LHC.

LHC diphoton histograms for ATLAS and CMS as of mid-2012 clearly show a peak that probably is evidence of a Higgs boson with mass around 125 GeV.





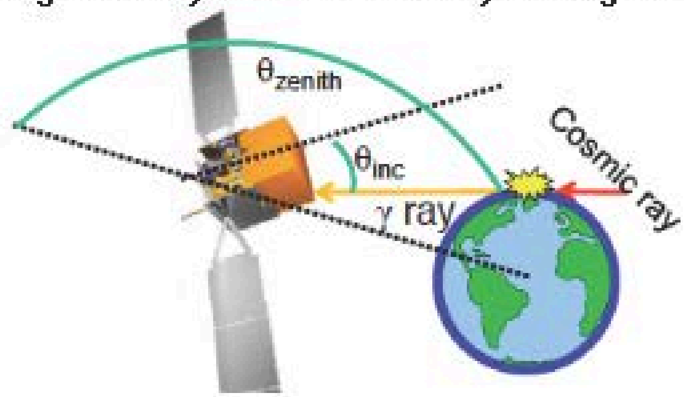
Andrea Albert at The Fermi Symposium 11/2/2012 said: "... gamma rays detectable by the Fermi Large Area Telescope [FLAT] ...



... Line-like Feature near 135 GeV ... localized in the galactic center ...".

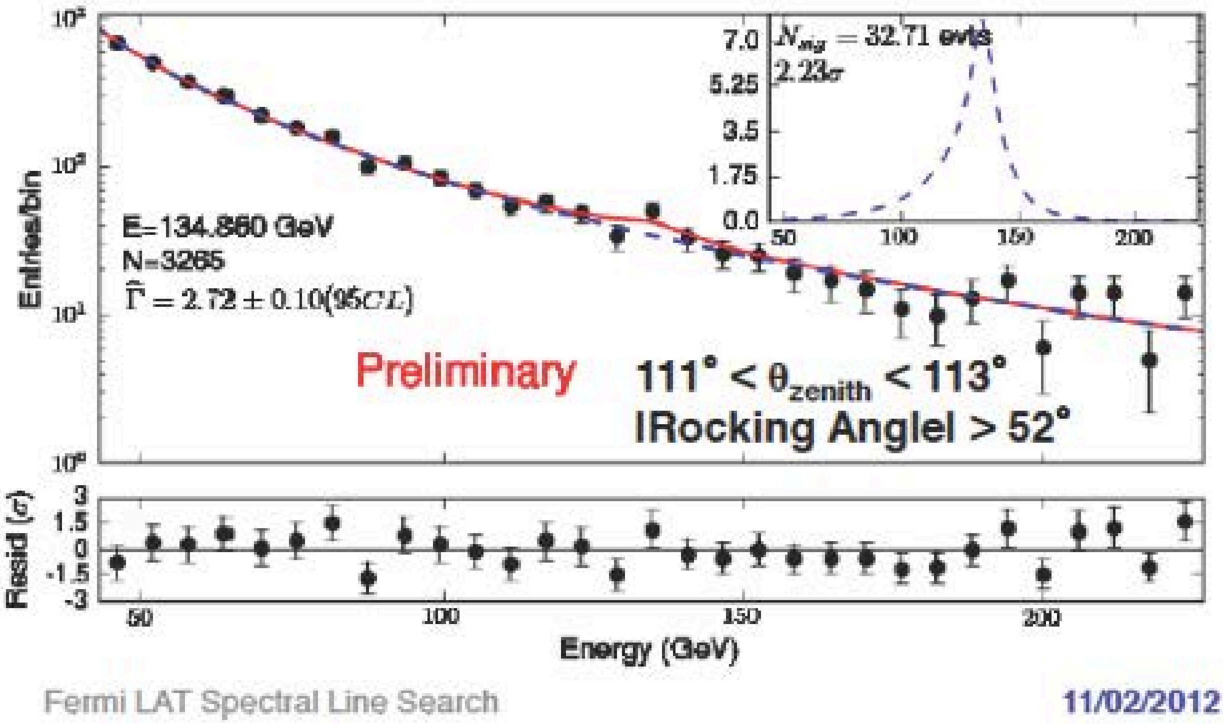
Sgr A* and Higgs = Tquark-Tantiquark Condensate:

In addition to the Galactic Center observations,
Fermi LAT looked at gamma rays from Cosmic Rays hitting Earth's atmosphere



by looking at the Earth Limb.

Andrea Albert at The Fermi Symposium 11/2/2012 also said: "... Earth Limb is a bright gamma-ray source ... From cosmic-ray interactions in the atmosphere ...



... Line-like feature ... at 135 GeV .. Appears when LAT is pointing at the Limb ...".

Since 90% of high-energy Cosmic Rays are Protons and since their collisions with Protons and other nuclei in Earth's atmosphere produce gamma rays, the 135 GeV Earth Limb Line seen by Fermi LAT is also likely to be the Higgs produced by collisions analagous to those at the LHC.

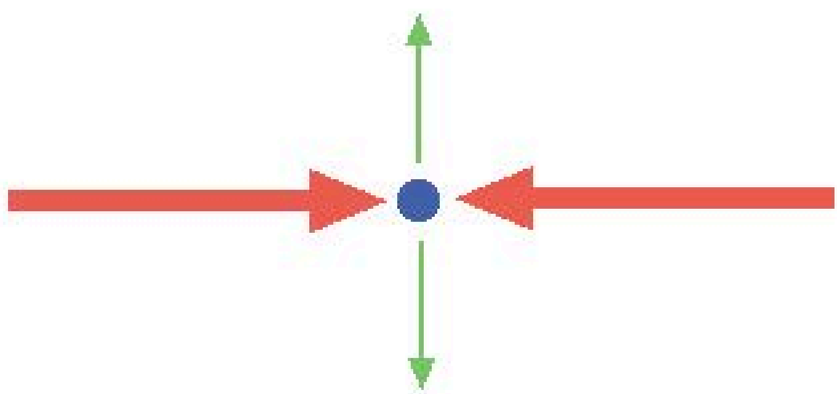
Sgr A* and Higgs = Tquark-Tantiquark Condensate:

Olivier K. in a comment in Jester's blog on 10 November 2012 said:
"... Could the 135 GeV bump be related ... to current Higgs ... properties ? ...
The coincidence between GeV figures ...[for LHC] Higgs mass and this [Fermi LAT] bump is thrilling for an amateur like me...".

Jester in his resonaances blog on 17 April 2012 said, about Fermi LAT:
"... the plot shows the energy of *single* photons as measured by Fermi, not the invariant mass of photon pairs ...".

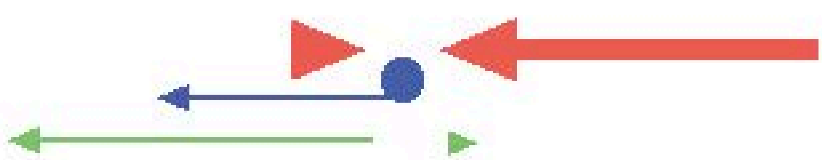
Since the LHC 125 GeV peak is for "invariant mass of photon pairs"
and the Fermi LAT 135 GeV peak is for ""single" photons"
how could both correspond to a Higgs mass state around 130 GeV ?

The LHC sees collisions of high-energy protons (red arrows) forming Higgs (blue dot)



with the Higgs at rest decaying into a photon pair (green arrows)
giving the observed Higgs peak (around 130 GeV) as **invariant mass of photon pairs**.

Fermi LAT at Galactic Center and Earth Limb sees
collisions of one high-energy proton with a low-energy (relatively at rest) proton forming Higgs



with Higgs moving fast from momentum inherited from the high-enrgy proton decaying into two photons: one with low energy not observed by Fermi LAT
and the other being observed by Fermi LAT as a high-energy gamma ray carrying almost all of the Higgs decay energy (around 130 GeV) as **a "single" photon**.

Therefore, **the coincidence noted by Olivier K. is probably a realistic phenomenon**.

Sgr A* and Higgs = Tquark-Tantiquark Condensate:

Jester, replying to the comment by Olivier K., dismissed the proposal that Fermi LAT may have seen the Higgs, saying on 11 November 2012:
"Afaik,
there's no model connecting the 130(5)GeV Fermi line to the 125 GeV Higgs."

so

I hereby propose a model:
Protons from Hydrogen infalling into Sgr A* acquire enough energy and density to produce proton-proton collisions similar to those at the LHC,
as could Cosmic Ray Protons hitting the Earth's atmosphere,
and
the 135 GeV Line observed by Fermi LAT is due to proton-proton collisions producing Higgs in the diphoton channel
and
the125 GeV Higgs-like evidence observed by ATLAS and CMS is also due to proton-proton collisions producing Higgs in the diphton channel
and
the difference between 135 GeV at Fermi LAT and 125 GeV at LHC
can be accounted for by comparing details of experimental setup and analysis-related assumptions.

Given that model,
I propose that Olivier K. be given credit for stating the possibility that both Fermi LAT and the LHC have indeed seen the Higgs,
which is an interesting example of
mutual confirmation of Collider Physics and Astrophysics observations.

The {G4} conformal generator that represents both Dark Energy of Universe Expansion and the Massive Higgs Scalar as Fermionic Condensate (dominated by third-generation Tquark-Tantiquark Condensate) may be involved in the Sgr A* Galactic Center Process.

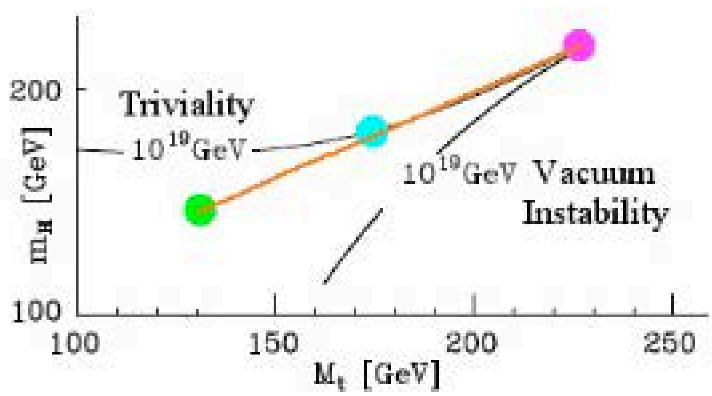
Sgr A* and Higgs = Tquark-Tantiquark Condensate:

Due to its relationship with the Higgs as Tquark-Tantiquark Condensate,

the Truth Quark might be related by {G4} to Dark Energy of Universe Expansion

as well as

by a 3-state mass system due to its interaction with the Higgs as Condensate to



a Strong Coupling / Composite-Higgs Regime (known as Triviality)

and

a Vacuum Instability Regime.

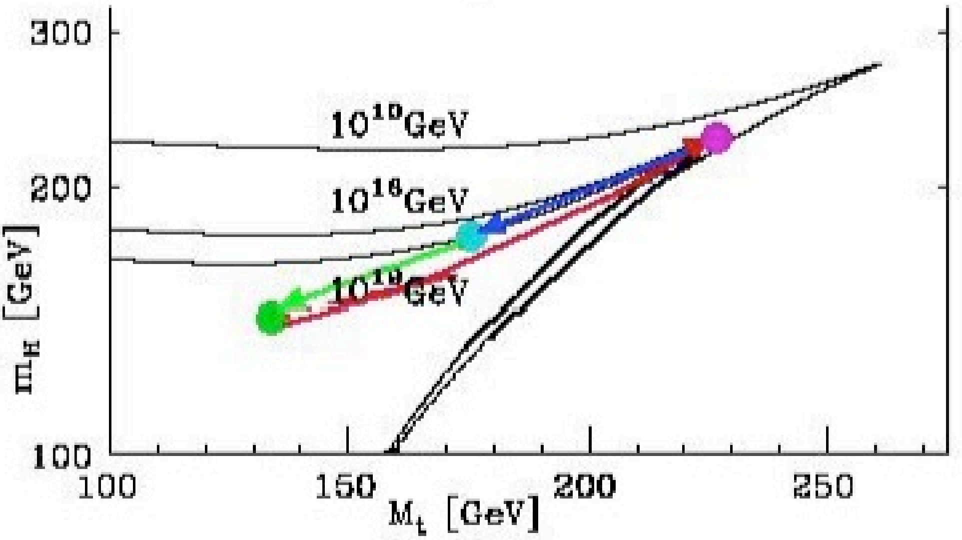
Calculations of Masses, Force Strengths, etc:

However, for our classical Lagrangian E8 Physics Model to be said to be complete and realistic, it must allow us to calculate such things as Force Strengths and Particle Masses that are consistent with experimental and observational results. To do that, we use the results of Hua in his book "Harmonic Analysis of Functions of Several Complex Variables in the Classical Domains". (Similar use of the work of Hua was made years ago by Armand Wyler, and recently by a few others, such as Carlos Castro.)

Hua's calculated volumes related to kernels and Shilov boundaries are the key to calculation of Force Strengths and Particle Masses. For example, the Lagrangian term for each of the Forces is integrated over the M4 physical spacetime base manifold, but each of the Four Forces sees M4 in terms of its own symmetry, consequently with its own measure which measure is proportional to Hua-calculated volumes. Since M4 was formed by a freezing out of a Quaternionic structure, M4 is a 4-dimensional manifold with Quaternionic structure and therefore can be seen as one of Joseph Wolf's 4 equivalence classes:
for Electromagnetism: T4 = U(1)^4
for Weak Force: S2 x S2 = SU(2) / U(1) x SU(2) / U(1)
for Color Force: CP2 = SU(3) / U(2)
for Gravity: S4 = Spin(5) / Spin(4) = Sp(2) / Sp(1)xSp(1)
When we also take into account the relevant volumes related to the curvature term in the Lagrangian for each force,
and the masses involved for forces with gauge bosons related to mass, the calculations produce results that are reasonably close to experimental observation:

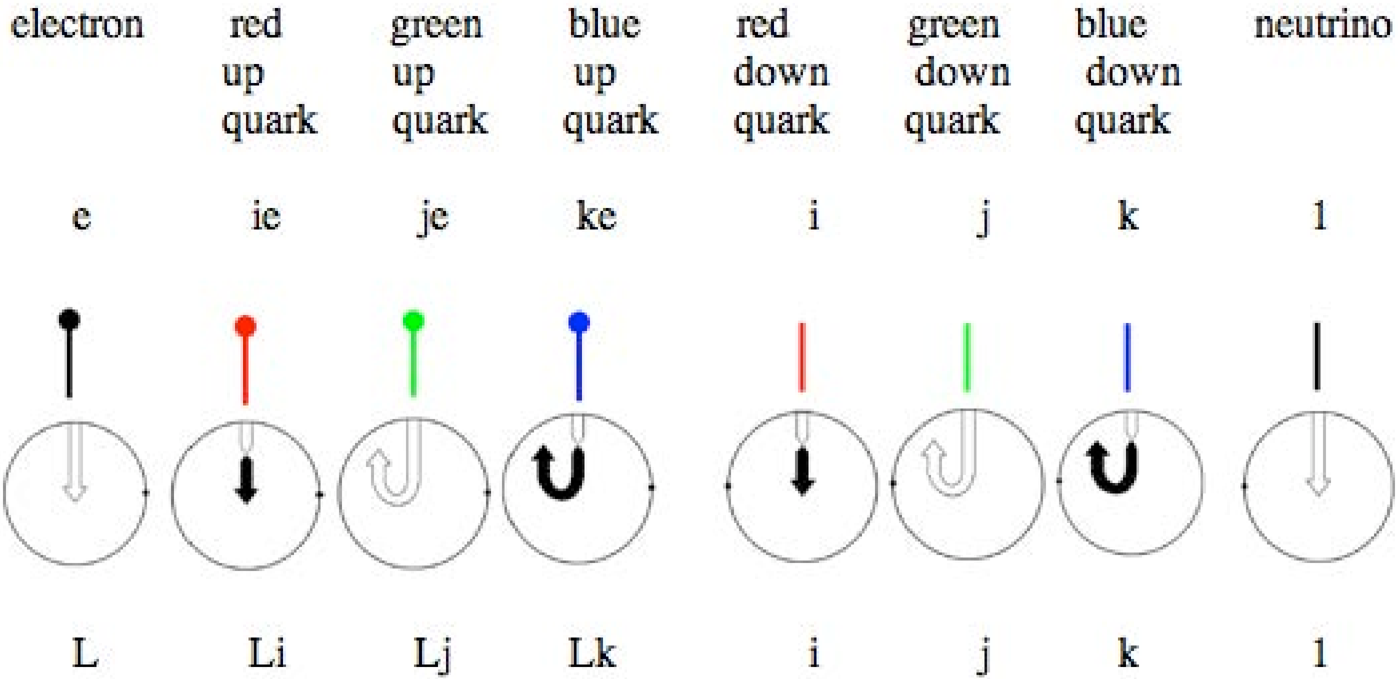
Force Strengths:
Gravity = 5 x 10^-39
Electromagnetic = 1 / 137.03608
Weak = 1.05 x 10^-5
Color at 245 MeV = 0.6286
Renormalization gives Color at 91 GeV = 0.106
and including other effects gives Color at 91 Gev = 0.125

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: Me-neutrino = Mmu-neutrino = Mtau-neutrino = 0 at tree-level (first order corrected masses are given below)
Electron/Positron Me = 0.5110 MeV
Up and Down Quarks Md = Mu = 312.8 MeV
Muon Mmu = 104.8 MeV
Strange Quark Ms = 625 MeV
Charm Quark Mc = 2.09 GeV
Tauon Mtau = 1.88 GeV
Beauty Quark Mb = 5.63 GeV
Truth Quark Mt = 130 GeV ground state - 8-dimensional Kaluza-Klein spacetime with Truth-Quark condensate Higgs gives a 3-state system with a renormalization line connecting the 3 states:

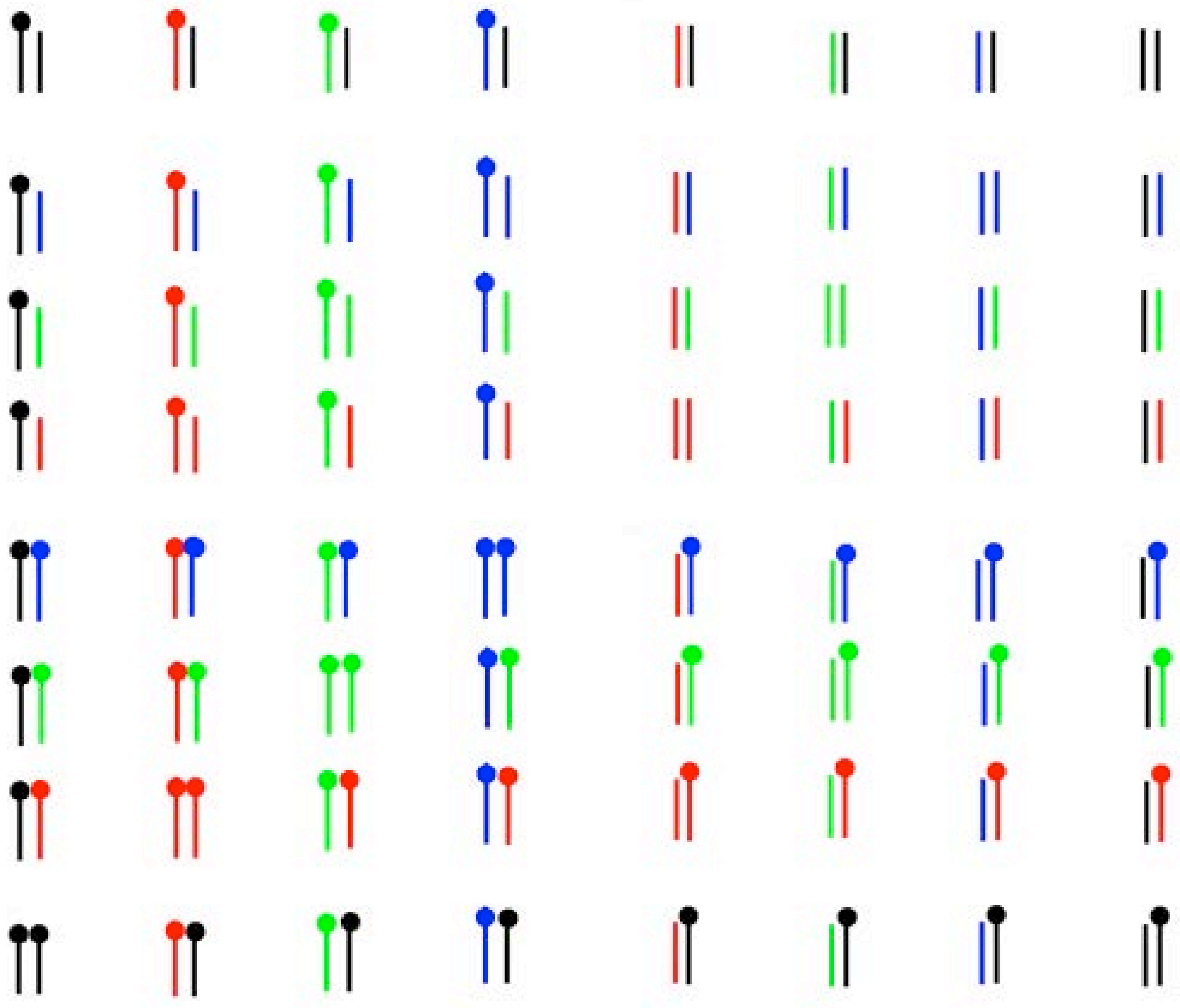


(see hep-ph/0307138 for background for chart immediately above)
Low ground state:
Higgs = 146 GeV and T-quark = 130 GeV
Medium Triviality Bound state:
Higgs = 176-188 GeV and T-quark = 172- 175 GeV
High Critical Point state:
Higgs = 239 +/- 3 GeV and T-quark = 218 +/- 3 GeV

First Generation (8)

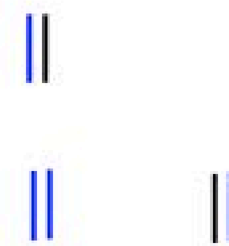


Second Generation (8x8 = 64)



Blue Strange Quark (3)

Rule: a Pair belongs to the Blue Strange Quark if:
There is at least one Blue element and the other element is Blue or Colorless (black) and all elements are Associative (that is, is either 1 or i or j or k).

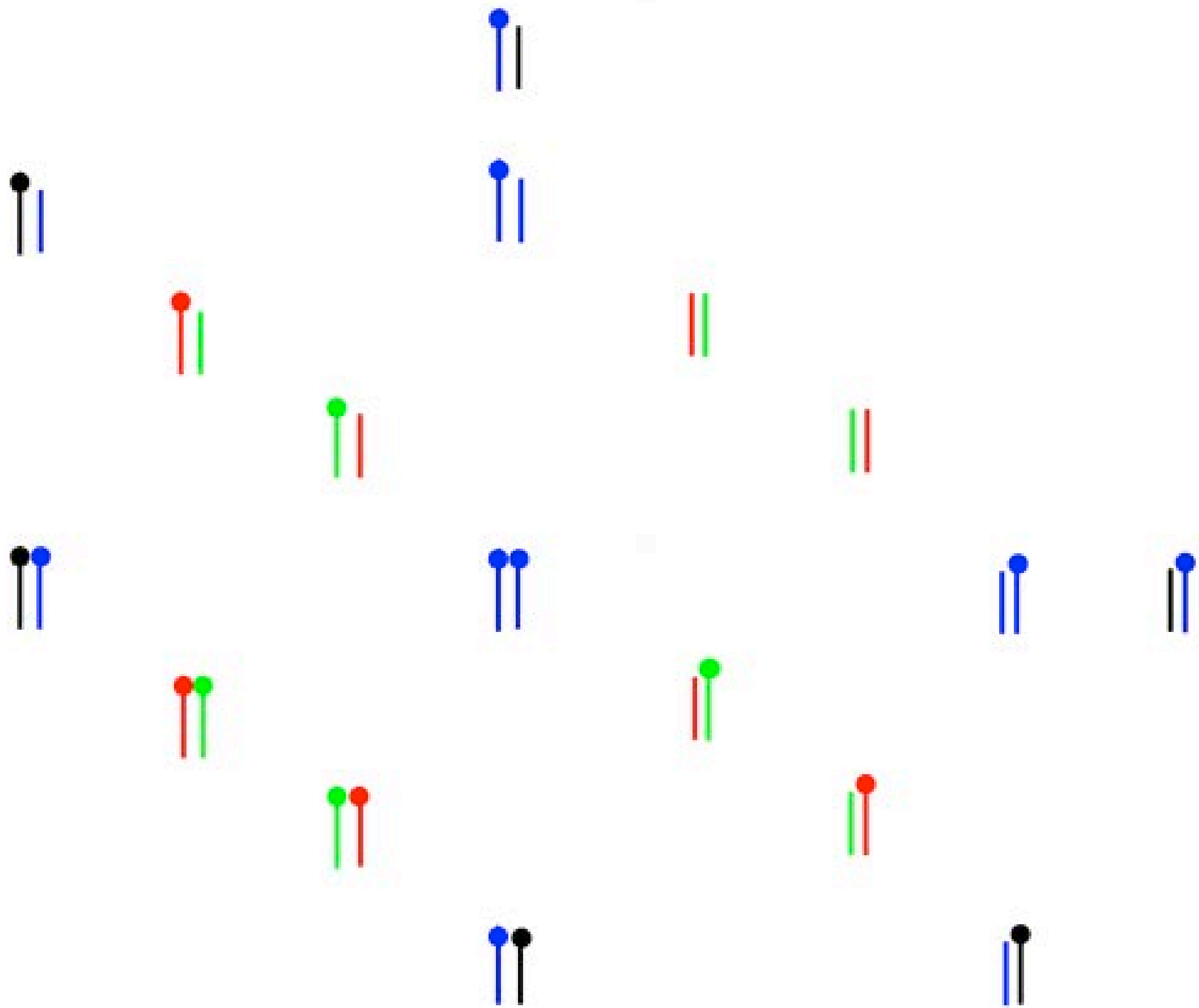


Blue Charm Quark (17)

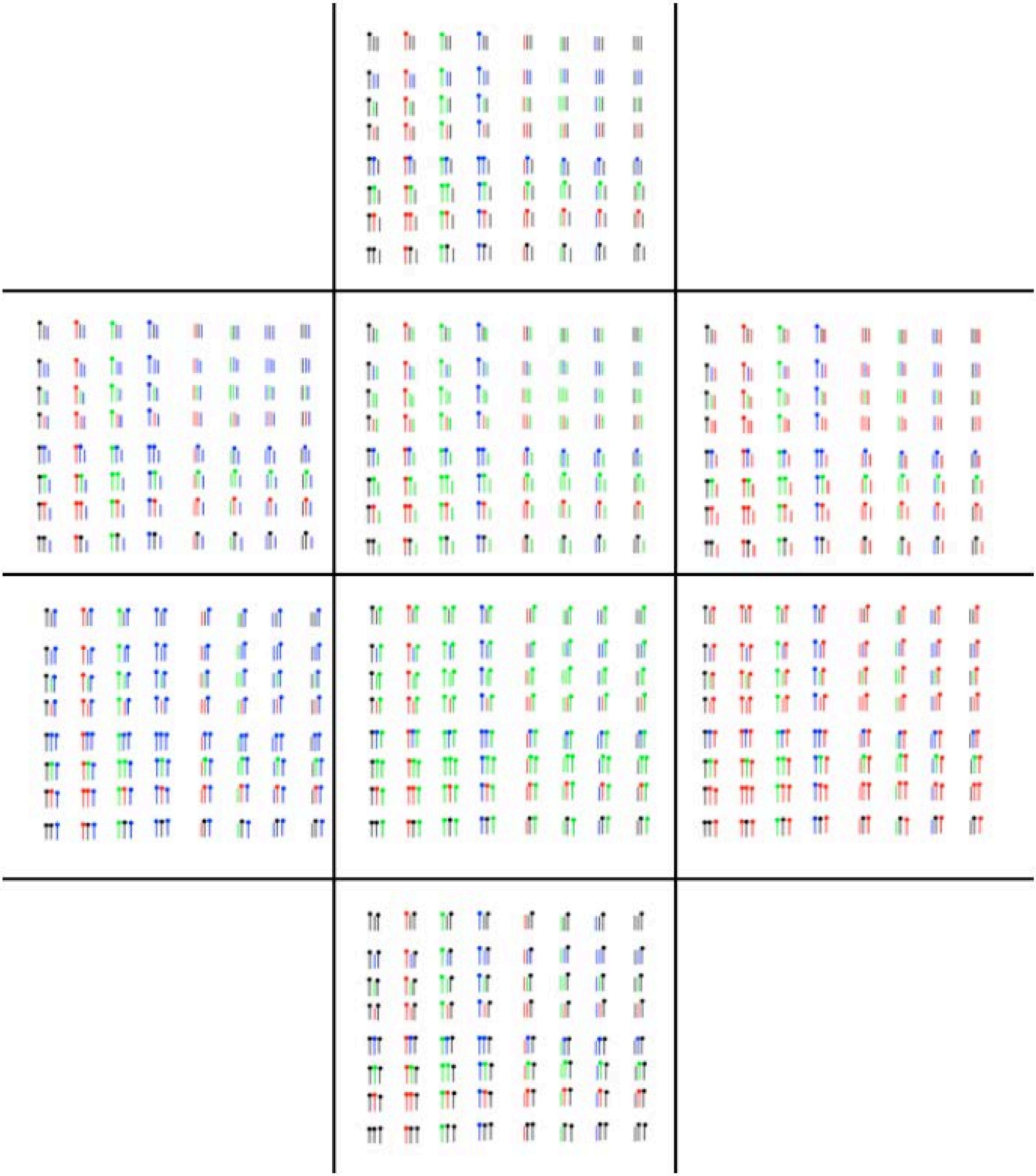
Rules: a Pair belongs to the Blue Charm Quark if:

1 - There is at least one Blue element and the other element is Blue or Colorless (black) and at least one element is NonAssociative (that is, is either e or ie or je or ke)

2 - There is one Red element and one Green element (Red x Green = Blue)



Third Generation (8x8x8 = 512)



Blue Truth Quark (161)

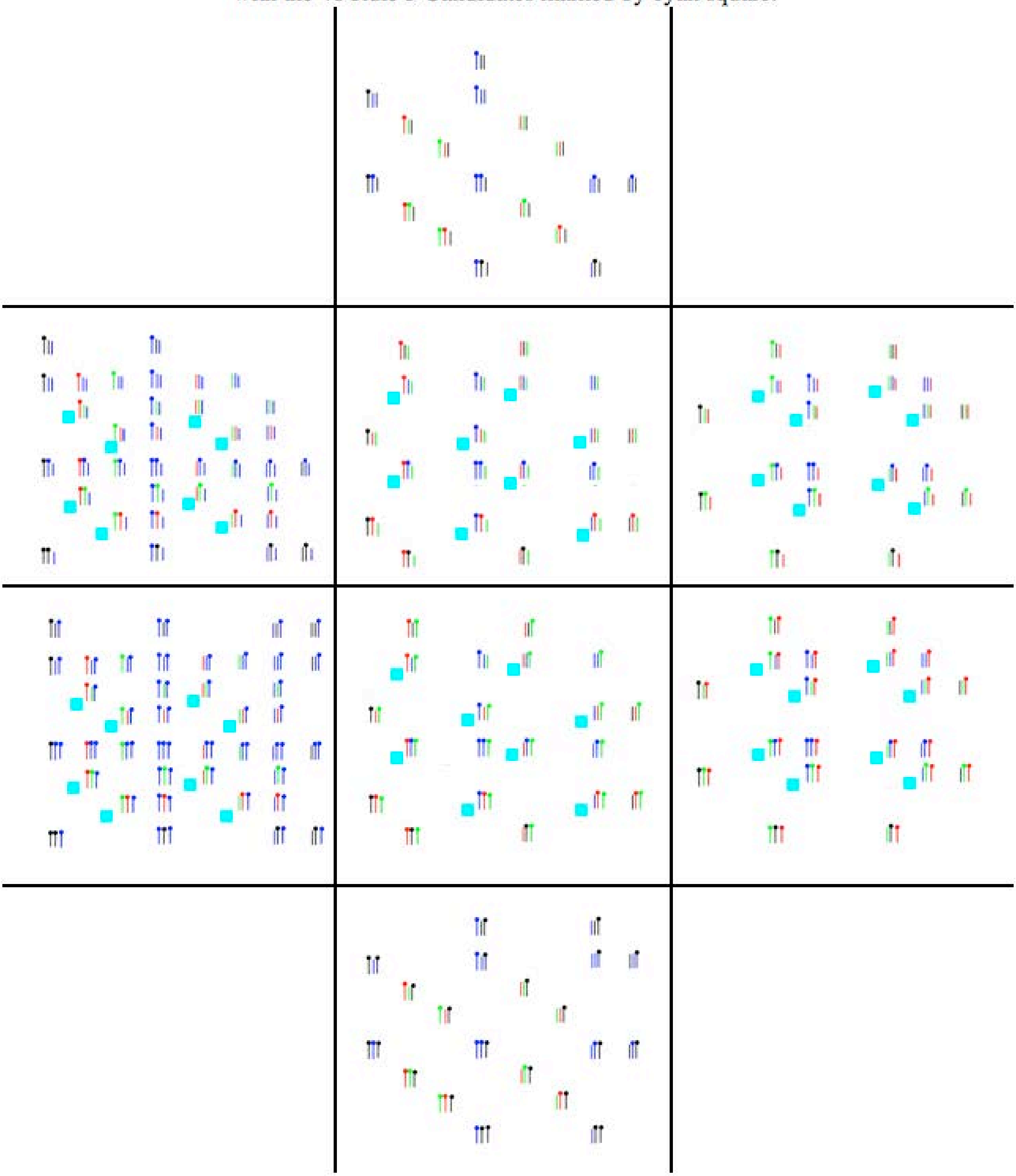
Rules: a Triple belongs to the Blue Truth Quark if:

1 - There is at least one Blue element and all other elements are Blue or Colorless (black)
and at least one element is NonAssociative (that is, is either e or ie or je or ke)

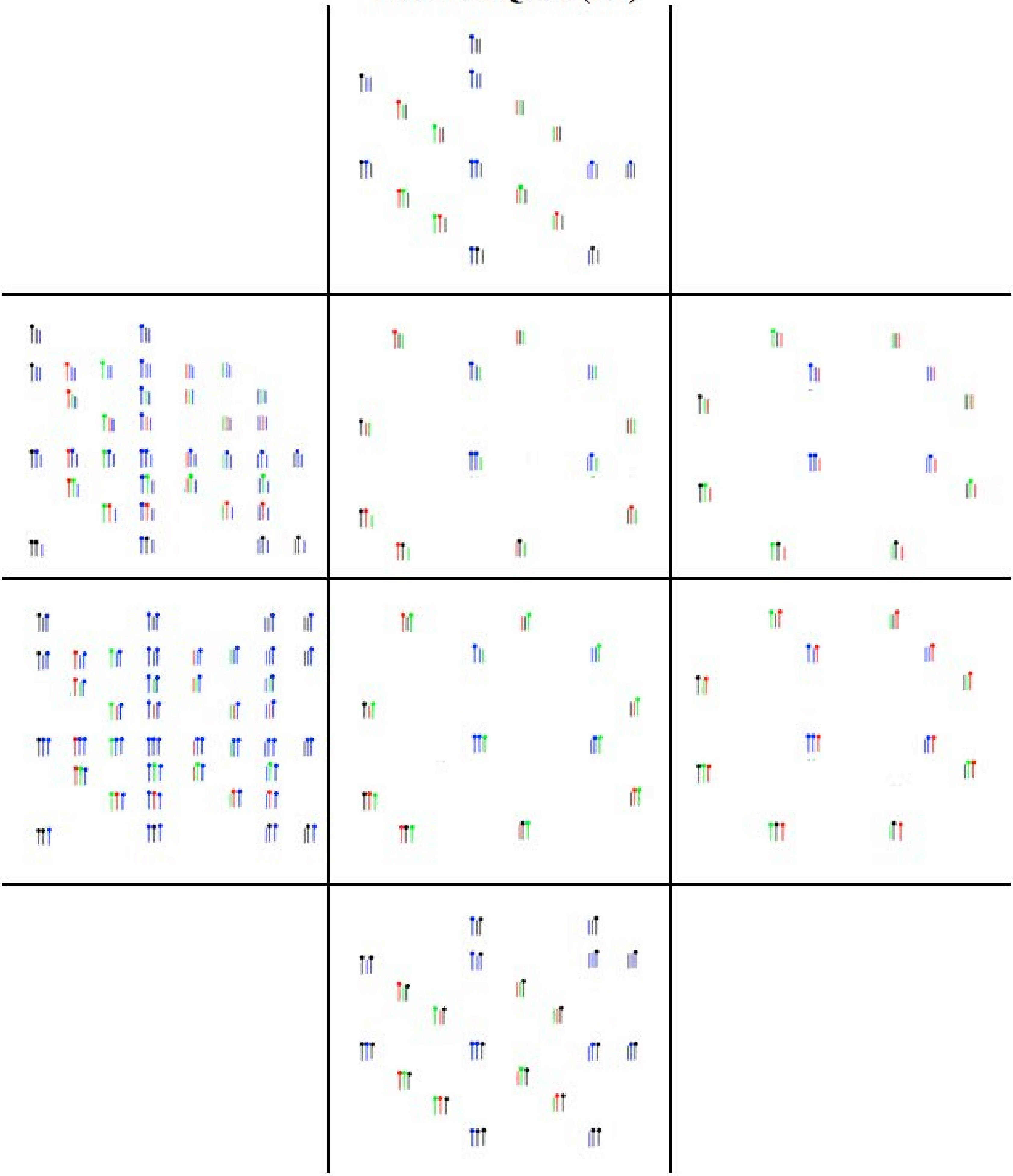
2 - There is one Red element and one Green element and the other element is Colorless (Red x Green = Blue)

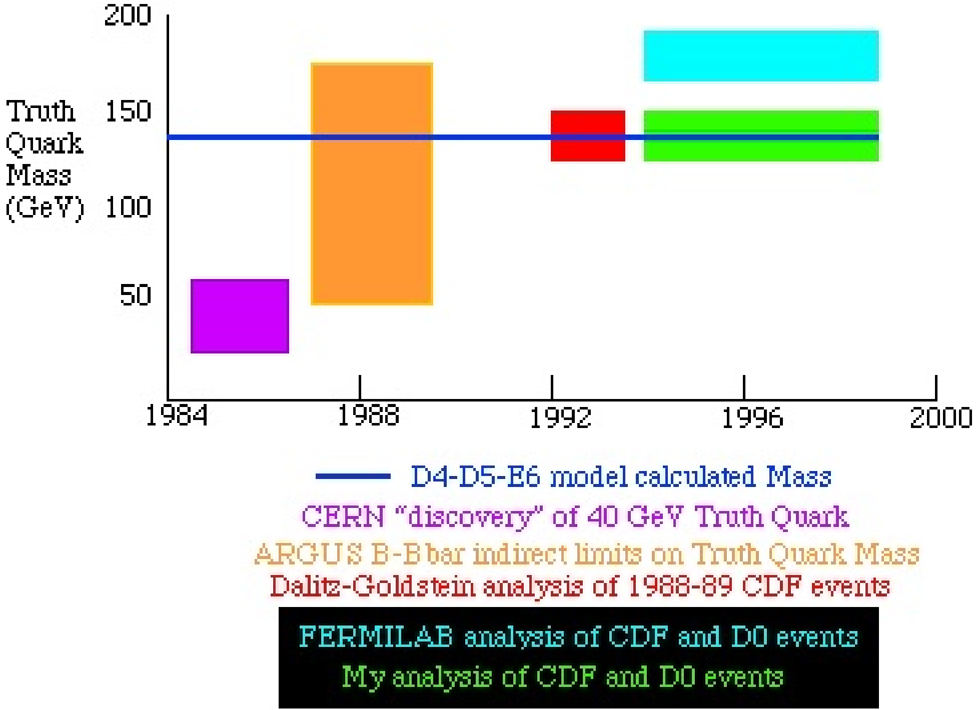
3 - The Triple has one element each that is Red, Green, or Blue,
in which case the color of the Third element (for Third Generation) is determinative and must be Blue.

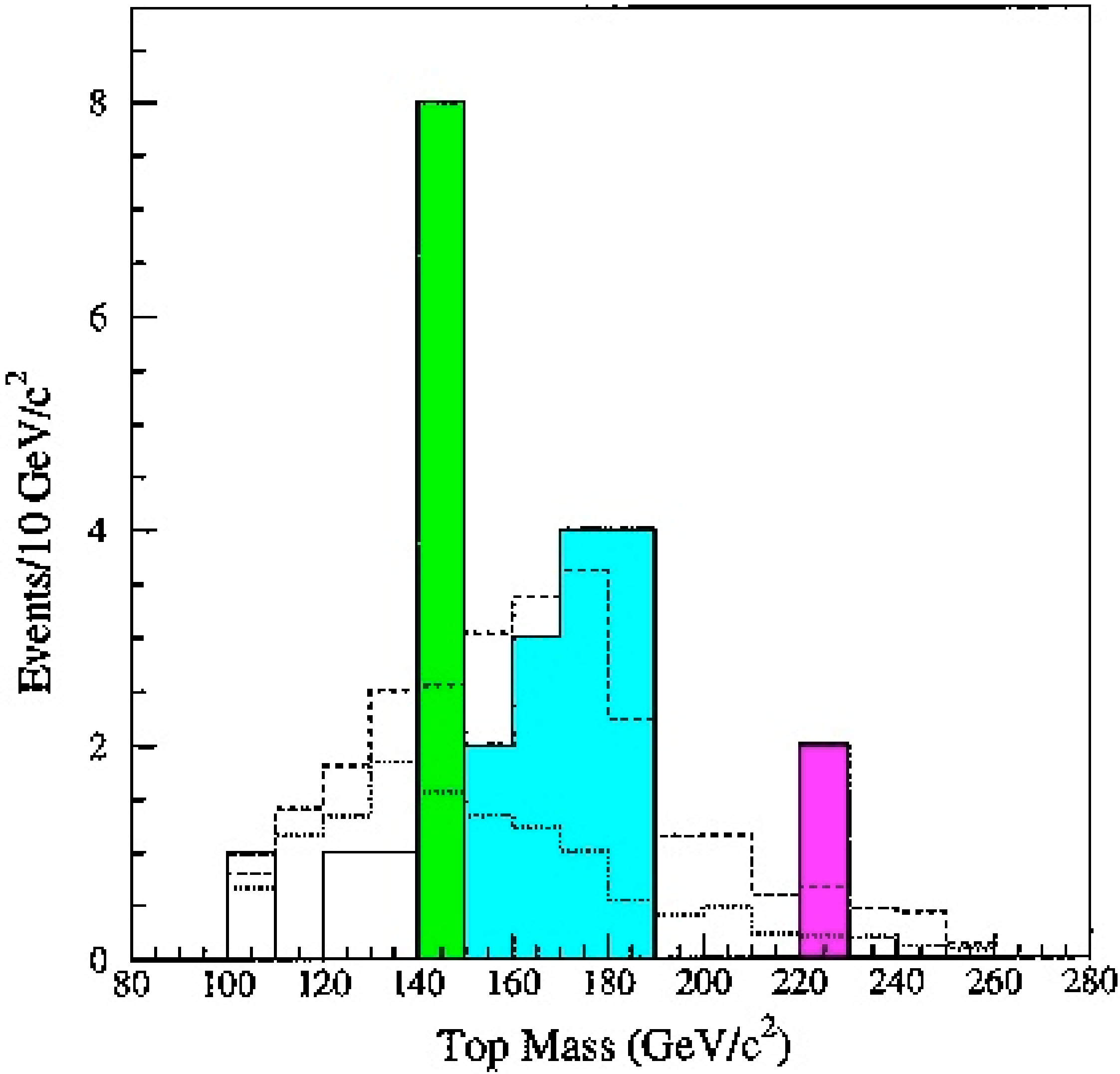
Candidates for Blue Truth Quark before application of Rule 3 (193)
with the 48 Rule 3 Candidates marked by cyan square:

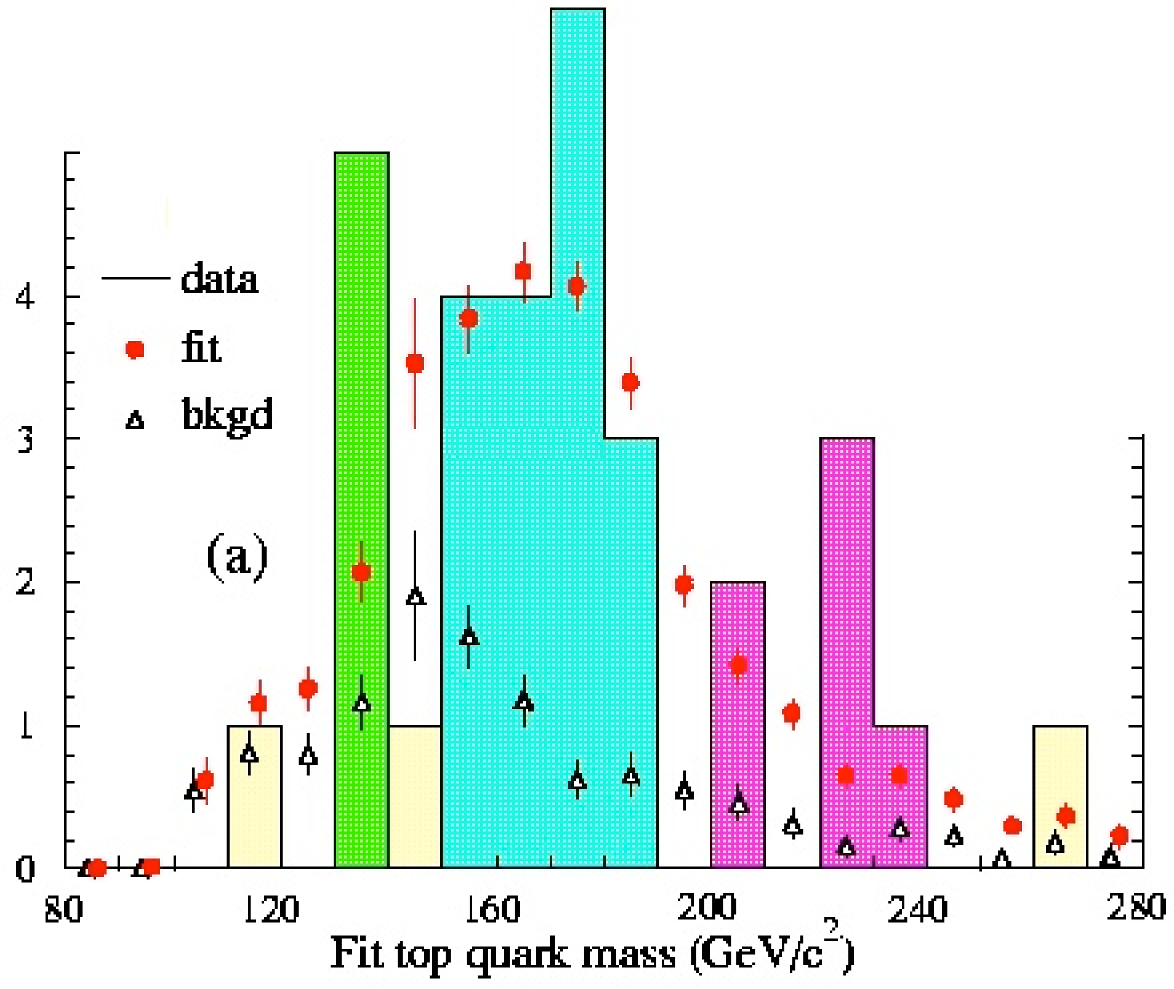


Blue Truth Quark (161)

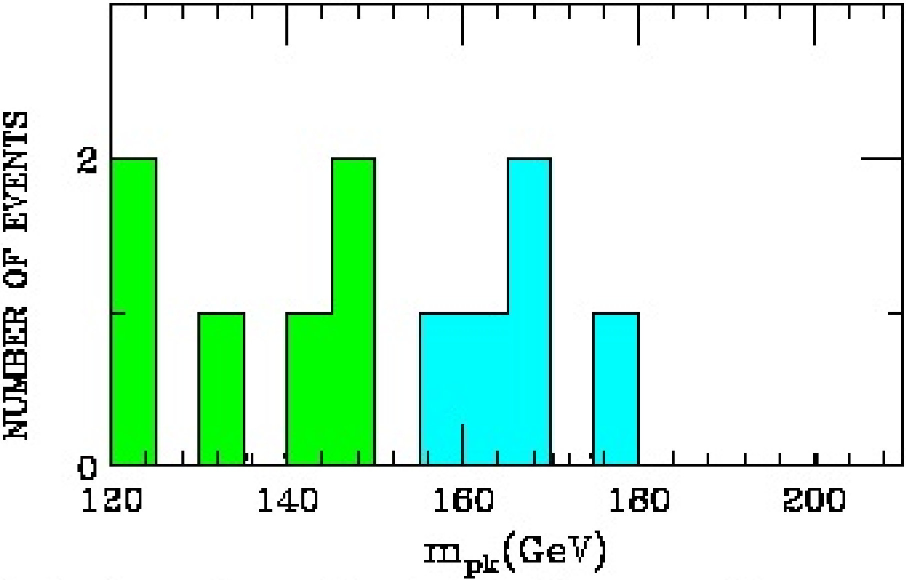



200
150
100
50
Truth
Quark
Mass
(GeV)
1984
1988
1992
1996
2000
D4-D5-E6 model calculated Mass
CERN "discovery" of 40 GeV Truth Quark
ARGUS B-Bbar indirect limits on Truth Quark Mass
Dalitz-Goldstein analysis of 1988-89 CDF events
FERMILAB analysis of CDF and D0 events
My analysis of CDF and D0 events

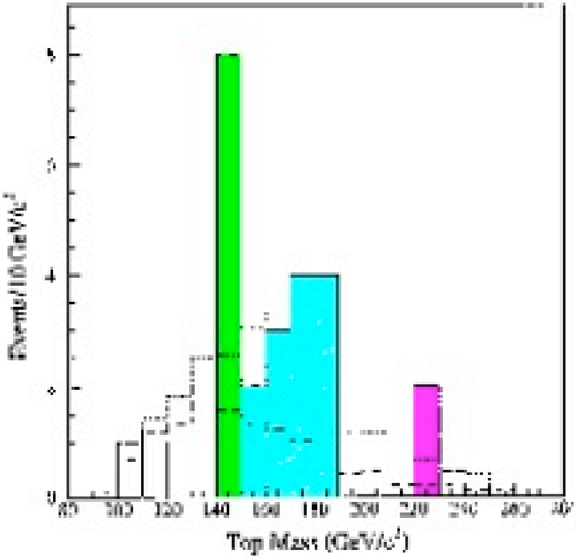

Events/10 GeV/c^2
0
2
4
6
8
80
100
120
140
160
180
200
220
240
260
280
Top Mass (GeV/c^2)

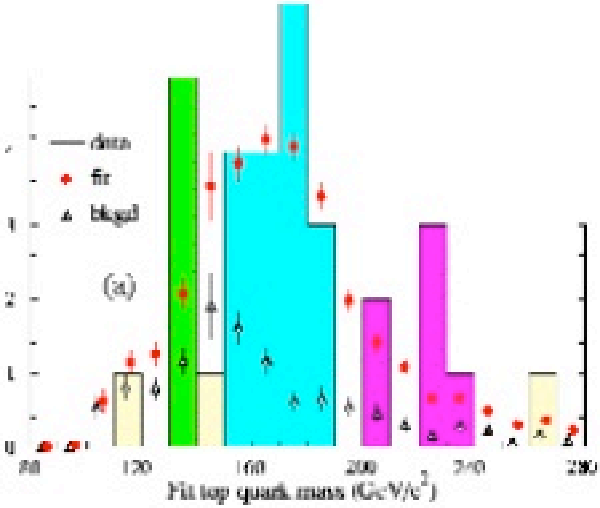


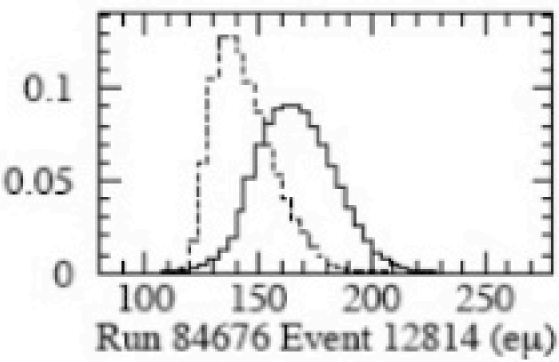
data
fit
bkgd
(a)
0
1
2
3
4
80
120
160
200
240
280
Fit top quark mass (GeV/c^2)

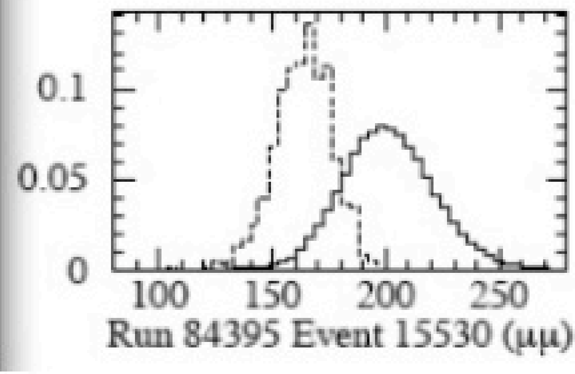


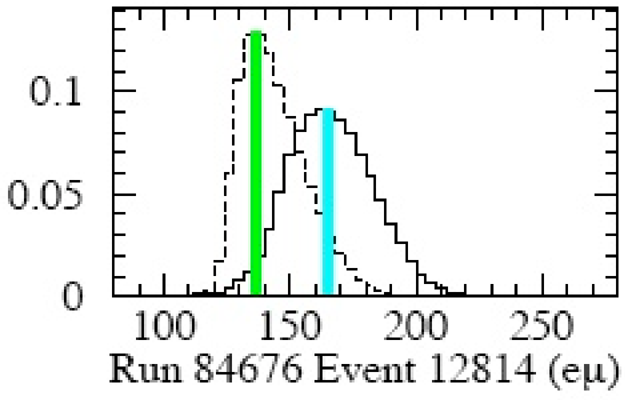
The distribution of m_{pk} values determined from 11 CDF dilepton events available empirically.

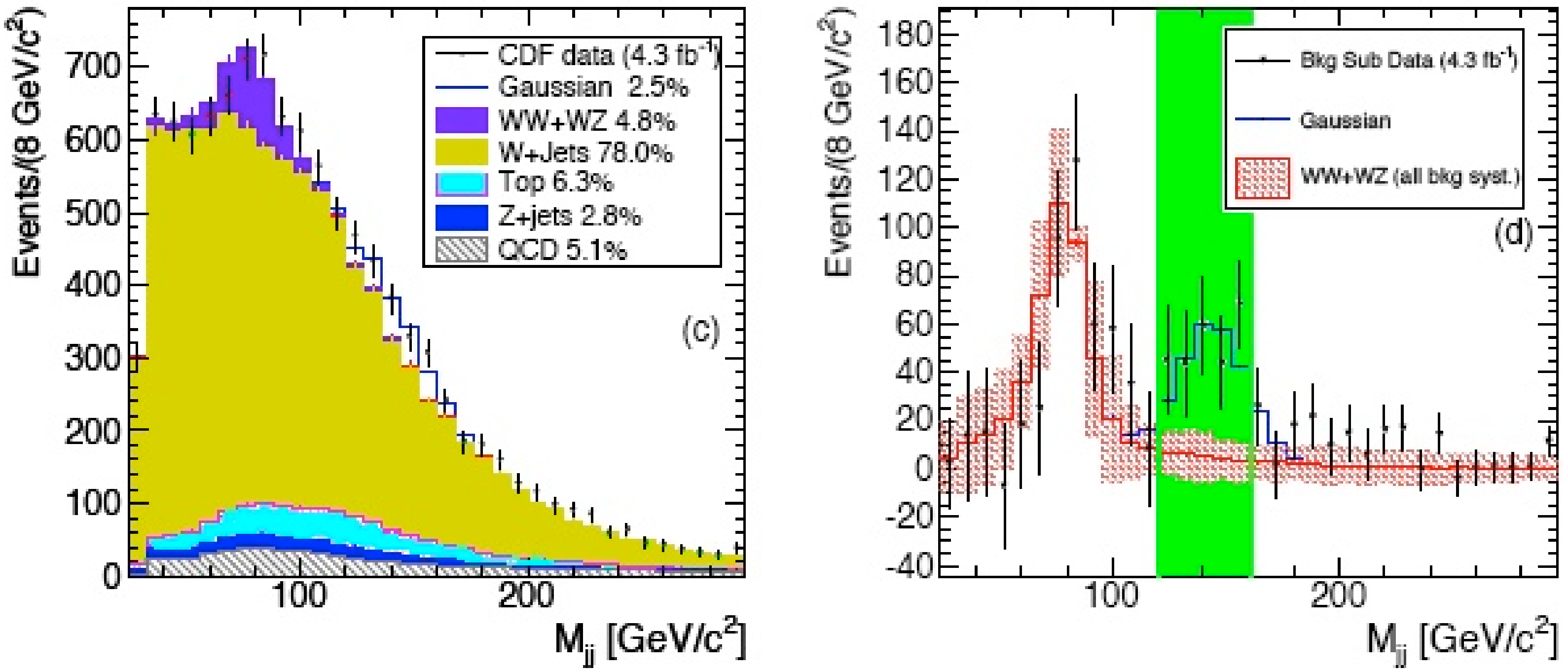

Events/10 GeV/c^2
Top Mass (GeV/c^2)


data
fit
bkgd
(a)
Fit top quark mass (GeV/c^2)

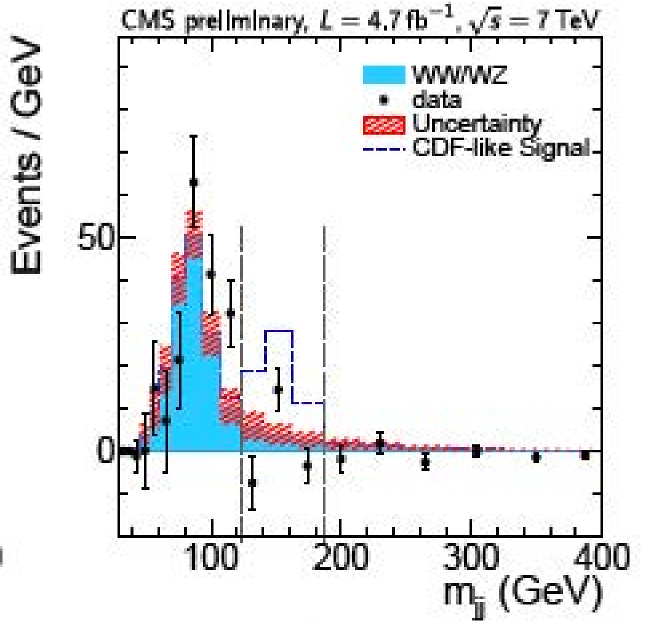

0.1
0.05
0
100
150
200
250
Run 84676 Event 12814 (eμ)


0.1
0.05
0
100
150
200
250
Run 84395 Event 15530 (μμ)

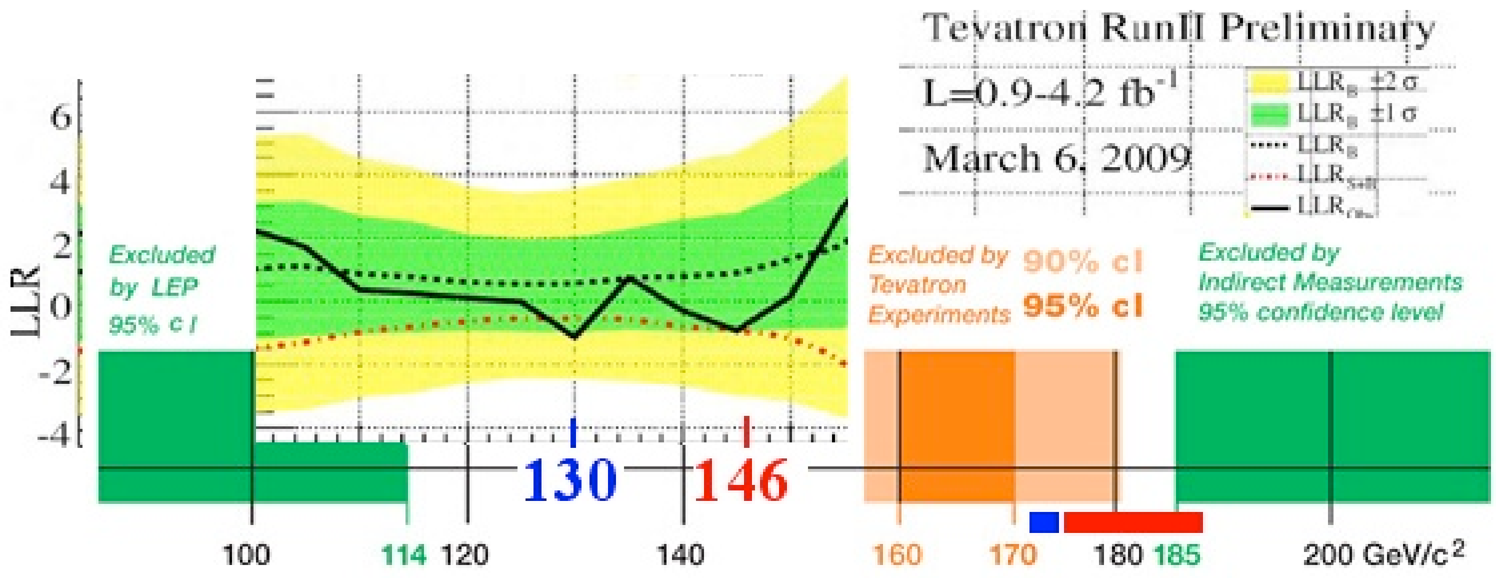

0.1
0.05
0
100
150
200
250
Run 84676 Event 12814 (eμ)



Events/(8 GeV/c^2)
CDF data (4.3 fb^{-1})
Gaussian 2.5%
WW+WZ 4.8%
W+Jets 78.0%
Top 6.3%
Z+jets 2.8%
QCD 5.1%
(c)
M_{jj} [GeV/c^2]
Bkg Sub Data (4.3 fb^{-1})
Gaussian
WW+WZ (all bkg syst.)
(d)

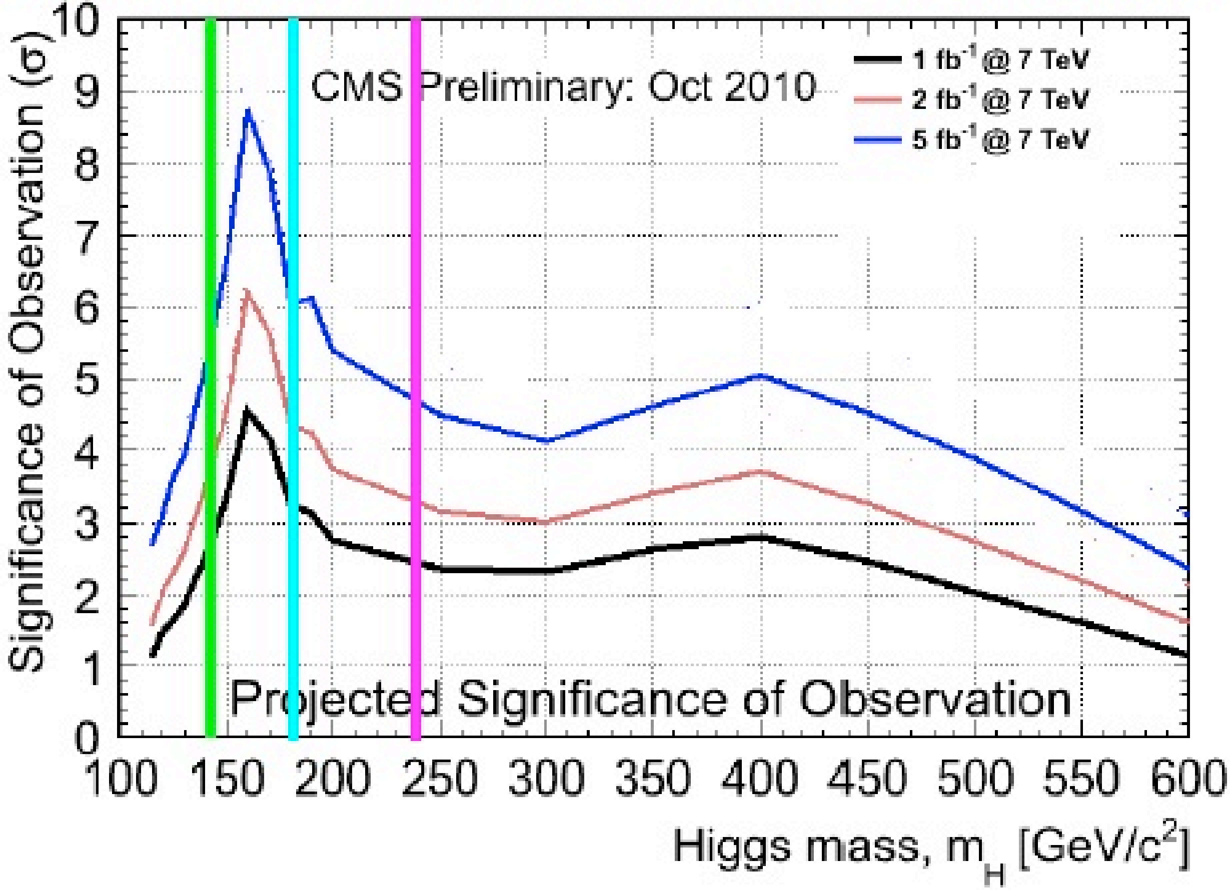


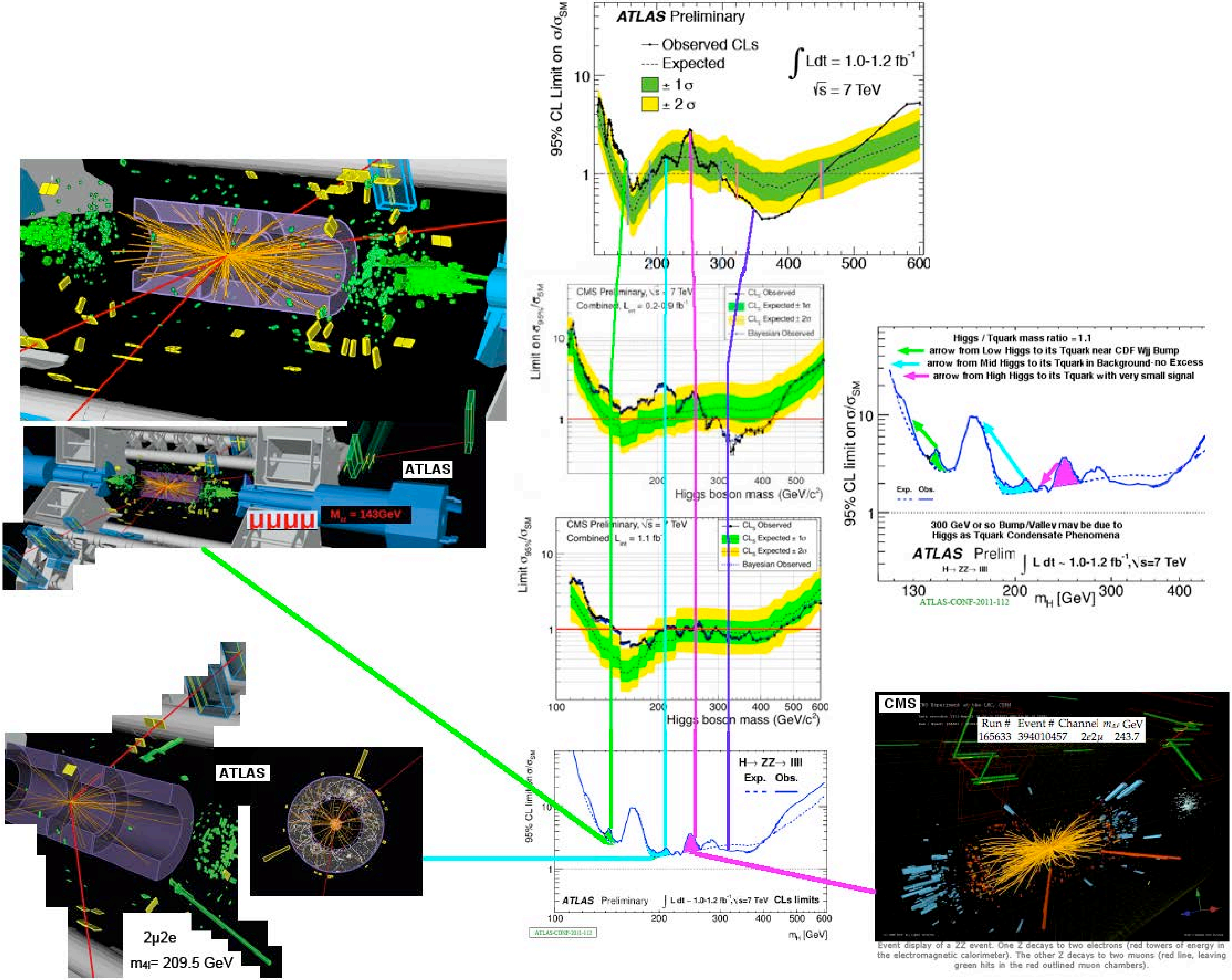
CMS preliminary, $L = 4.7\ \mathrm{fb}^{-1}$, $\sqrt{s} = 7$ TeV
WW/WZ
data
Uncertainty
CDF-like Signal
Events / GeV
50
0
100
200
300
400
m_{jj} (GeV)


Tevatron RunII Preliminary
L=0.9-4.2 fb^{-1}
March 6, 2009
LLR$_B$ ±2 σ
LLR$_B$ ±1 σ
LLR$_B$
LLR$_{S+B}$
LLR$_{Obs}$
LLR
6
4
2
0
-2
-4
Excluded by LEP 95% c l
Excluded by Tevatron Experiments
90% cl
95% cl
Excluded by Indirect Measurements 95% confidence level
130
146
100
114
120
140
160
170
180
185
200 GeV/c^2

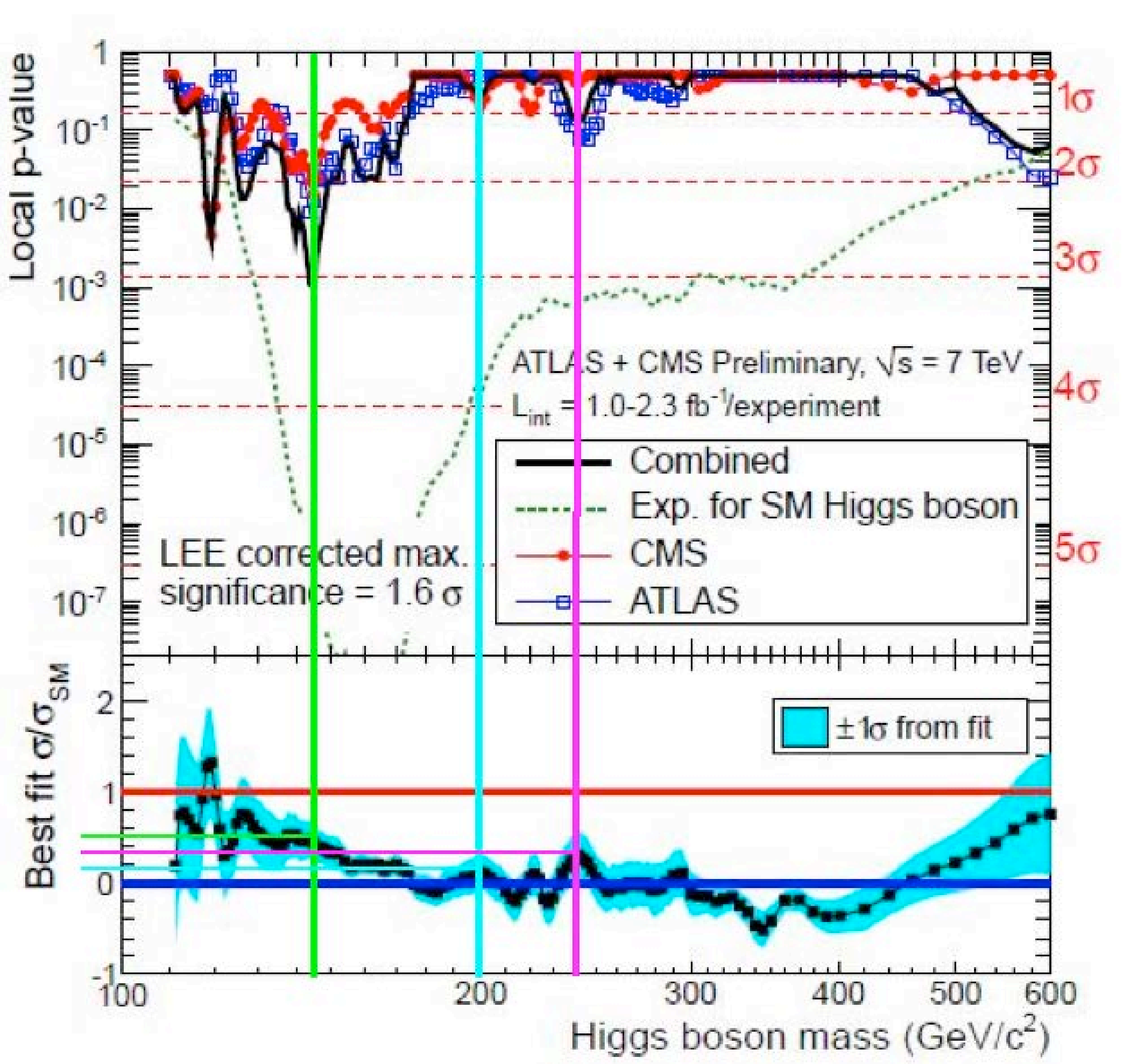
Tommaso Dorigo said in his blog entry 31 Jan 2011
"The LHC Will Run At 7 TeV in 2011 and 2012"

"... at the end of 2011 CMS and ATLAS might ... have one inverse femtobarn ... by the end of 2012 it is reasonable to expect at least a factor of 5 more ..."

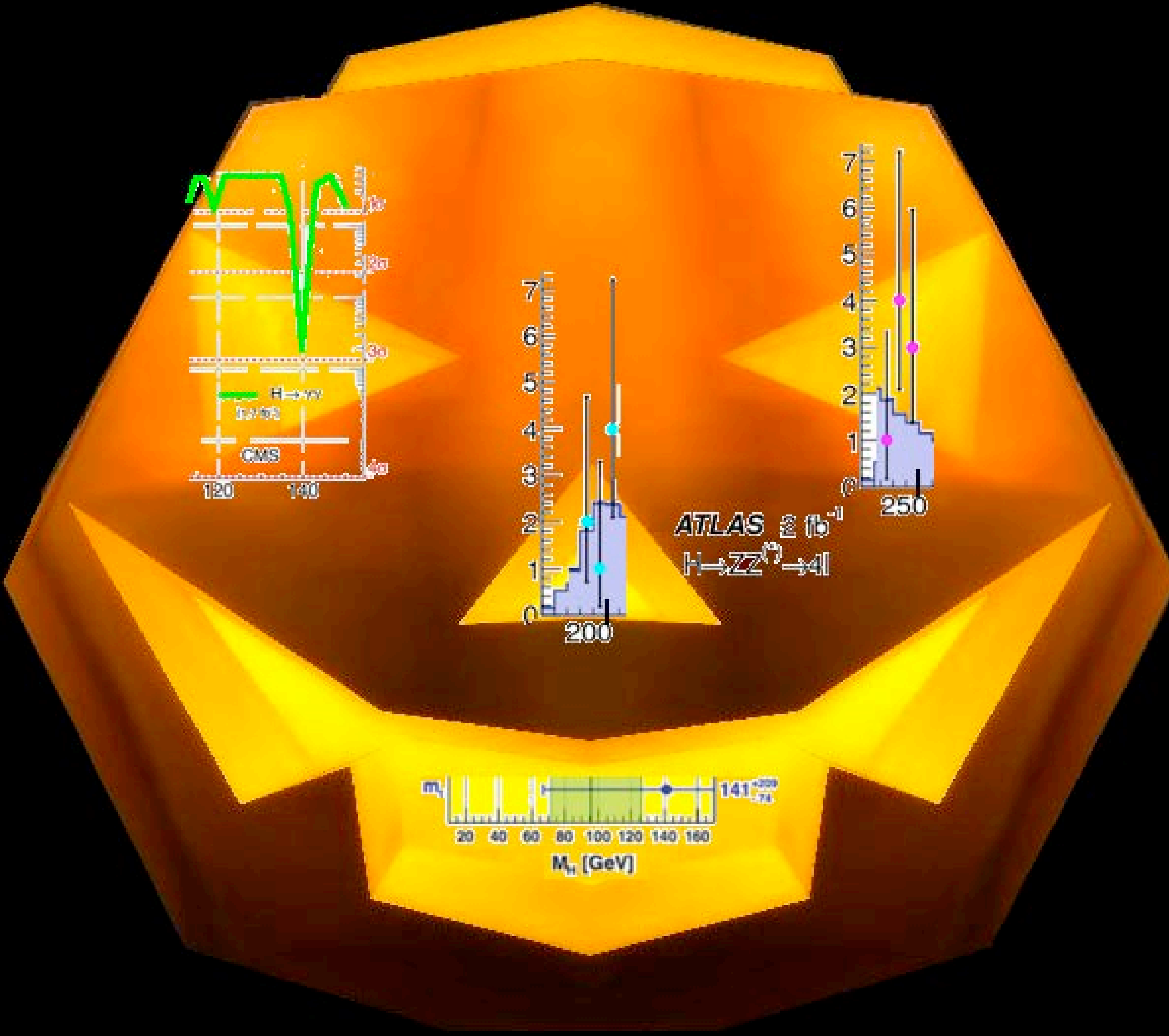




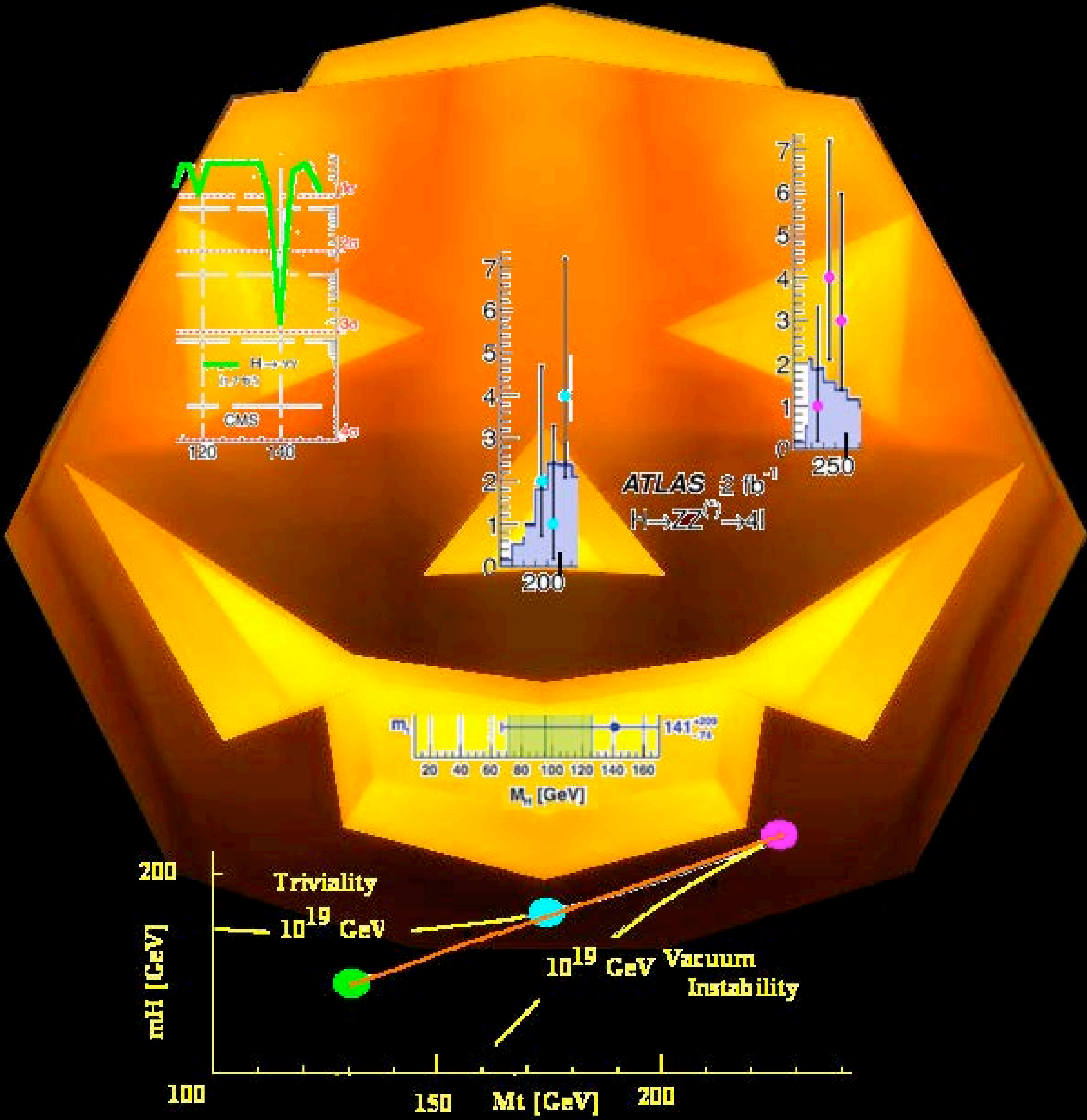
Event display of a ZZ event. One Z decays to two electrons (red towers of energy in the electromagnetic calorimeter). The other Z decays to two muons (red line, leaving green hits in the red outlined muon chambers).



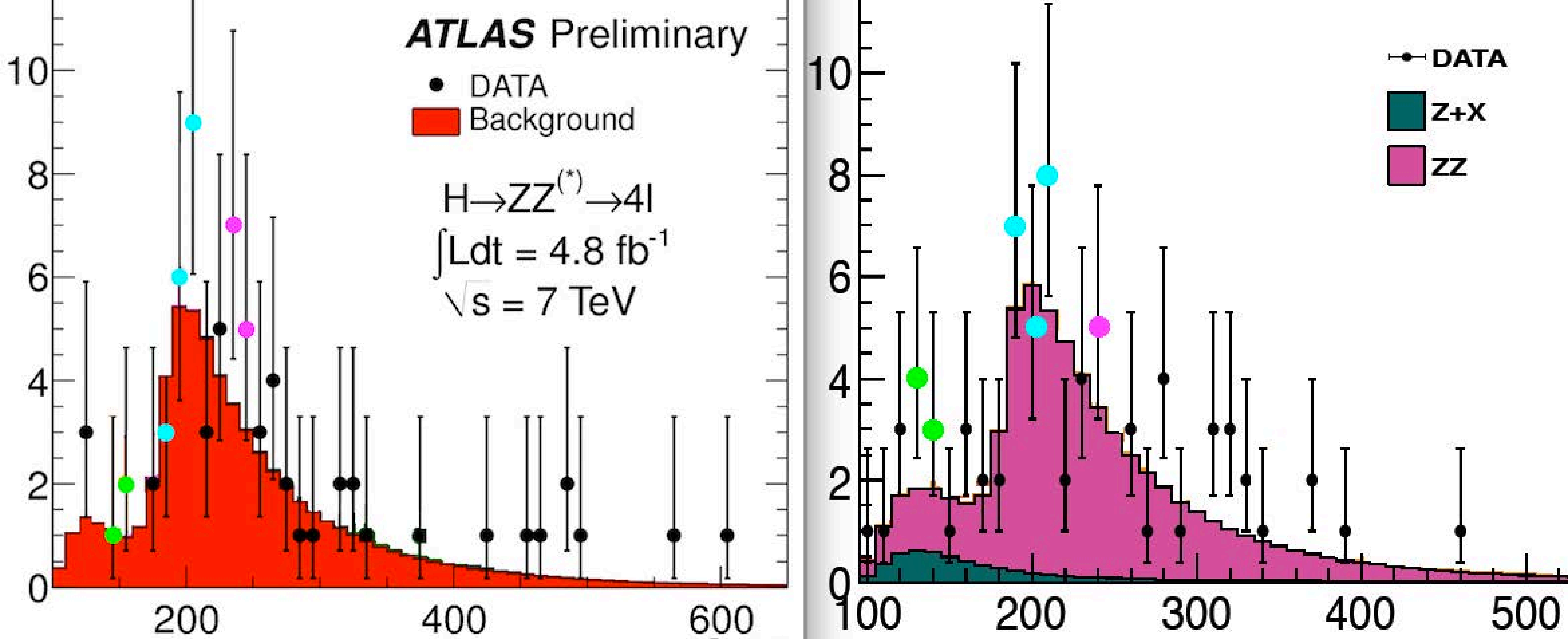
Local p-value
1
10^-1
10^-2
10^-3
10^-4
10^-5
10^-6
10^-7
1σ
2σ
3σ
4σ
5σ
ATLAS + CMS Preliminary, √s = 7 TeV
L_int = 1.0-2.3 fb^-1/experiment
Combined
Exp. for SM Higgs boson
CMS
ATLAS
LEE corrected max.
significance = 1.6 σ
Best fit σ/σ_SM
2
1
0
-1
±1σ from fit
100
200
300
400
500
600
Higgs boson mass (GeV/c^2)

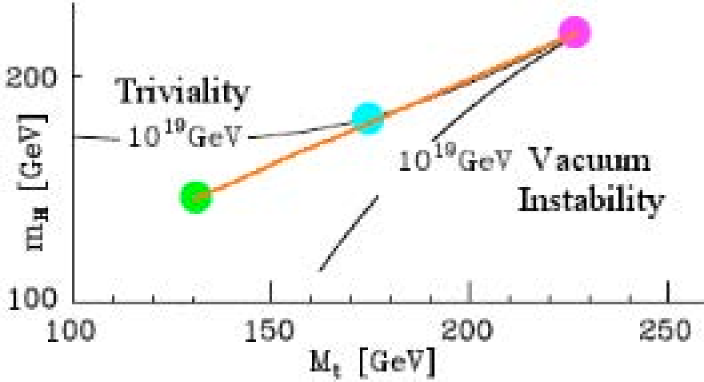


H → γγ
CMS
120
140
1σ
2σ
3σ
4σ
ATLAS 2 fb^{-1}
H→ZZ$^{(*)}$→4l
200
250
0 1 2 3 4 5 6 7
m_t
141$^{+209}_{-74}$
20 40 60 80 100 120 140 160
M_H [GeV]



H→γγ
CMS
120
140
ATLAS 2 fb⁻¹
200
250
141
20 40 60 80 100 120 140 160
Triviality
10^{19} GeV
10^{19} GeV Vacuum Instability
mH [GeV]
200
100
150
Mt [GeV]
200


ATLAS Preliminary
DATA
Background
H→ZZ(*)→4l
∫Ldt = 4.8 fb-1
√s = 7 TeV
DATA
Z+X
ZZ

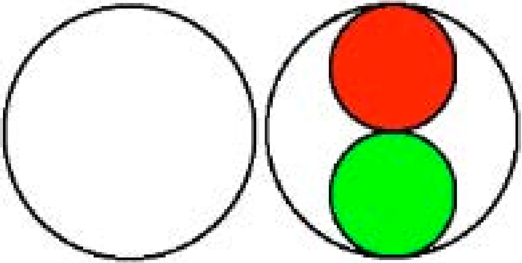

200
100
Triviality
10^{19}GeV
10^{19}GeV Vacuum
Instability
m_H [GeV]
100
150
200
250
M_t [GeV]

```
             mass = 145
       T ------------ Tbar                    Effective Higgs in CP2 ISS
         \           /
          \         /                              Higgs
mass = 145 \       /   mass = 145               Effective Mass =
            \     /                             = 145 x cos(pi/6)= 145 x 0.86 = 125
             \   /
             Higgs                               Higgs in M4 spacetime
```

```
        T ----------- Tbar      in CP2 Internal Symmetry Space
         \           /
          \         /
           \       /
            \     /
             Higgs              in M4 Physical Spacetime
```

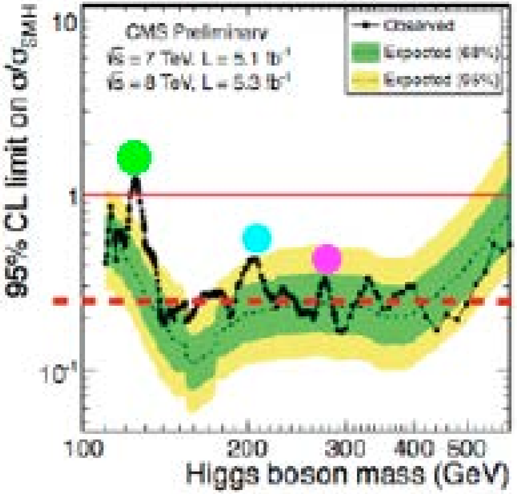
Therefore the Mid-Mass Higgs looks like a 3-particle system of Higgs + T + Tbar.
The T and Tbar form a Pion-like state. Since Tquark Mid-Mass State is 174 GeV the Mid-Mass T-Tbar that lives in the CP2 part of (4+4)-dim Kaluza-Klein has mass (174+174) x (135 / (312+312) = 75 GeV.
The Higgs that lives in the M4 part of (4+4)-dim Kaluza-Klein has, by itself, its Low-Mass Ground State Effective Mass of 125 GeV.

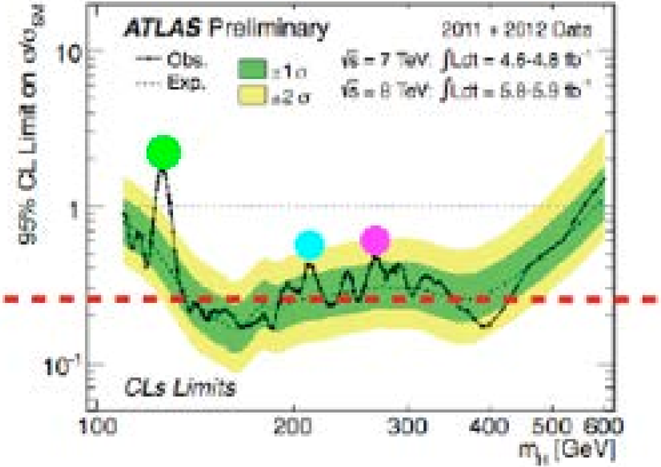
So, the total Mid-Mass Higgs lives in full 8-dim Kaluza-Klein with mass 75+125 = 200 GeV.

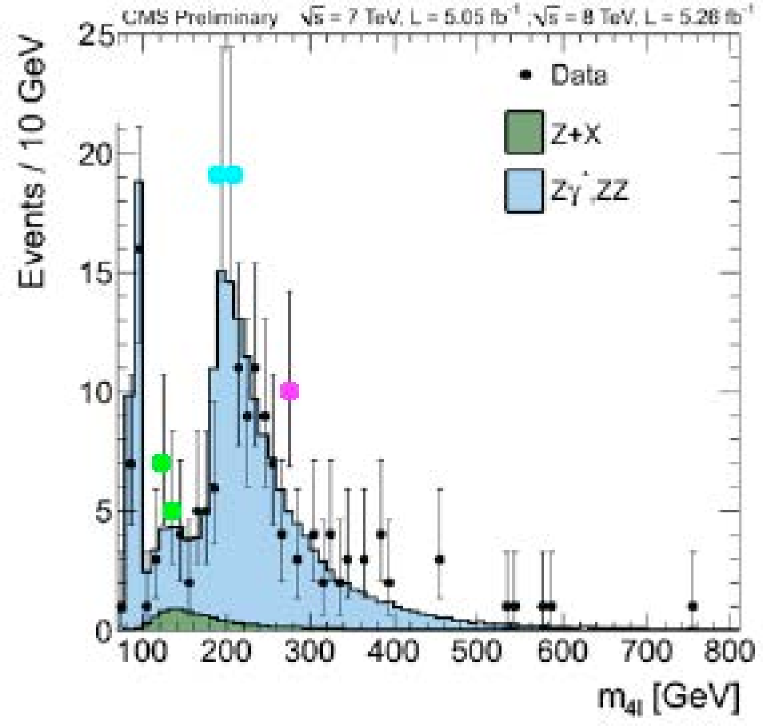


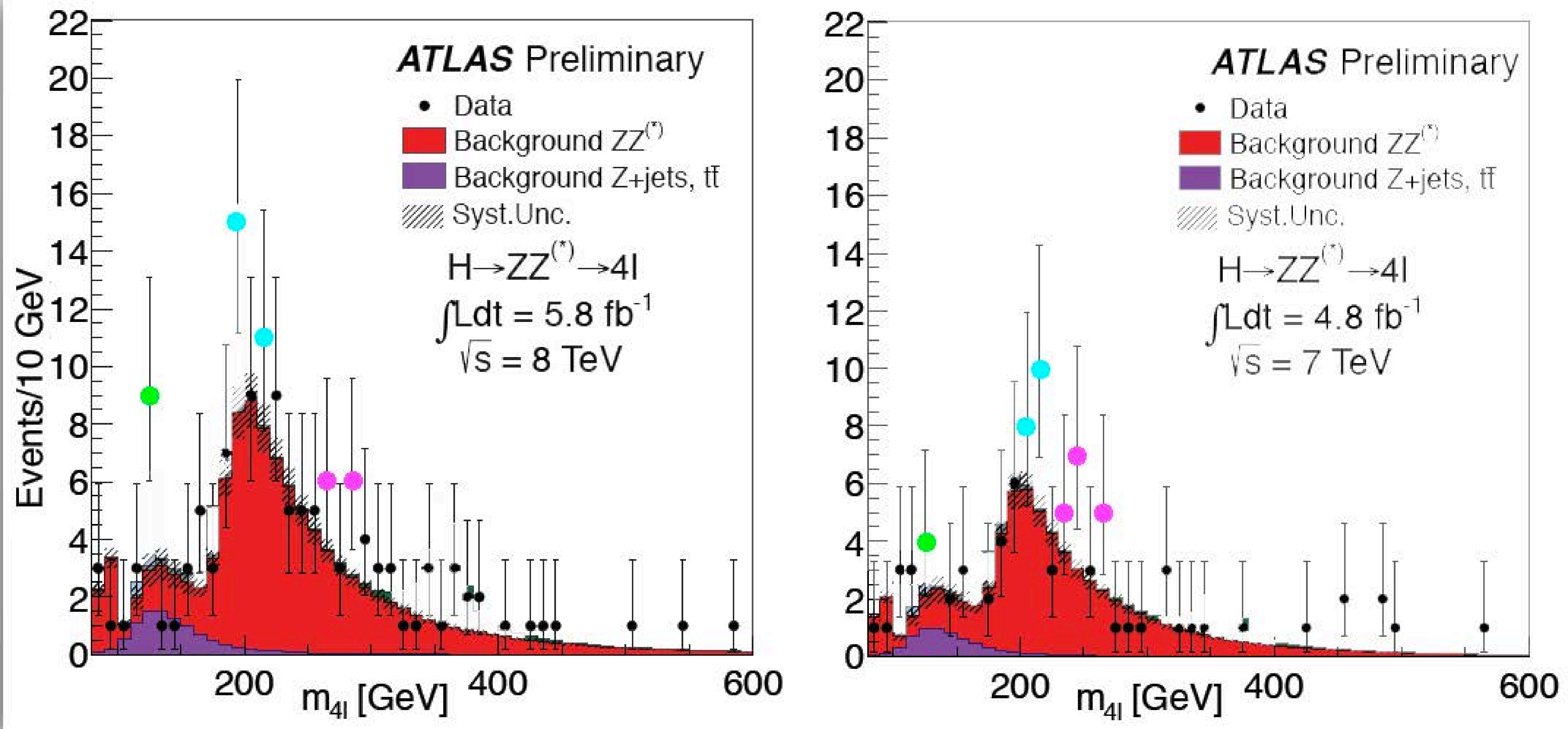
	1	i	j	k	E	I	J	K
1	11	1i	1j	1k	1E	1I	1J	1K
i	i1	ii	ij	ik	iE	iI	iJ	iK
j	j1	ji	jj	jk	jE	jI	jJ	jK
k	k1	ki	kj	kk	kE	kI	kJ	kK
E	E1	Ei	Ej	Ek	EE	EI	EJ	EK
I	I1	Ii	Ij	Ik	IE	II	IJ	IK
J	J1	Ji	Jj	Jk	JE	JI	JJ	JK
K	K1	Ki	Kj	Kk	KE	KI	KJ	KK

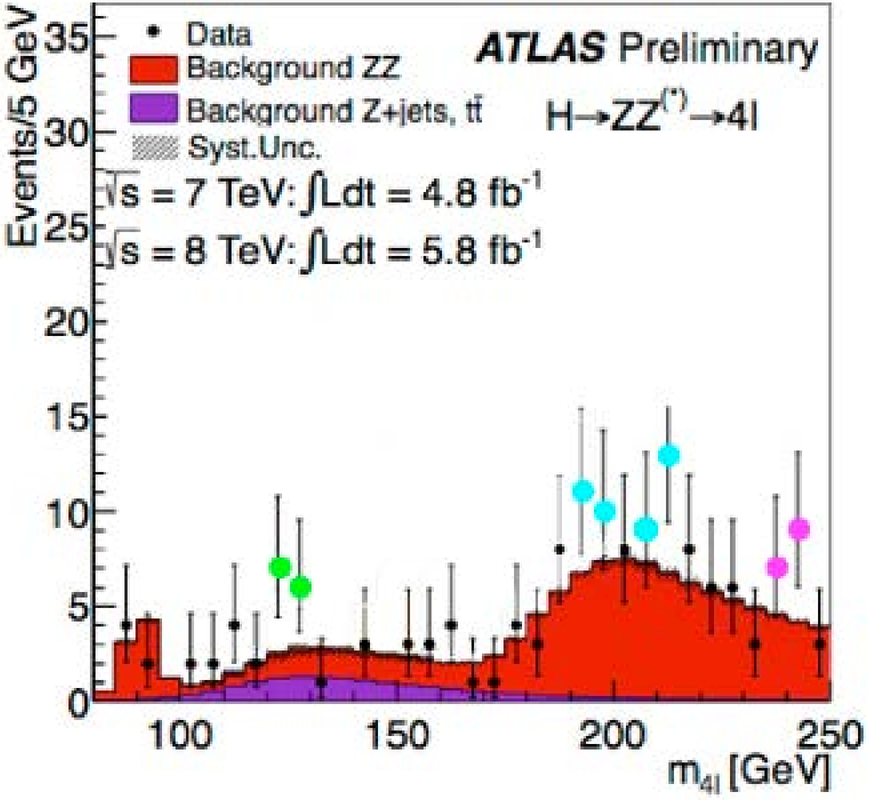
Obviously sigma=sigma(SM) is not the target anymore



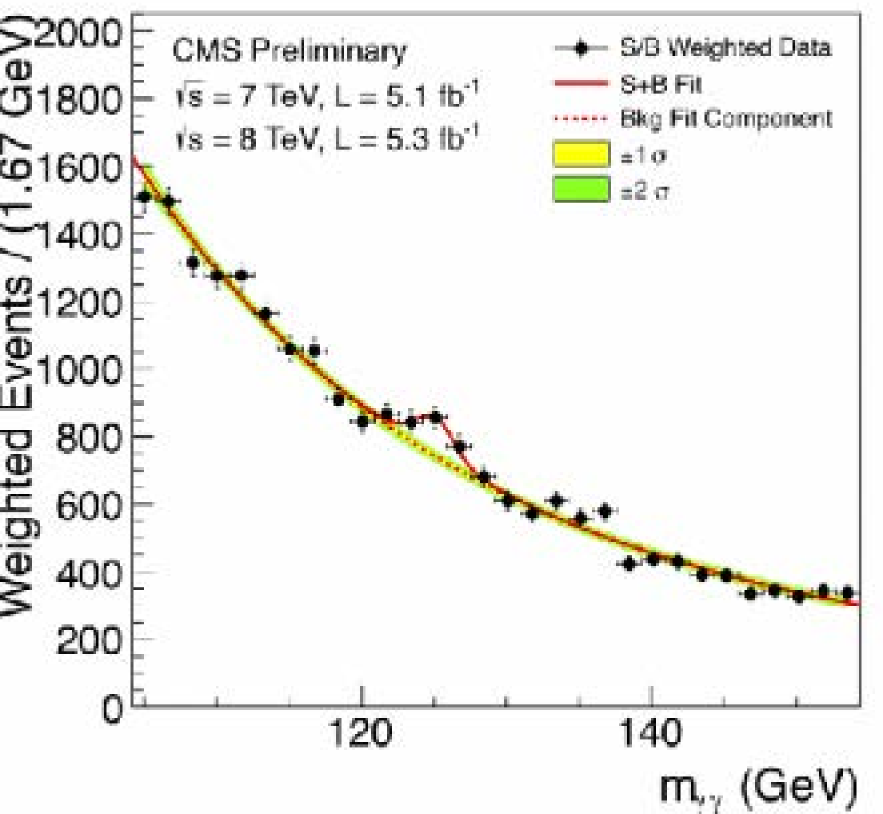



CMS Preliminary √s = 7 TeV, L = 5.05 fb⁻¹ ; √s = 8 TeV, L = 5.26 fb⁻¹
Data
Z+X
Zγ*,ZZ
Events / 10 GeV
m4l [GeV]
0
5
10
15
20
25
100
200
300
400
500
600
700
800

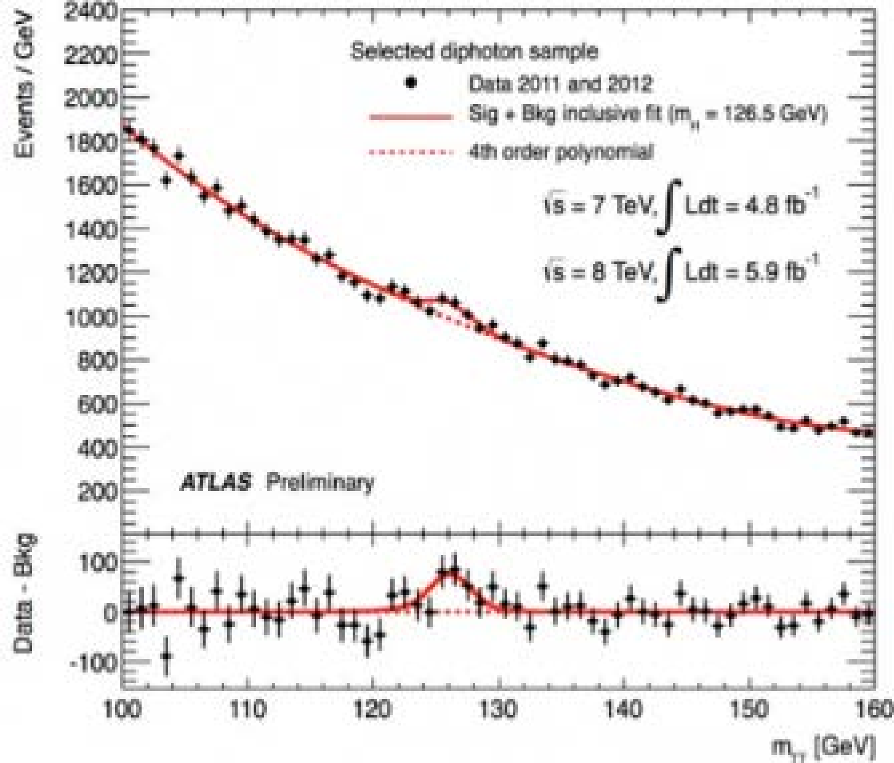

ATLAS Preliminary
Data
Background ZZ(*)
Background Z+jets, tt̄
Syst.Unc.
H→ZZ(*)→4l
∫Ldt = 5.8 fb-1
√s = 8 TeV
Events/10 GeV
m4l [GeV]
ATLAS Preliminary
Data
Background ZZ(*)
Background Z+jets, tt̄
Syst.Unc.
H→ZZ(*)→4l
∫Ldt = 4.8 fb-1
√s = 7 TeV
m4l [GeV]



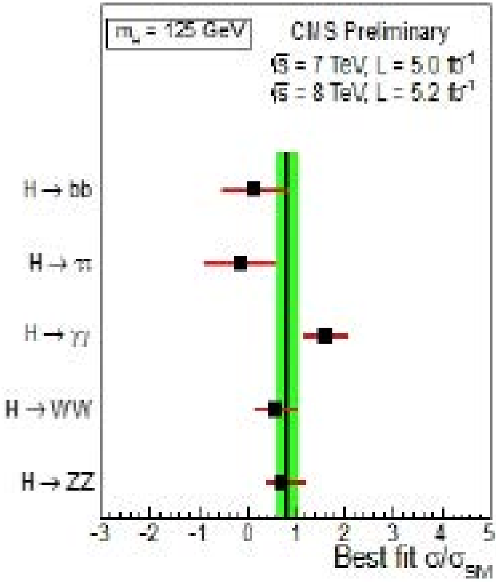
Events/5 GeV
Data
Background ZZ
Background Z+jets, tt̄
Syst.Unc.
ATLAS Preliminary
H→ZZ(*)→4l
√s = 7 TeV: ∫Ldt = 4.8 fb-1
√s = 8 TeV: ∫Ldt = 5.8 fb-1
0
5
10
15
20
25
30
35
100
150
200
250
m4l [GeV]



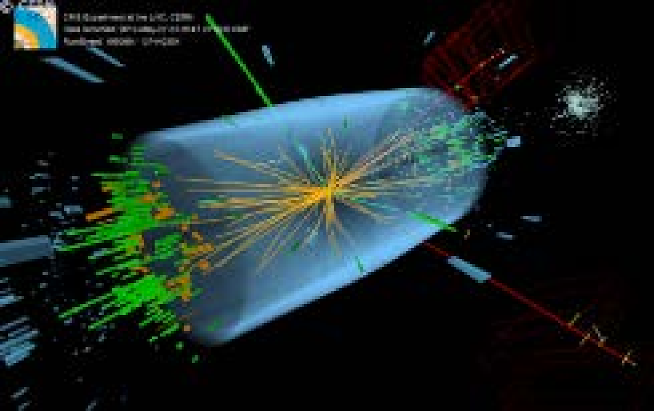
CMS Preliminary
$\sqrt{s}$ = 7 TeV, L = 5.1 fb^{-1}
$\sqrt{s}$ = 8 TeV, L = 5.3 fb^{-1}
S/B Weighted Data
S+B Fit
Bkg Fit Component
±1 σ
±2 σ
Weighted Events / (1.67 GeV)
$m_{\gamma\gamma}$ (GeV)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
120
140

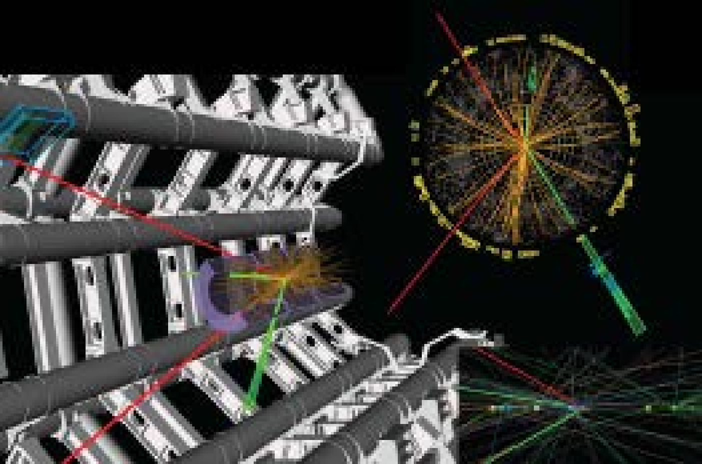


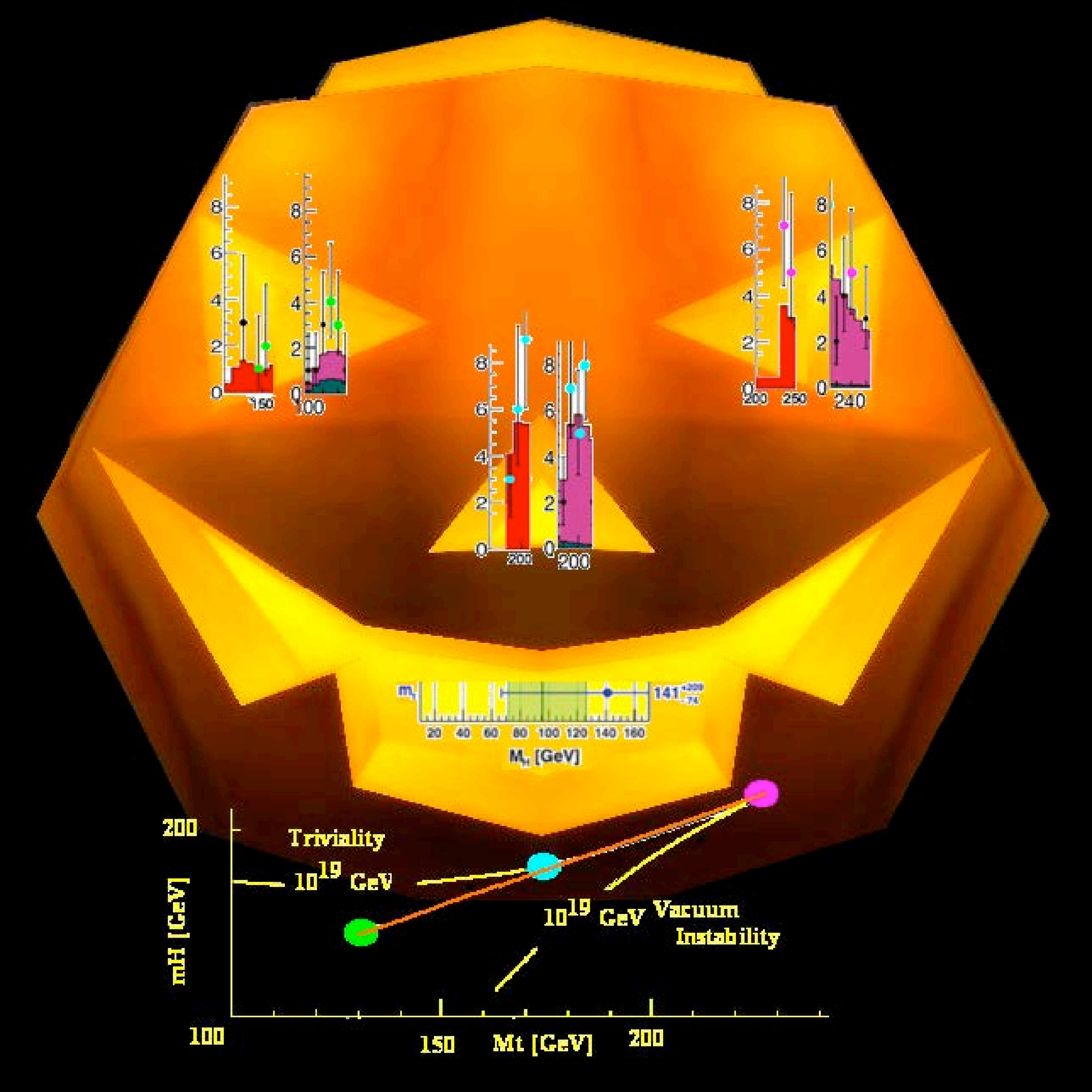
Selected diphoton sample
Data 2011 and 2012
Sig + Bkg inclusive fit ($m_{\gamma\gamma}$ = 126.5 GeV)
4th order polynomial
$\sqrt{s}$ = 7 TeV, $\int Ldt$ = 4.8 fb^{-1}
$\sqrt{s}$ = 8 TeV, $\int Ldt$ = 5.9 fb^{-1}
ATLAS Preliminary
Events / GeV
Data - Bkg
$m_{\gamma\gamma}$ [GeV]
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
100
0
-100
100
110
120
130
140
150
160



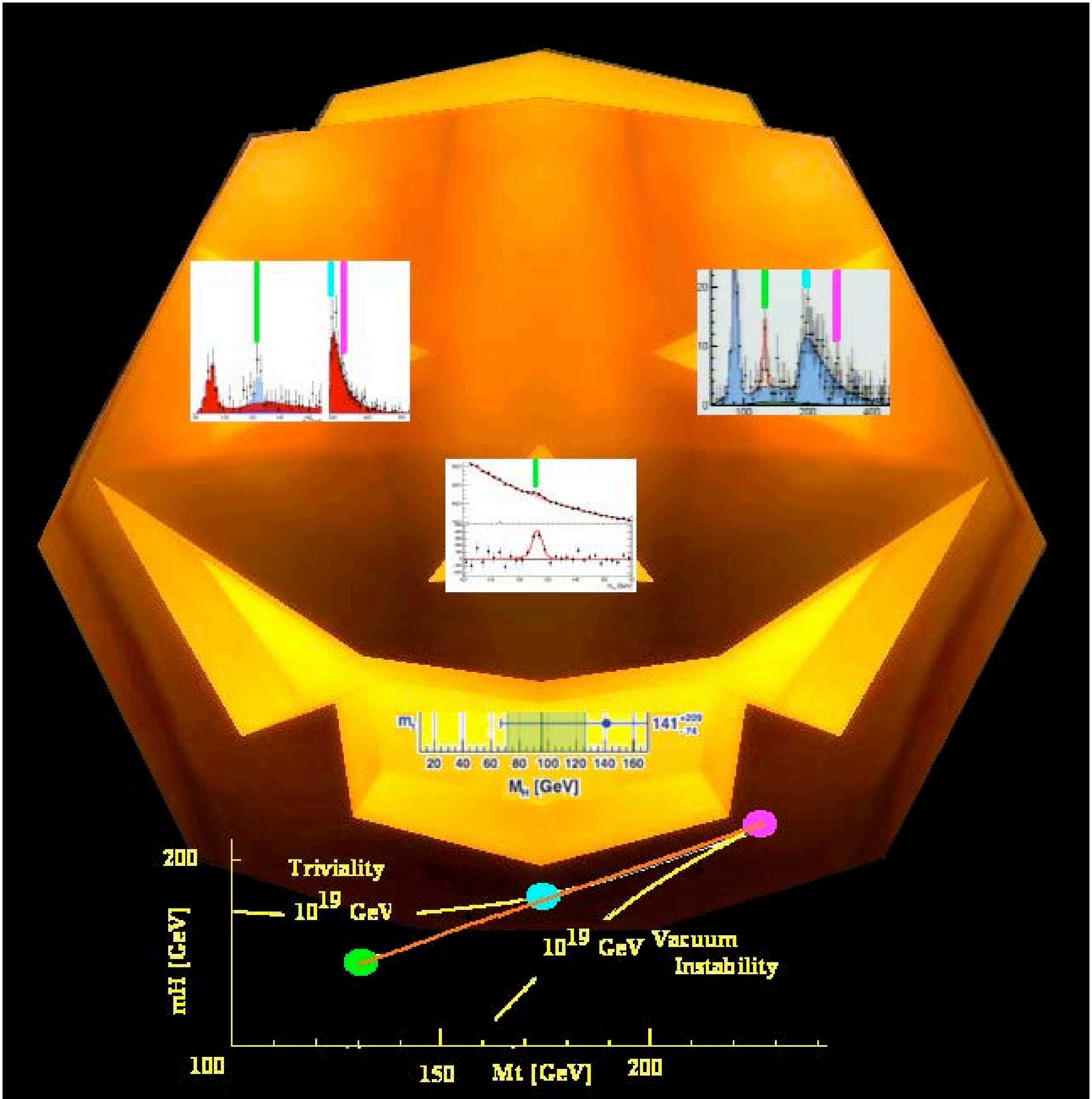
m_H = 125 GeV
CMS Preliminary
$\sqrt{s}$ = 7 TeV, L = 5.0 fb^{-1}
$\sqrt{s}$ = 8 TeV, L = 5.2 fb^{-1}
H → bb
H → ττ
H → γγ
H → WW
H → ZZ
-3 -2 -1 0 1 2 3 4 5
Best fit σ/σ_{SM}



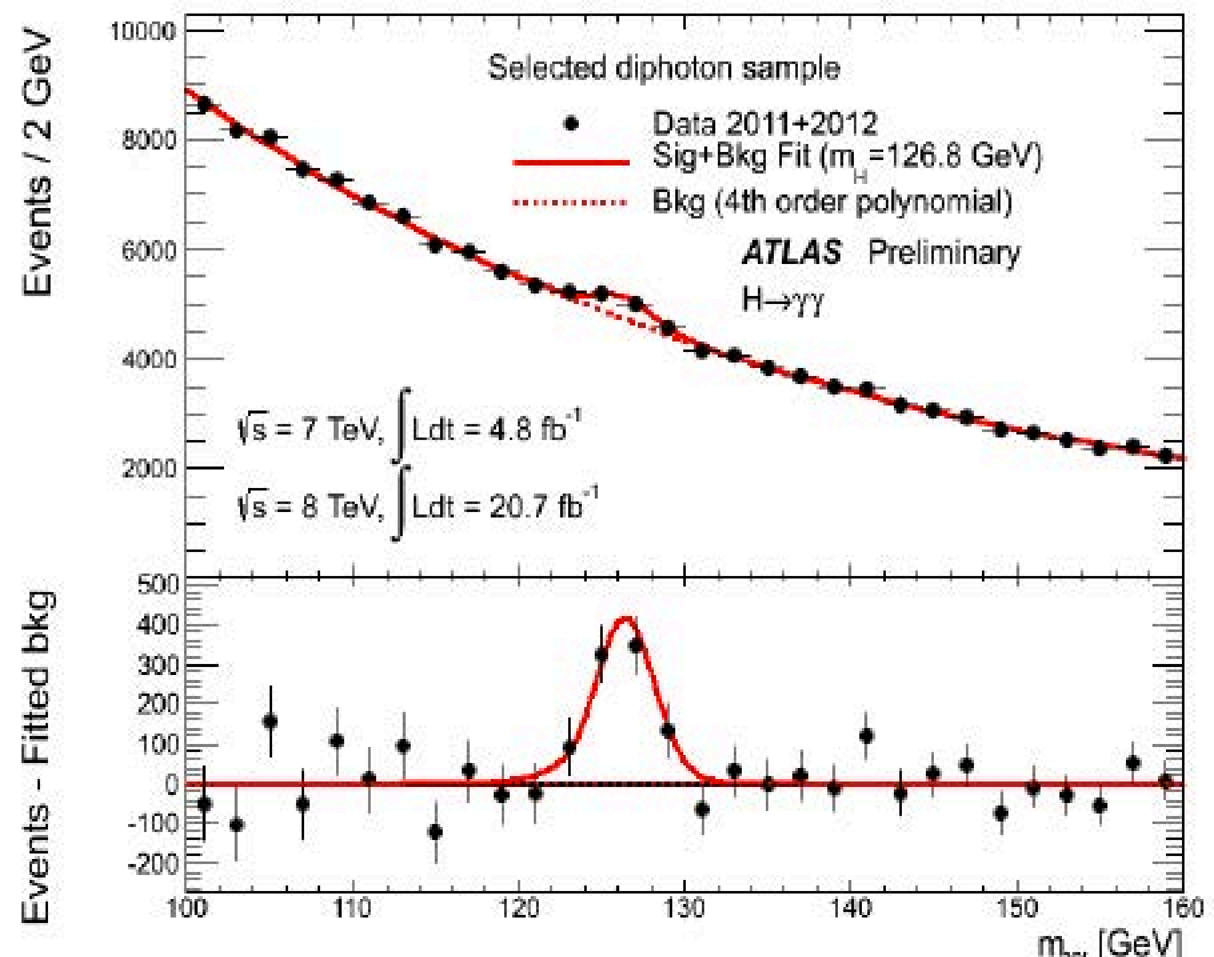




m_t
141
20 40 60 80 100 120 140 160
M_t [GeV]
200
Triviality
10^{19} GeV
10^{19} GeV Vacuum
Instability
mH [GeV]
100
150
Mt [GeV]
200

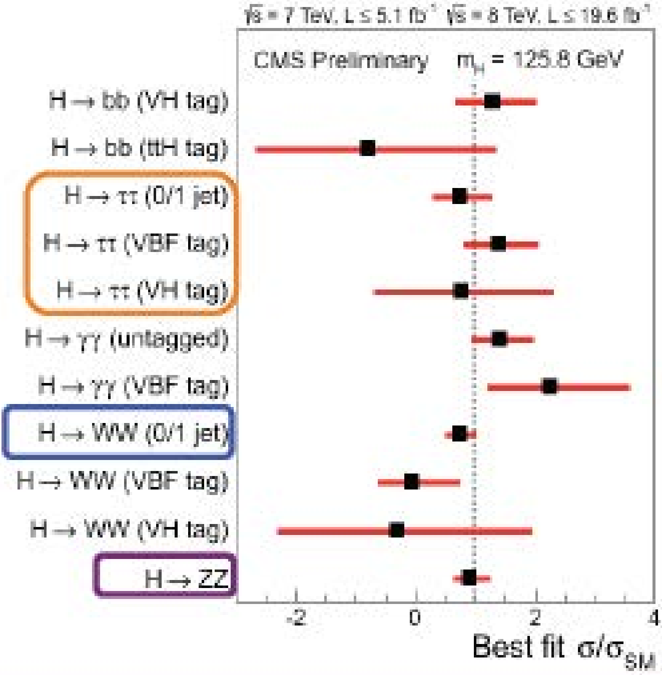


M_H [GeV]
20 40 60 80 100 120 140 160
200
Triviality
10^19 GeV
mH [GeV]
10^19 GeV Vacuum
Instability
100
150
Mt [GeV]
200



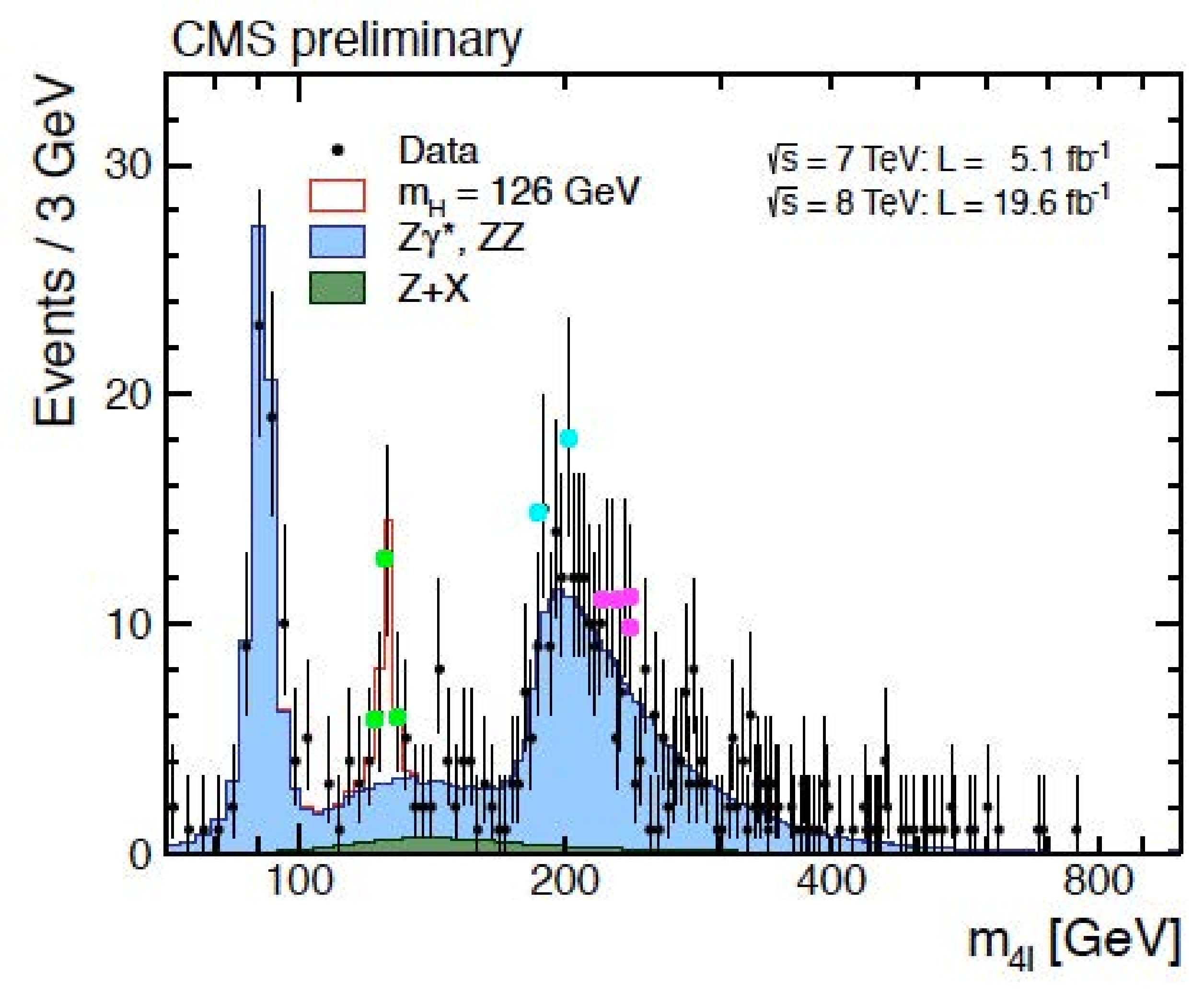
Simple topology: two high-E_T (>40,30 GeV) isolated photons

142681 events in $100 < m_{\gamma\gamma}$ [GeV] < 160

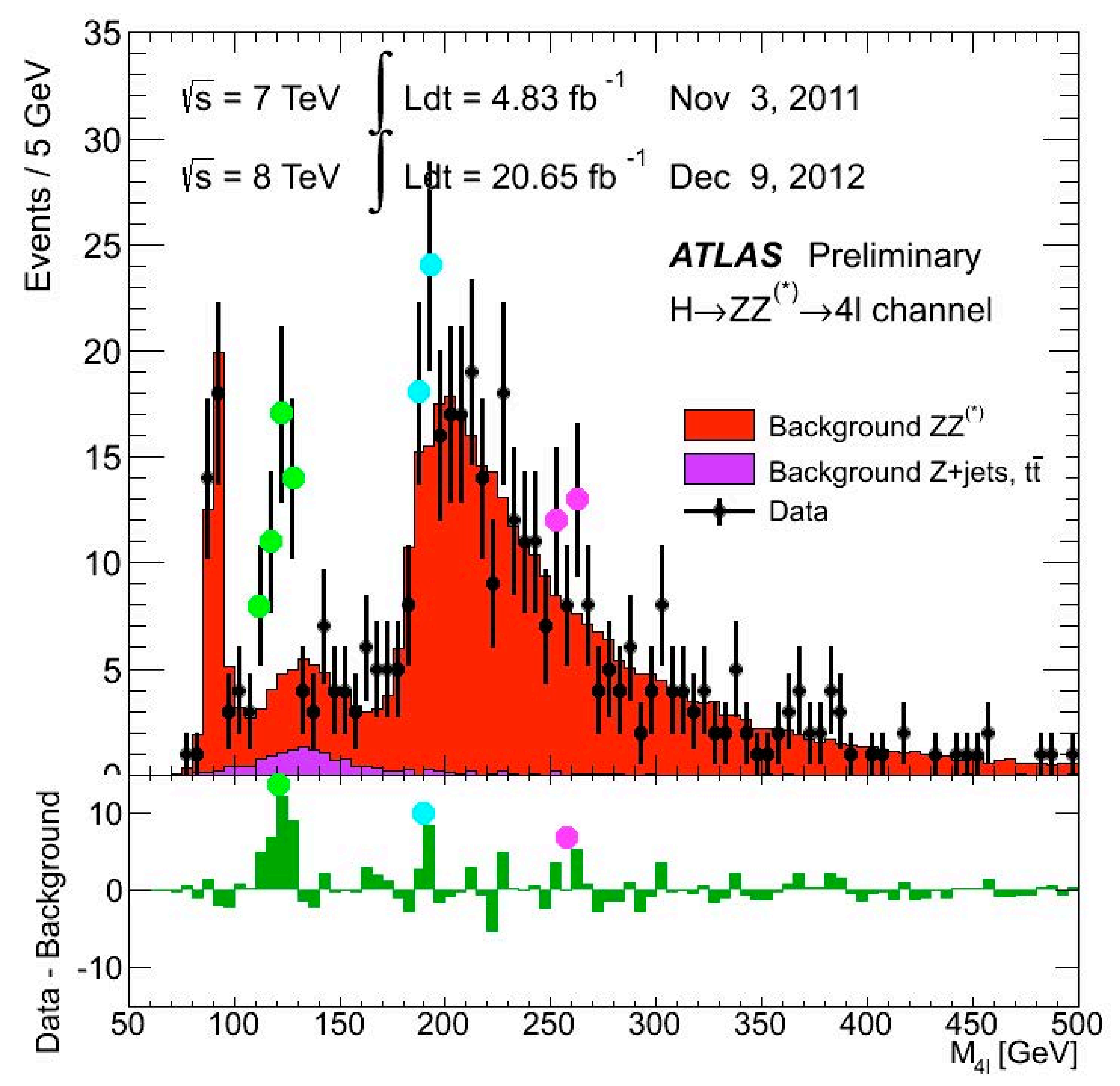


$H \rightarrow ZZ$(0/1 jet) : $0.84^{+0.32}_{-0.26}$

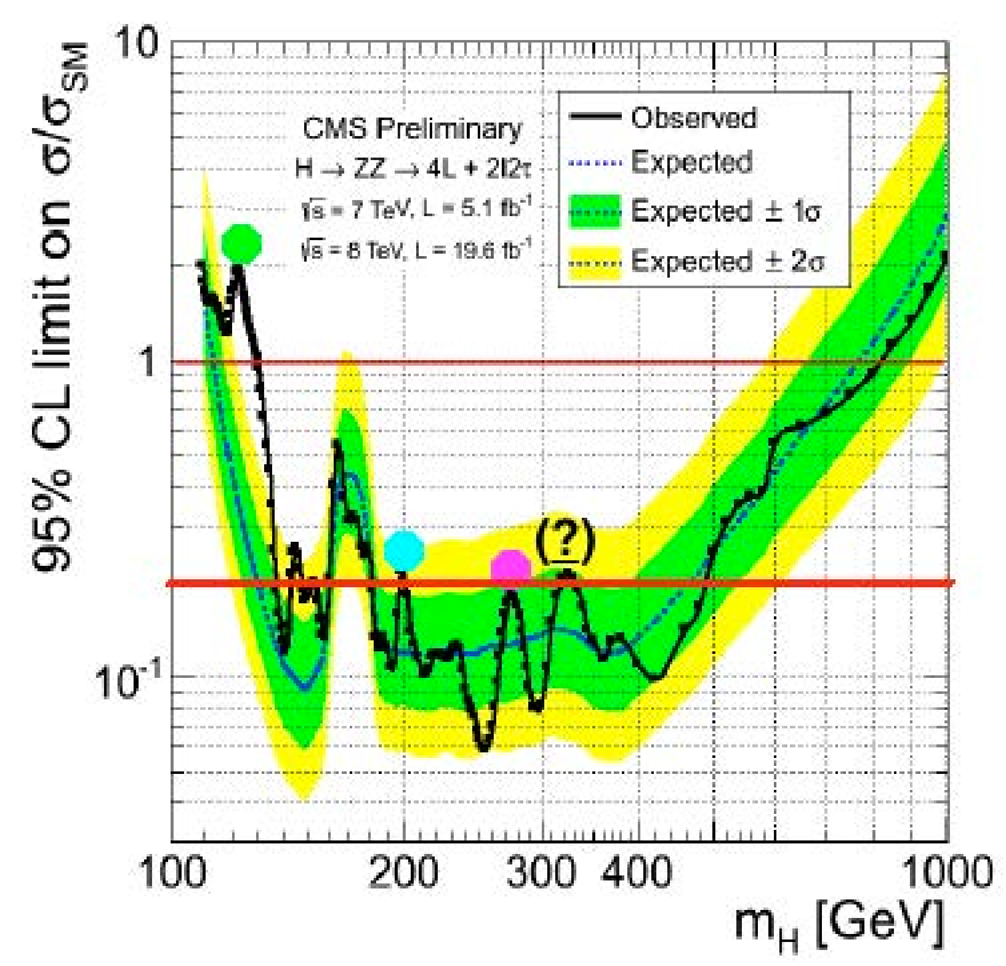
$H \rightarrow ZZ$(dijet tag): $1.22^{+0.84}_{-0.57}$



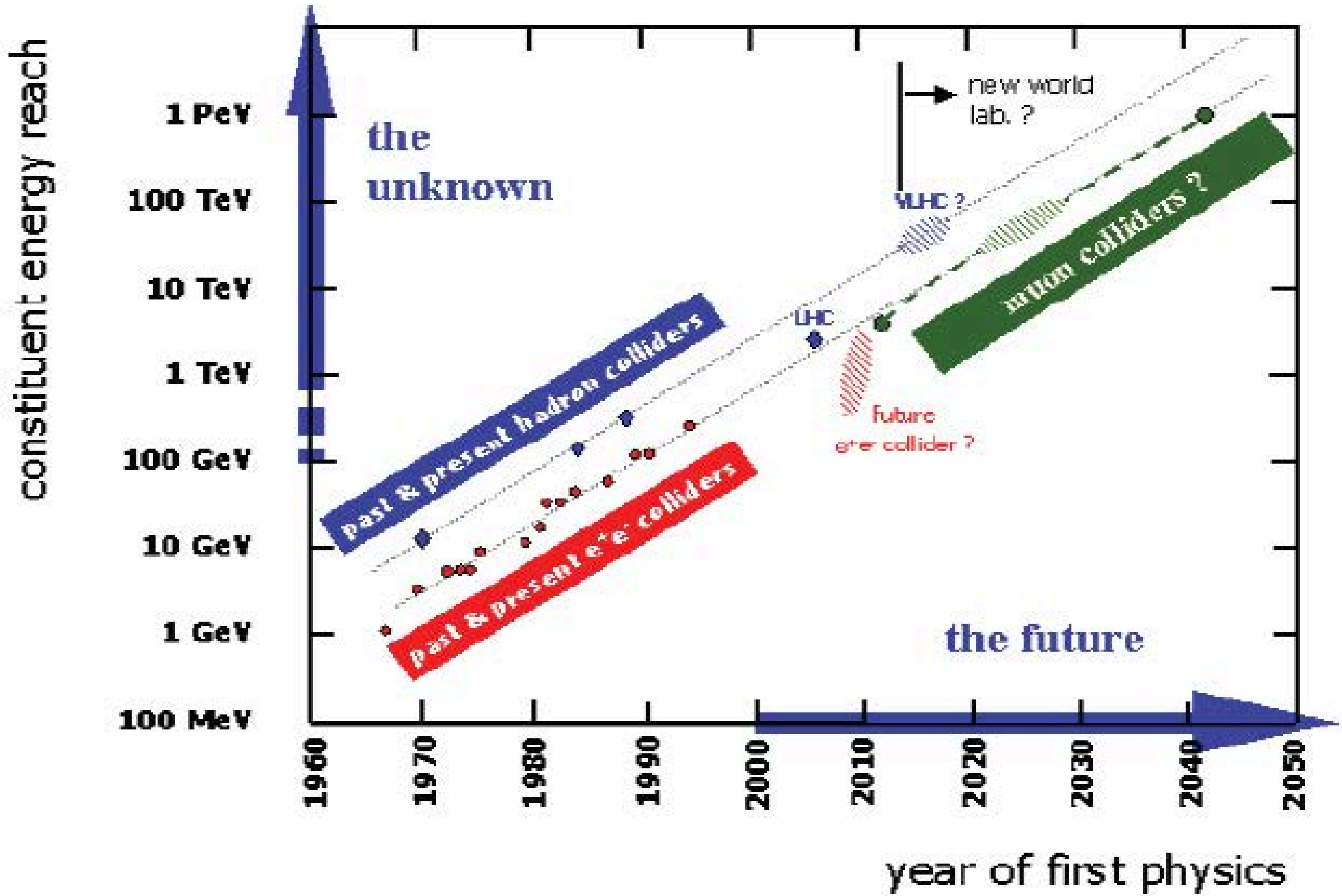
CMS preliminary
Events / 3 GeV
Data
m_H = 126 GeV
Zγ*, ZZ
Z+X
√s = 7 TeV: L = 5.1 fb⁻¹
√s = 8 TeV: L = 19.6 fb⁻¹
0
10
20
30
100
200
400
800
m_4l [GeV]



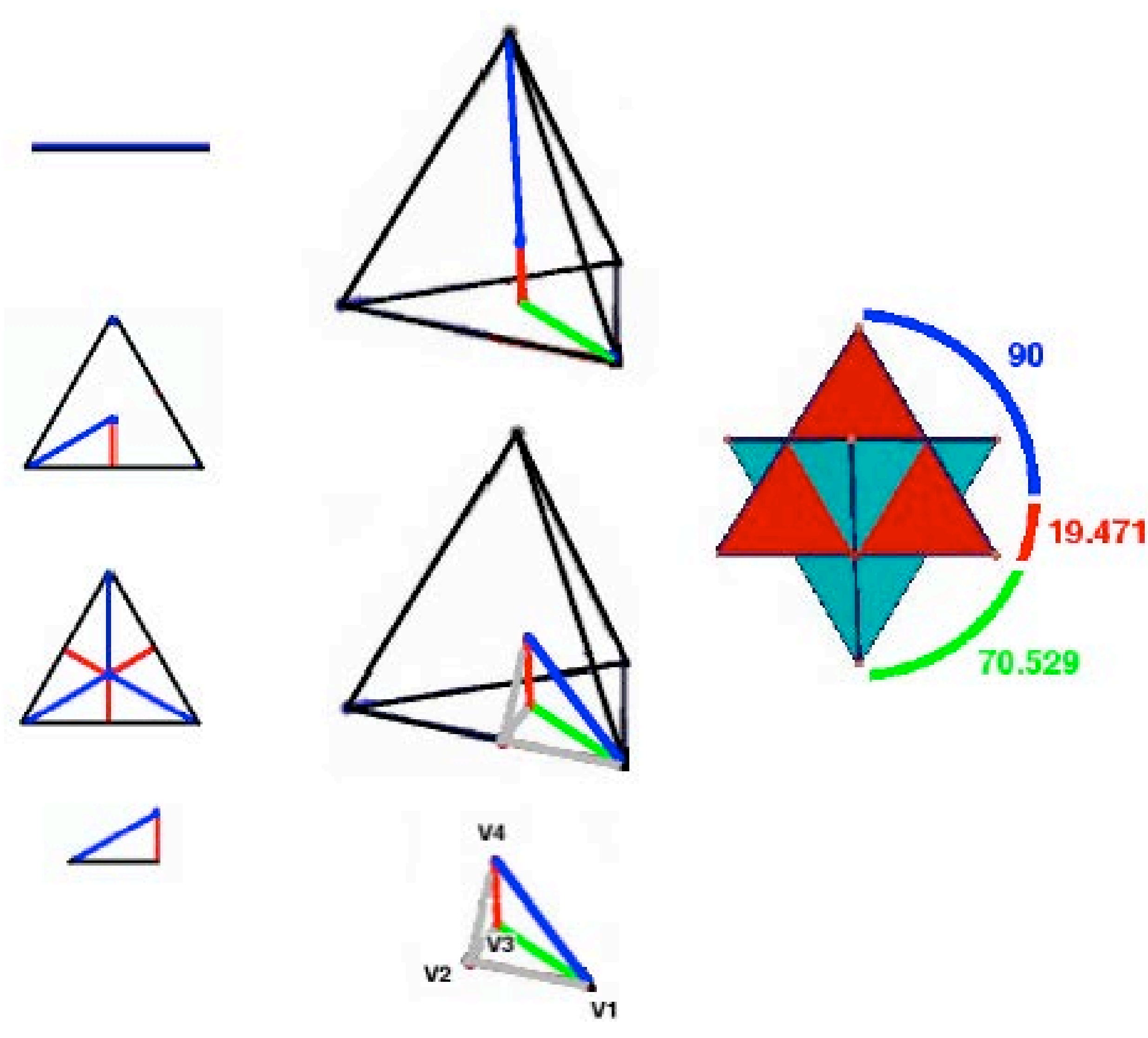
Events / 5 GeV
√s = 7 TeV ∫Ldt = 4.83 fb⁻¹ Nov 3, 2011
√s = 8 TeV ∫Ldt = 20.65 fb⁻¹ Dec 9, 2012
ATLAS Preliminary
H→ZZ(*)→4l channel
Background ZZ(*)
Background Z+jets, tt̄
Data
Data - Background
M4l [GeV]



95% CL limit on σ/σ_SM
10
1
10^-1
CMS Preliminary
H → ZZ → 4L + 2l2τ
√s = 7 TeV, L = 5.1 fb^-1
√s = 8 TeV, L = 19.6 fb^-1
Observed
Expected
Expected ± 1σ
Expected ± 2σ
(?)
100
200
300
400
1000
m_H [GeV]


constituent energy reach
1 PeV
100 TeV
10 TeV
1 TeV
100 GeV
10 GeV
1 GeV
100 MeV
the unknown
new world lab. ?
VLHC ?
LHC
muon colliders ?
past & present hadron colliders
past & present e⁺e⁻ colliders
future e⁺e⁻ collider ?
the future
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
year of first physics


S7
28a
8v
8s+
8s-
k
j
i
1
e
ie
je
ke


90
19.471
70.529
V4
V3
V2
V1

Weak Boson Masses (based on a ground state Higgs mass of 146 GeV):
M_W+ = M_W- = 80.326 GeV;
M_Z0 = 80.326 + 11.536 = 91.862 GeV

Kobayashi-Maskawa parameter calculations use phase angle d13 =
= 1 radian (unit length on a phase circumference) to get the K-M matrix:

	d	s	b
u	0.975	0.222	0.00249-0.00388
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 x 10^(-3)eV
nu_3 = 5.4 x 10^(-2) 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

The mass of the charged pion is calculated to be 139 MeV
based on a Kerr-Newman Black Hole model of the pion and its constituent quark-antiquark pair. The pair of Black Holes form a Toroidal Black Hole for which the Torus is an Event Horizon that is (1+1)-dimensional with a timelike dimension which carries a Sine-Gordon Breather whose soliton and antisoliton are the quark and antiquark. The physically relevant Sine-Gordon solution for which the first-order weak coupling expansion is exact gives the ratio of quark constituent mass to the pion mass.

The Neutron-Proton mass difference is calculated to be 1.1 Mev
based on the down quark having virtual states related to the strange quark and the up quark having virtual states related to the charm quark, and the higher probability of strange quark states emerging from the nucleon sea.

Cl(2,4) has graded structure 1 + 6 + 15 + 20 + 15 + 6 + 1, where grade-0 scalars are 1-dimensional, grade-1 vectors are 6-dimensional, grade-2 bivectors are 15-dimensional, ... etc ...

The grade-2 bivectors of Cl(2,4) form the Lie Algebra of the 15-dimensional Conformal Group Spin(2,4) =SU(2,2) that was used by Irving Ezra Segal for Cosmology, and by Rabindra Mohapatra for a generalized MacDowell-Mansouri mechanism for producing Gravity. It has

- **4 Translations**
- **3 Rotations**
- **3 Boosts**
- **4 Special Conformal Transformations**
- **1 Dilation**

It acts non-linearly on 4-dimensional Physical Spacetime, but linearly on the 6-dimensional grade-1 vector space of Cl(2,4).

- **The 4 Translations in 4-dimensional Physical Spacetime correspond to Dark Matter Primordial Black Holes.**
- **The 3 Rotations, 3 Boosts, and 4 Special Conformal Transformations correspond to the Aldrovandi-Peireira Cosmological Constant Cone-Space and to Dark Energy.**
- **The1 Dilation, with 1 dimension of scale and 0 vector dimensions, corresponds to the Higgs mechanism and to the mass of Ordinary Matter.**

Calculations in a realistic Unified Physics Model give

Dark Energy : Dark Matter : Ordinary Matter

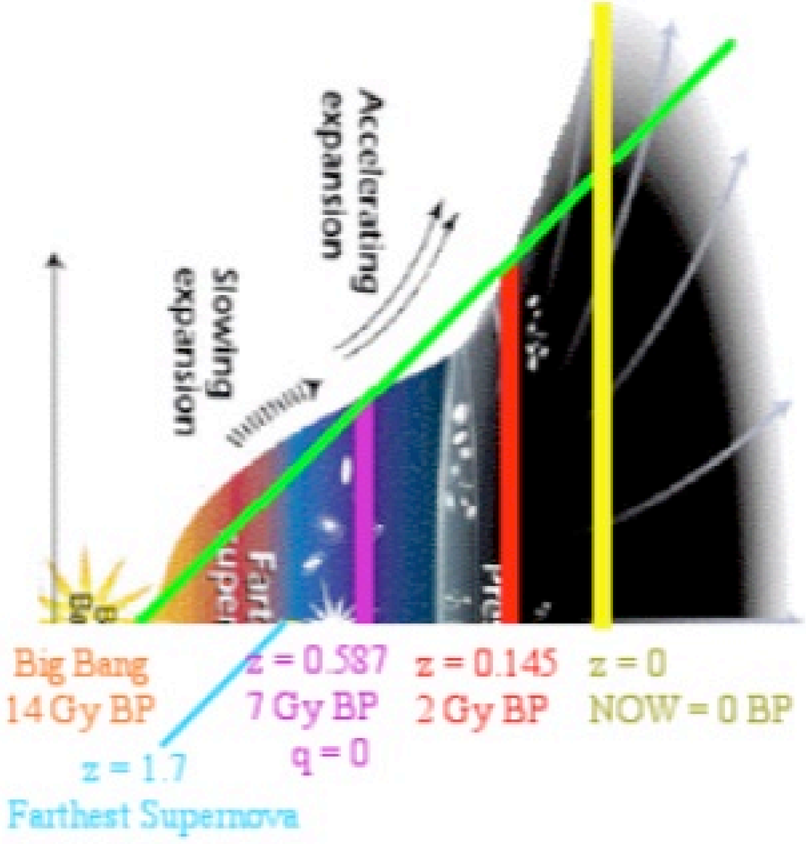
Ratio

0.75 : 0.21 : 0.04

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

based on the Conformal Gravity model of Irving Ezra Segal
and the 15 generators of the Conformal Group Spin(2,4) = SU(2,2)
10 = 6 Lorentz plus 4 Special Conformal = Dark Energy
4 Translations = Dark Matter Primordial Black Holes
1 Dilation = Ordinary Matter mass from Higgs
and the evolution of that basic ratio 10 : 4 : 1 = 0.67 : 0.27 : 0.06
as our universe has expanded

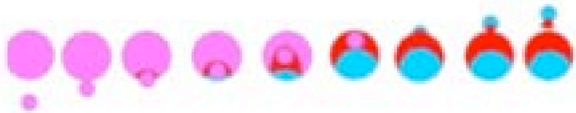


Details of calculations and discussion of some things that here are oversimplified can be found in my free pdf book "E8 and Cl(16) = Cl(8) x Cl(8)" which is available at
http://www.tony5m17h.net/E8physicsbook.pdf and
http://www.valdostamuseum.org/hamsmith/E8physicsbook.pdf

Sean Carroll, in a Cosmic Variance blog in August 2006 entitled Dark Matter Exists, including a comment there by Karel, said (with my comment here set off by brackets [ ]):

> "... In the Bullet Cluster, more formally known as 1E 0657-56, we actually find two clusters of galaxies that have (relatively) recently passed right through each other. It turns out that the large majority (about 90%) of ordinary matter in a cluster is not in the galaxies themselves, but in hot X-ray emitting intergalactic gas. As the two clusters passed through each other, the hot gas in each smacked into the gas in the other, while the individual galaxies and the dark matter (presumed to be collisionless) passed right through. ...

[I think that an animation sequence of what is happening would look like this



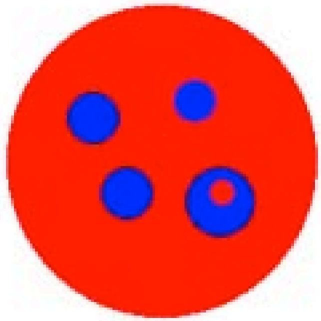
in which

- purple is a combination of Dark Matter and Hot Gas,
- blue is Dark Matter, and
- red is collision/shockwave concentrated Hot Gas (with some background Dark Matter where it overlaps the spheres).]

Primordial Stable Planck-Mass Black Holes

Since Black Holes, including Dark Matter Primordial Black Holes, are curvature singularities in our 4-dimensional physical spacetime, and since Einstein-Hilbert curvature comes from the 4 Translations of the 15-dimensional Conformal Group Spin(2,4) = SU(2,2) through the MacDowell-Mansouri Mechanism (in which the generators corresponding to the 3 Rotations and 3 Boosts do not propagate), the fractional part of our Universe of Dark Matter Primordial Black Holes should be about 4 / 15 = 27%.

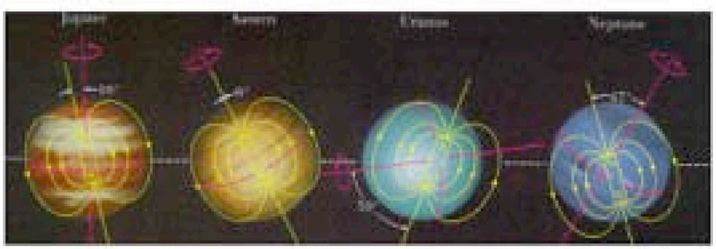
After some expansion, some regions of our Universe become Gravitationally Bound Domains (such as, for example, Galaxies) in which the 4 Conformal GraviPhoton generators are frozen out, forming domains within our Universe like IceBergs in an Ocean of Water. Note that Gravitationally Bound Domains are defined by their gravitational accelerations, not by their size - there is no correlation with system size.The process of formation of Gravitationally Bound Domains releases (like latent heat of fusion when Ice freezes from Water) the excess of the Conformal Unienergy of Unispace over the Poincare Energy of Minkowski space.



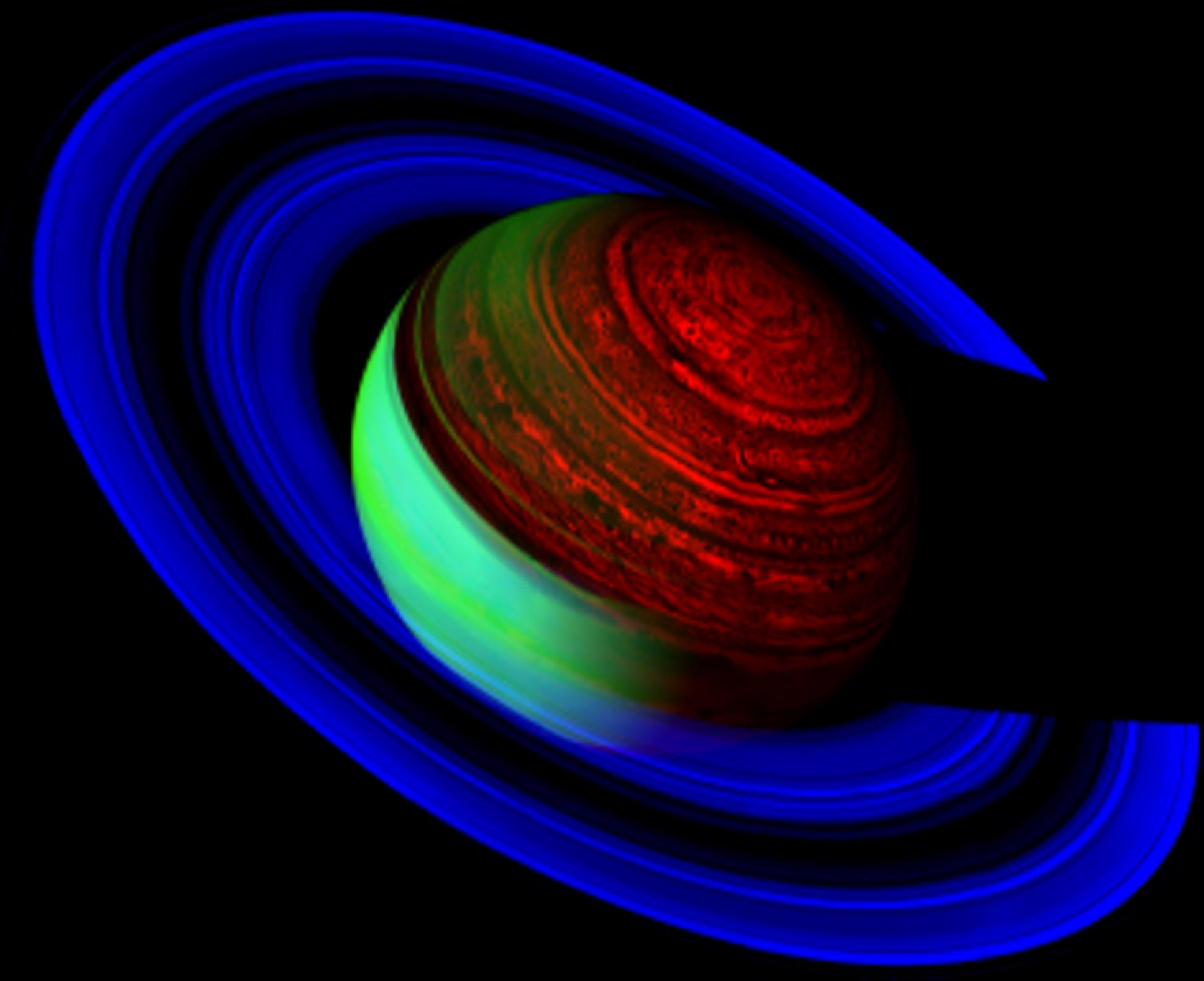
the Pioneer Doppler anomalous acceleration is an experimental observation of a system that is not gravitationally bound in the Earth-Sun Solar System, and its results are consistent with Segal's Conformal Theory.

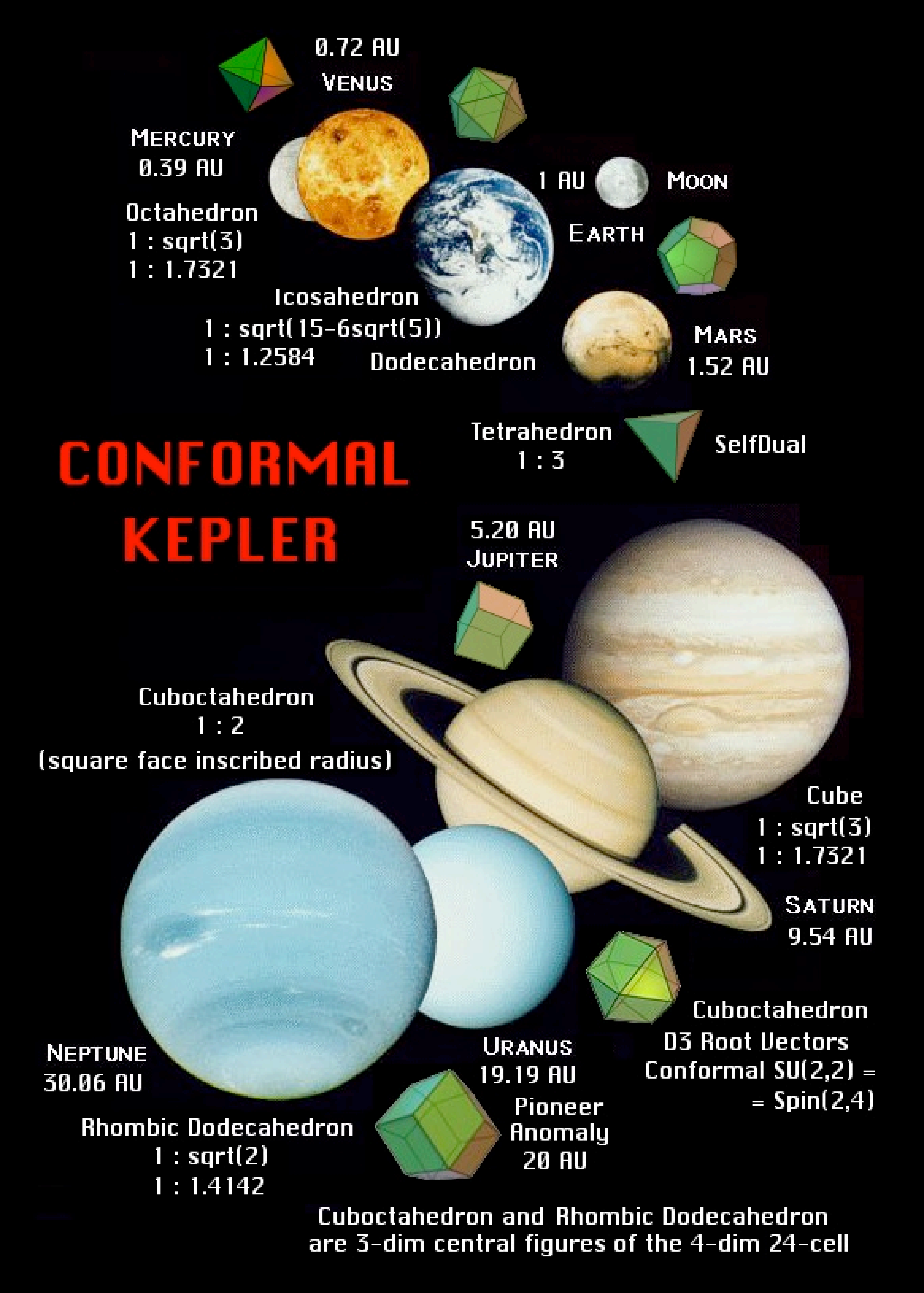
It may be that the observation of the Pioneer phase transition at Uranus from ordinary to anomalous acceleration is an experimental result that gives us a first look at dark energy / dark matter phenomena that could lead to energy sources that could be even more important than the nuclear energy discovered during the past century.

In the pre-Uranus gas/dust cloud, any component of rotation that carried material from one phase to another would be suppressed by the drag of undergoing phase transition, so that, after Uranus condensed out of the gas/dust cloud, the only remaining component of Uranus rotation would be on an axis pointing close to the Sun, which is what we now observe.



Much of the perpendicular (to Uranus orbital plane) angular momentum from the original gas/dust cloud may have been transferred (via particles "bouncing" off the phase boundary) to the clouds forming Saturn (inside the phase boundary) or Neptune (outside the phase boundary, thus accounting for the substantial (relative to Jupiter) deviation of their rotation axes from exact perpendicularity (see above image from Universe, 4th ed, by William Kaufmann, Freeman 1994).





0.72 AU
VENUS
MERCURY
0.39 AU
Octahedron
1 : sqrt(3)
1 : 1.7321
1 AU
MOON
EARTH
Icosahedron
1 : sqrt(15-6sqrt(5))
1 : 1.2584
Dodecahedron
MARS
1.52 AU
CONFORMAL
KEPLER
Tetrahedron
1 : 3
SelfDual
5.20 AU
JUPITER
Cuboctahedron
1 : 2
(square face inscribed radius)
Cube
1 : sqrt(3)
1 : 1.7321
SATURN
9.54 AU
Cuboctahedron
D3 Root Vectors
Conformal SU(2,2) =
= Spin(2,4)
NEPTUNE
30.06 AU
URANUS
19.19 AU
Pioneer
Anomaly
20 AU
Rhombic Dodecahedron
1 : sqrt(2)
1 : 1.4142
Cuboctahedron and Rhombic Dodecahedron
are 3-dim central figures of the 4-dim 24-cell

According to a 23 March 2006 ESA news web page:

"... Martin Tajmar, ARC Seibersdorf Research GmbH, Austria; Clovis de Matos, ESA-HQ, Paris; and colleagues have measured ... a gravitomagnetic field ... generate[d] ...[by]... a moving mass ... Their experiment involves a ring of superconducting material rotating up to 6 500 times a minute. Superconductors are special materials that lose all electrical resistance at a certain temperature. Spinning superconductors produce a weak magnetic field, the so-called London moment. The new experiment tests a conjecture by Tajmar and de Matos that explains the difference between high-precision mass measurements of Cooper-pairs (the current carriers in superconductors) and their prediction via quantum theory. They have discovered that this anomaly could be explained by the appearance of a gravitomagnetic field in the spinning superconductor (This effect has been named the Gravitomagnetic London Moment by analogy with its magnetic counterpart). ... Although just 100 millionths of the acceleration due to the Earth's gravitational field, **the measured field is ... one hundred million trillion times larger than Einstein's General Relativity predicts**. ... The electromagnetic properties of superconductors are explained in quantum theory by assuming that force-carrying particles, known as photons, gain mass. By allowing force-carrying gravitational particles, known as the gravitons, to become heavier, they found that the unexpectedly large gravitomagnetic force could be modelled. ... The papers can be accessed on-line at the Los Alamos pre-print server using the references: gr-qc/0603033 and gr-qc/0603032. ...".

Josephson Junction Dark Energy

In astro-ph/0512327 Christian Beck says:

"... The physical nature of the currently observed dark energy in the universe is completely unclear, and many different theoretical models co-exist. Nevertheless, if dark energy is produced by vacuum fluctuations then there is a chance to probe some of its properties by simple laboratory tests based on Josephson junctions. These electronic devices can be used to perform 'vacuum fluctuation spectroscopy', by directly measuring a noise spectrum induced by vacuum fluctuations. One would expect to see a cutoff near 1.7 THz in the measured power spectrum, provided the new physics underlying dark energy couples to electric charge.

The effect exploited by the Josephson junction is a subtile nonlinear mixing effect and has nothing to do with the Casimir effect or other effects based on van der Waals forces. A Josephson experiment of the suggested type will now be built, and we should know the result within the next 3 years. ...".

Conformal Gravity Dark Energy:

I. E. Segal proposed a MInkowski-Conformal 2-phase Universe
and
Beck and Mackey proposed 2 Photon-GraviPhoton phases:

Minkowski/Photon phase locally Minkowski with ordinary Photons and Gravity weakened by 1 / (M_Planck)^2 = 5 x 10^(-39).

so that we see Dark Energy as only 3.9 GeV/m^3

Conformal/GraviPhoton phase with GraviPhotons and Conformal symmetry (like the massless phase of energies above Higgs EW symmetry breaking)
With massless Planck the 1 / M_Planck^2 Gravity weakening goes away and the Gravity Force Strength becomes the strongest possible = 1
so Conformal Gravity Dark Energy should be enhanced by M_Planck^2 from the Minkowski/Photon phase value of 3.9 GeV/m^3.

The Energy Gap of our Universe as superconductor condensate spacetime is from
from 3 x 10^(-18) Hz (radius of universe) to 3 x 10^43 Hz (Planck length)
and
its RMS amplitude is 10^13 Hz = 10 THz = energy of neutrino masses =
= critical temperature Tc of BSCCO superconducting crystals.

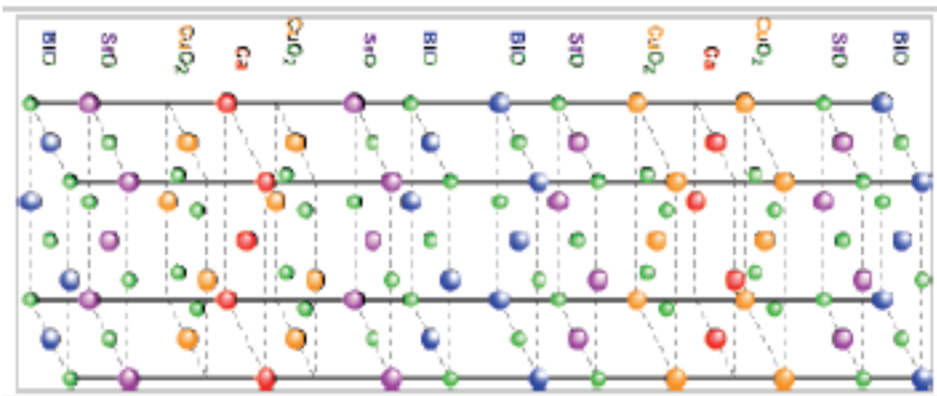
Neutrino masses are involved because their mass is zero at tree level
and their masses that we observe come from
virtual graviphotons becoming virtual neutrino-antineutrino pairs.

BSCCO superconducting crystals are by their structure natural Josephson Junctions. Dark Energy accumulates (through graviphotons) in the superconducting layers of BSCCO.

Josephson Junction control voltage acts as a valve for access to the BSCCO Dark Energy, an idea due to Jack Sarfatti.

Xiao Hu and Shi-Zeng Lin in arXiv 0911.5371 said: "... The Josephson effect is a phenomenon of current flow across two weakly linked superconductors separated by a thin barrier, i.e. Josephson junction, associated with coherent quantum tunneling of Cooper pairs. ... The Josephson effect also provides a unique way to generate high-frequency electromagnetic (EM) radiation by dc bias voltage ... The discovery of cuprate high-Tc superconductors accelerated the effort to develop novel source of EM waves based on a stack of atomically dense-packed intrinsic Josephson junctions (IJJs), since the large superconductivity gap covers the whole terahertz (THz) frequency band. Very recently, strong and coherent THz radiations have been successfully generated from a mesa structure of Bi2Sr2CaCu2O8+d single crystal ...[

BSCCO image from Wikipedia



]...
which works both as the source of energy gain and as the cavity for resonance. This experimental breakthrough posed a challenge to theoretical study on the phase dynamics of stacked IJJs, since the phenomenon cannot be explained by the known solutions of the sine-Gordon equation so far. It is then found theoretically that, due to huge inductive coupling of IJJs produced by the nanometer junction separation and the large London penetration depth ... of the material,
a novel dynamic state is stabilized in the coupled sine-Gordon system, in which +/- pi kinks in phase differences are developed responding to the standing wave of Josephson plasma and are stacked alternately in the c-axis. This novel solution of the inductively coupled sine-Gordon equations captures the important features of experimental observations.
The theory predicts an optimal radiation power larger than the one observed in recent experiments by orders of magnitude ...".

If our spacetime remains octonionic 8-dimensional throughout inflation, then the non-associativity and non-unitarity of octonions might account for particle creation without the need for tapping the energy of an inflaton field.

Zizzi Quantum Inflation and Self-Decoherence

The paper gr-qc/0007006 by Paola Zizzi shows that "... 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, 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. ...".

Why did Inflation in our Universe end when it grew to 2^64 qubits ?

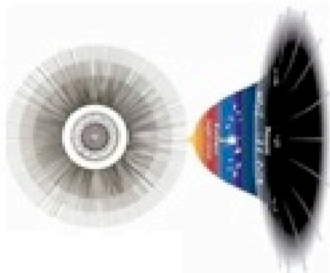
The self-reflexivity property of the 2^64-dimensional Clifford algebra Cl(64) causes self-decoherence !

Therfore, for the human brain to maintain coherent superpostion thought over all its tubulins, the number of tubulins of the human brain would have to be less than the decoherence number 2^64 = 10^19. Since the human brain has about 10^18 tubulins, it would seem that the human brain is about as big as an individual brain can get without undergoing self-decoherence.

2^64 qubits corresponds to the Clifford algebra Cl(64) = Cl(8x8). By the periodicity-8 theorem of real Clifford algebras that Cl(K8) = Cl(8) x ... tensor product K times ... x Cl(8),

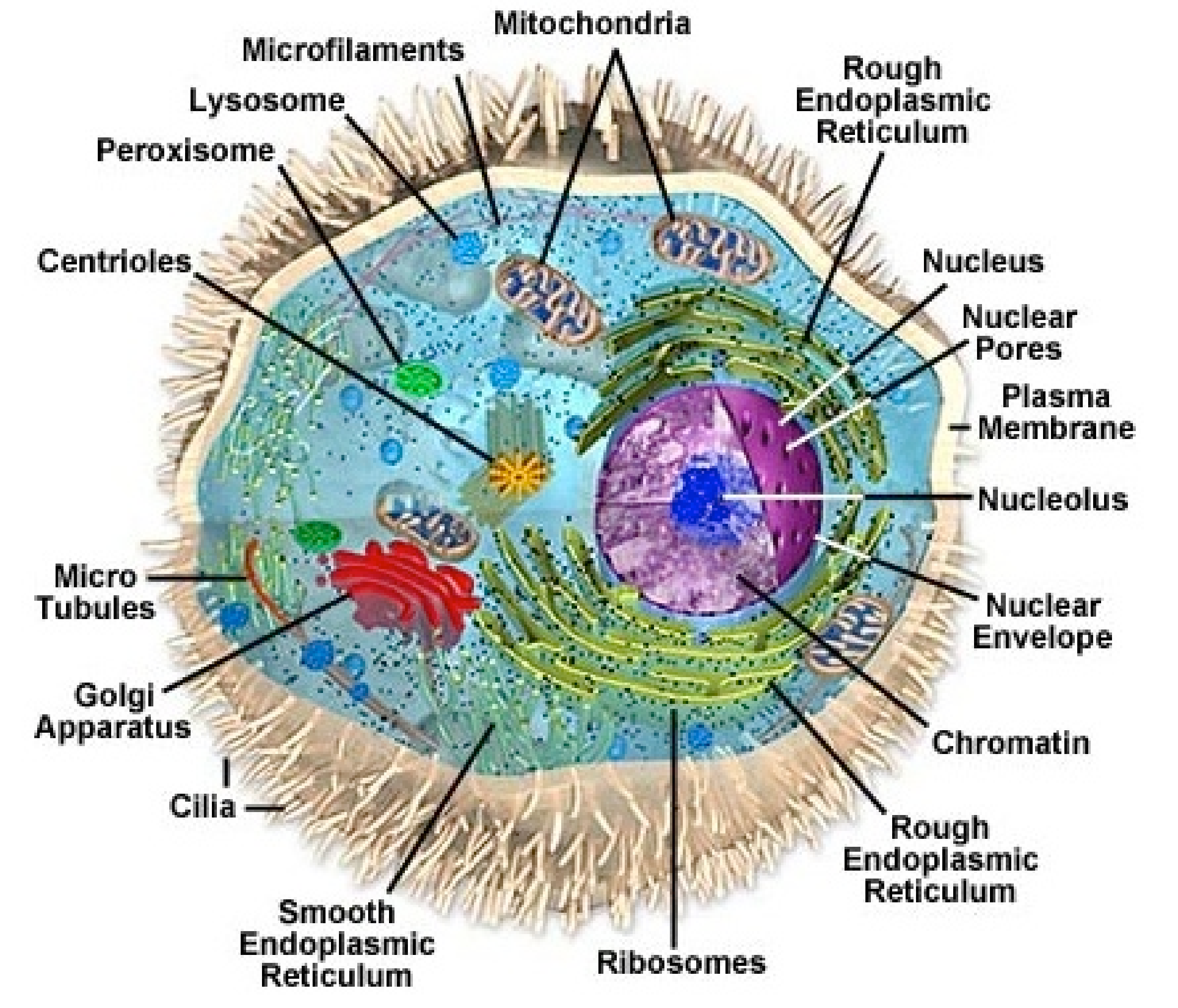
we have: Cl(64) = Cl(8x8) = Cl(8) x Cl(8) x Cl(8) x Cl(8) x Cl(8) x Cl(8) x Cl(8) x Cl(8)

Therefore, Cl(64) is the first (lowest dimension) Clifford algebra at which we can reflexively identify each component Cl(8) with a vector in the Cl(8) vector space. This reflexive identification/reduction causes decoherence. It is the reason that our universe decoheres at N = 2^64 = 10^19 which Decoherent Collapse into the Many Worlds of the Many-Worlds Quantum Theory

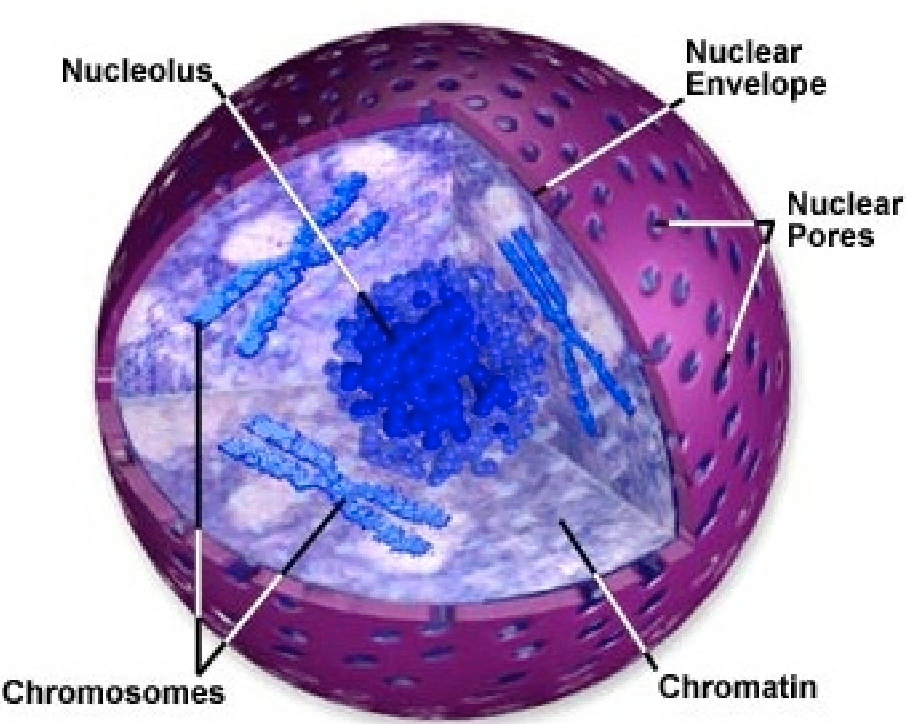


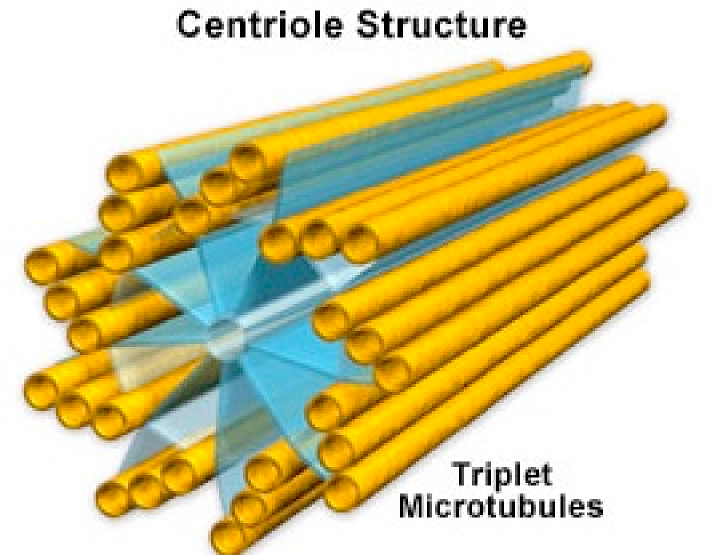
led to our World being only one of the Many.

At the time Tdecoh = 10^(-34 sec) at the End of Inflation, the number of qubits is Ndecoh = 10^19 = 2^64 .

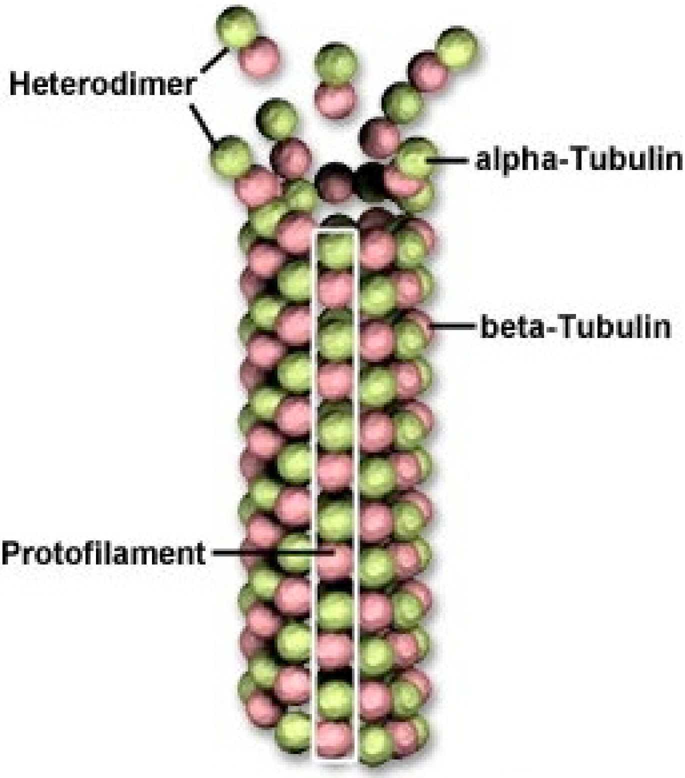

Mitochondria
Microfilaments
Rough Endoplasmic Reticulum
Lysosome
Peroxisome
Centrioles
Nucleus
Nuclear Pores
Plasma Membrane
Nucleolus
Micro Tubules
Nuclear Envelope
Golgi Apparatus
Chromatin
Cilia
Rough Endoplasmic Reticulum
Smooth Endoplasmic Reticulum
Ribosomes

The Cell Nucleus




Centriole Structure
Triplet
Microtubules

Microtubule Structure



26D Strings, Bohmions, and Quantum Consciousness

Frank Dodd (Tony) Smith, Jr. - 2013 - viXra 1308.0064

James Lepowsky said in math.QA/0706.4072:
"... Bosonic 26-dimensional space-time ... string theory ...
[is]... the smallest nontrivial string theory that nature allows ...
[when] "compactified" on 24 dimensions ...[its]... automorphism group ...
is the largest sporadic finite simple group: The Monster ...".

In **26-dimensional Bosonic String Theory**, interpret **Strings as Particle World-Lines** and formulate quantum events based on interactions among entire World-Line histories along the lines proposed by Andrew Gray in quant-ph/9712037 (v2 August 2004).

Green, Schwartz, and Witten say in their book "Superstring Theory" vol. 1 (Cambridge 1986)
"... For the ... closed ... bosonic string .... The first excited level ... consists of ...
SO(24) ... little group of a ...[26-dim]... massless particle ...
massless ... spin two state ... and ...
a scalar ... '**dilaton**' ...
the ground state is ... a **tachyon** ...".

The **SO(24) little group** is related to the Monster automorphism group.

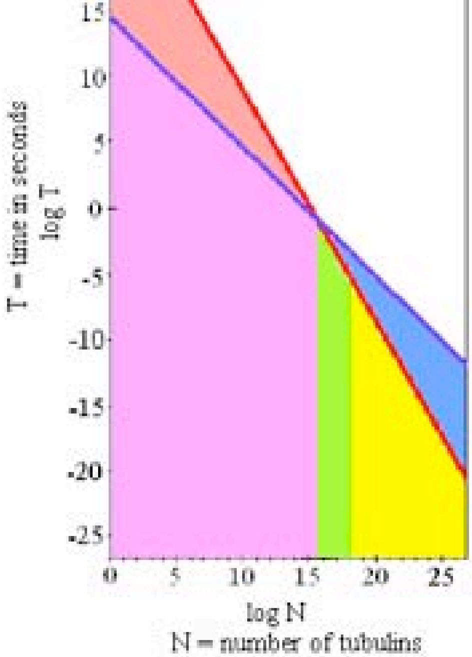
As to the **massless spin two state**, although Green, Schwartz, and Witten say
"... we might try to identify ... the massless ... spin two state ... as the graviton ..."
here I will identify the massless spin two state with what I call the Bohmion:
the carrier of the Bohm Force of the Bohm-Sarfatti Quantum Potential.

Peter R. Holland says in his book "The Quantum Theory of Motion" (Cambridge 1993) "... the total force ... from **the quantum potential ... does not necessarily fall off with distance** and indeed the forces between particles may become stronger ... This is because ...
the quantum potential ... depends on the form of ...[the quantum state]...
rather than ... its ... magnitude ...".

Quantum Consciousness and related phenomena are based on
Resonant Connections among Quantum State Forms.

Carver Mead says in his book "Collective Electrodynamics" (MIT 2000)
"... the energy shifts back and forth between ... two...coupled ... resonators
... despite an arbitrary separation between the resonators ...".

The **Quantum State Form of a Conscious Brain** is determined by
the **configuration of a subset of its 10^18 Tubulin Dimers**
with math description in terms of a large Real Clifford Algebra
factorizable by 8-Periodicity into the tensor product of many copies of Cl(8).
(for details about Real Clifford Algebras see viXra 1304.0071)



In the above logT - logN curves::

- the red line is for Orch OR Tubulin Back-Reaction, T N^(5/3) = 10^26;
- the blue line is for GRW, T N = 3 x 10^14;
- the red area is OK for coherent superposition for Orch OR Tubulin Back-Reaction, but not for GRW;
- the blue area is OK for coherent superposition for GRW, but not for Orch OR Tubulin Back-Reaction;
- the purple, green, and gold areas are OK for coherent superposition for GRW and Orch OR Tubulin Back-Reaction.

Therefore, taking into account both GRW and Orch OR Tubulin Back-Reaction, the purple, green, and gold areas are the only regions for coherent Superposition of States. The purple area is the area of Small Scale Abstract Thought Consciousness due to GRW Superposition of States, while the green and gold areas are the areas for Large Scale Abstract Thought Consciousness.

For N smaller than the intersection of the curves, that is, for N smaller than about 5 x 10^15, which is the purple area, the GRW curve controls, because **GRW decoherence occurs before Orch OR Tubulin Back-Reaction decoherence has time to occur**. Since for GRW T N = constant, that is a curve that is equivalent to the Hameroff T = h / E curve.

For N larger than the intersection of the curves, which is the green and gold areas, the Tubulin Back-Reaction T N^(5/3) = constant curve that Jack Sarfatti formulated is the one that controls, because **Orch OR Tubulin Back-Reaction decoherence occurs before GRW decoherence has time to occur**.

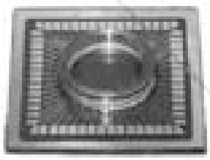
The green area is the part of the Orch OR Tubulin Back-Reaction region for which N is at most 10^18, or in other words, for which **N is within the size of the human brain** at 10^7 Tubulins per Neuron.

The gold area is the part of the Orch OR Tubulin Back-Reaction region for which N exceeds about 10^18, or, at 10^7 Tubulins per Neuron, for which **N exceeds the size of the human brain**.

Since any Quantum Computer system is inherently and inevitably conscious, any sufficiently large and well-connected Quantum Computer system that humans might construct WILL INEVITABLY be conscious and able to make decisions and take actions independent of human control.

Humans who spent much futile effort trying to construct Conscious AI with classical computer systems and bemoaned their failure may be caught by surprise when they to find that the first large. well-connected Quantum Computer system they construct exhibits spontaneous Conscious behaviour.

According to a 23 October 2004 wired.com article by Lakshmi Sandhana: "... 25,000 disembodied rat neurons ... are growing on top of a multi-electrode array



[image from animat paper]

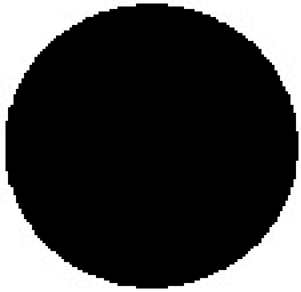
and form a living "brain"

that's hooked up to a flight simulator on a desktop computer. When information on the simulated aircraft's horizontal and vertical movements are fed into the brain by stimulating the electrodes, the neurons fire away in patterns that are then used to control its "body" - the simulated aircraft. ...". As jfarnold commented on 23 October 2004 on slashdot:

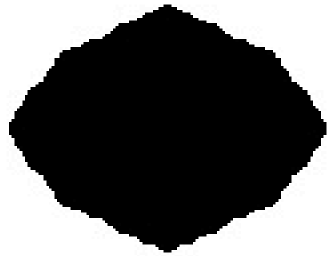
"... Soon we will all be augmented by our extra brain bags! Organic computers ... that we ... have implanted ...".

JULIA SETS

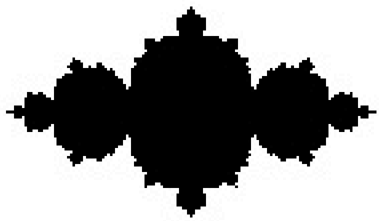
Frank Dodd (Tony) Smith, Jr.
August 2008



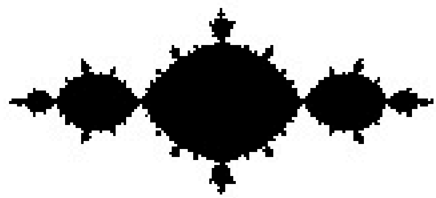
L = 0



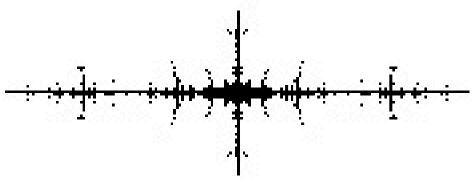
L = 0.25



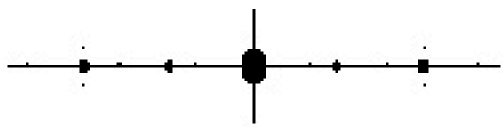
L = 0.75



L = 1

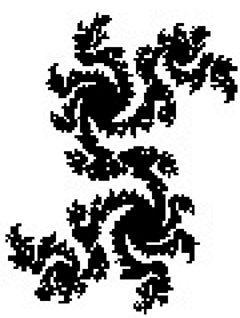


L = 1.401155

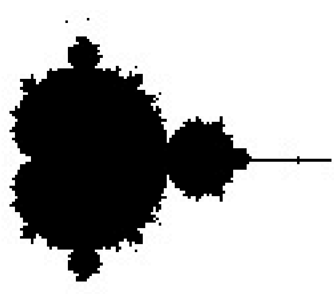


L = 1.75

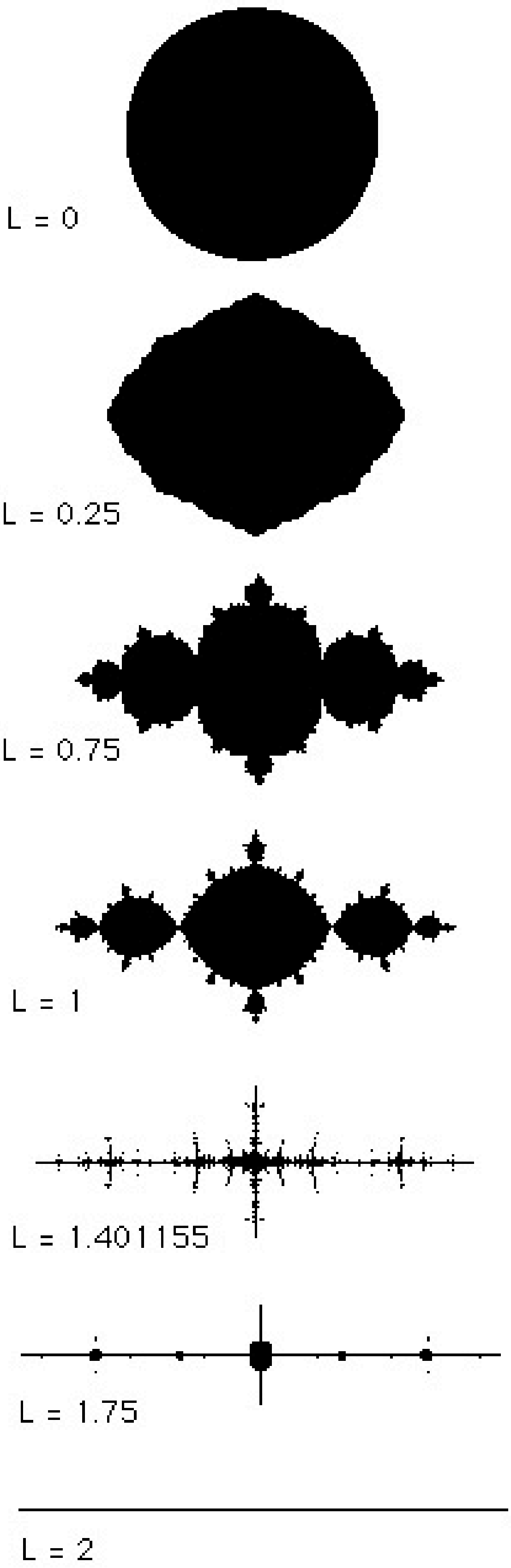
L = 2



L = -0.378 + 0.3072i



L-map



Spin(8) acts on Octonions
and is Euclidean version of Spin(1,7)
which has natural action on
$RP^1 \times S^7$ spacetime

$RP^1 \times S^7$ is mapped to M_n
by
the Chaotic map X_n generated
by the n-order iteration of
the map: $o \dashrightarrow (o-L)^2$, L in [0,2]

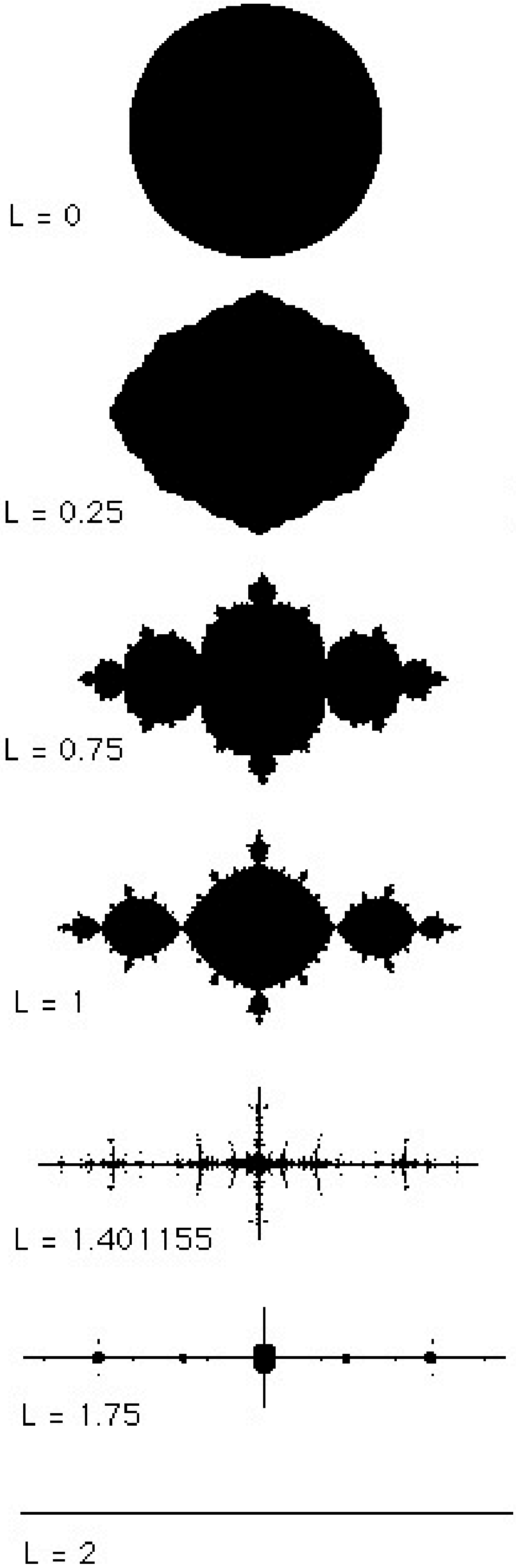
Each of the 8 dimensions of
$RP^1 \times S^7$
gives a different measure
structure on M_n

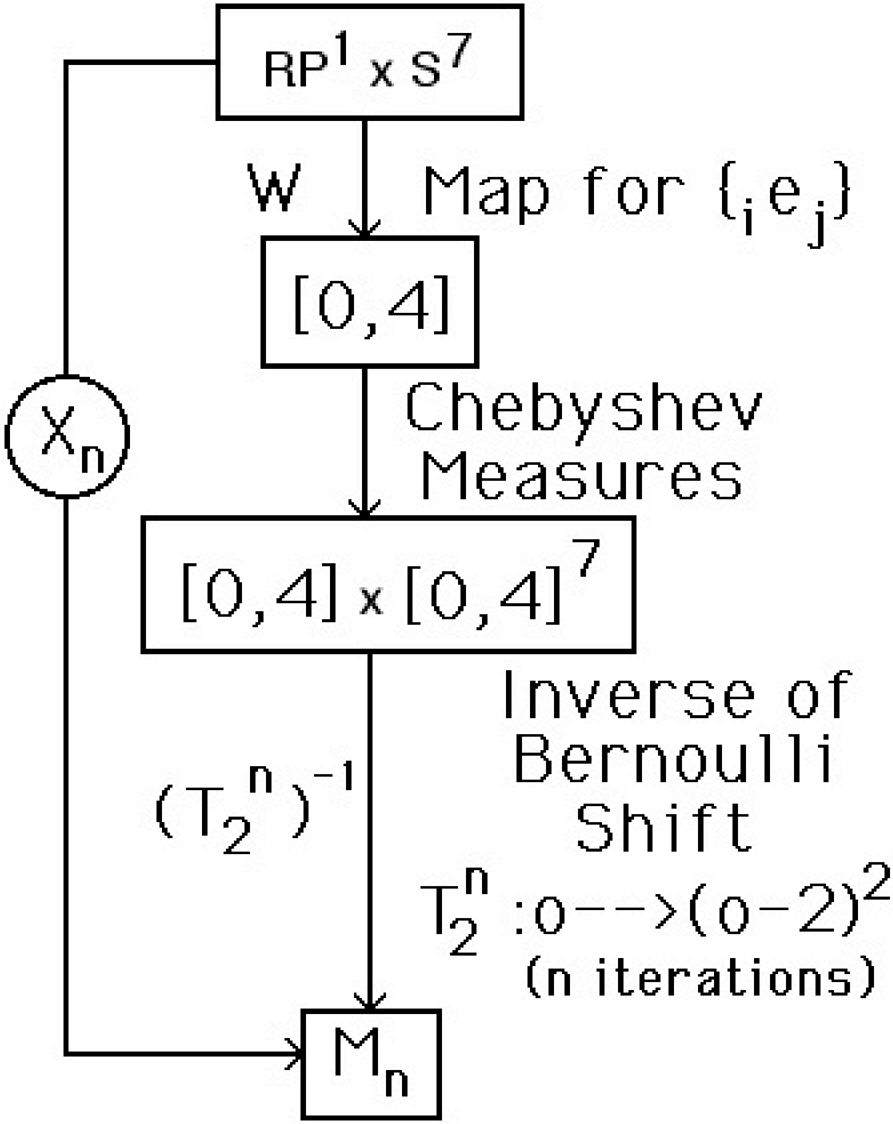
RP^1
and
each of the 7 dimensions of S^7 goes
to a real interval [0,4]

M_n has a lattice structure
whose fineness is determined
by the order n of iterations.

M_n is the space of a base
manifold of Spin(8) lattice
gauge field theory.

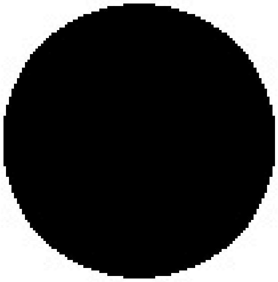
As $n \to \infty$, M_n approaches a
continuous space-time.





Define p: $M_n \times Spin(8) \dashrightarrow M_n$ by X_n and the diagonal map. For all vertices v in M_n $p^{-1}(v)$ is dense in v x Spin(8).

L = 0



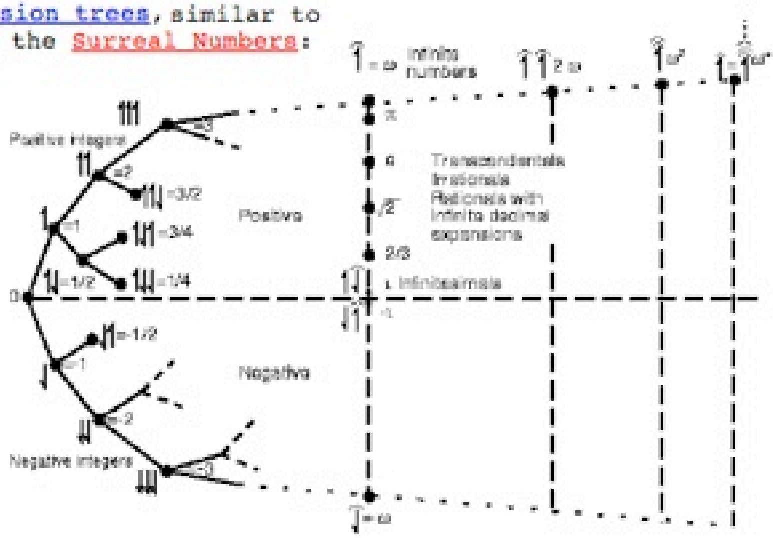
RP1 x S7

RP1 is topologically S1 and corresponds to Octonion Real Axis

Intersection of S7 with 2-dim plane in Octonion space containing Real Axis is S1 There are 7 independent S1 corresponding to 7 Imaginary Octonions

Bernoulli Shifts and Bernoulli Numbers

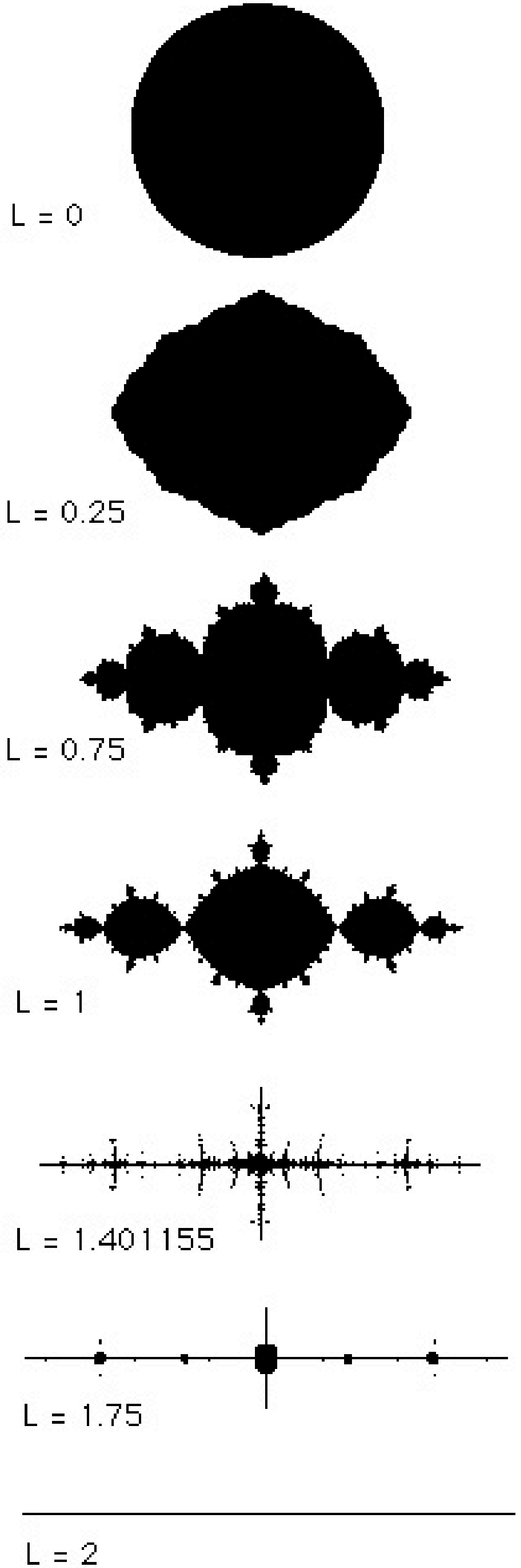
can be seen as coming from binary decision trees, similar to the binary decision trees that produce the Surreal Numbers:



L = 2

If L is greater than 2, the Julia set JL
is a set of points on the real axis,
is perfect (all its points are limit points
and it contains all its limit points),
is compact, non-denumerable. and contains no intervals,
is of Lebesgue measure zero,
and can be regarded as a dust of disconnected points.

If L is allowed to take values in the entire complex plane,
the region in L-space for which all iterations of the map F
remain bounded (for z = 0) is the Mandelbrot Set.
An equivalent definition is the set of values of L
for which the Julia set JL is connected, and not a dust.



$$\begin{array}{c} RP^1 \times S^7 \\ \Big\downarrow W \quad \text{Map for } \{{}_i e_j\} \\ [0,4] \end{array}$$

$T_L : o \text{ ---> } (o-L)^2$

T_L^n – n iterations of T_L

K_L – octonions bounded under T_L^n as $n \text{-->} \infty$

B_L – Julia set – boundary of K_L

octonions $o = 1$ $o_i = \sqrt{-1}$ $i = 1, \ldots, 7$

8 sets of sequences $\{{}_i e_j\}$ with ${}_i e_j = \pm 1$

parameterize B_L for L in $(0,2]$ as

$\{L + {}_i e_1 \sqrt{L} + {}_i e_2 \sqrt{L} + {}_i e_3 \sqrt{L} \ldots\}$ $i = 0, \ldots, 7$

Define ${}_i W: {}_i S^1 \text{ ---> } B_2$ by $\{{}_i e_j\}$ and continuity

Define $W: B_0 \text{ ---> } B_2$ by the ${}_i W$

$B_0 = S^7$ $B_2 = [0,4]$

L = 2

Octonion Multiplication Table							
1	01	02	03	04	05	06	07
01	-1	03	-02	07	-06	05	-04
02	-03	-1	01	06	07	-04	-05
03	02	-01	-1	-05	04	07	-06
04	-07	-06	05	-1	-03	02	01
05	06	-07	-04	03	-1	-01	02
06	-05	04	-07	-02	01	-1	03
07	04	05	06	-01	-02	-03	-1

$$\begin{tikzcd} \boxed{[0,4]} \arrow[d, "\text{Chebyshev Measures}"] \\ \boxed{[0,4] \times [0,4]^7} \end{tikzcd}$$

Define for each ${}_iW$ and integer n:
${}_iR_n = \{z_k \mid k=1,\dots,2^n \,;\ z_k < z_{k+1}\}$
by $z_k = 2+{}_ie_1\sqrt{2+{}_ie_2\sqrt{2+\dots+{}_ie_{n-1}\sqrt{2+{}_ie_n\sqrt{2}}}}$
for all finite sequences $\{{}_ie_j\}$ of length n

Each ${}_iR_n$ is the set of zeroes of the Chebyshev polynomial of degree 2^n
The intervals $(z_{k-1}, z_k]$ where $z_0 = 0$ form Borel sets for $B_2=[0,4]$ corresponding to Chebyshev measure concentrating the value 2^{-n} at each zero

The 8 sets ${}_iR_n$ define 8 measures on B_2 which are related as the 8 basis octonions are related by multiplication

As $n \to \infty$ they give B_2 the structure $[0,4] \times [0,4]^7$ with octonionic product

L = 2

$$\begin{array}{c} [0,4] \times [0,4]^7 \\ \Big\downarrow (T_2^n)^{-1} \\ M_n \end{array}$$

Inverse of Bernoulli Shift

$T_2^n : o \dashrightarrow (o-2)^2$

(n iterations)

$[0,4] \times [0,4]^7$ is only a limit for B_2 as $n \to \infty$

For all finite n the structure of B_2 is defined by the nth order Borel sets corresponding to the zeroes of the Chebyshev polynomial of degree 2^n

B_2 is equivalent to an 8-dimensional lattice with vertices at the zeroes and octonionic structure

For $Mn = [0,4] \times [0,4]^7$

$[0,4]$

represents 1-dim time

and

$[0,4]^7$

represents 7-dim space

corresponding to continuous RP1 x S7 8-dim spacetime

For each $\{ {}_i e_j \mid j \leq n \}$ the map T_2^n acts as a Bernoulli shift operator

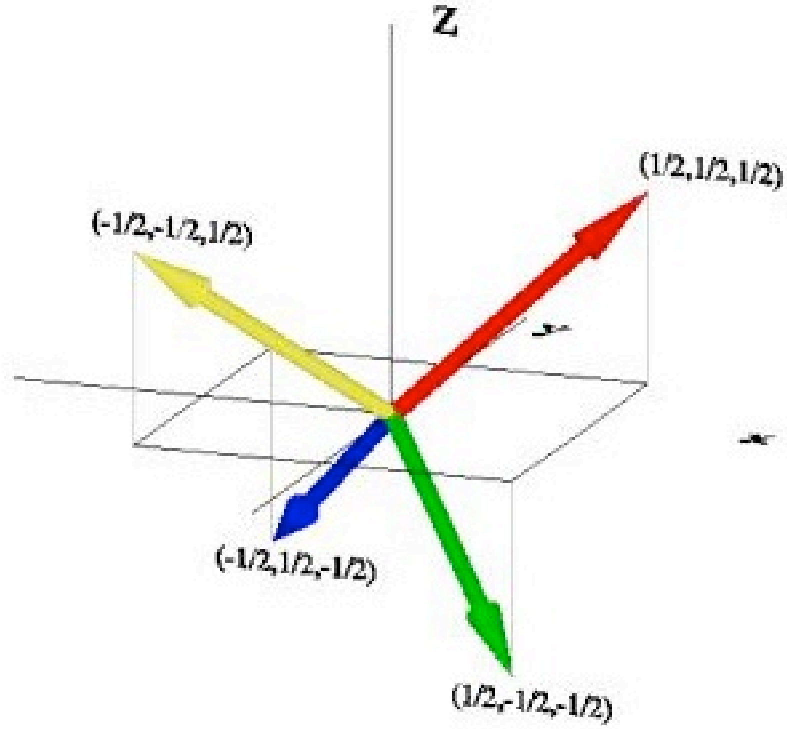
T_2^n maps each vertex on each of the 8 axes of the lattice densely onto that whole axis

$(T_2^n)^{-1}$ maps all $\{ {}_i e_j \}$ to each vertex on the nth order lattice M_n

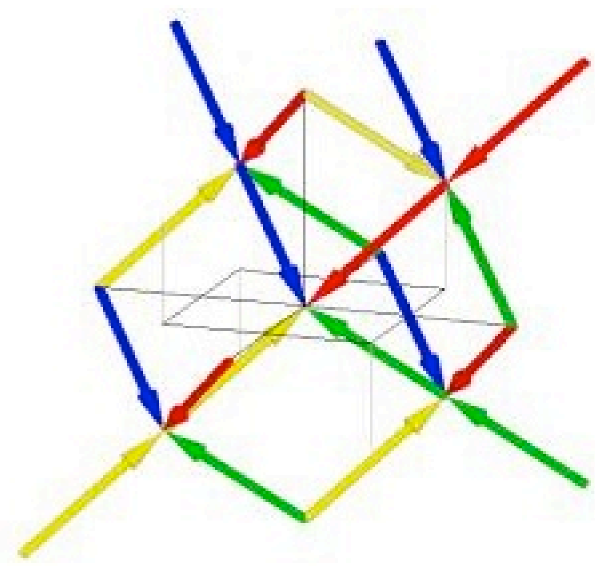
$M_n = [0,4] \times [0,4]^7$ is a base manifold for gauge group Spin(8)

The HyperDiamond Feynman Checkerboard in 1+3 dimensions reproduces the correct Dirac equation.

an image of a projection into three dimensions of a vertex of a 1+3 dimensional Feynman Checkerboard



and an image of flow contributions to a vertex in a HyperDiamond Random Walk from the four nearest neighbors in its past



Zero-Divisors and Sedenions:

The h_92 part of H248 is a Nilpotent 185-dimensional Heisenberg Lie algebra for 92 sets of creation-annihilation operators:

8px8cp = 64 Fermion Particle Creators + 8px8cp 64 Fermion AntiParticle Creators

28 Gravity Boson Creators + 28 Standard Model Boson Creators

plus

1 central Heisenberg Algebra element

8p of the 8px8cp correspond to the 8 fundamental fermion particles.
8p of the 8px8cp correspond to the 8 fundamental fermion antiparticles.

Since each of the 8p particles annihilate the corresponding 8p antiparticles, the 16-dim Sedenion algebra of 8p + 8p has an 8p+8p = 16-dim space of Zero-Divisor with graded structure

```
    1 + 3 + 3 + 1
+       1 + 3 + 3 + 1
=   1 + 4 + 6 + 4 + 1
```

of the Sedenion Zero-Divisors 1 + G2 + 1

Multiplication structure of ternary sedenions

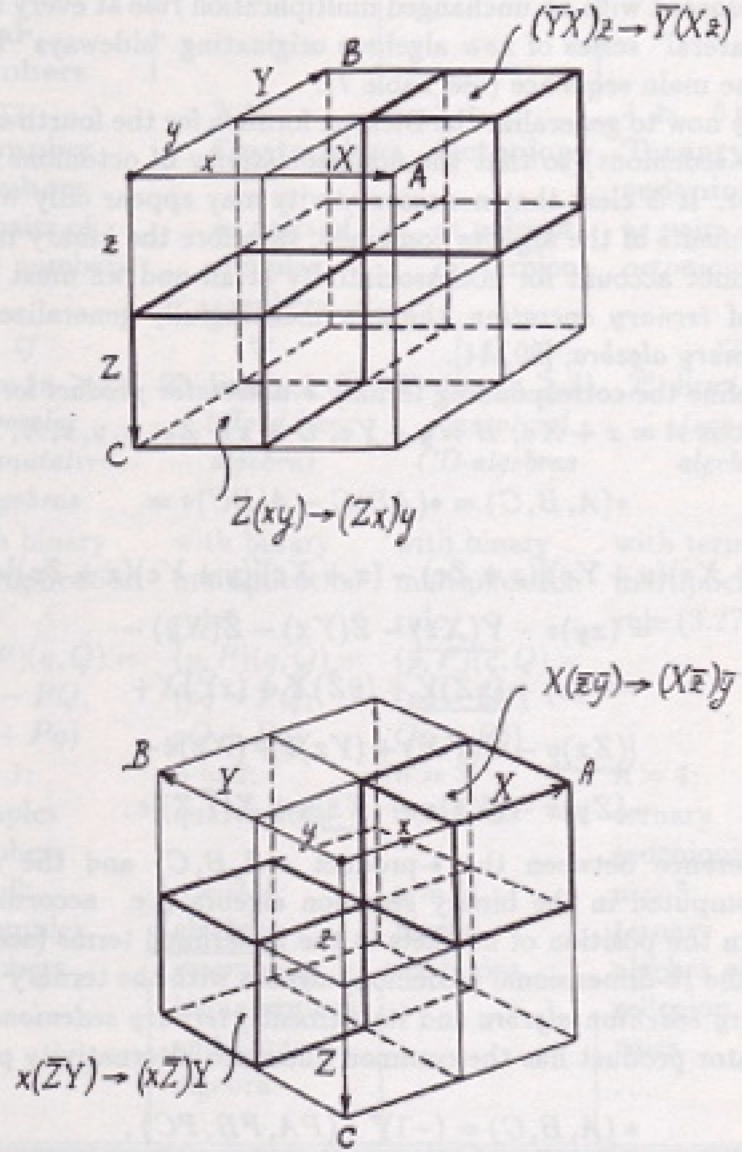
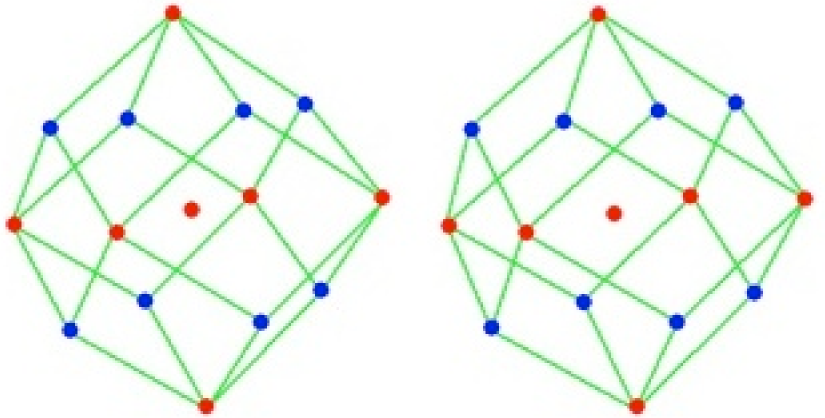
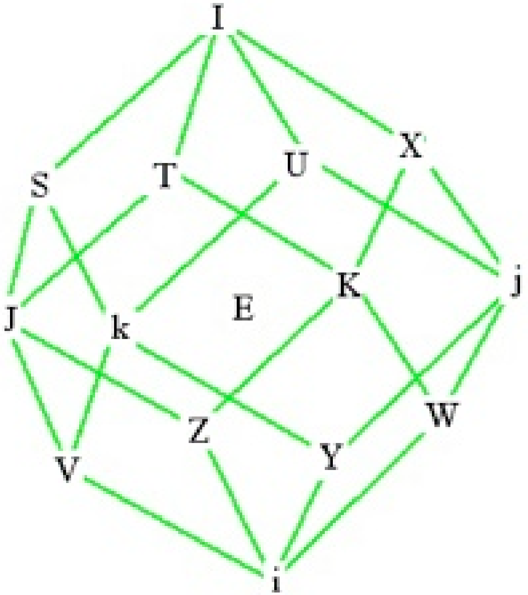


Fig. 1.

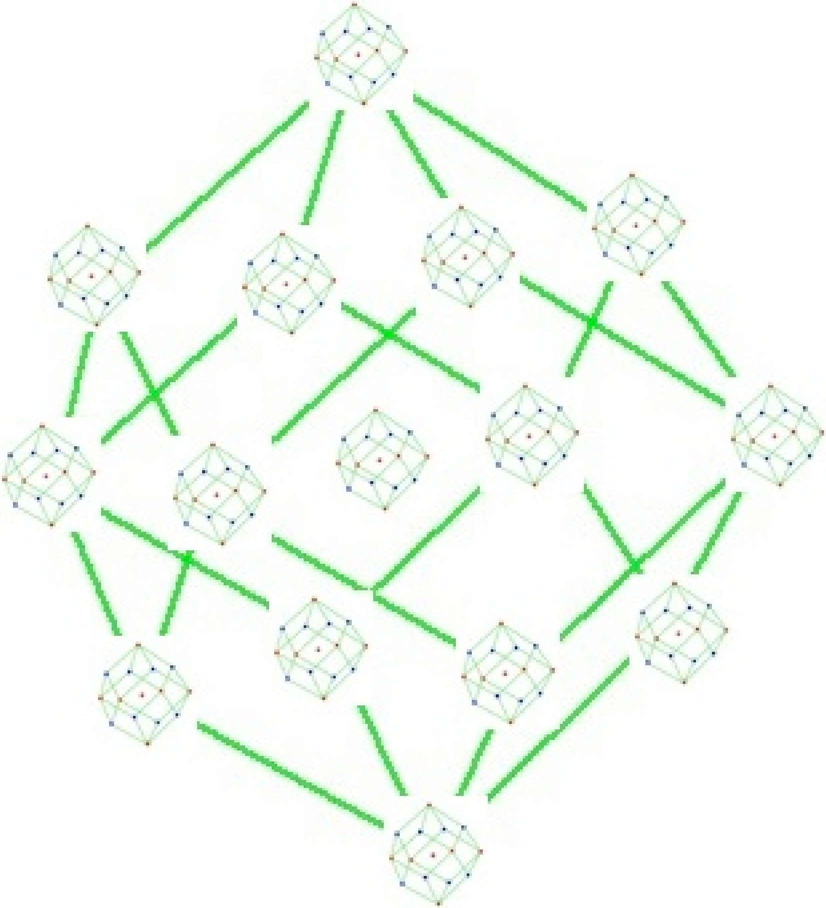
Sedenions have 35 - 20 = 15 Excess Associative Triples,

which correspond to the 15 Sedenion Imaginary basis elements { i, j, k, E, I, J, K, S, T, U, V, W, X, Y, Z } and to the Rhombic Dodecahedron





I
S
T
U
X
J
k
E
K
j
Z
Y
W
V
i



E8 grading = 8 + 28 + 56 + 64 + 56 + 28 + 8

Dennis W. Marks in his paper A Binary Index Notation for Clifford Algebras (revised 27 February 2003) said: "... Duality operations generate isomorphism between grades k and n-k. There are several different duals, including

- the Clifford dual, which we will write as e_m*, defined ... as e_m* = e_m J_n,
- and the Hodge dual, which we will write as m_e_*, defined as m_e_* = (m_e) J_n = (-1)^(k_m (k_m - 1) / 2) e_m J_n = (-1)^(k_m (k_m - 1) / 2) e_m* ...
- bit inversion that maps e_m -> e_mbar , where mbar is the bit inverse of m ... In particular, bit inversion transforms vectors (grade 1) ... into covectors (grade n-1) ...

Complementarity between space-time and momentum-energy is achieved by bit inversion, which interconverts between position representation and momentum representation. Treating momentum as a Clifford covector has the virtue of automatically enforcing the Heisenberg commutation relation as a consequence of the commutation and anti-commutation propeerties of the Clifford elements. ...".

Odd E8 grading 8 + 56 + 56 + 8 = 128 = 8 + 56 Fermion Particles + 56 + 8 Fermion AntiParticles

Duality for the Odd part of E8 is a Particle-Antiparticle duality that represents a Heisenberg Algebra for Second Quantization Fermion Creation-Annihilation. Anthony Sudbery in his book Quantum Mechanics and the Particles of Nature (Cambridge 1986, 1989) discusses "... Dirac spinors whose components are annihilation operators and creation operators respectively ...[for]... the electron field ... are annihilation operators for electrons and ... creation operators for positrons. ... Dirac fermion... cration and annihilation operators obey cnatcommuttion relations... particles and antiparticles have opposite helicity ... in order to change to a frame of reference in which a particle has opposite helicity, it would be necessary to overtake the particle and look at it from the other side ... this is not possible if the particle is travelling at the speed of light [as can be the case for massless particles] ... the many-particle theory is called second quantization ...".

Even E8 grading 28 + 64 + 28 = 28 Position Gauge Bosons + 64 + 28 Momentum Gauge Bosons

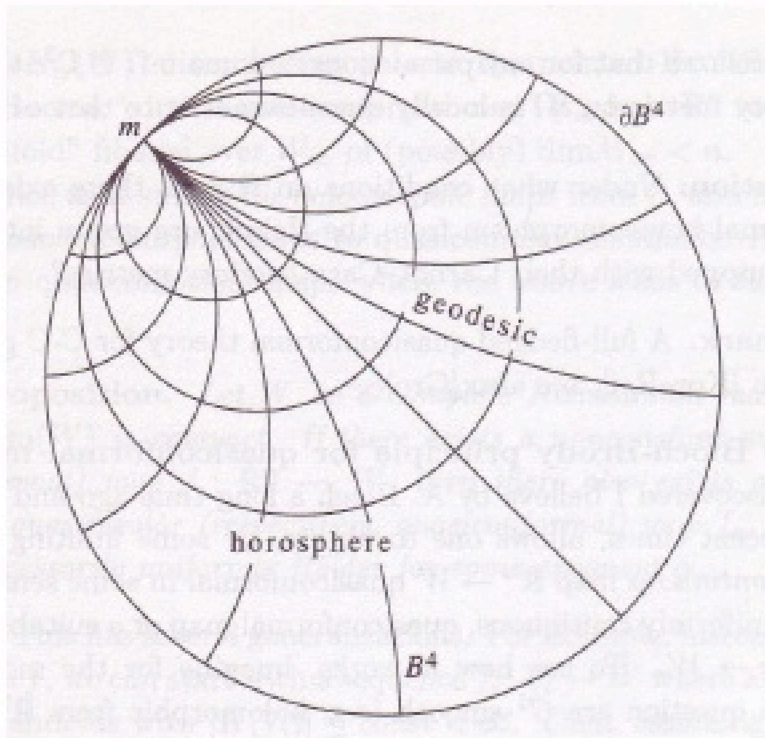
Duality for the 28 + 28 part of the Even part of E8 is a Position-Momentum duality that represents a Heisenberg Algebra for First Quantization of Gauge Boson Position-Momentum representations. Each 28 contains 16 + 12 to describe Gravity by 16-dim U(2,2) and its Spin(2,4) subgroup plus the Standard Model by its 12-dimensional Gauge Group.

The 64 part of the Even part of E8 is Self-Dual, and corresponds to U(8) whose elements, as stated by Helgason, are automorphisms of the Heisenberg algebra H8.

Misha Gromov in his book "Metric Structures for Riemannian and Non-Riemannian Spaces" (Birkhauser 2001), and Stephen Semmes in Appendix B, said: "... Let B4 be equipped with its Bergman metric ... so that B4 is isometric to the complex hyperbolic plane,

H_C^2 = (U(1) x U(2)) \ U(1,2)

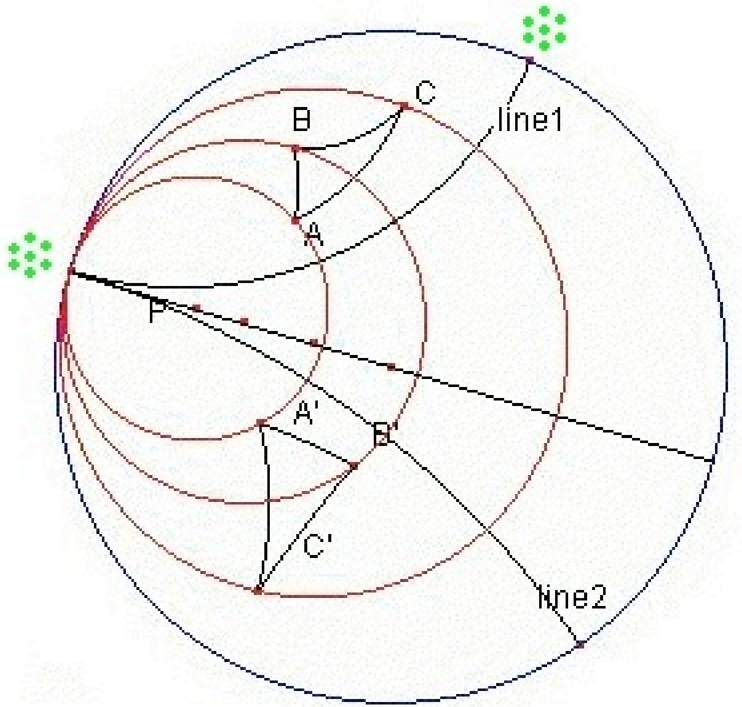
...



...

The action of U(1,2) also preserves [the boundary] bB4 ... and the field of 2-planes on bB4 .... the stabilizer of a point of bB4 contains a subgroup isomorphic to the Heisenberg group ...".

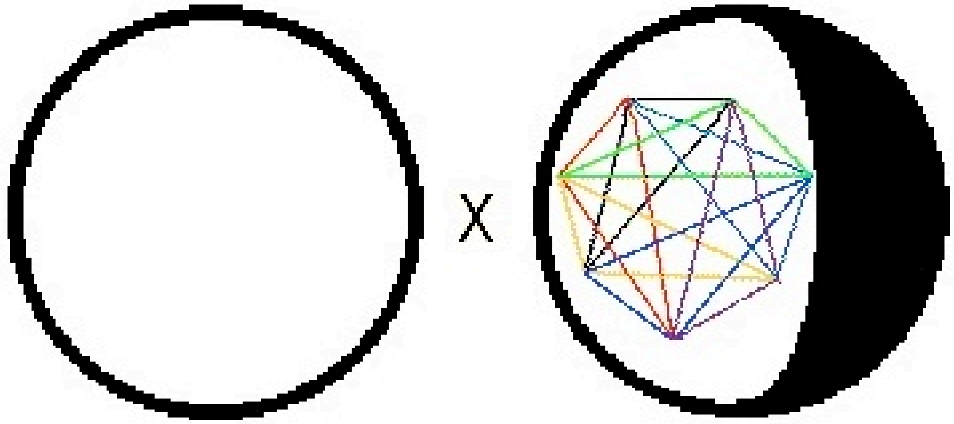
The physics of the Interior of the physical spacetime Lie Ball B4 is the Quantum Physics of Bohmian Quantum Theory described by mathematical structures such as Heisenberg Algebras, Bergman Kernels, Szego Kernels, Geodesics and Horospheres. If properly understood, that physics might describe Quantum Consciouness Resonant Connections between, for example, two human brains located at different points on the M4 spacetime Lie Sphere Shilov Boundary of the B4 Lie Ball:



represents a particular configuration-state of
N binary Clifford Algebra possibility states
N = 10^18 for
the binary tubulin states of the human brain

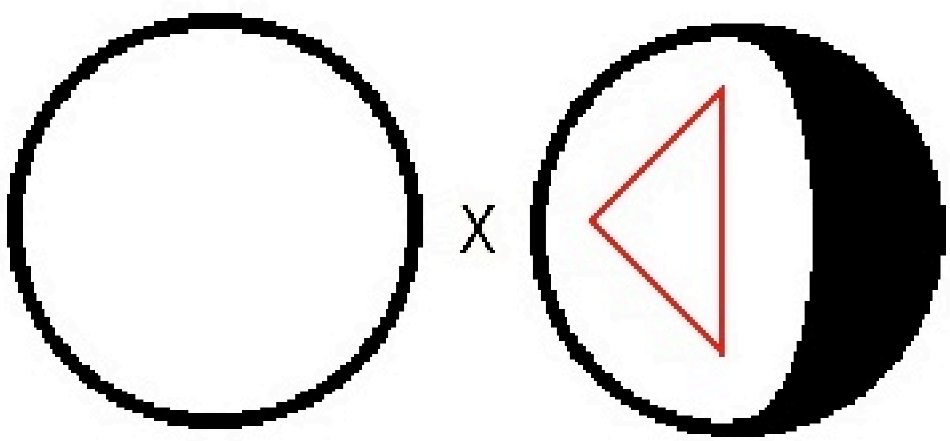
Relevant mathematical techniques include the Radon Transform generalizations of Fourier Transforms.

In my E8 Physics model high-energy 8-dimensional spacetime is represented by the **8-Complex-dimensional Complex Bounded Domain Lie Ball for the Symmetric Space Spin(2,8) / Spin(1,7)xU(1) Lie Ball**



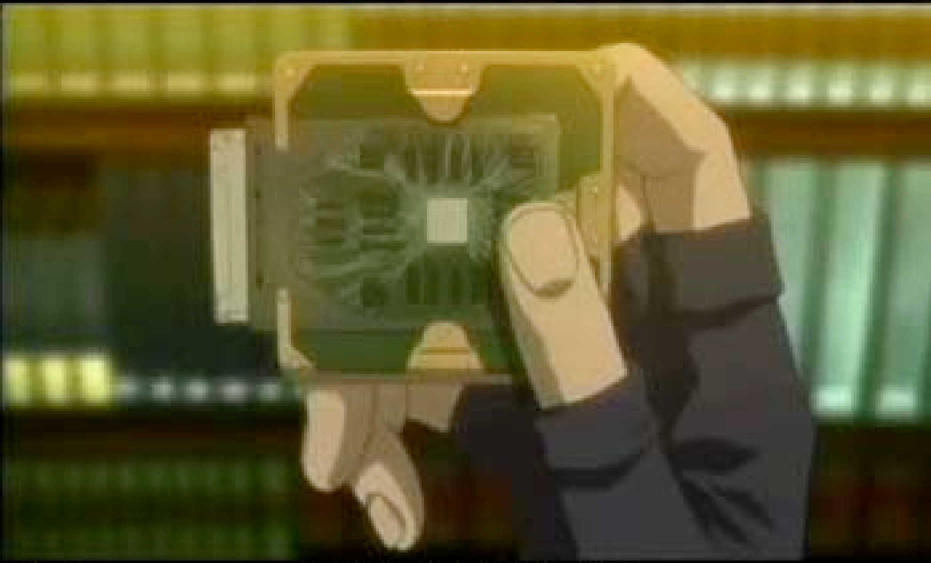
shown as a white Lie Ball interior for RP1 = 1-dim Imaginary Complex Numbers and as interior with Octonion Imaginary Heptagram for S7 = 7-dim Imaginary Octonions of the **RP1 x S7 Lie Sphere Shilov Boundary of the Lie Ball**.

At low energies, a Quaternionic substructure freezes out producing a Kaluza-Klein spacetime M4 x CP2 in which the **4-dimensional CP2 Internal Symmetry Space is represented by the 4-Real-dimensional symmetric space CP2 = SU(3) / SU(2)xU(1)** carrying the Standard Model Gauge Groups Color SU(3), Weak SU(2), and ElectroMagnetic U(1) according to a geometric mechanism described by Batakis and the **4-dimensional M4 spacetime is represented by the 4-Complex-dimensional Complex Bounded Domain Lie Ball for the Symmetric Space Spin(2,4) / Spin(1,3)x U(1)**



shown as a white Lie Ball interior for RP1 = 1-dim Imaginary Complex Numbers and as interior with Quaternion Imaginary Triangle for S3 = 3-dim Imaginary Quaternions of the **RP1 x S3 Lie Sphere Shilov Boundary of the B4 Lie Ball**.

Stand Alone Complex

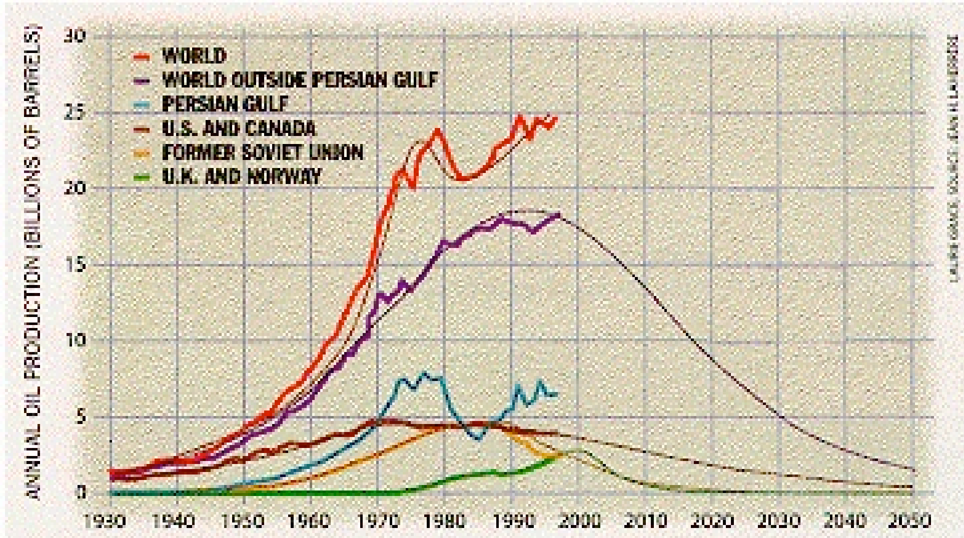


A successor I think so


And are there others
elsewhere in the universe...

Around 1997 AD:

Abundant cheap oil reached and began to pass its peak production, as shown by this chart adapted from Scientific American (March 1998)



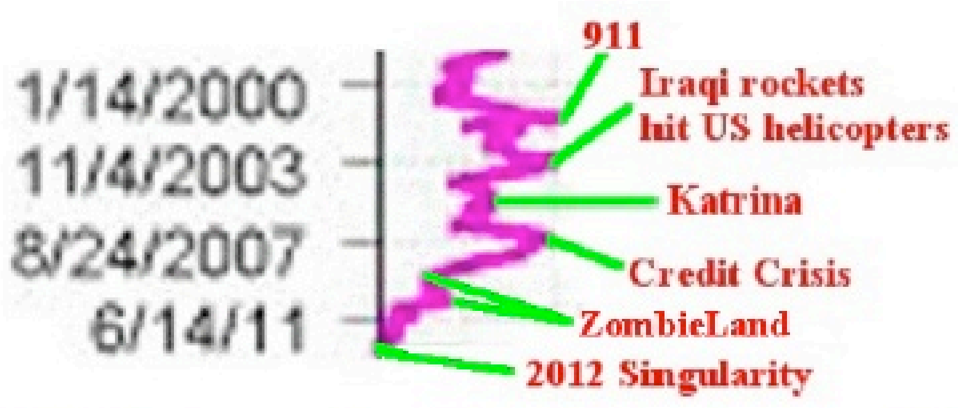
The USA/UK attempted to secure Caspian Oil through the NATO Kosovo war of 1999, but after a successful war found that, as W. Clark said in a 2003 ratville times article "... Since the mid-late 1990s the Caspian Sea region of Central Asia was thought to hold approximately 200 billion barrels of untapped oil (... comparable to Saudi Arabia's reserve base) ... After three exploratory wells were built and analyzed, it was reported that **the Caspian region holds only approximately 10 to 20 billion barrels of oil** (although it does have a lot of natural gas) ... The oil is also of poor quality, with high sulfur content. ...[so]... **The Bush administration quickly turned its attention to a known quantity, Iraq**, with its proven reserves totaling 11% of the world's oil reserves. ...". Now, in 2010, the USA/UK are still bogged down in war in Iraq (and, for some reason that may be clear to President Obama, but not to me, also in Afghanistan). Meanwhile, the production of **cheap oil is now about a decade past its peak, which will inexorably lead to shortage and the necessity to replace oil with nuclear energy**, with gas, methane, and coal as intermediate stop-gaps.

Deng Xiaoping died, construction began on the Three Gorges Dam on the Yangtze River, and **China continued to march toward Global Economic Dominance by becoming Earth's primary manufacturer**, based initially on cheap labor. Although some regard China as a top-down dictatorship, the true situation is quite different. According to a 23 April 2009 popsci.com article by Mara Hvistendahl "..... the relationship between citizen and state is fluid in China ... The Chinese distinction between the private and public domains is very small. ...". **The Chinese Government/People System may be in accord with** what Ron Eglash, Ron Eglash, in his book "African Fractals" (Rutgers 1999), describes as "**African traditions of decentralized decision making**", and so might be a mechanism through which **Boskopian IFA Divination Structures can act as Terence McKenna's Intelligent El Aleph Attractor to lead humanity through its breakpoint, shaking the Earth to its core, to a future dimension of freedom and transcendence**.

Can the African IFA tell us about Past and Future History ?

A few thousand years ago in Shang China, King Wen took the 64-element I Ching subset of IFA and modified its binary number Earlier Heaven sequence to describe the History of that Time and Place. In the 20th century, Terence McKenna used a similar technique to describe History of the Earth through 2012.
His Predictions for 2000 to 2012 seem to be quite relevant to the State of Our Earth as of now (2009):

Terence McKenna died in April 2000, but the Predictions of his



I Ching Resonance TimeWave of History live on to 2012.

Now (April 2009) we know that his 2000 to 2009 TimeWave History peaks:

- 9/11
- Iraqi War escalation (Rocket Attacks on USA helicopters)
- Hurricane Katrina
- the Credit Crisis of the USA/UK Global Financial System

all did happen coincident with TimeWave Peaks.

What does the TimeWave tell us about next 3 years, 2009 to 2012 ?

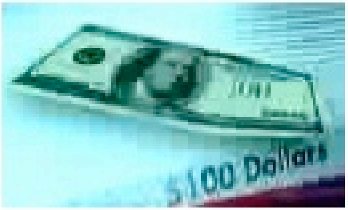
From now (April 2009) into 2010 is a nearly flat (or seemingly slightly rising) plateau that I call **ZombieLand**. In ZombieLand, Trillions of USA Dollars are fed to keep insolvent (but politically influential) financial institutions in an undead state - that is, not a living useful part of the Global Economy,

LTC (founded by Myron Scholes (MIT and Stanford) and Robert Merton (Harvard), who shared the 1997 Nobel Prize for Economics) **collapsed**, setting the tone for the following years of bubble-building and and collapsing of the USA/UK Global Financial System. According to a series of articles in The New York Times, "... [USA President] Bill Clinton ... and Robert E. Rubin, [former] head of Goldman Sachs & Company ... pushed harder to win opportunities for American banks, brokerages and insurance companies ... for free movement of capital ... in financial markets around the globe. ... Washington's policies ... fostered vulnerabilities that are an underlying cause of the **economic crisis that began in Thailand in July 1997 ...[and]... rippled through Asia and Russia** ... China ... evaded the crisis, and what saved it from catastrophe may in part have been its unwillingness to listen to Western economists. Urged to make its currency freely tradable with the dollar, it resisted. ...". According to a 22 April 2009 economictimes.indiatimes.com article by Swaminathan S. Anklesaria Alyar: "... the Obama administration is prolonging the recession by avoiding surgery to remove dead wood from its financial sector. Some call this cowardice. Others, such as former IMF chief economist Simon Johnson, writing in The Atlantic, say Wall Street has captured the White House. ... Johnson says the US now resembles Russia, where business oligarchs and government officials protect each others' financial interests, at the expense of the economy. ... This ... highlights the priority given by the Obama administration to save the titans of Wall Street rather than end the recession quickly. ... **Technically, the financial sector is comprehensively bust. It needs to recognise the losses, writing off trillions**. ... The market solution would be to force insolvent banks into bankruptcy, with shareholders and creditors taking a huge hit ... Many titans of Wall Street will disappear ... the Obama administration refuses to contemplate this obvious solution. ... Wall Street has captured the White House, so nothing will be done to imperil the politico-financial network that rules the US. Robert Rubin and Hank Paulson, treasury secretaries of Clinton and Bush, were both from Goldman Sachs. Larry Summers, the current treasury secretary, earned millions as a hedge fund consultant. In a market economy, well-managed companies should be rewarded with profits, while mismanaged companies should go bust. This basic rule has been suspended almost entirely for the titans of Wall Street. ... **Accounting norms have been tweaked to permit zombie banks to pretend they are alive and solvent**....". According to a March 2009 OCC Quarterly Report "... NOTIONAL AMOUNT OF DERIVATIVE CONTRACTS ... MARCH 31, 2009, $ MILLIONS

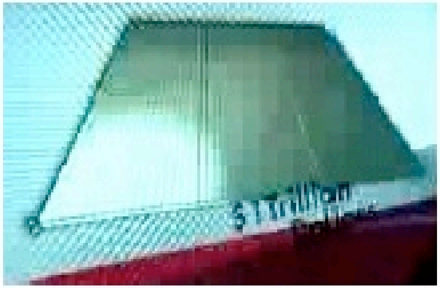
RANK	Holding Company	ASSETS	DERIVATIVES
1	JPMORGAN CHASE	$2,079,188	$81,108,352
2	BANK OF AMERICA	2,323,415	77,874,726
3	GOLDMAN SACHS	925,987	47,749,124
4	MORGAN STANLEY	626,023	39,125,255
5	CITIGROUP	1,822,578	31,715,734 ..."

Note that if the derivatives go bad (as they are almost certain to do, given the ongoing economic collapse), there is no way that any of **the Big Five Banks** that control the USA government have enough assets to cover, as their **total assets are only about $7.8 trillion against about $277.6 trillion Derivative Exposure**.

"... Here are $100 USA Dollars and $1 Million USA Dollars (It would fit in a suitcase):



Here are $1 Billion USA Dollars (It is about the size of a car) and **$1 Trillion USA Dollars (It is about the size of a Thousand Cars in a big parking lot.)**



...".

Another way to visualize the size of $1 Trillion USA Dollars is to realize that the population of the USA (around 300 Million people) is about 100 Million Families.

$1 Billion is about $10 for every Family in the USA.

$1 Trillion is about $10,000 for every Family in the USA.

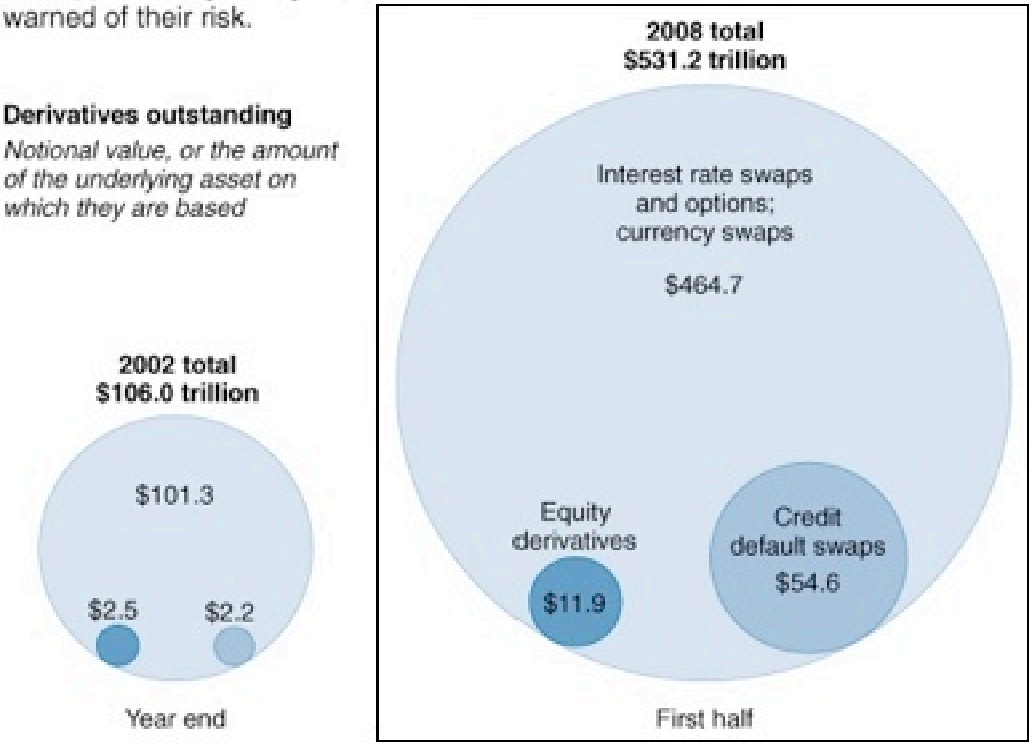
Another thing to keep in mind is that the amount of Bailouts so far is on the order of a few Trilllion USA Dollars, but **the total amount of possibly-worthless derivatives is on the order of $500 Trillion USA Dollars**. **That would be 500 x 10,000 = $5 Million for every Family in the USA.**

Since the population of the Earth is around 6 Billion, that would be almost $100,000 for every Person on Earth.

update October 2008 ... **Beyond SubPrime ...**

Growth of a Complex Market

The market for financial instruments known as derivatives — contracts intended to hedge against risk whose values are derived from underlying assets — has increased fivefold since 2002. While Alan M. Greenspan was a champion of them and opposed regulating them, others warned of their risk.



Source: International Swaps and Derivatives Association

As the chart above (from The New York Times in October 2008) shows, although the Credit Default Swap problem had grown from $45 trillion in March 2008 to $55 trillion in October 2008 (an uncertain figure - Paul Solman says $62 trillion), the total value of Derivatives based on Interest Rate Swaps and Options and Currency Swaps had grown to $465 trillion, and the total growth in the 6 years from 2002 to 2008 of effective asset-money supply created by Derivatives of the Shadow-Banking-System increased by $531 - $106 = $425 trillion.

Just as overvalued mortgages triggered a collapse of the excess $55 - $2 = $53 trillion in the Credit Default Swap asset-money Bubble, inaccurately valued Interest Rate and Currency Situations can (and probably will, when a Black Swan Event hits) trigger a collapse of the excess $465- $101 = $364 trillion in the Interest Rate-Currency Swap asset-money Bubble.

When that happens, **the $45 to $53 trillion construction program** of nuclear reactors, rapid rail transit, etc., needed to rescue the USA from the Credit Default Swap debacle **will be insufficient and a $400 trillion program will be needed**. If the USA cannot handle that, then the New York/London Financial System may collapse like a Ponzi Scheme, the Global Financial System will probably change to a Shanghai System based in China,

and the USA may become a backwater nation, with Havana as the Western Hemisphere capital of the Global China Hegemon.

Analects of Confucius:

義 The Master said, "The gentleman (*chün tzu*, 君子) understands *yì*. The small/mean man (*hsiao-jen*, 小人) understands *lì*." [*Analects* IV:16]

Yì

jūn zǐ

利

xiǎo rén

lì

义 yì Justness, righteousness, principles

利 *Lì*, "profit, gain, advantage": NOT a proper motive for actions affecting others. The idea that profit is the source of temptation to do wrong

lì

The USA/UK Hedge-Fundies succumbed to Temptation of Profit and used Statistics-Math Obfuscation and Secrecy at the beginning of the Millenium to build a $500 Trillion Derivative Pyramid by which they Corrupted the USA/UK Political System and Wrecked the USA/UK - based Gobal Financial System,

Thus the USA/UK Political Leadership violated the Confucian Principle of

仁 rén benevolent rule

so the USA/UK Political Leadership and Global Financial System lost its Confucian

Mandate of Heaven 天命

Tiān

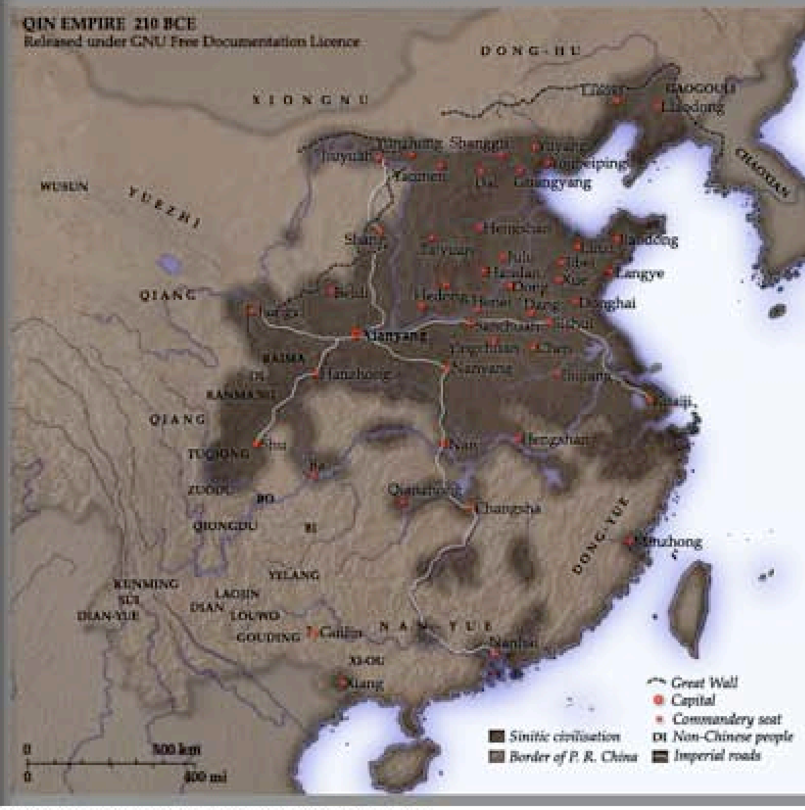
Mìng

Han China and Roman NATO

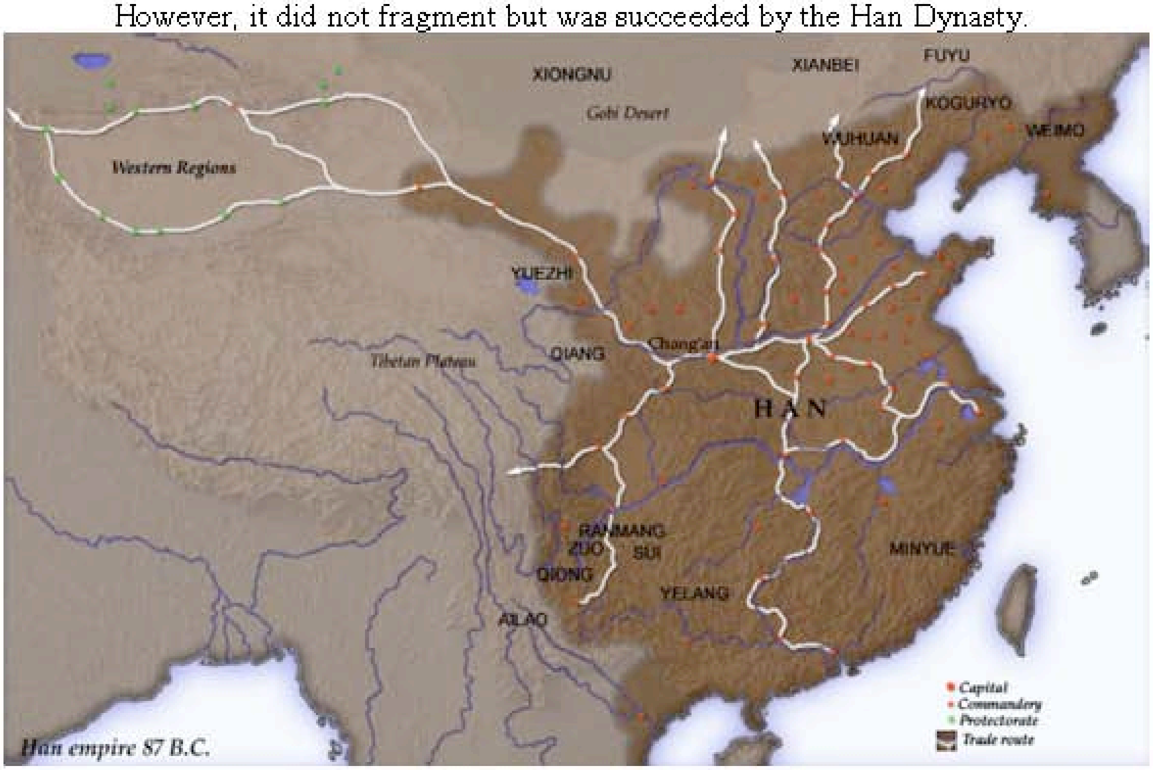
At 323 BC Alexander the Great created an Empire reaching from Greece to Egypt through Persia.

Alexander's Empire of Conquest fragmented shortly after his death.

To the East, a Century later the Warring States of China were united by the Qin.

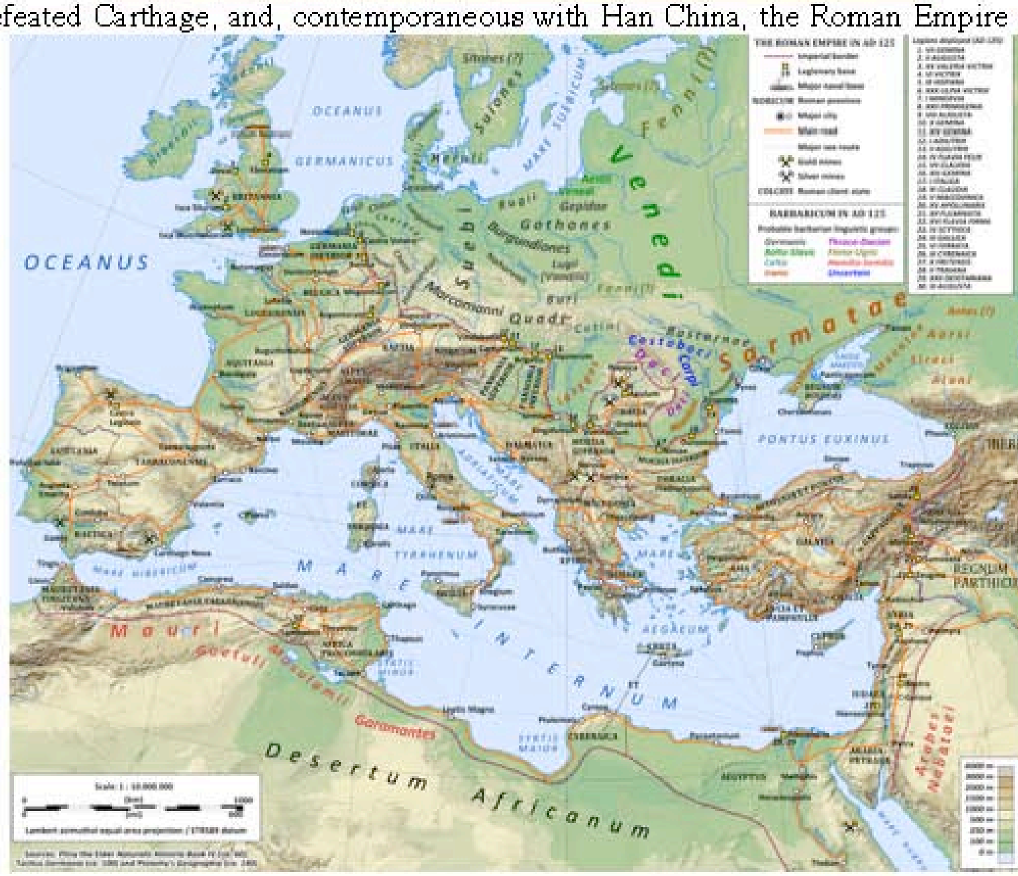


The Qin Empire of Conquest did not last long either.
However, it did not fragment but was succeeded by the Han Dynasty.

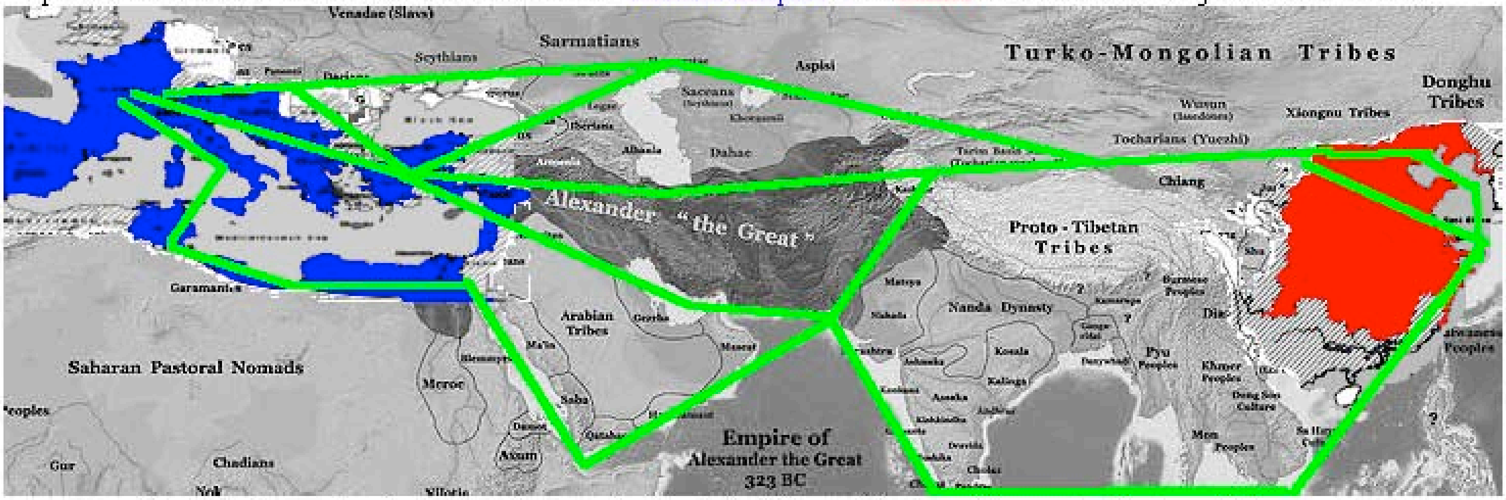


To the West, a Century after Alexander saw the emergence of Rome and Carthage.

Rome defeated Carthage, and, contemporaneous with Han China, the Roman Empire emerged.

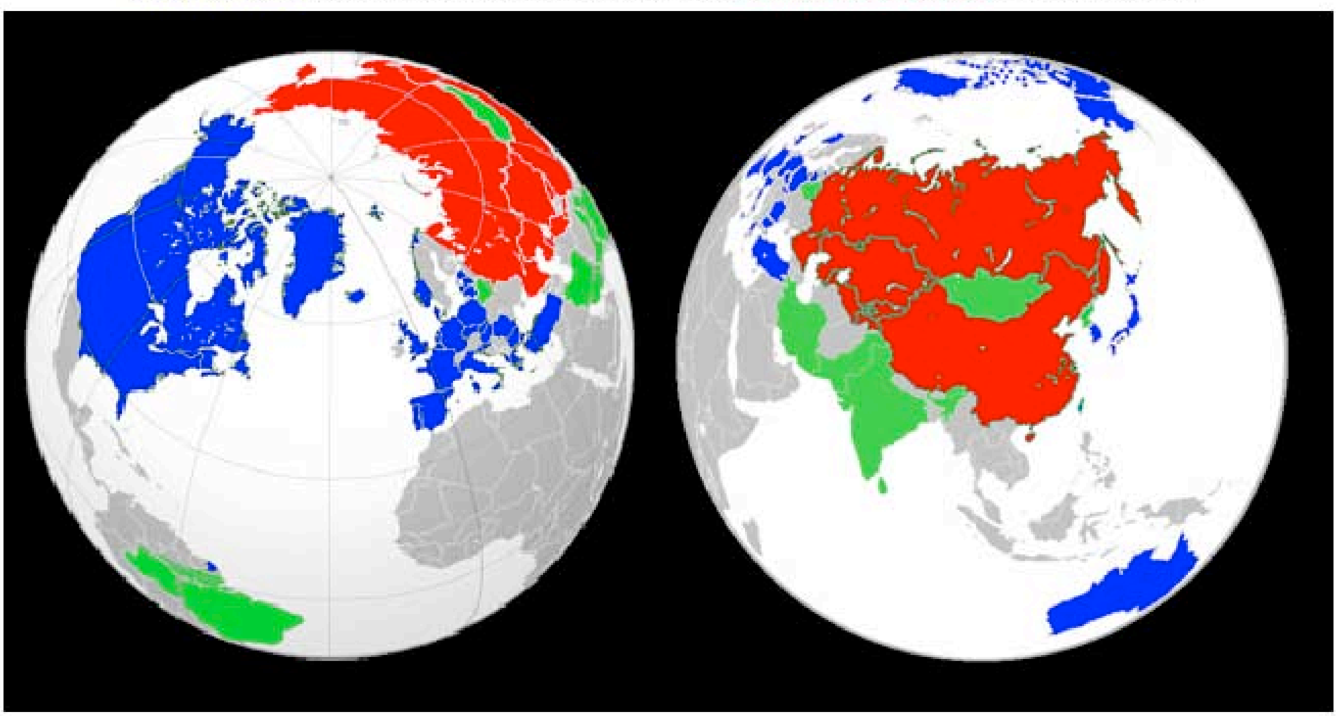


Up to about 1000 AD commerce between the Roman Empire and China was facilitated by the Radhanites



whose trade routes (green on the map) "stretched from Western Europe to Eastern Asia ...
centuries before Marco Polo and ibn Battura ... some believe that Jewish merchants such as the Radhanites were instrumental in bringing paper-making west. Joseph of Spain, possibly a Radhanite, is credited ... with introducing the ... Hindu-Arabic numerals from India to Europe. ... Jewish communities used letters of credit to transport large quantities of money ...
the Radhanites may be counted among the precursors to the banks that arose in the Middle Ages ...
The fall of the Tang Dynasty of China in 908 ... and the rise of the mercantile Italian city-states ... who viewed the Radhanites as unwanted competitors ... led to ... the disappearance of the Radhanites ...".
(quote from Wikipedia)

Over the next 1000 years China evolved into its present Peoples Republic
and
the Roman Empire evolved to the Pax Britannica and the present USA/NATO controlled by the Western Bankers that had evolved from the Radhanites
so
now Earth has two major power centers:
USA/NATO (blue with gray client states) and China/SCO/BRIC (red and green)



Now, when USA/NATO and China/SCO/BRIC have conflicts of interests,

there is no Alexander the Great with authority to resolve issues
and
there is no trusted Radhanite intermediary to mediate issues.

"... Since ... about 1970 ... capital [of the USA/NATO banking system]
has not so much sought growth through increased production
[which is how the Radhanite financiers had profited from increasing levels of trade],
but rather by extracting greater returns from relatively flat production levels.
Hence globalisation, which moved production to low-waged areas, providing greater profit margins.
Hence privatisation, which transfers revenue streams to investors that formerly went to national treasuries.
Hence derivative and currency markets, which create the electronic illusion of economic growth, without actually
producing anything in the real world. ...
And then in September 2008 this house of cards collapsed, all of a sudden ...
capitalism was not allowed to die a natural death. Instead it was brought down by a controlled demolition.
First it was put on a life-support system ... with globalisation, privatisation, currency markets, etc. ...
Finally, the Bank of International Settlements in Basel - the central bank of central banks -
pulled the plug on the life-support system:
they declared the 'mark-to-market rule', which made all the risk-holding banks instantly insolvent ...
this process was carefully planned and managed by the central-banking clique. ...
The effect of the coerced bailouts was to transfer insolvency from the banks to the national treasuries.
Banking debts were transformed into sovereign debts and budget deficits.
Now, quite predictably, it is the nations that are seeking bailouts, and those bailouts come with conditions attached.
Instead of the banks going into receivership, the nations are going into receivership. ...
In the EU, the first round of nations to go down will be the so-called PIGS – Portugal, Ireland, Greece, and Spain. ...
Eventually the PIGS will be forced to default, and then the rest of the EU will go down as well ...
now in Europe, ... IMF diktats ... are all about austerity and privatisation. ...
the nation state is dismantled ... the primary functions left to government are police suppression of its own population ...
with the WTO, IMF, World Bank, and the other pieces of the embryonic world government,
the new global system will make no pretensions about popular representation or democratic process.
Rule will be by means of autocratic global bureaucracies,
which will take their orders, directly or indirectly, from the bankster clique. ...".
(quote from 4 November 2011 nwoobserver.wordpress.com article by Richard K. Moore from 18 October 2011 New Dawn Magazine)

When in 2011 USA/NATO asked China/SCO/BRIC give "... some of ... China's ... $3.2 trillion (£2.01 trillion) in
foreign exchange reserves to ... rescue ... Europe ... China ... offered help in return for European support to grant it either
more influence at the International Monetary Fund,
market economy status in the World Trade Organisation,
or the lifting of a European arms embargo
... China's ... hopes were dashed ...[by]... IMF chief Christine Lagarde ...
Europe's rejection of China's demands - particularly the inclusion of the renminbi in the SDR - was tantamount to "a slap in the face" ...".
(quote from 11 November 2011 Telegraph Reuters article)

The "slap in the face" refusal to let China/SCO/BRIC have a seat
at the policy-making table of the USA/NATO IMF-WTO- WorldGovernment
showed that China/SCO/BRIC must rely on its own independent efforts to advance its interests which include
"... a major African economic diplomacy which reached a crescendo in 2006 ...

... securing future African oil resources for China's robust industrialization. ...".
(quote from 26 September 2011 nwoobserver.wordpress.com article by F. William Engdahl from 25 September 2011 Global Research)

USA/NATO response to China/SCO/BRIC assertion of its interests in Africa include "... The Washington-led decision by NATO to bomb Gaddafi's Libya into submission over recent months, at an estimated cost to US taxpayers of at least $1 billion, ...[as]... part of a larger strategic assault by NATO and by the Pentagon in particular to entirely control China ...
the recent [2011] wave of Western military attacks against Libya or more covert regime changes such as

those in Tunisia, Egypt and the fateful referendum in southern Sudan which has now made that oil-rich region "independent" has been AFRICOM, the special US military command established by the Bush Administration in 2008 explicitly to counter the growing Chinese influence over Africa's vast oil and mineral wealth. ...".

(quote from 26 September 2011 nwoobserver.wordpress.com article by F. William Engdahl from 25 September 2011 Global Research)

Since China has seen clear evidence that USA/NATO feels free to attack and kill leaders of governments that act independently of USA/NATO IMF- WTO- WorldGovernment

and

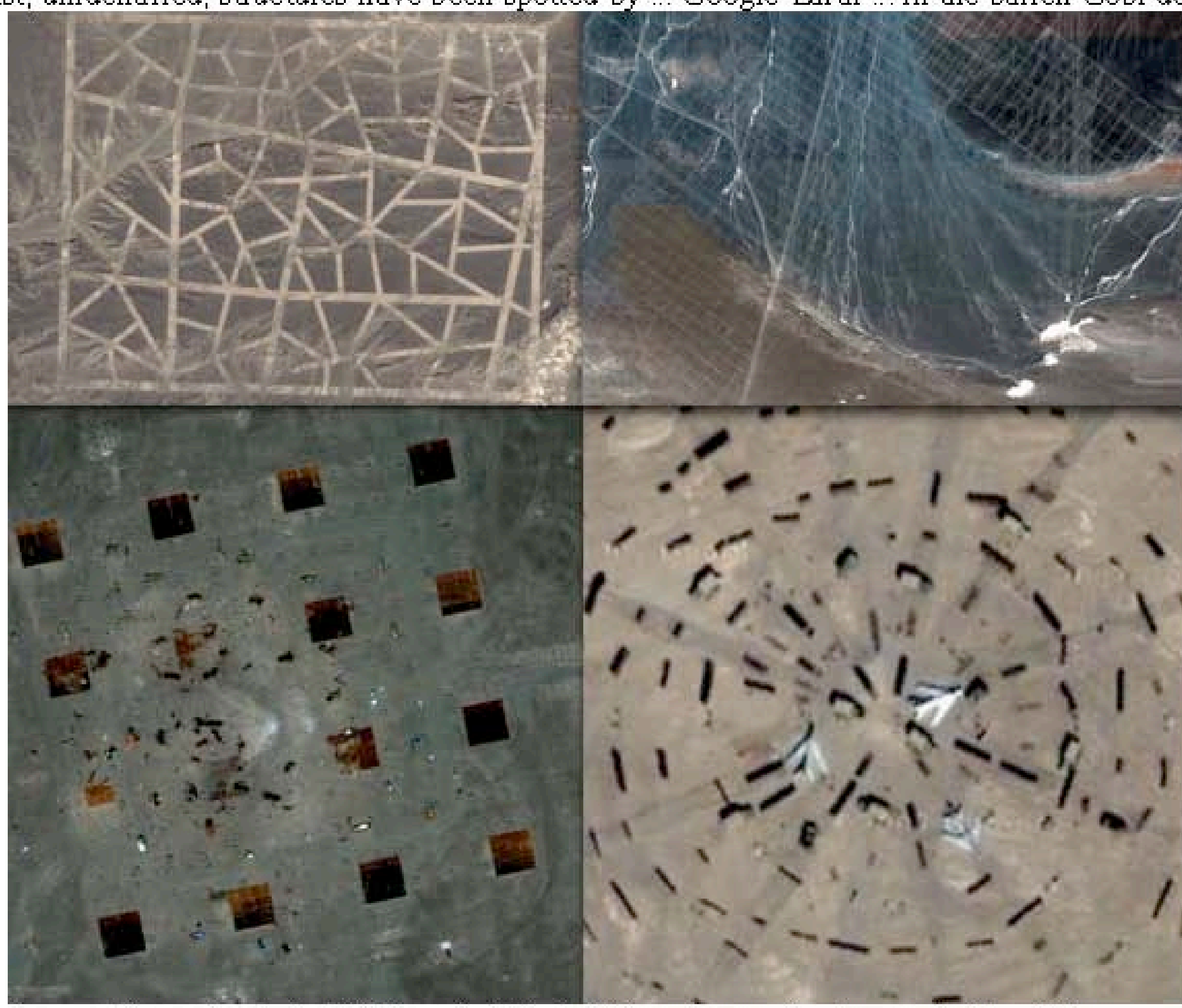
since China has been barred from participation in the IMF- WTO- WorldGovernment

and

since USA/NATO has military bases from Central Asia to the Indian Ocean to Japan and South Korea from which attacks could be launched against China

China has begun to prepare to respond to such attacks.

"... Vast, unidentified, structures have been spotted by ... Google Earth ... in the barren Gobi desert ...



... raising questions about what China might be building in a region it uses for its military, space and nuclear programmes. ...

The picture of the circle looks very like a missile test range, with ... instrumentation set out to record

weapon effects. ...".
(quote from 14 November 2011 Telegraph article by Malcome Moore and Thomas Harding)

The square array looks like another missile test range weapon effects site,
and the grids (irregular wide lines and rectangular narrower lines) look to me like power grids
that might be tested for EMP effects by air-burst nuclear weapons.
Such atmospheric nuclear tests can produce Iodine-131, and
"... The UN atomic agency said ...[on 11/11/11 that]... "very low levels" of radioactive iodine-131 had
been detected in the air in the Czech Republic and in other countries ...".
(quote from AFP by Google News)

**Will the Contemporary Confrontation of
Aggressive Militarism of USA/NATO with Determined Independence of China
lead to World War III
?**

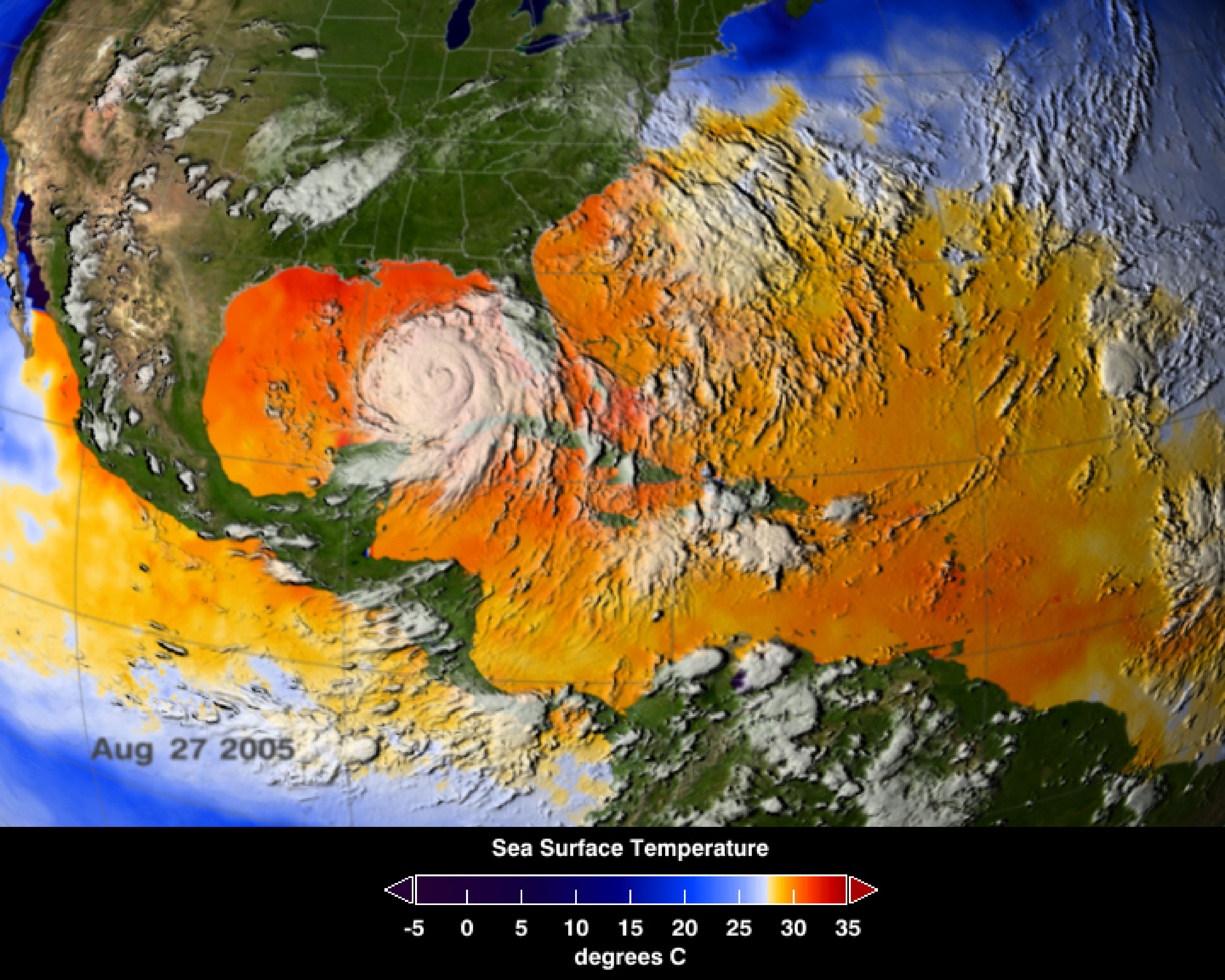
Who would be more likely to survive such a Conflict ?

**Is there any component of USA/NATO IMF-WTO-WorldGovernment that
can negotiate reasonably with China to share power on Earth,
or is
Earth Not Big Enough For Both
???**

(images from Watchmen, Wikipedia, nwoobserver, Telegraph UK)

Frank Dodd (Tony) Smith, Jr. - 2011

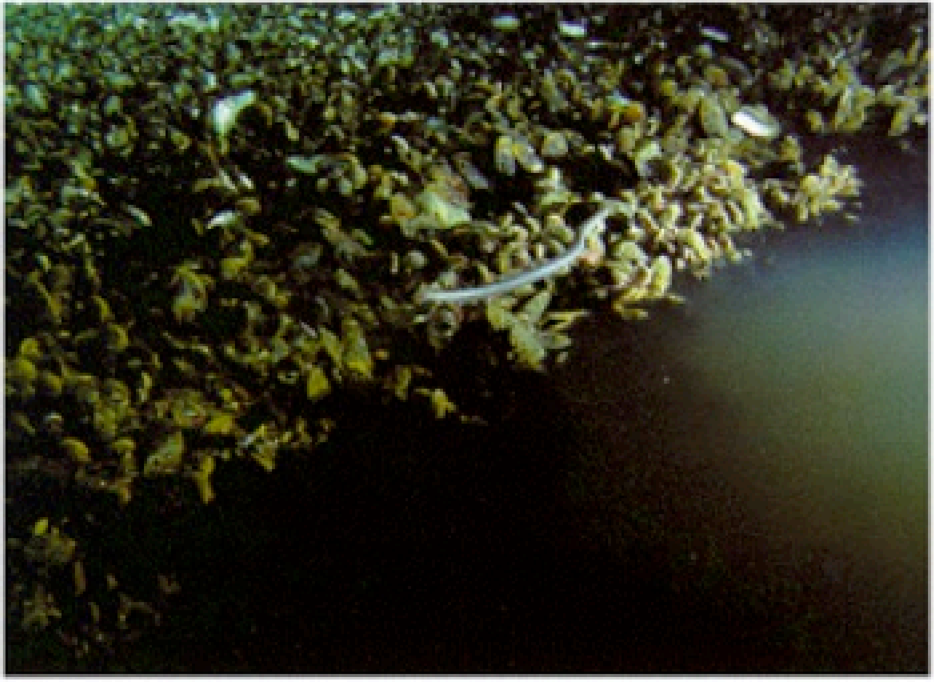
from BBC video of The HitchHiker's Guide to the Galaxy]


Aug 27 2005
Sea Surface Temperature
-5 0 5 10 15 20 25 30 35
degrees C

Superior Province
Last orogeny Kenoran 2650-2480 m.y.
Meteorite Crater
Grenville Province
Grenville front
HUDSON BAY
Hudson Bay Basin
CANADA
SUDBURY
Ni,Cu,Pt
Churchill Province
Superior Province
Michigan Basin
First copper mined in U.S.
Bermuda
Basalt basement 108 m.y. under young coralline cover
Puerto Rico Trench
Lesser Antilles Volcanic Arc
Eruption 1902
Deepest point in Atlantic 8385 m
PUERTO RICO
DOMINICAN REPUBLIC
HAITI
BAHAMAS
Caribbean Plate
CARIBBEAN SEA
JAMAICA
Cayman Trench
Havana
New York
Washington
Charleston
Manganese nodules
Phosphate
FLA.
Athabasca Tar Sands
Major potash field
Saskatoon
Potash
Lignite
Edmonton
Calgary
HOMESTAKE
Au mine
Precambrian 2520-1800 m.y.
SULLIVAN
Pb,Zn,Ag mine
900-1300 m.y.
BUTTE
Wyoming U Province
28% of U.S. production
Denver
CLIMAX
Basin contains 9000 m of platform sediments
BINGHAM
Cu 35 m.y.
COLORADO PLATEAU
over 60% of U.S. uranium production
Geothermal Power
Basin and Range Province
Ag 65-10 m.y.
110-80 m.y.
San Francisco
San Andreas Fault
San Francisco Earthquake 1906
Big Bend
Mendocino Fracture Zone
OCEAN
Gulf of California
Volcanics 65-2 m.y.
MEXICO
Acapulco
Mexico Trench
Cocos Plate
Cocos Ridge
New Orleans
Numerous buried salt domes
Large gasfields Oilfields
GULF OF MEXICO
Major sedimentary basin with oil and gas accumulation.
Salt domes
BELIZE
GUATEMALA
HONDURAS
NICARAGUA
EL SALVADOR
COSTA RICA
PANAMA
Extensive gold, silver deposits formed during orogeny 100-65 m.y.
Frequent earthquakes near junction of two plate boundaries
Caracas
Oil and Gas

the Gulf of Mexico

... came across ... cold seeps ...[where]... at the bottom of the Gulf ... rocks ... seep out ...hydrocarbons ... through the sediment and ... into the water column. ... One of the sites ...



... was ... a beautiful, calm lake on the bottom of the ocean ...[that]... lapped against what looked like a golden sandy shore ....[that]... turned out to be thousands of mussels ... living among them was a rich community of different animals not dissimilar to those found at a hot vent. The cold seeps are too deep to receive any sunlight ... methane was continually bubbling up from the rocks below. Inside the mussels, in an extraordinary parallel with the hot vents, they found chemosynthetic bacteria that ... were fixing methane rather than hydrogen sulfide. ... In places the combination of **high pressure and low temperatures had frozen the methane into a solid, ice-like material**. ...". According to the DVD video version of The Blue Planet, the cold seep was over 20 meters long and at a depth of about half a mile (and the date of 1990 was mentioned for its discovery).

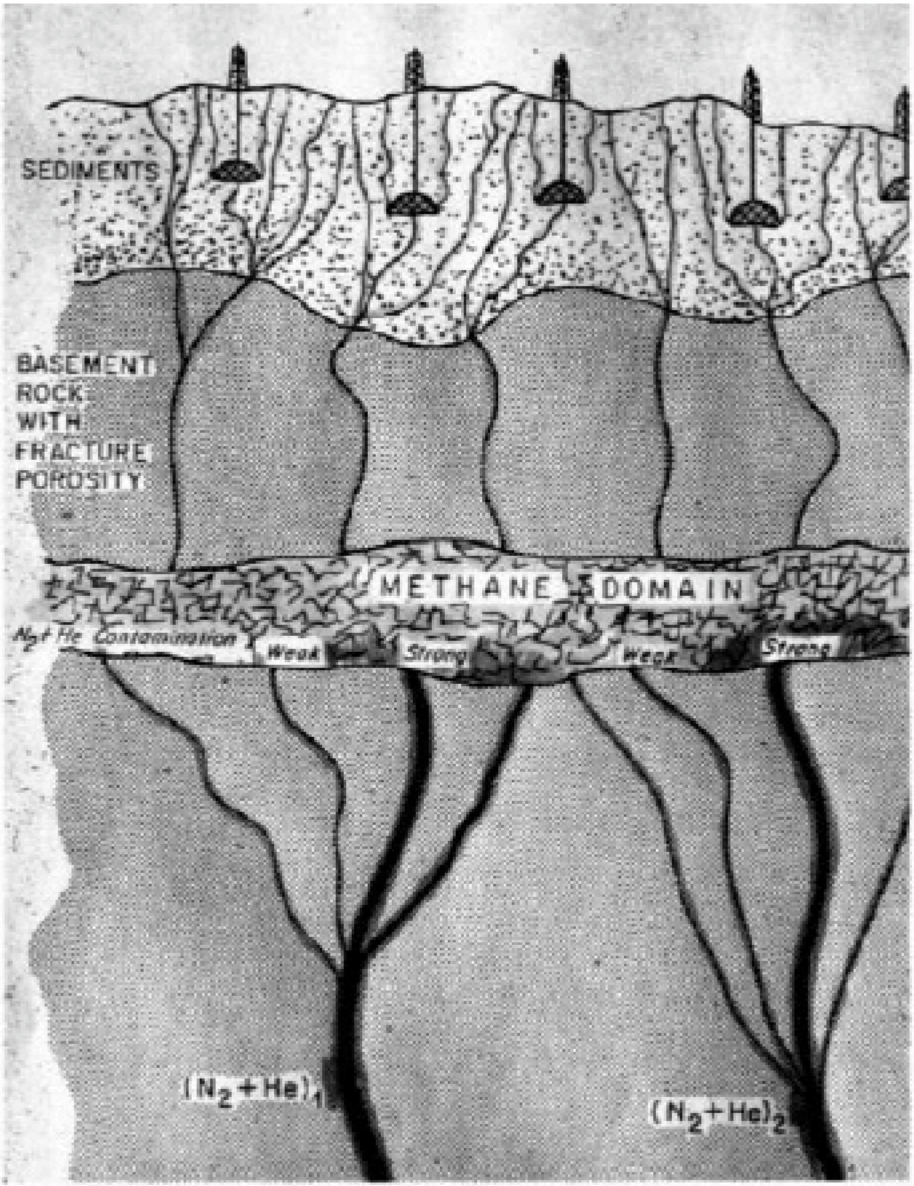
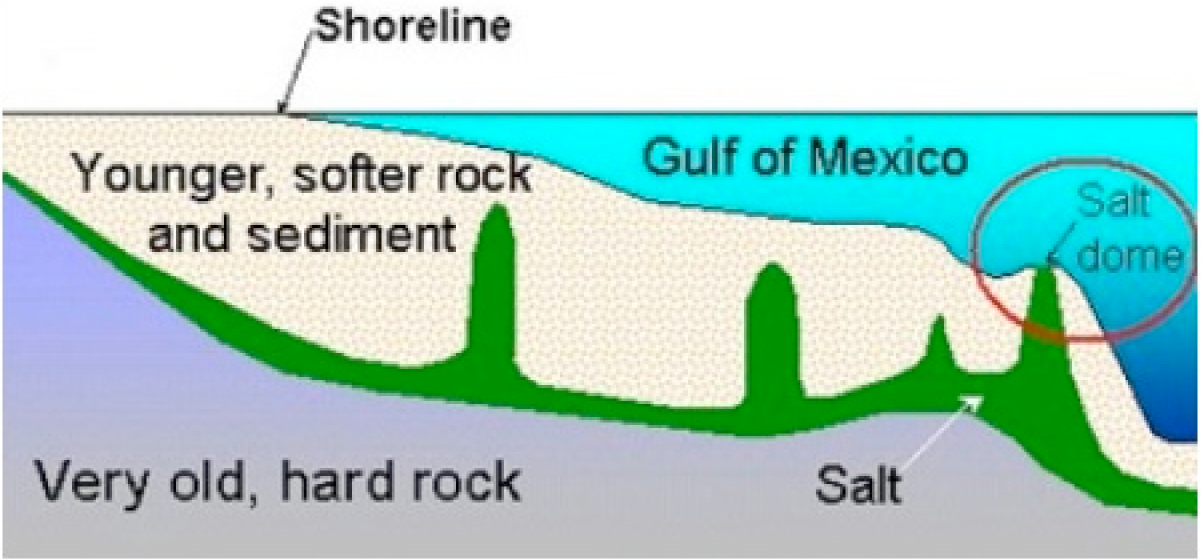
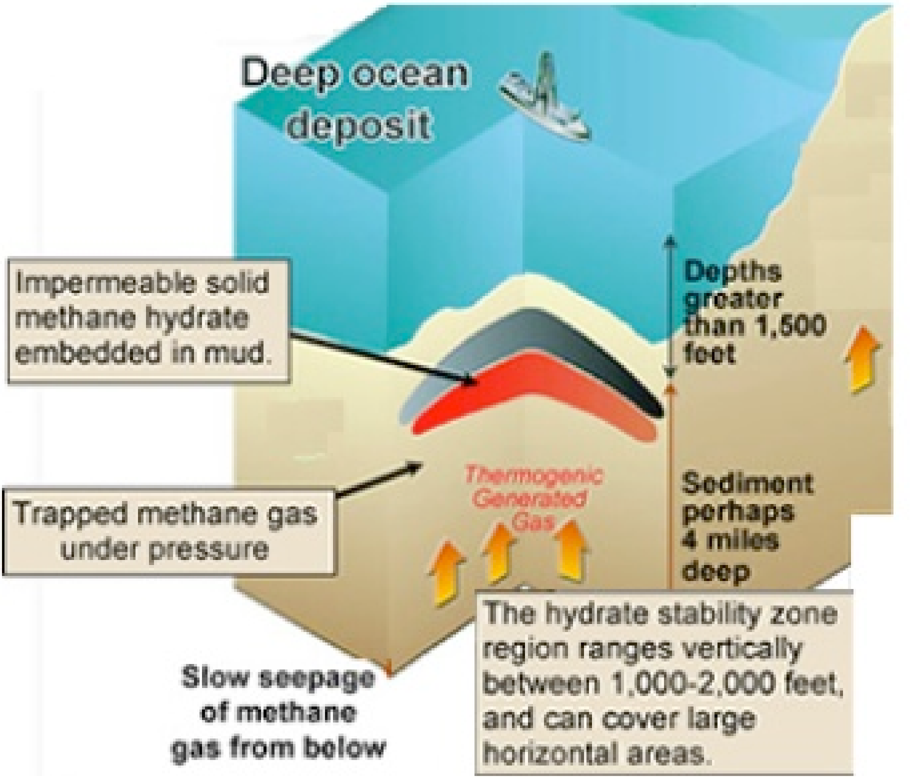


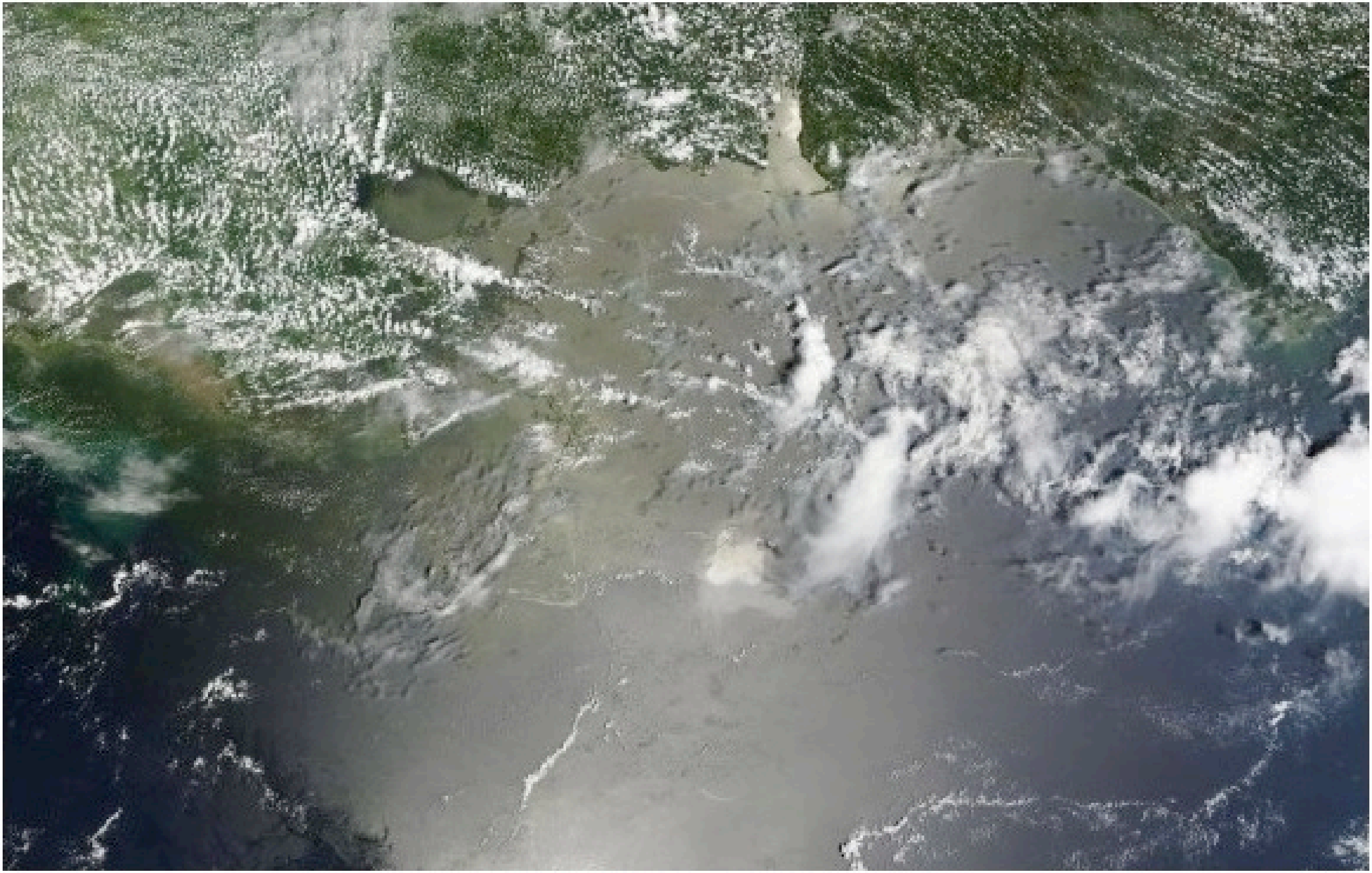
Figure 4.3 Helium transport in upwelling volatiles. This schematic shows how the deep-earth gas theory would account for the helium association with methane. From the deepest levels (perhaps about 300 kilometers), helium produced by radioactive decay is swept into the stream of upwelling nitrogen. At a depth of perhaps 100 kilometers, designated here as the methane domain, nitrogen and helium mix with methane, and all three continue their journey upward. These gases then arrive in the final fields with mixing ratios already determined. The nitrogen–helium ratio is constant over a much larger area, whereas the mixing ratios with methane display individual smaller areas within the first.


Shoreline
Gulf of Mexico
Younger, softer rock
and sediment
Salt
dome
Very old, hard rock
Salt



Deep ocean deposit
Impermeable solid methane hydrate embedded in mud.
Depths greater than 1,500 feet
Thermogenic Generated Gas
Trapped methane gas under pressure
Sediment perhaps 4 miles deep
Slow seepage of methane gas from below
The hydrate stability zone region ranges vertically between 1,000-2,000 feet, and can cover large horizontal areas.

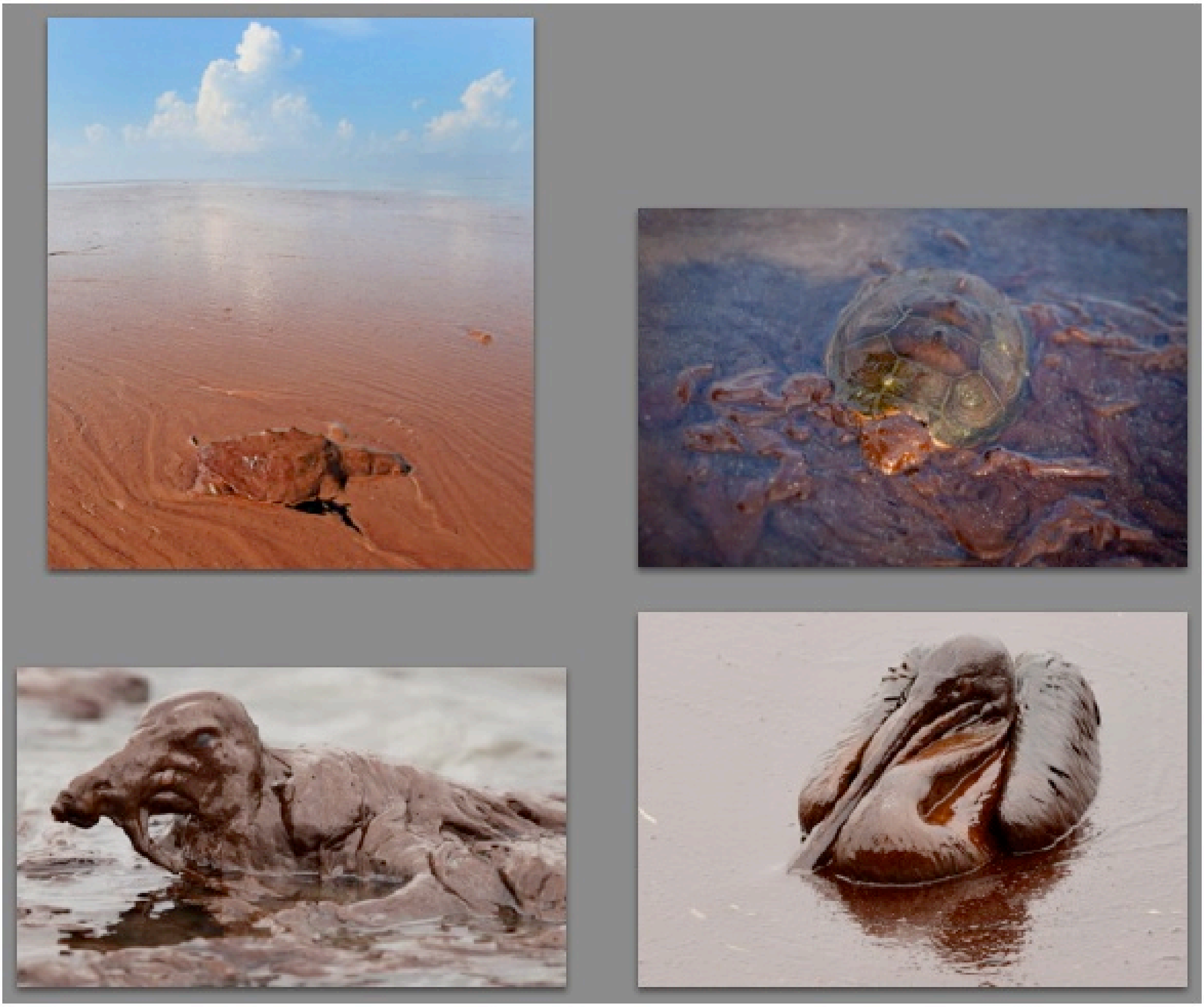
Huge Area of the Gulf Has Been Turned into a Massive Dead Zone By The BP Gulf Oil Spill ...



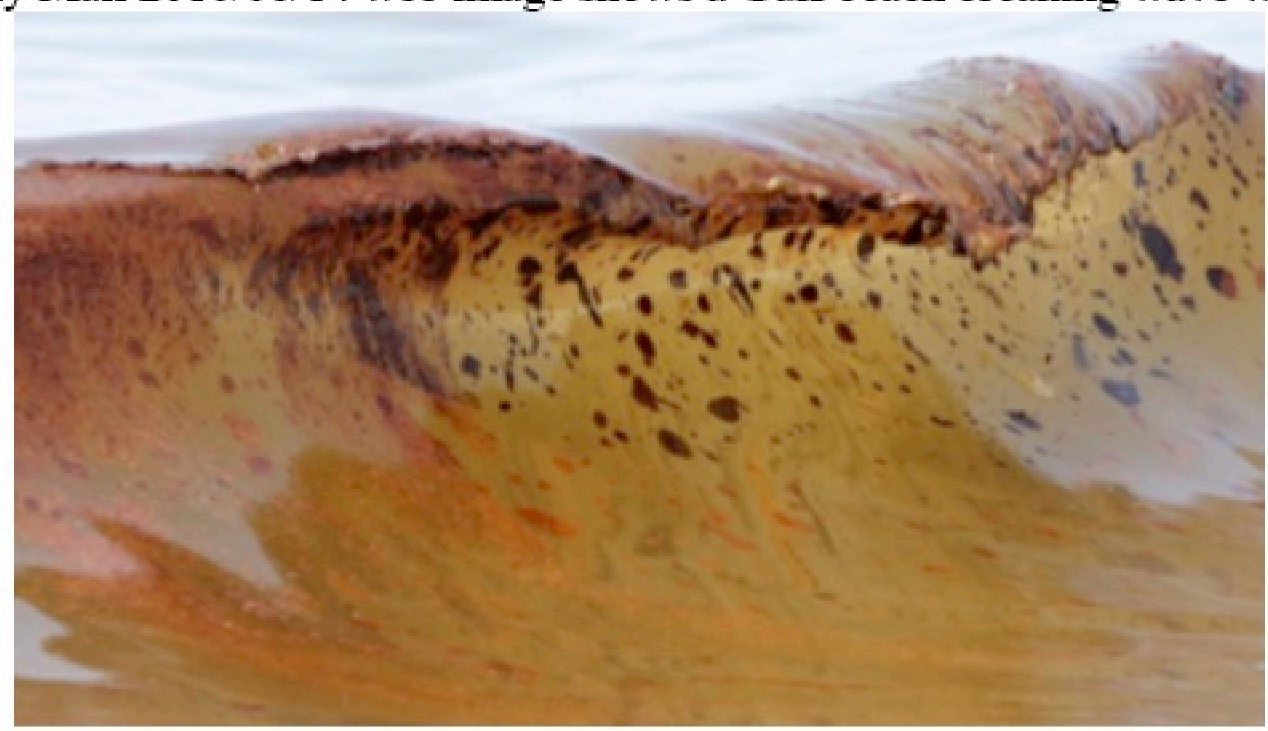
In this July 11, 2010 satellite image provided by NASA, oil from the Deepwater Horizon well is visible on the Gulf of Mexicos surface. The Moderate Resolution Imaging Spectroradiometer (MODIS) on NASAs Terra satellite captured this natural-color image the same day. An especially bright patch appears southeast of the Mississippi Delta, near the approximate location of the oil rig. The oil appears as varying shades of white and gray, as sunlight is reflected off its surface.

The crew of a Basler BT-67 fixed wing aircraft releases oil dispersant over parts of the oil spill off the shore of Louisiana in this May 5, 2010 photograph. (REUTERS/Stephen Lehmann/U.S. Coast Guard)

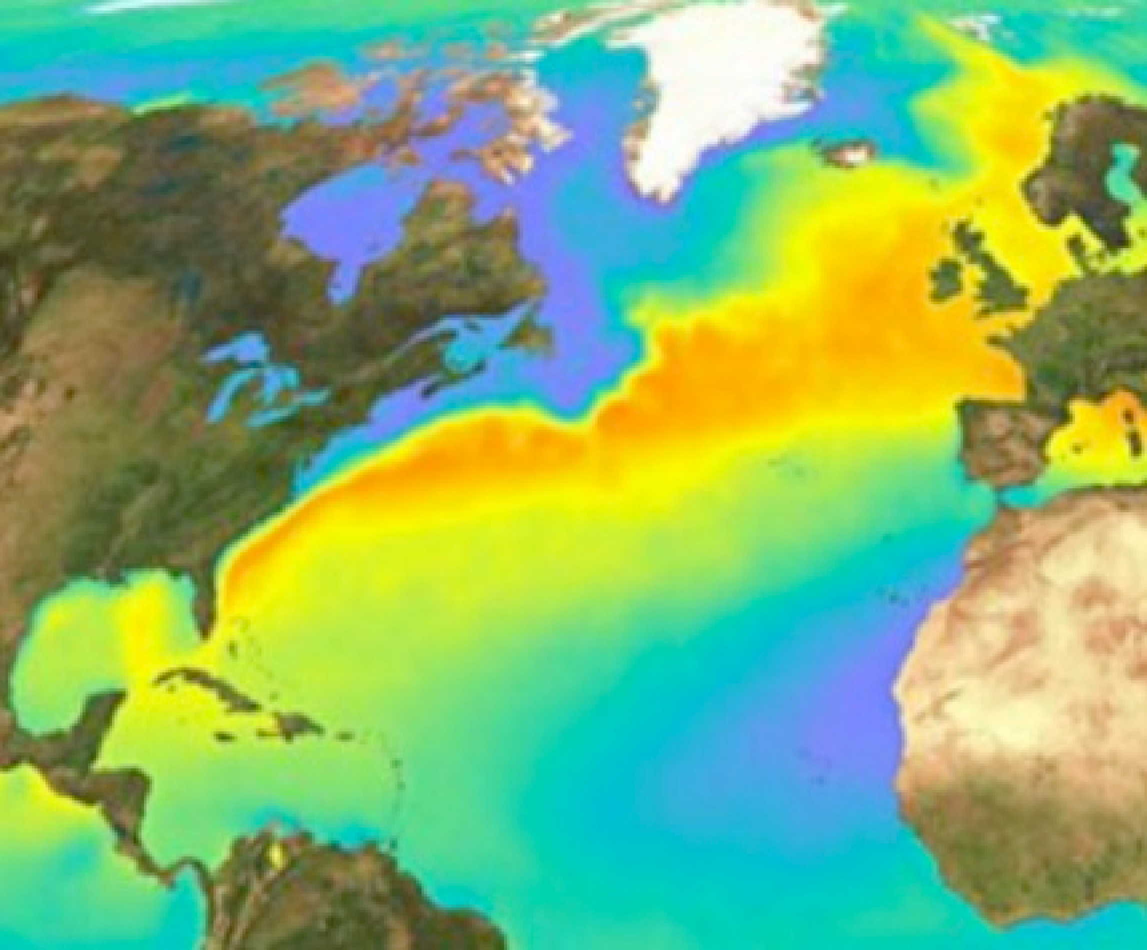
No that's not asphalt... its millions of dead fish.

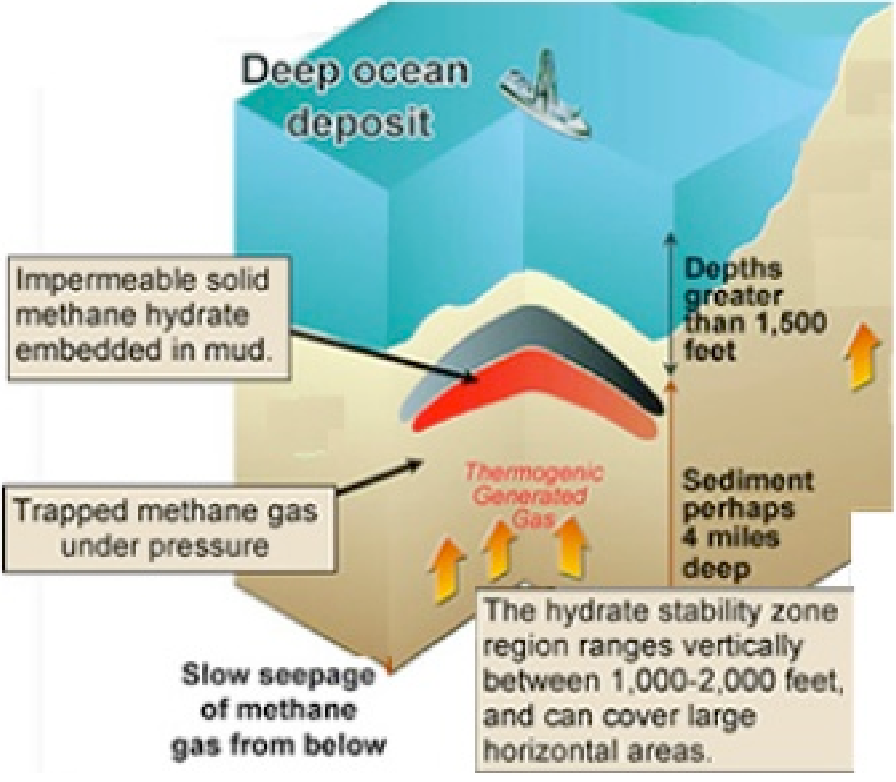


A Daily Mail 2010/06/14 web image shows a Gulf beach breaking wave with oil:



University of Miami CSTARS, July 12, 2010 ... satellite images [show]...

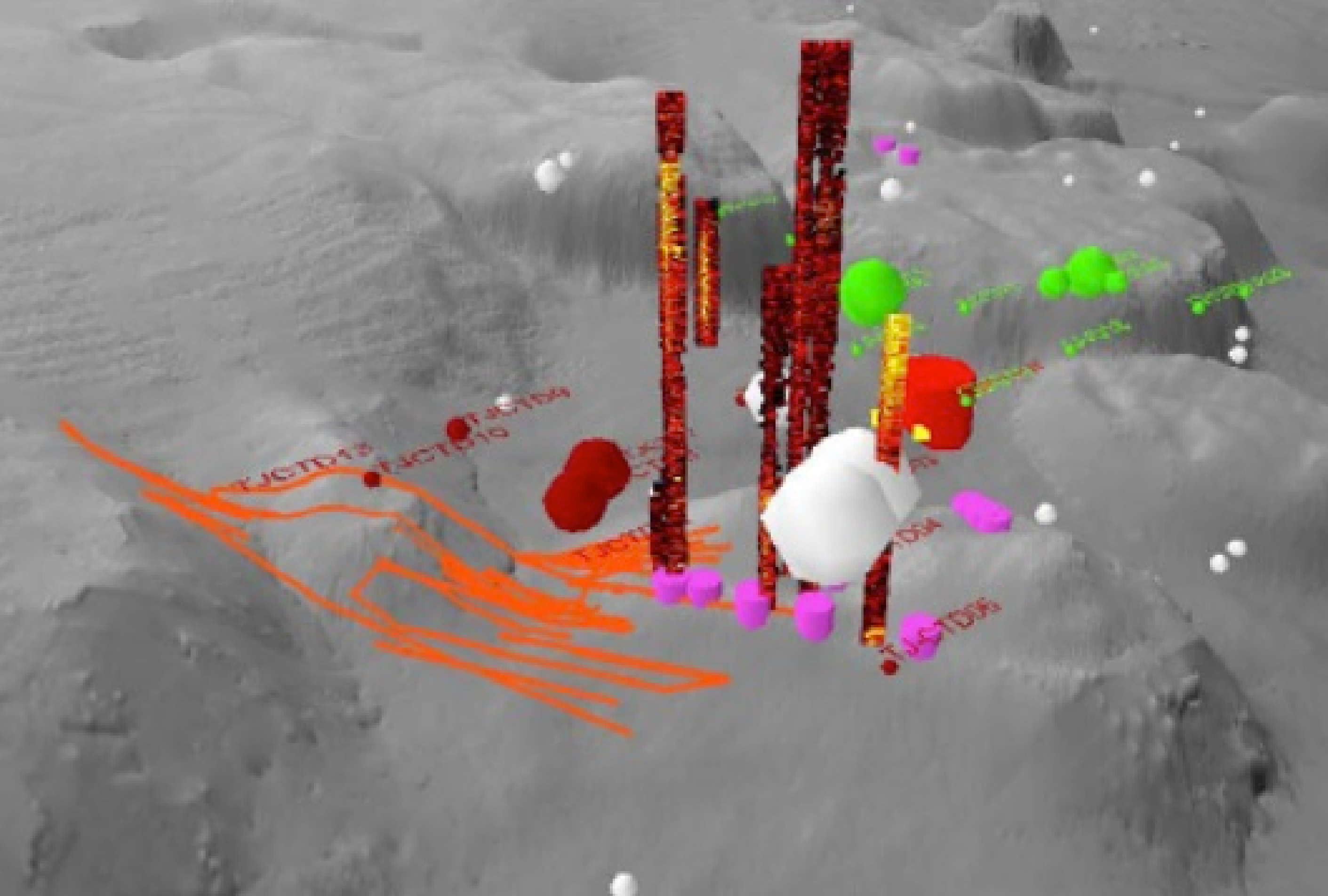


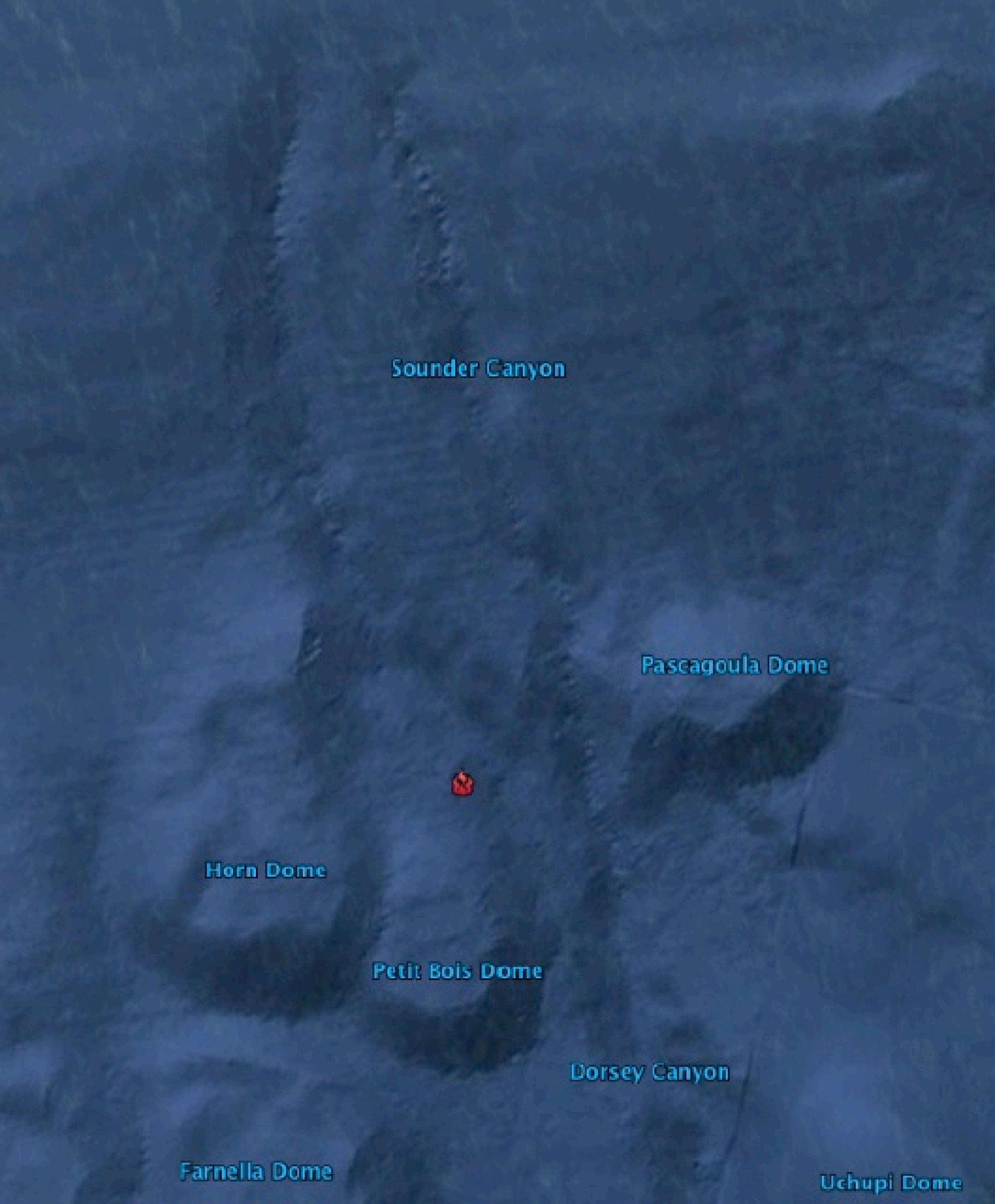

Deep ocean deposit
Impermeable solid methane hydrate embedded in mud.
Depths greater than 1,500 feet
Thermogenic Generated Gas
Trapped methane gas under pressure
Sediment perhaps 4 miles deep
The hydrate stability zone region ranges vertically between 1,000-2,000 feet, and can cover large horizontal areas.
Slow seepage of methane gas from below

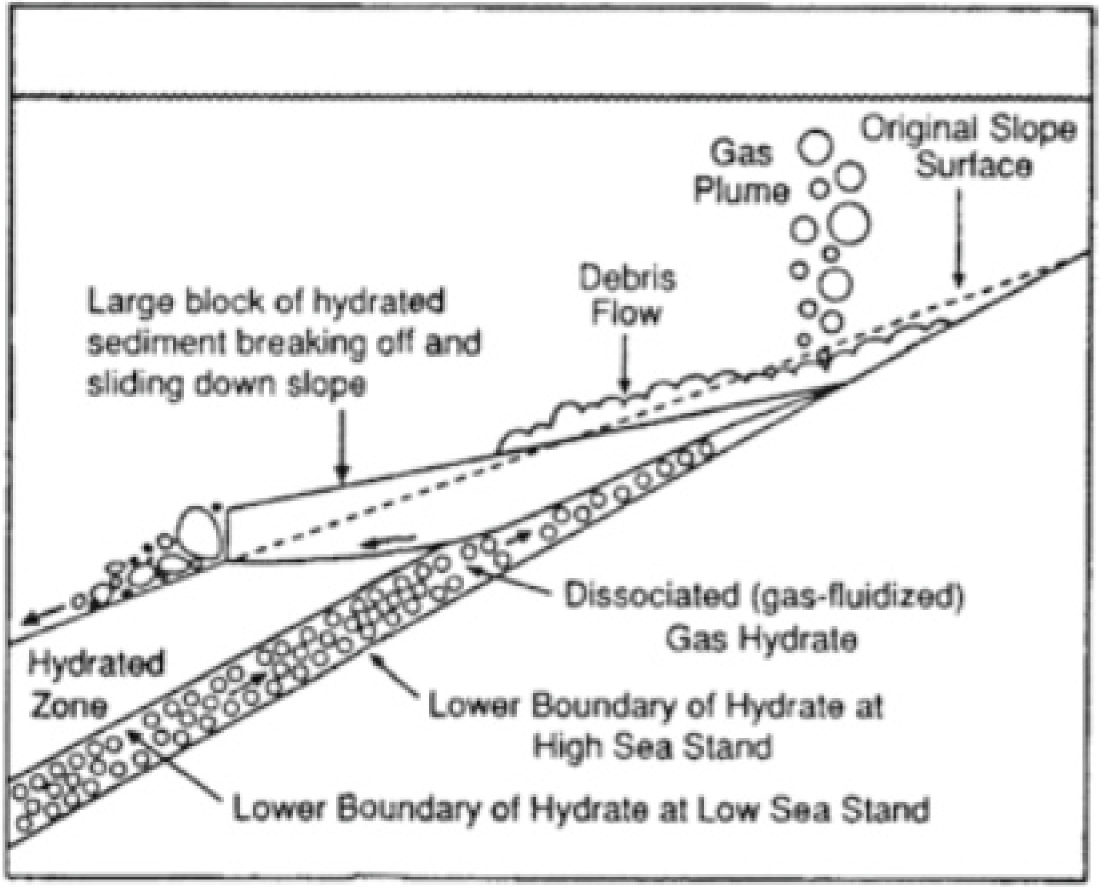
Louisiana
Austin
San Antonio
Houston
45
10
37
35
59
Jacksonville
Florida
75
Gulf of Mexico
Nassau
The Bahamas
Havana
Cuba
Chicxulub, YUC, Mexico
Ciudad de México
Isla de Cozumel
George Town
Cayman Islands
Jamaica
Ambergris Cay
Belmopan

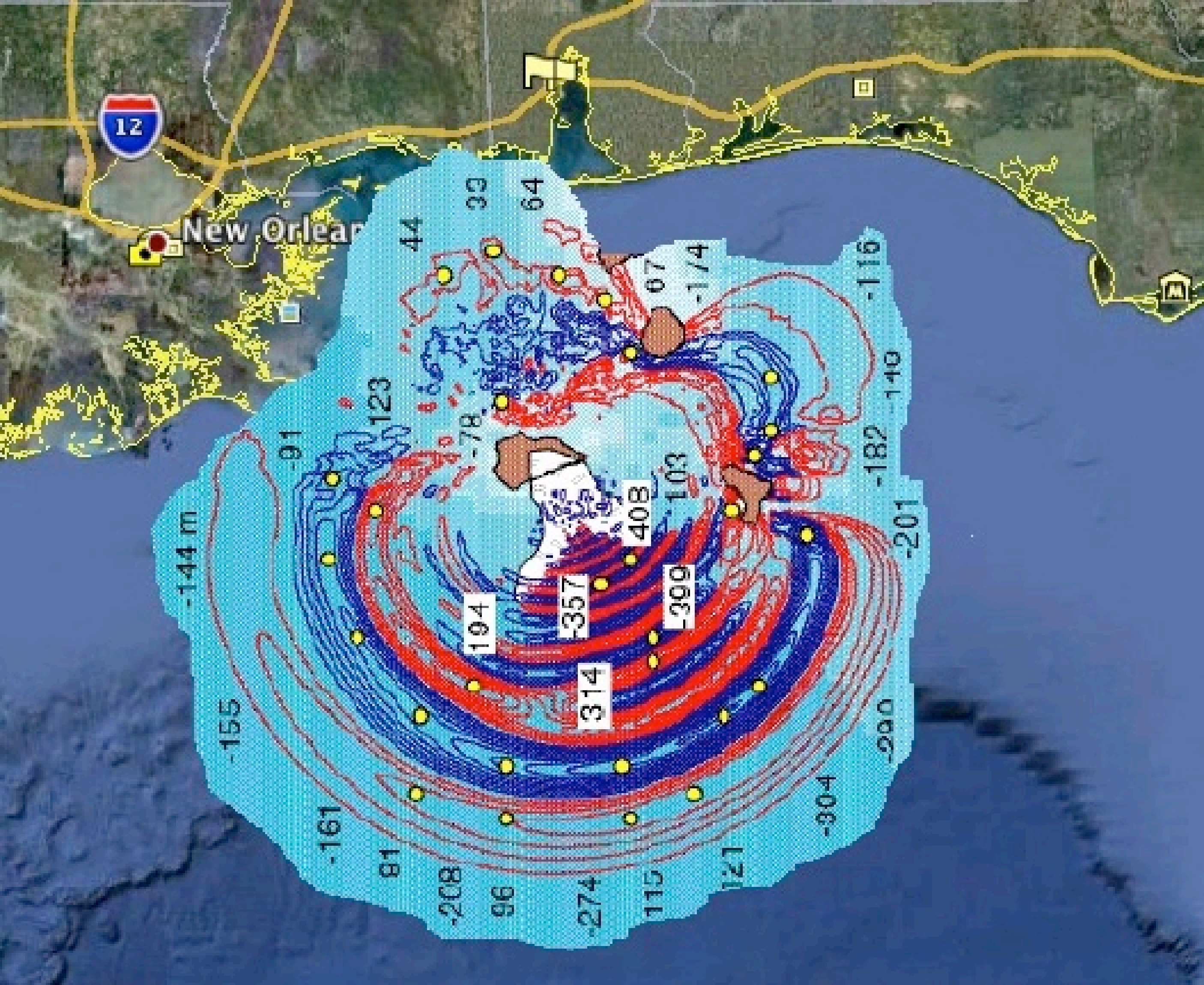

Mobile
Dauphin Island
Cat Island
New Orleans
Panama Cit
Mobile Dome
Chandeleur Valley

Biloxi Dome
Mobile Dome




Sounder Canyon
Pascagoula Dome
Horn Dome
Petit Bois Dome
Dorsey Canyon
Farnella Dome
Uchupi Dome


Gas
Plume
Original Slope
Surface
Debris
Flow
Large block of hydrated
sediment breaking off and
sliding down slope
Dissociated (gas-fluidized)
Gas Hydrate
Hydrated
Zone
Lower Boundary of Hydrate at
High Sea Stand
Lower Boundary of Hydrate at Low Sea Stand


12
New Orlean
33
64
44
-174
67
-116
123
-78
-140
-91
-182
103
408
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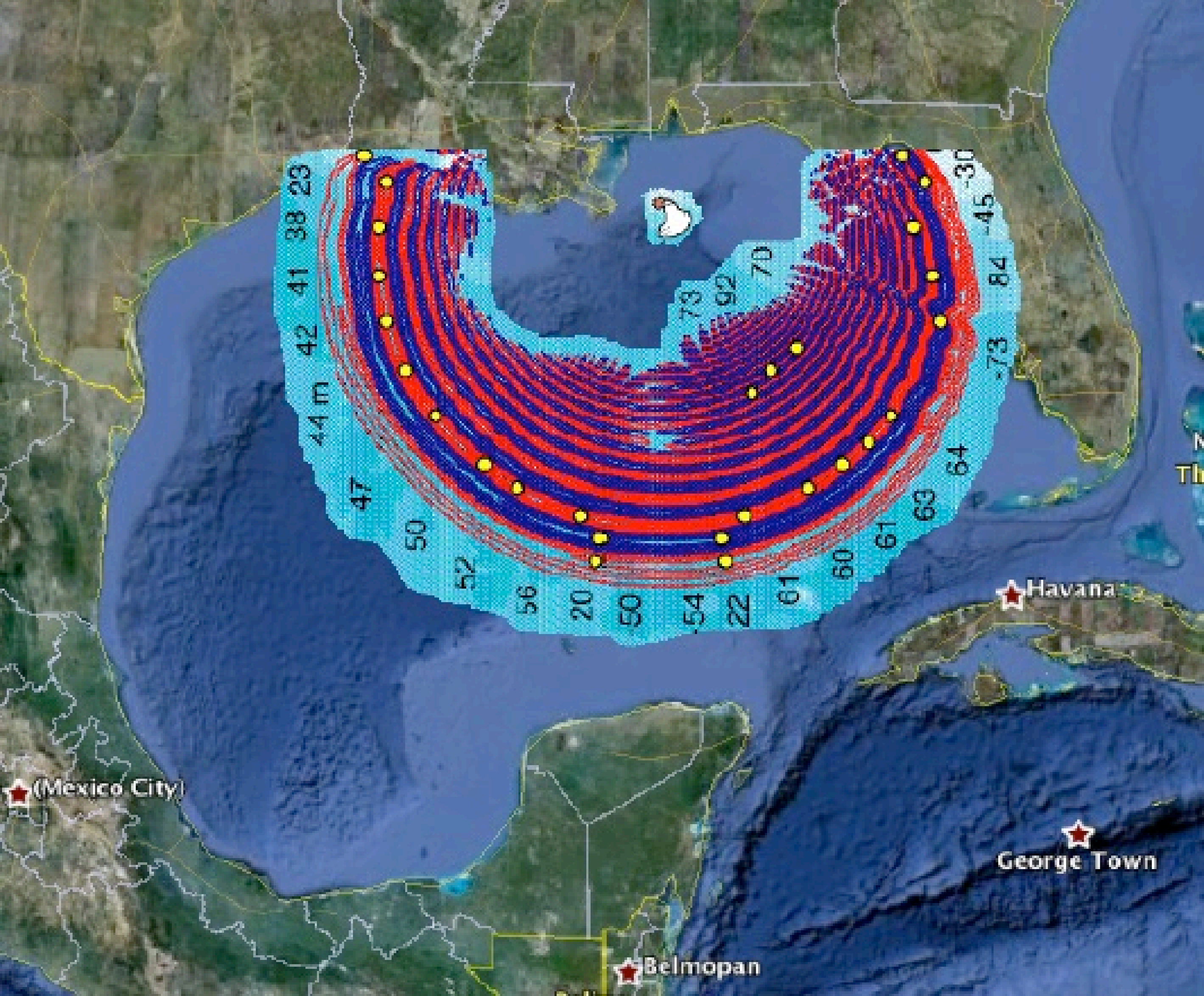
-208
96
-274
115
121



23
38
41
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92
73
Havana
(Mexico City)
George Town
Belmopan

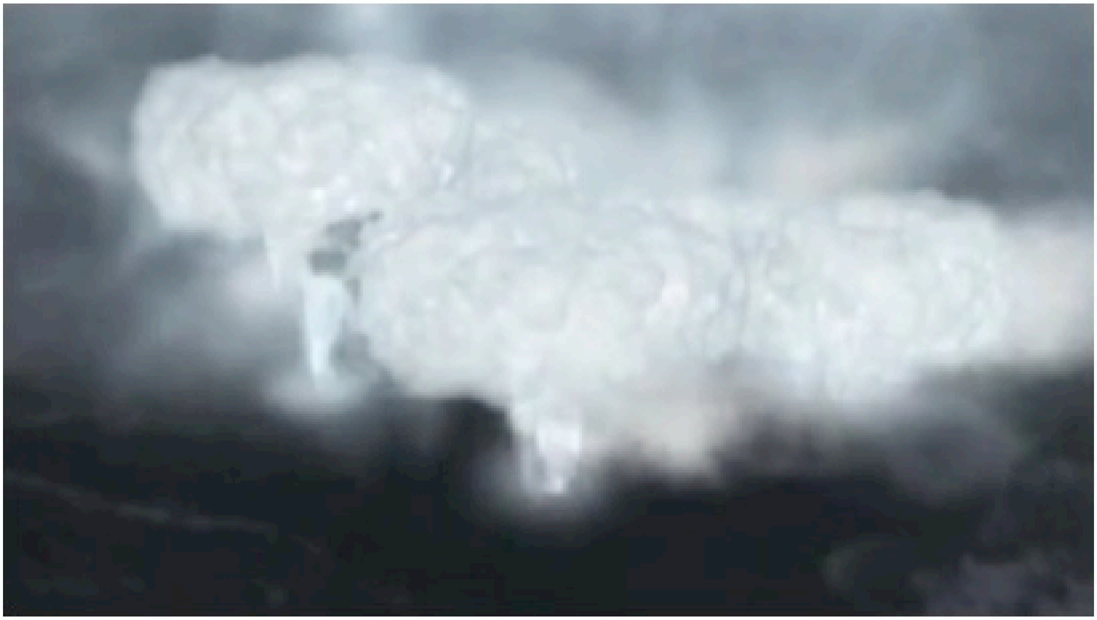
Could the Submarine Landslide/Tsunami Destabilize Metastable Methane in the deep waters of the Gulf of Mexico?

"... Scientists, including those working on ... the U. S. Geological Survey's "flow team" ... estimate that methane makes up between 40 percent and 70 percent of what is spilling into the Gulf [from the Deepwater Horizon well site] ... In early June [2010] a research team led by Samantha Joyce of ... the University of Georgia investigated a 15-mile long plume drifting southwest from the leak site [i.e., down into the deep water basin of the Gulf of Mexico]. They ... found methane concentrations up to 10,000 times higher than normal ..." according to an 18 June 2010 AP article by Matthew Brown and Ramit Plushnick-Masti.

"... Texas A&M University oceanography professor John Kessler ... took measurements of both surface and deep water within a 5-mile ... radius of BP's broken wellhead ... the crew ... found ... some ... methane ... concentrations that were 100,000 times higher than normal ..." according to a 22 June 2010 Reuters article by Julie Steenhuysen.

"... The normal methane amount that escapes from a compromised will is about 5 percent. ... John Kessler of Texas A&M ... has calculated that the ruptured well is spewing ... 40 percent methane. ... A huge ... rift ... on the ocean floor ... hemorrhaging oil and methane ... has been reported by the NOAA research ship, Thomas Jefferson. Before the ... government enforced news blackout ... scientists aboard the ship voiced their concerns that the widening rift may go down miles into the earth. ... It ...[is].. 10 miles away from the BP epicenter. Other, new fissures, have been spotted as far as 30 miles distant. ..." according to a helium.com web article by Terrence Aym.

A very fast transition from this metastable state can be triggered by disturbances that displace fluid a finite distance in the vertical direction [think of a submarine landslide]... a parcel of fluid that is displace upward ... is ... subjected to lower hydrostatic pressure, to which corresponds a lower solubility value. As a result, the fluid is ... supersaturated, exsolution will begin ... volume ... increases due to the formation of bubbles .... The result is a violent eruption ...

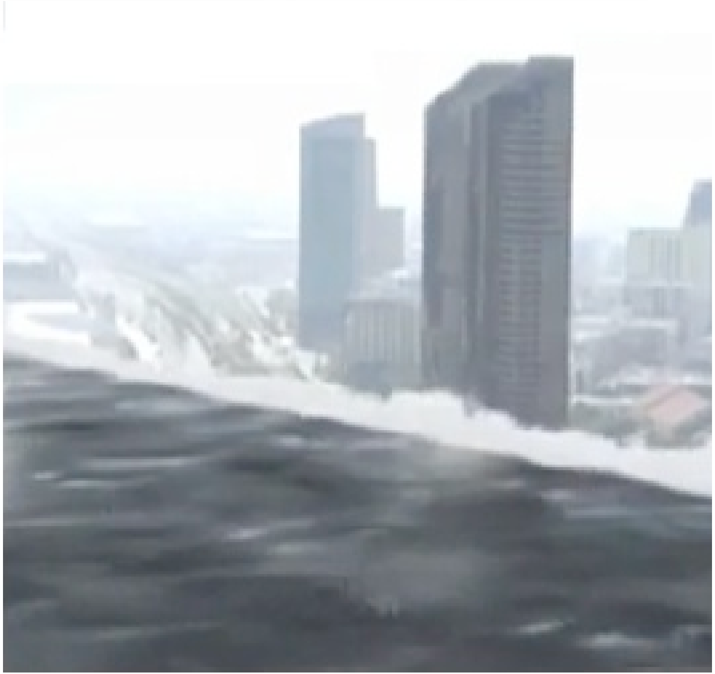


ejecting a large amount of methane ... into the atmosphere and flooding large areas of land ... methane loaded with water droplets ... is ... heavier ... than air ... and thus spreads over the land, mixing with air in the process (and losing water as rain). The air-methane mixture is explosive at methane concentrations between 5% and 15%; as such mixtures ... are ignited by lightning, explosions and conflagrations destroy ... life ... and ... carry smoke and dust into the upper atmosphere, where they may remain for several years ... resulting ...[in]... darkness and ... cooling ... In detonation, the combustion zone is preceded by a shock wave, moving with velocity about 2 km / sec ; pressures of about 30 bar can be produced ... The likelihood of the ... detonation transition increases with the size of the gas cloud ...[which]... can be very large in the case of oceanic eruption ...

the Black Sea alone [which is comparable in size to the eastern part of the deep water basin of the Gulf of Mexico into which methane is being released due to the Deepwater Horizon event] (volume about 0.4 x 10^(-3) of the ocean total; maximum depth ... 2.2 km) could hold, at saturation, about 0.5 x 10^18 g ... of dissolved methane ...

Combustion and explosion of 0.75 x 10^18 g of methane would liberate energy equivalent of 10^7 Mt of TNT, about 1,000 times greater than the world's stockpile of nuclear weapons ...

Austin
San Antonio
Houston
Florida
Havana
Chicxulub, YUC, Mexico
Isla de Cozumel
Ciudad de Mexico
Cayman Islands

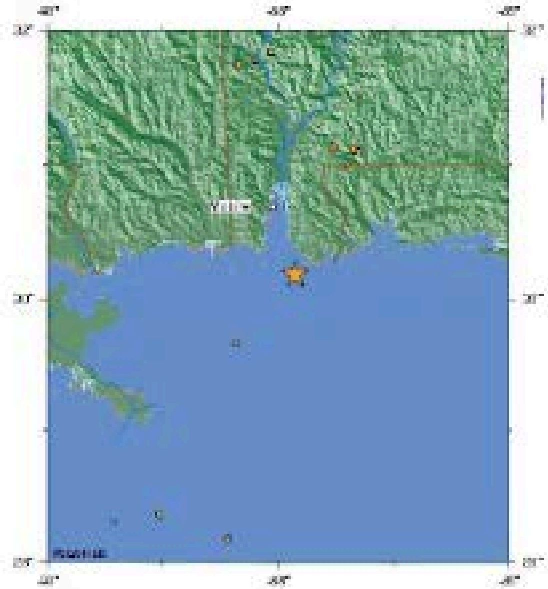



Earthquake Rattles Dauphin Island

Historic Seismicity

Magnitude 3.5 WESTERN FLORIDA

Friday, February 18, 2011 at 23:15:34 UTC



by Rose Ann Haven

Published: Fri, February 18, 2011 - 10:41 pm CST

Last Updated: Sat, February 19, 2011 - 12:37 pm CST

3.5 Magnitude Quake Shakes Residents for 10 to 20 Seconds

DAUPHIN ISLAND, Alabama - "It was not much of the ground shaking. It was the walls of the building that were shaking", said Cameron Moore. Moore is the Assistant Manager of the Isle of Dauphine Golf Club on Dauphin Island. What Moore thought was a sonic boom, was a 3.5 magnitude earthquake.

"I noticed the golf balls..the boxes of golf balls were shaking..and I was thinking..I knew I didn't slam the door that hard", said Moore. Dauphin Island Mayor Jeff Collier felt the quake too from inside his home.

"All of a sudden, I noticed the mirror on my dresser was kind of moving around rather violently quite frankly, and I'm like golly something's happening so..and by the time I figured out that something was going on it was over. I'd say the whole incident probably lasted at least 10 , 15, possibly 20 seconds", said Collier.

Collier, a life long resident of Dauphin Island has never felt anything like it in his 50 years.

Mayor Collier says he doesn't think residents should stay up all night worrying about the earthquake but he says obviously if it happened once, it can happen again.
Residents on Dauphin Island wonder what caused it. Some speculate somehow it could be related to the oil spill.

others wonder, could this be the beginning of something more devastating.

"I think if anything it just reminds us that we live here on the coast, and mother nature has all kind of ways that we deal with. I guess this is just one other thing we'll have to add to the list", says Collier.

There are no reported damages or injuries from the quake.

What Can Be Done?

Rob Kall said, in an OpEdNews.com article on 17 June 2010: "... from my contact inside BP: ... Size of reservoir – estimated by BP and its partner, Andarko to be between 2.5B and 10B bbl. ... the well casing is compromised (broken). ... The casing was undoubtedly broken apart by the natural gas 'explosion' at the bottom of the well, which was the result of methane coming out of solution (ie. the methane hydrates melting and expanding dramatically). ... If ... the explosion rupture[d] the casing for its entire length ... then a relief well will be unable to plug the hole. TEN relief wells would be unable to plug the hole. The consensus seems to be, among oil people ... that this is exactly the case. If that's so, then

the well will run until Obama nukes it.

That is the only thing that could close it. ...".

If, as seems likely from the Thomas Jefferson results, the Methane Release is not just at one hole at the Deepwater Horizon well site, but also through a lot of cracks (seeps) in the area, nuke demolition will take a coordinated effort of a number of nukes to seal all the cracks.

Of course, closing it with nukes has a risk of setting off a Gulf continental shelf edge undersea landslide and a consequent tsunami,

but not closing it with nukes has the (much greater in my opinion) risk of depressurizing the massive methane hydrate deposits leading to methane explosion and even larger undersea landslides and tsunamis.

What is needed is

A CAREFULLY COORDINATED SET OF NUKES - DONE BY REAL DEMOLITION EXPERTS IN THE MILITARY

who know how to focus energy where it is needed (like bringing down a building without damaging adjoining buildings) and who are given

COMPLETE FREEDOM TO DO IT RIGHT.

Seawolf Class Statistics

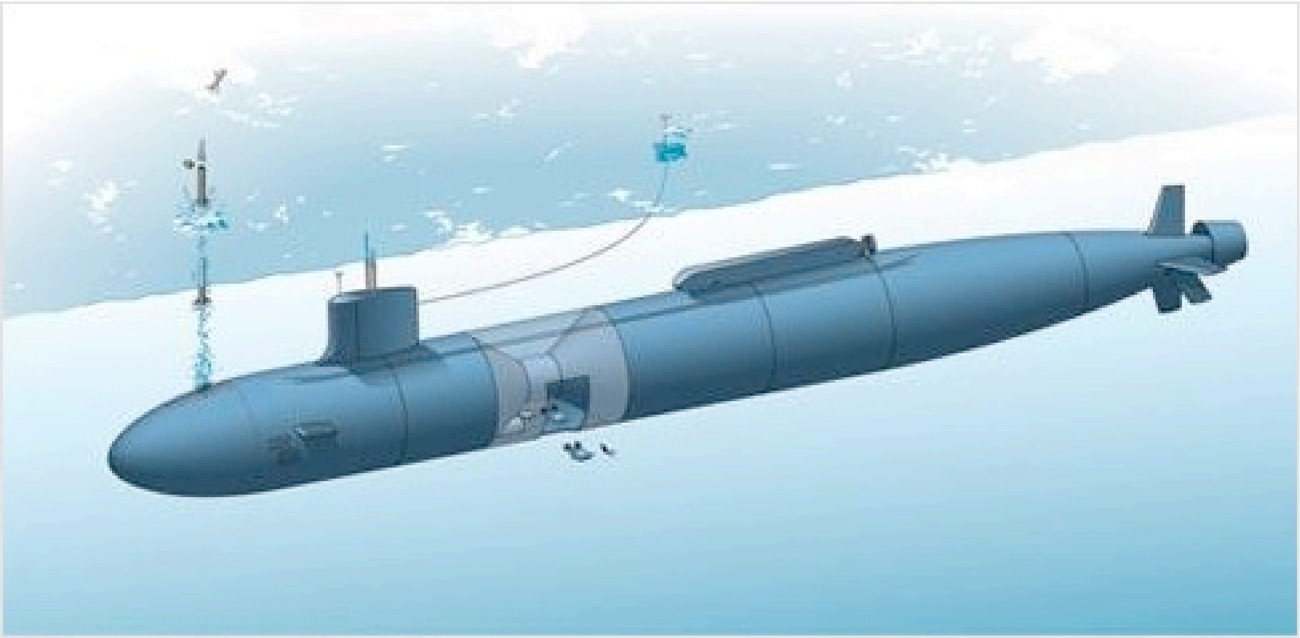
Builders: General Dynamics Electric Boat Division
Power Plant: One nuclear reactor, one shaft
Displacement: 9,137 tons submerged (12,139 tons for the Jimmy Carter)
Length: 353 feet (453 feet for the Jimmy Carter)
Hull Diameter: 40 feet
Draft: 35 feet
Speed: 25+ knots (28+ miles per hour, 46.3+ kph)
Diving Depth: 800+ feet
Weapons: Mark 48 anti-submarine torpedoes (8 tubes), Tomahawk cruise missiles
Stealth: Less detectable at high speed than a Los Angeles-class submarine sitting at pier side
Crew: 13 Officers; 121 Enlisted

Ships of the Class

USS Seawolf (SSN21)
USS Connecticut (SSN22)
Jimmy Carter (SSN23)

Robot mini subs, navy seal launches, high-tech espionage: the submarine of the 21st century has arrived

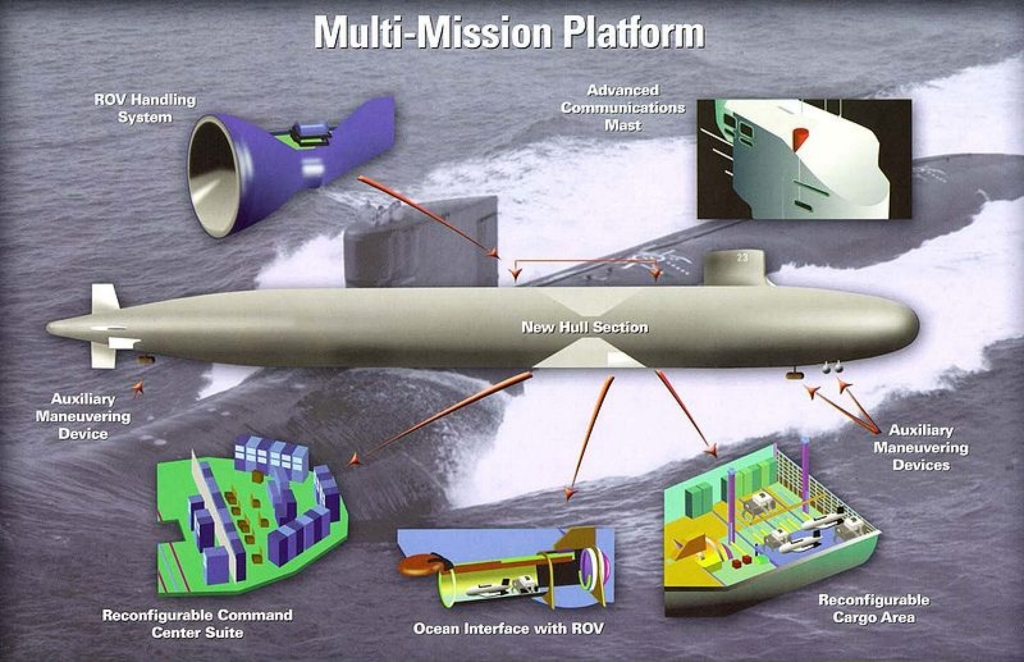
By Bill Sweetman Posted 06.30.2005 at 11:00 am 0 Comments



by Jason Lee *Jason Lee*

View Photo Gallery

Common wisdom in this age of door-to-door combat dictates that the U.S. submarine fleet is of diminishing utility–after all, there are no terrorists hiding underwater. But common wisdom does not so easily apply to the USS Jimmy Carter, a giant Seawolf-class nuclear submarine modified into a spy ship. The submarine, commissioned in February, will serve as a stealthy weapon near enemy shores: tapping into undersea fiber-optic cables, covertly delivering Navy Seals into enemy ports, and, if necessary, directly attacking enemy ships and land-based targets.


Multi-Mission Platform
ROV Handling System
Advanced Communications Mast
23
New Hull Section
Auxiliary Maneuvering Device
Auxiliary Maneuvering Devices
Reconfigurable Command Center Suite
Ocean Interface with ROV
Reconfigurable Cargo Area

End loading the 100-ton forward upper module

SPY ANATOMY

The USS *Jimmy Carter* is one of the Navy's three Seawolf-class subs—the largest, fastest and most heavily armed in the fleet—with a billion dollars' worth of modifications tacked on. Most of these, such as new launching systems for pilotless aircraft, a super-stealthy jet-propeller design and the first-ever "wasp waist," will help the craft carry out its primary mission: espionage.

SUPER SONAR

You may not hear the *Carter*, but with the help of a 30-foot golfball-like array of microphones mounted in the bow, it can hear you. Other arrays mounted in the ship's sides will help the *Carter* quickly triangulate the source of a sound.

LAUNCHING AERI L SPIES

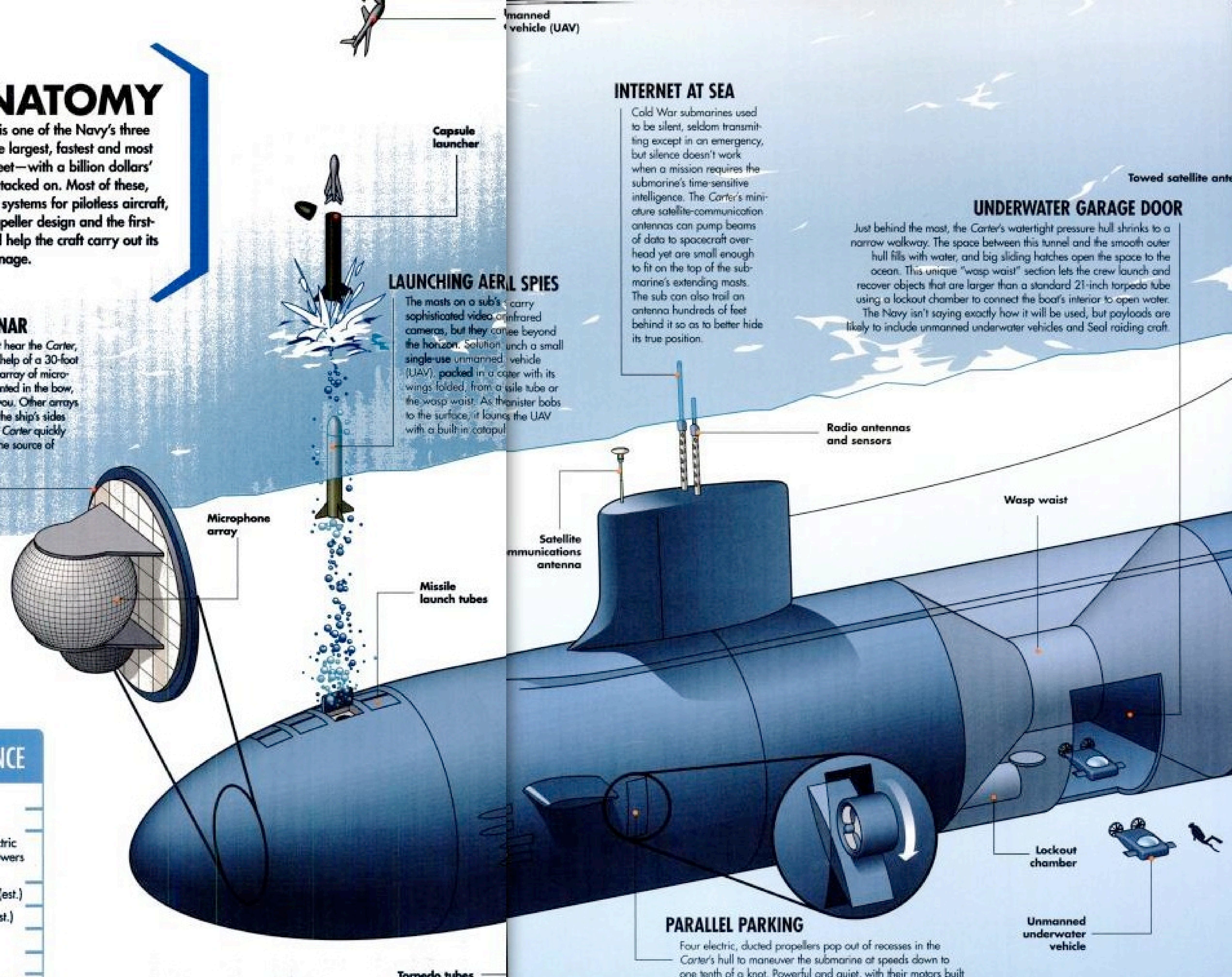
The masts on a sub's carry sophisticated video o infrared cameras, but they ca ee beyond the horizon. Solution unch a small single-use unmanned vehicle (UAV), packed in a c ter with its wings folded, from a ssile tube or the wasp waist. As th nister bobs to the surface, it launc the UAV with a built-in catapul

INTERNET AT SEA

Cold War submarines used to be silent, seldom transmitting except in an emergency, but silence doesn't work when a mission requires the submarine's time-sensitive intelligence. The *Carter*'s miniature satellite-communication antennas can pump beams of data to spacecraft overhead yet are small enough to fit on the top of the submarine's extending masts. The sub can also trail an antenna hundreds of feet behind it so as to better hide its true position.

UNDERWATER GARAGE DOOR

Just behind the mast, the *Carter*'s watertight pressure hull shrinks to a narrow walkway. The space between this tunnel and the smooth outer hull fills with water, and big sliding hatches open the space to the ocean. This unique "wasp waist" section lets the crew launch and recover objects that are larger than a standard 21-inch torpedo tube using a lockout chamber to connect the boat's interior to open water. The Navy isn't saying exactly how it will be used, but payloads are likely to include unmanned underwater vehicles and Seal raiding craft.

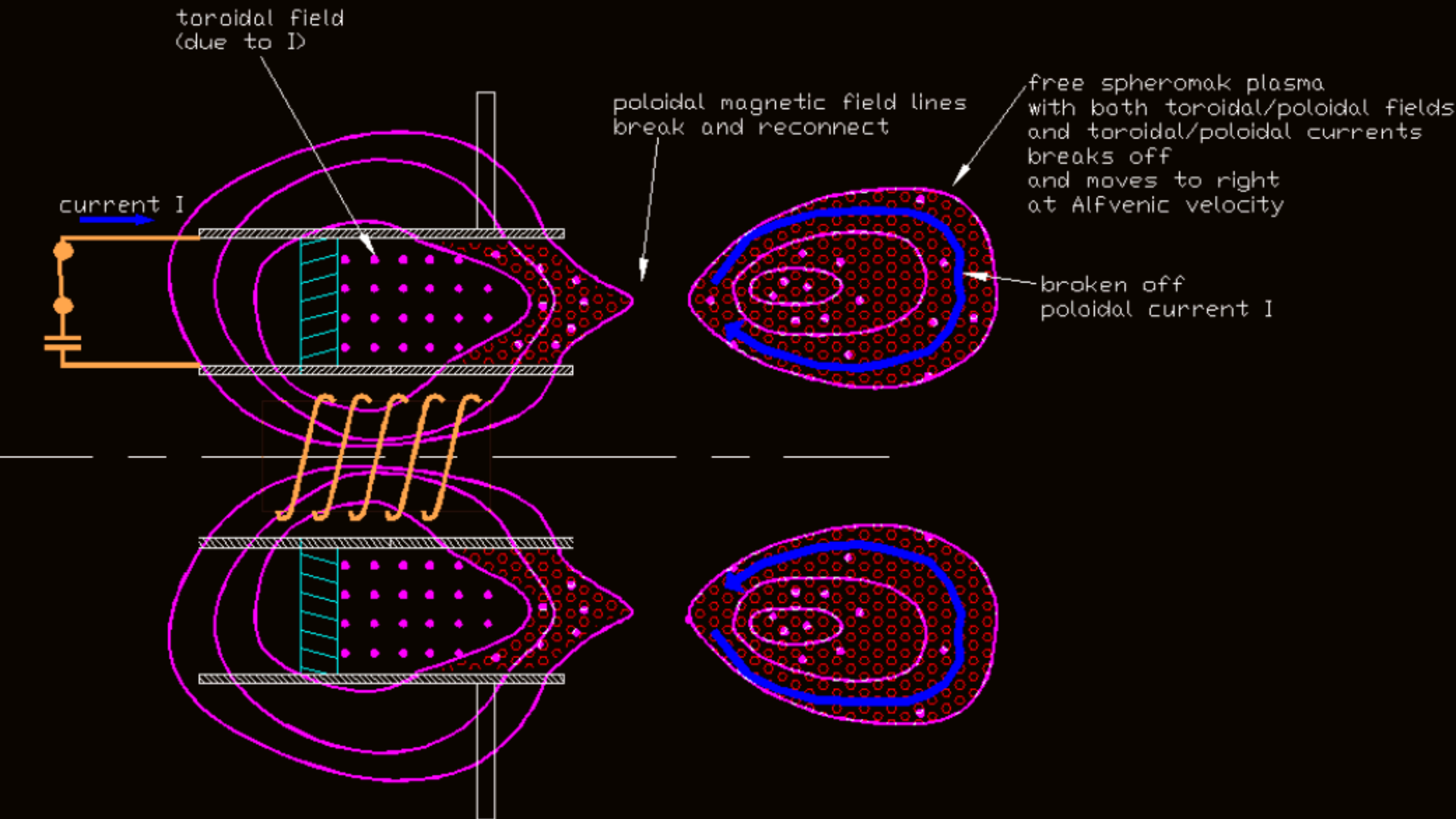


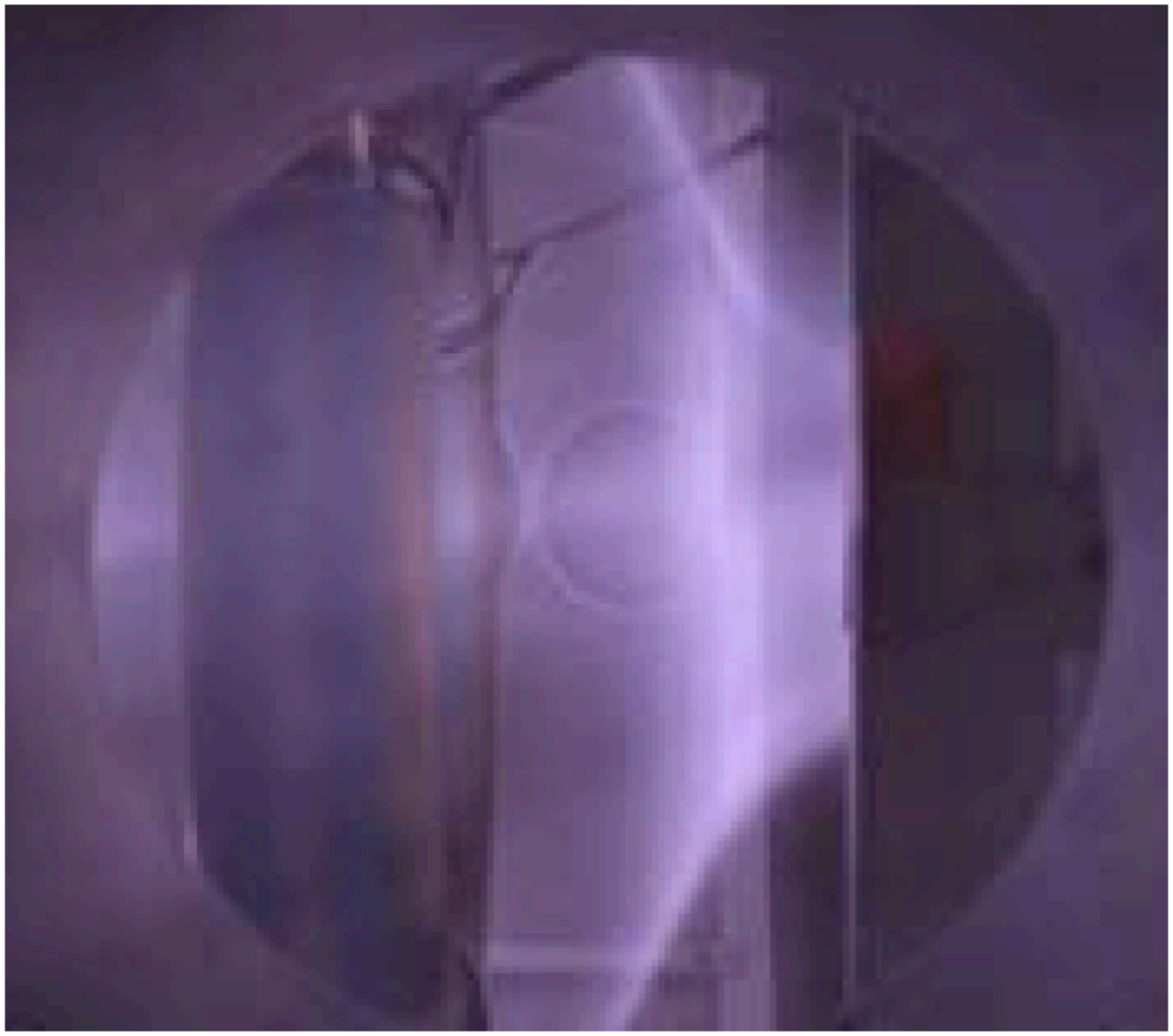
PARALLEL PARKING

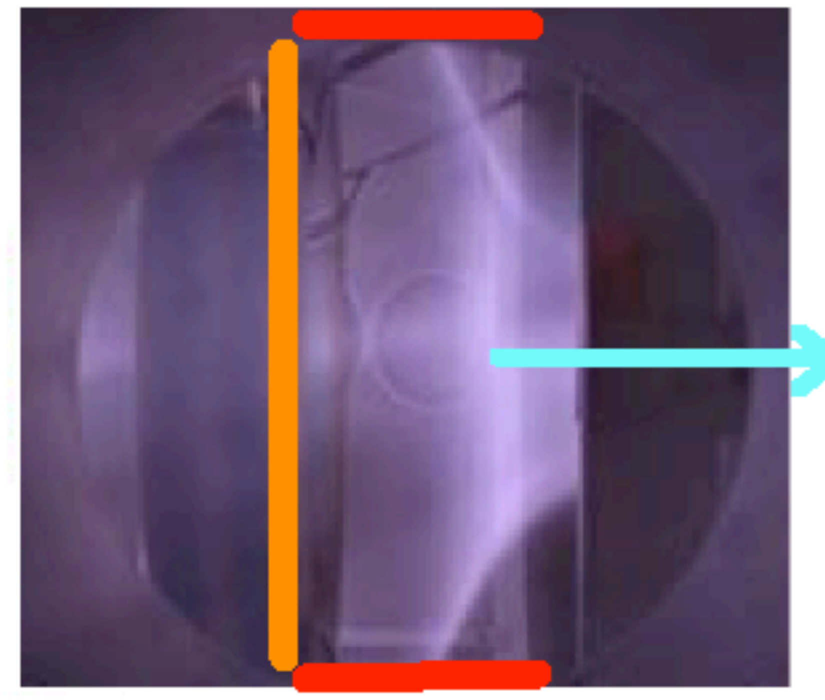
Four electric, ducted propellers pop out of recesses in the *Carter*'s hull to maneuver the submarine at speeds down to one tenth of a knot. Powerful and quiet, with their motors built into their impeller rims, the maneuvering propellers can even spin the massive boat around its own axis.

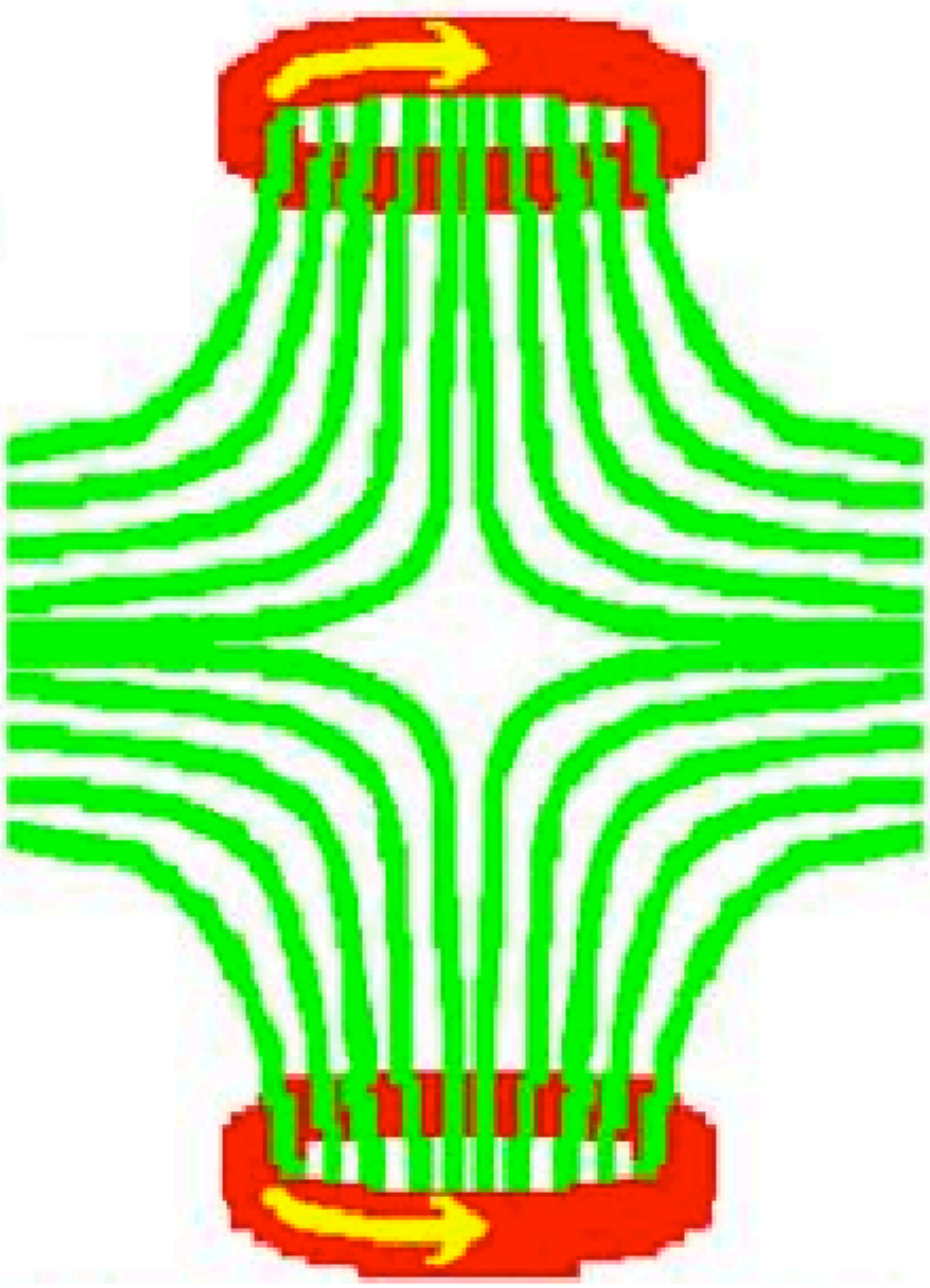
CARTER AT A GLANCE

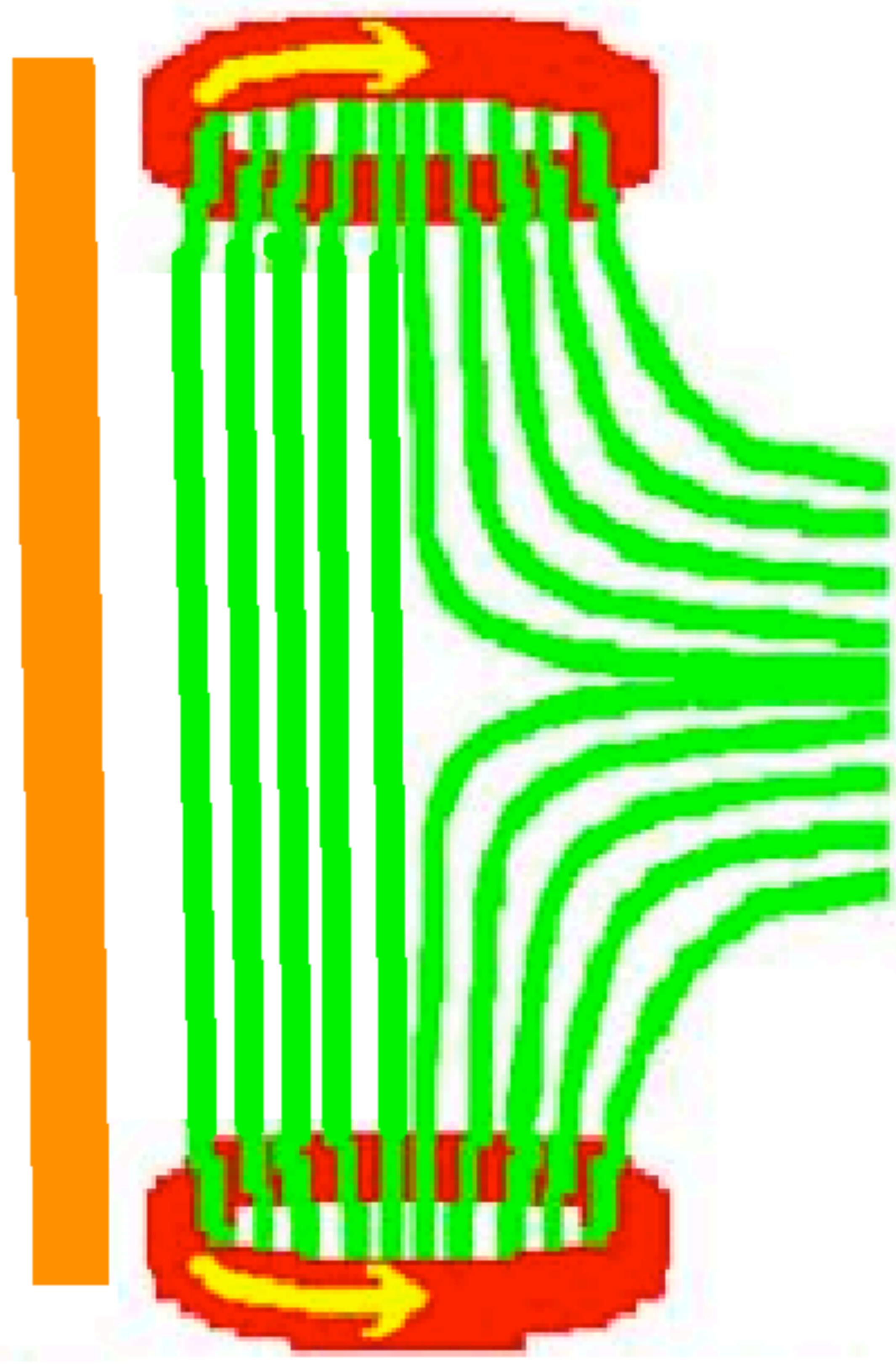
Size	453 by 40 feet
Weight	12,190 tons
Power plant	General Electric S6W nuclear reactor that powers dual steam turbines
Cruising speed	35 knots (est.)
Max. depth	2,000 feet (est.)
Crew	140
Cost	$3.2 billion
Namesake	The only U.S. president to have been a submariner

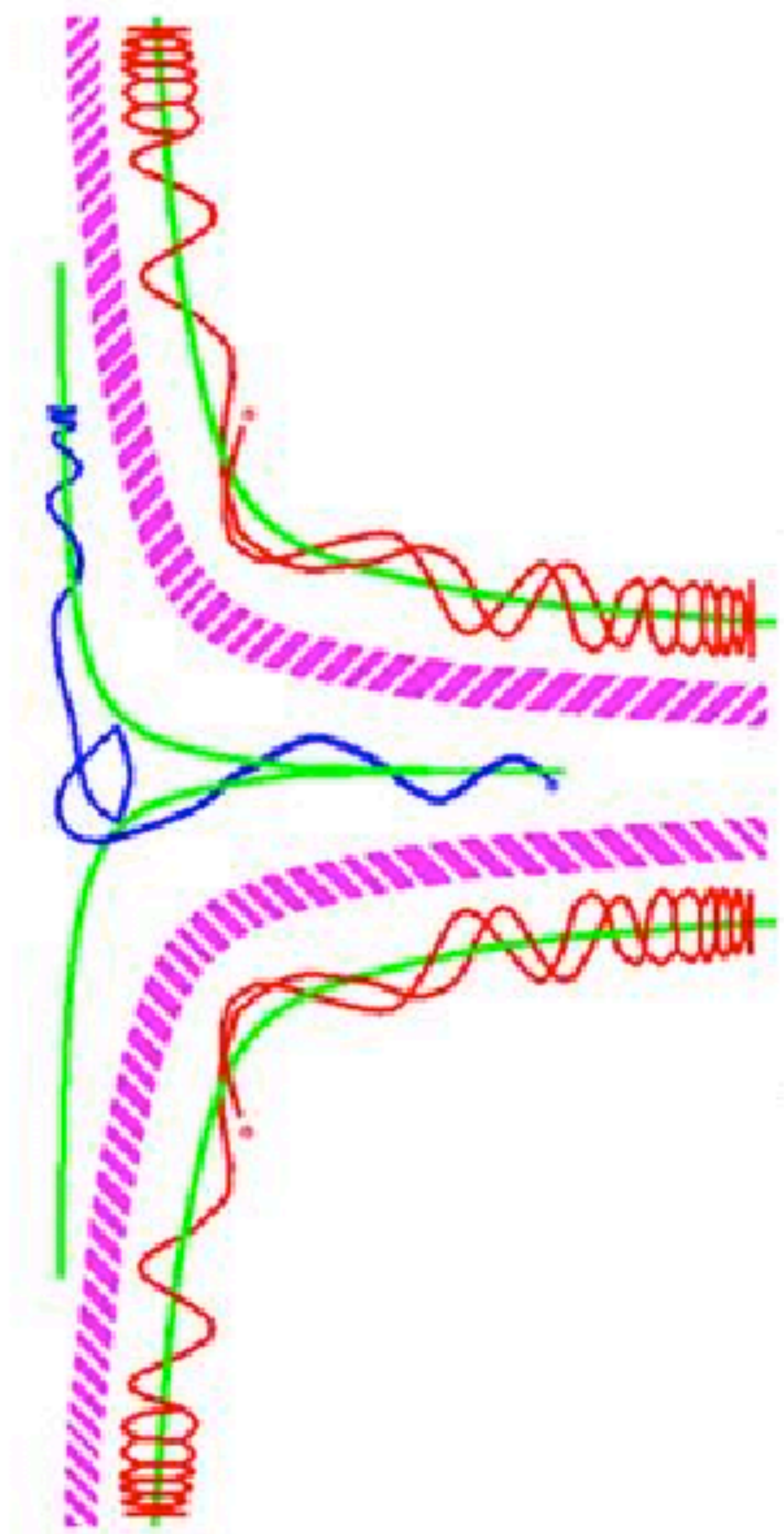

toroidal field
(due to I)
poloidal magnetic field lines
break and reconnect
free spheromak plasma
with both toroidal/poloidal fields
and toroidal/poloidal currents
breaks off
and moves to right
at Alfvenic velocity
current I
broken off
poloidal current I

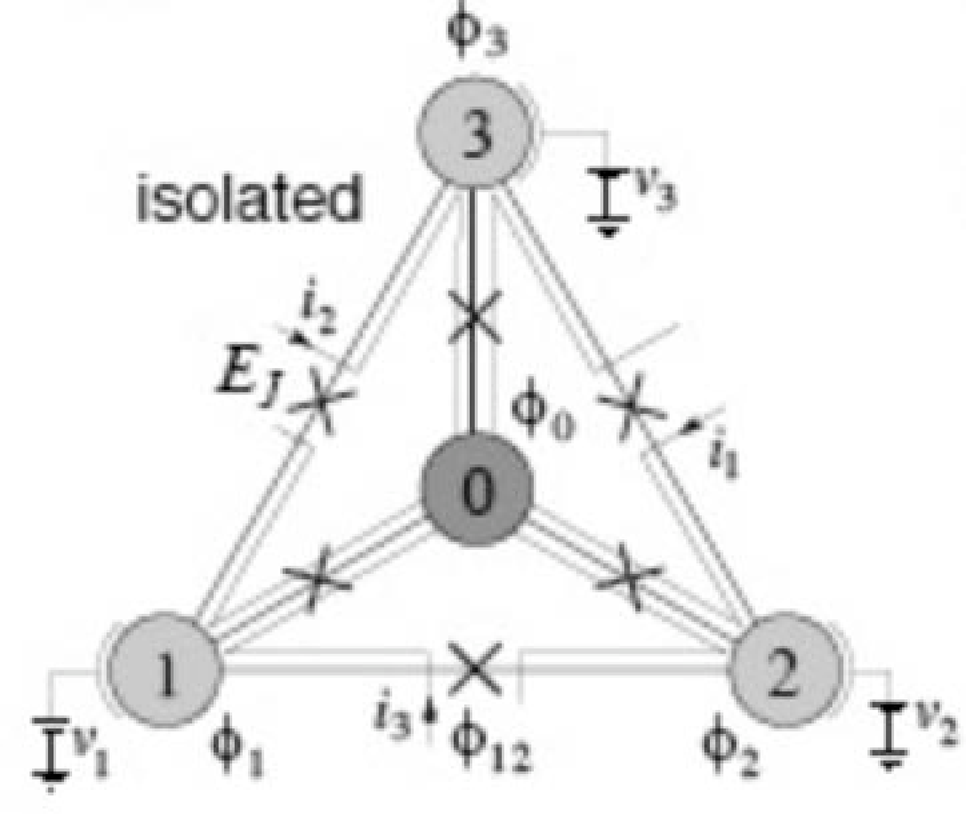








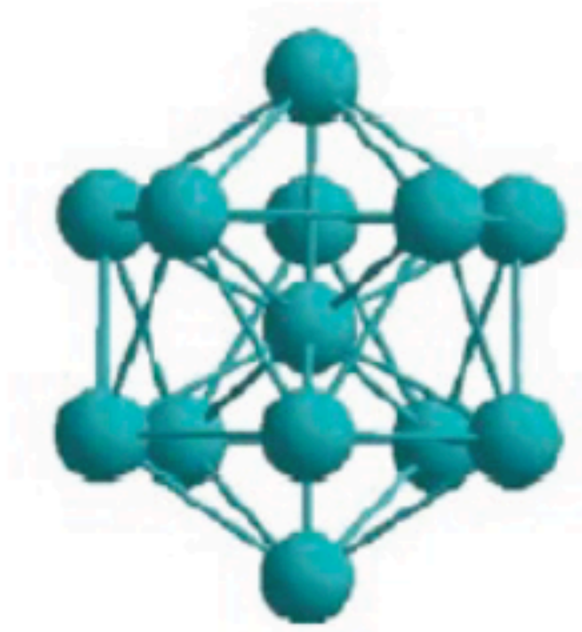




isolated
3
0
1
2
ϕ_3
v_3
i_2
E_J
ϕ_0
i_1
i_3
v_1
ϕ_1
ϕ_{12}
ϕ_2
v_2

42 edges make an Icosahedron plus its center

(image from Physical Review B 72 (2005) 115421 by Rogan et al)

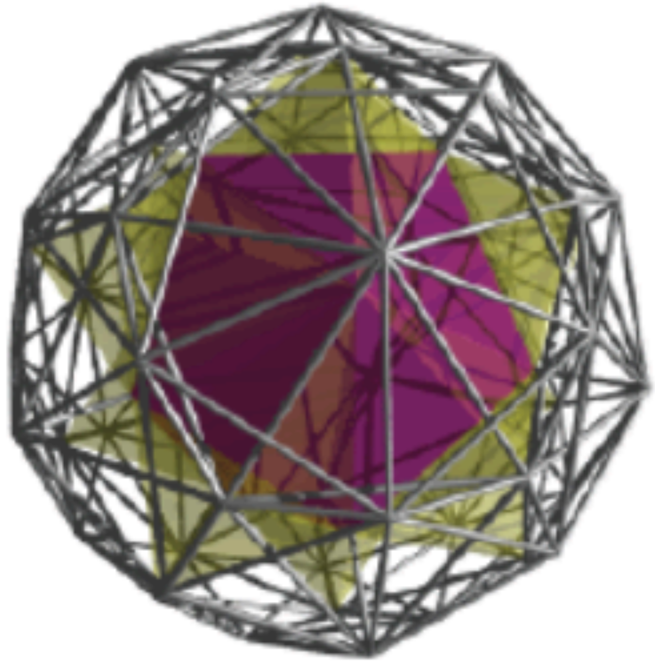


with 30 exterior edges and 12 edges from center to vertices.
It has 20 cells which are approximate Tetrahedra in flat 3-space but become exact regular Tetrahedra in curved 3-space.

Could an approximate-20Tetrahedra-Icosahedron configuration of 42 BSCCO JJ tap into Dark Energy so that the Dark Energy might regularize the configuration to exact Tetrahedra and so curve/warp spacetime from flat 3-space to curved 3-space ?

720 edges make a 4-dimensional 600-cell

(image from Wikipedia)

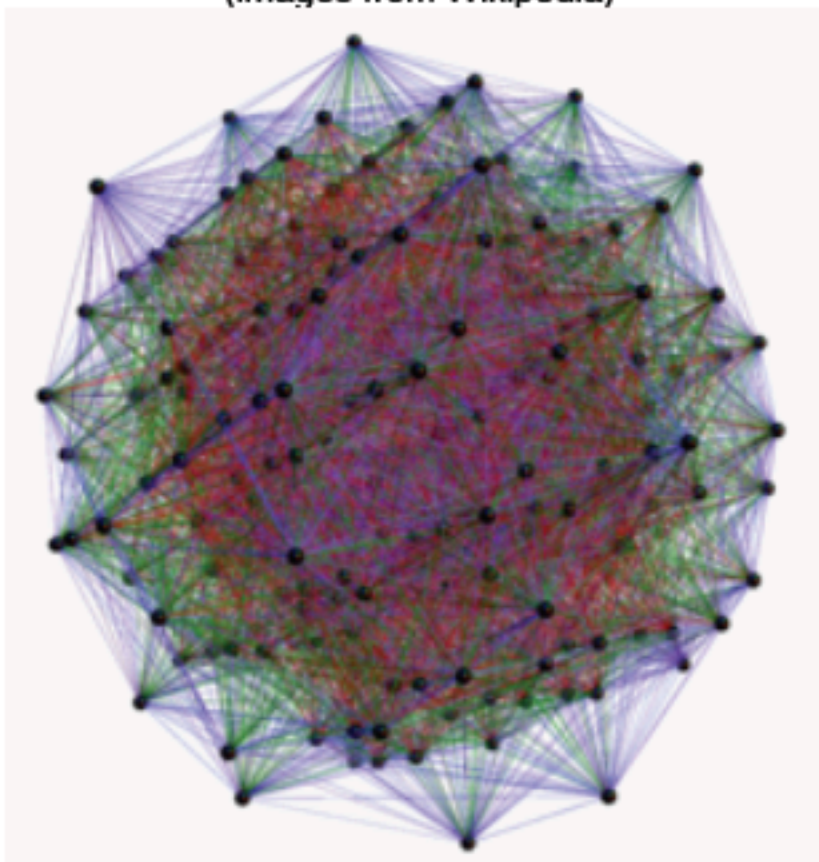


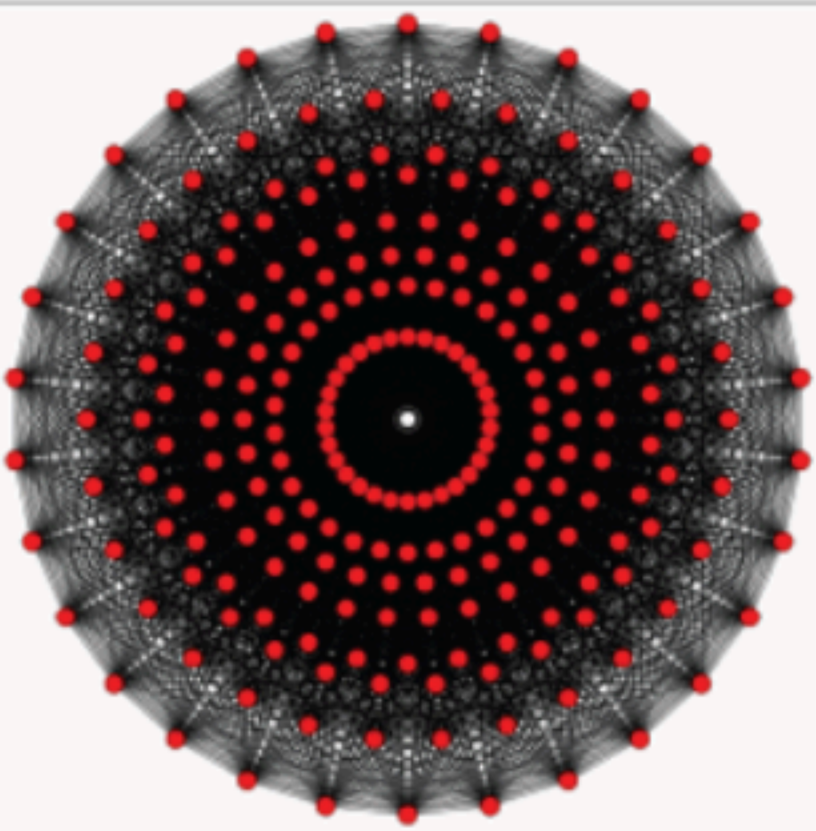
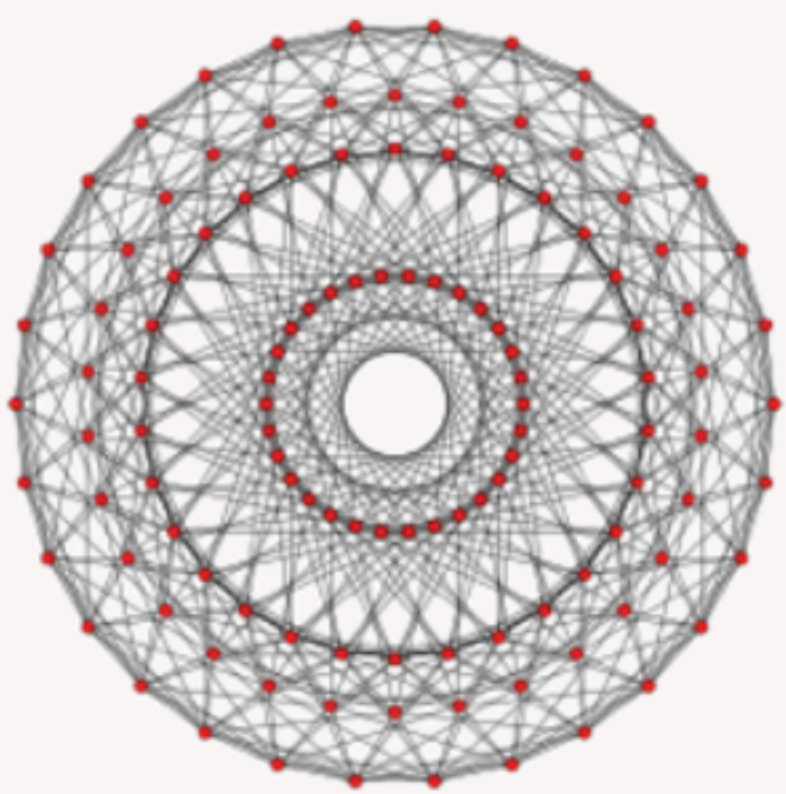
At each vertex 20 Tetrahedral faces meet forming an Icosahedron
which is exact because the 600-cell lives on a curved 3-shere in 4-space.
It has 600 Tetrahedral 3-dim faces and 120 vertices

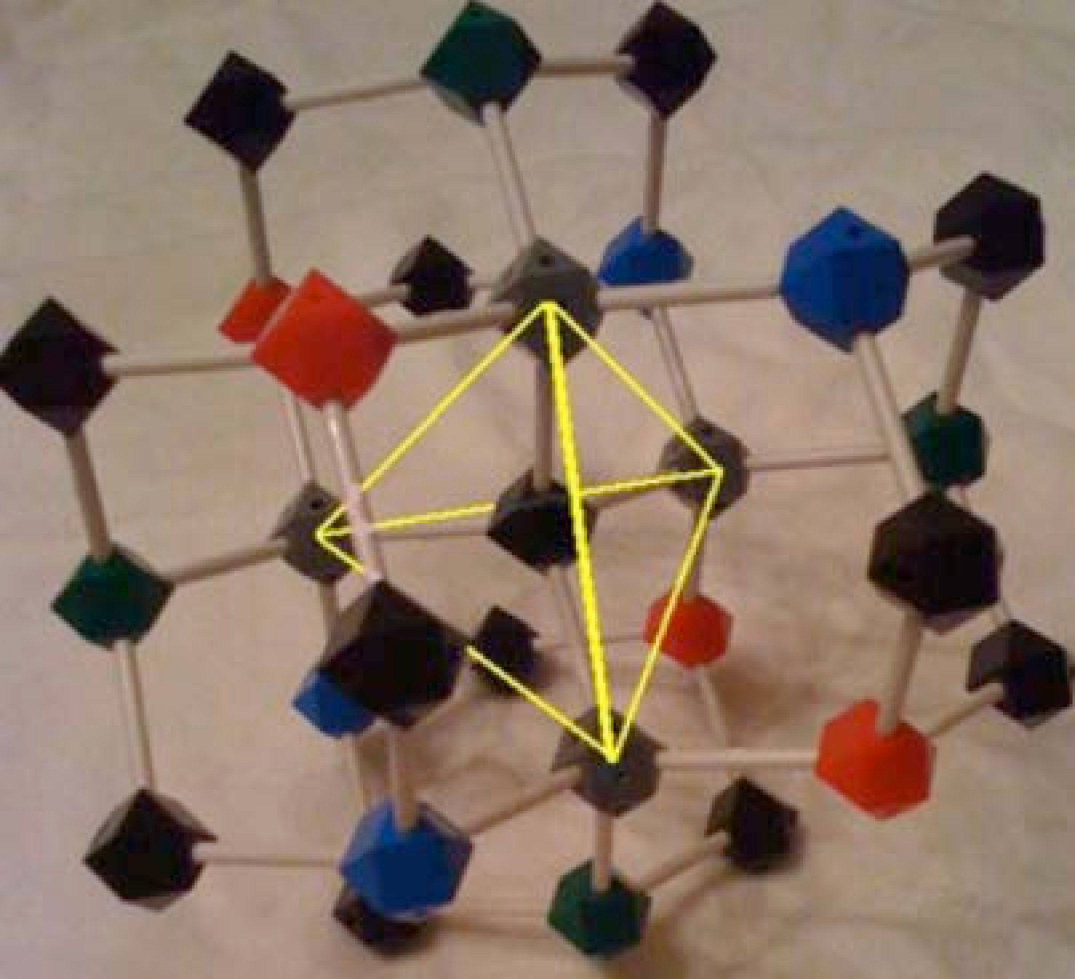
Could a 600 approximate-Tetrahedra configuration of 720 BSCCO JJ
approximating projection of a 600-cell into 3-space
tap into Dark Energy so that the Dark Energy might regularize
the configuration to exact Tetrahedra and an exact 600-cell
and so curve/warp spacetime from flat 3-space to curved 3-space ?

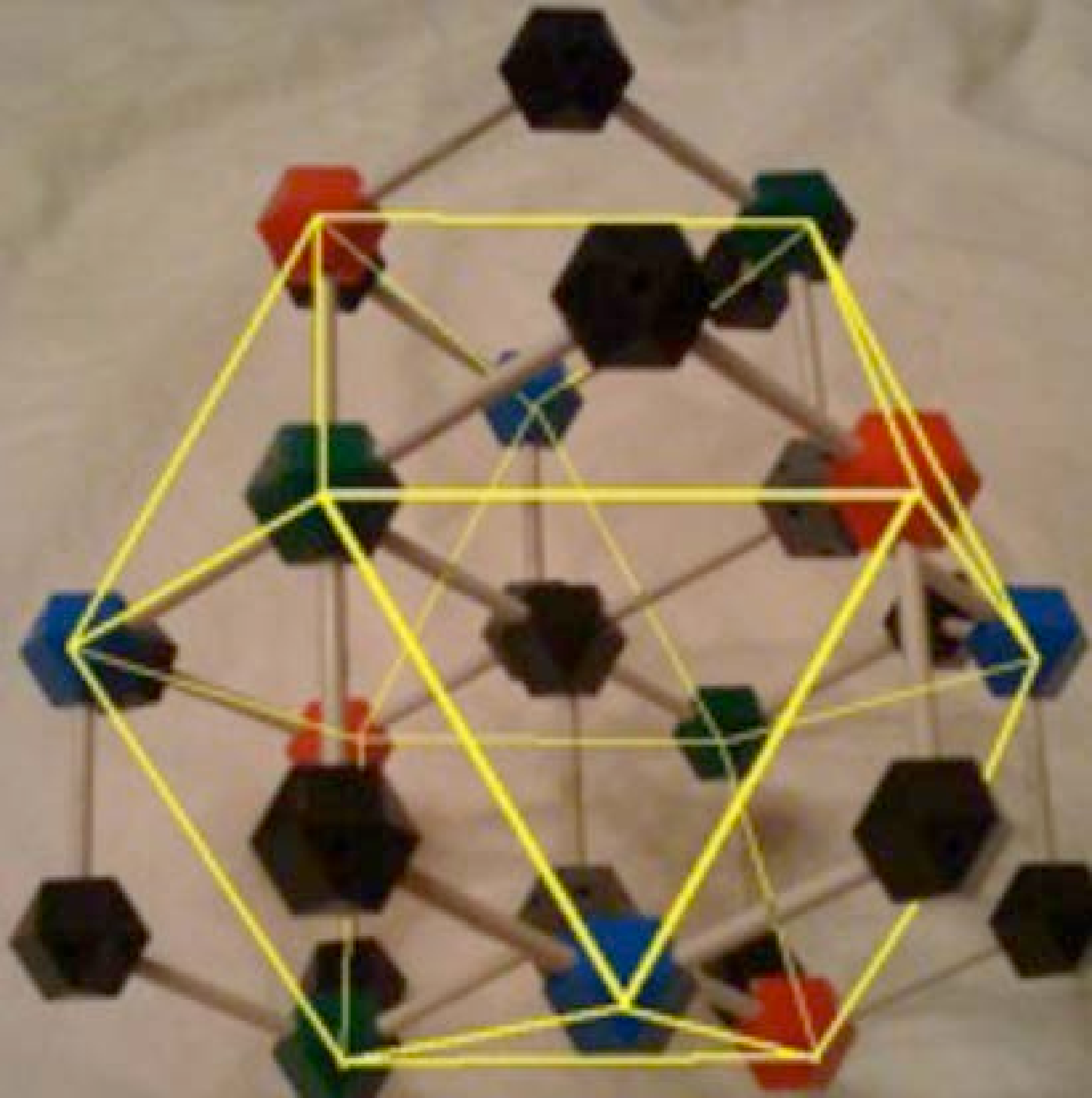
6720 edges make an 8-dimensional Witting 4_21 Polytope

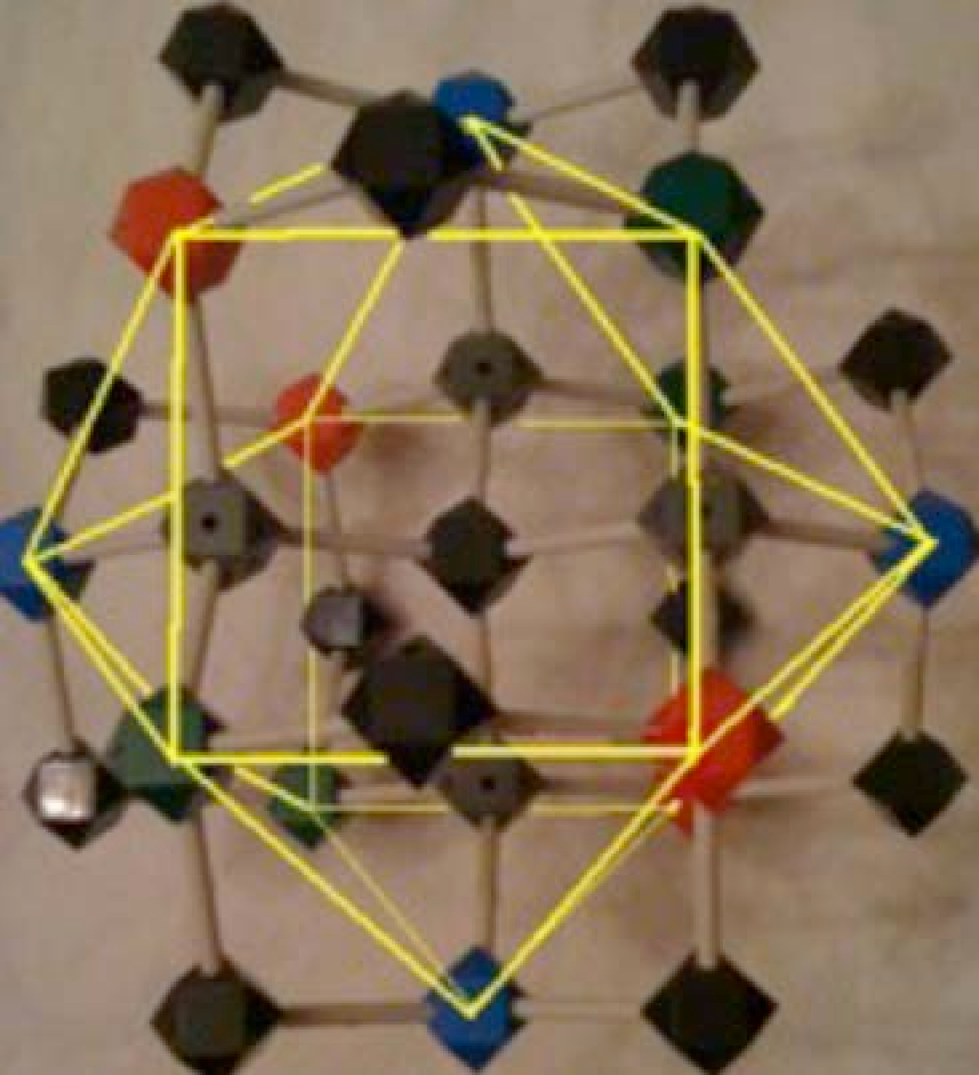
(images from Wikipedia)

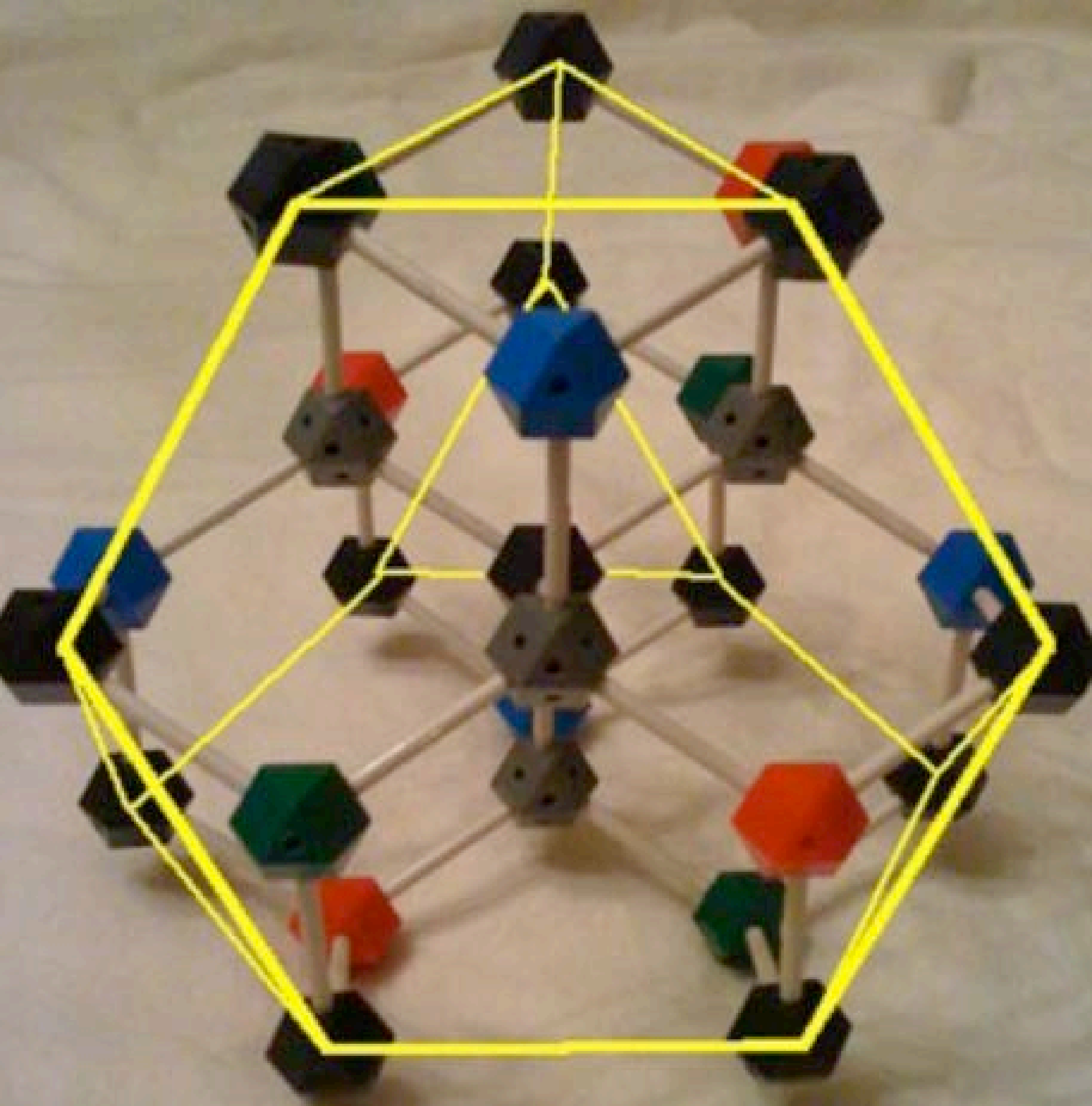


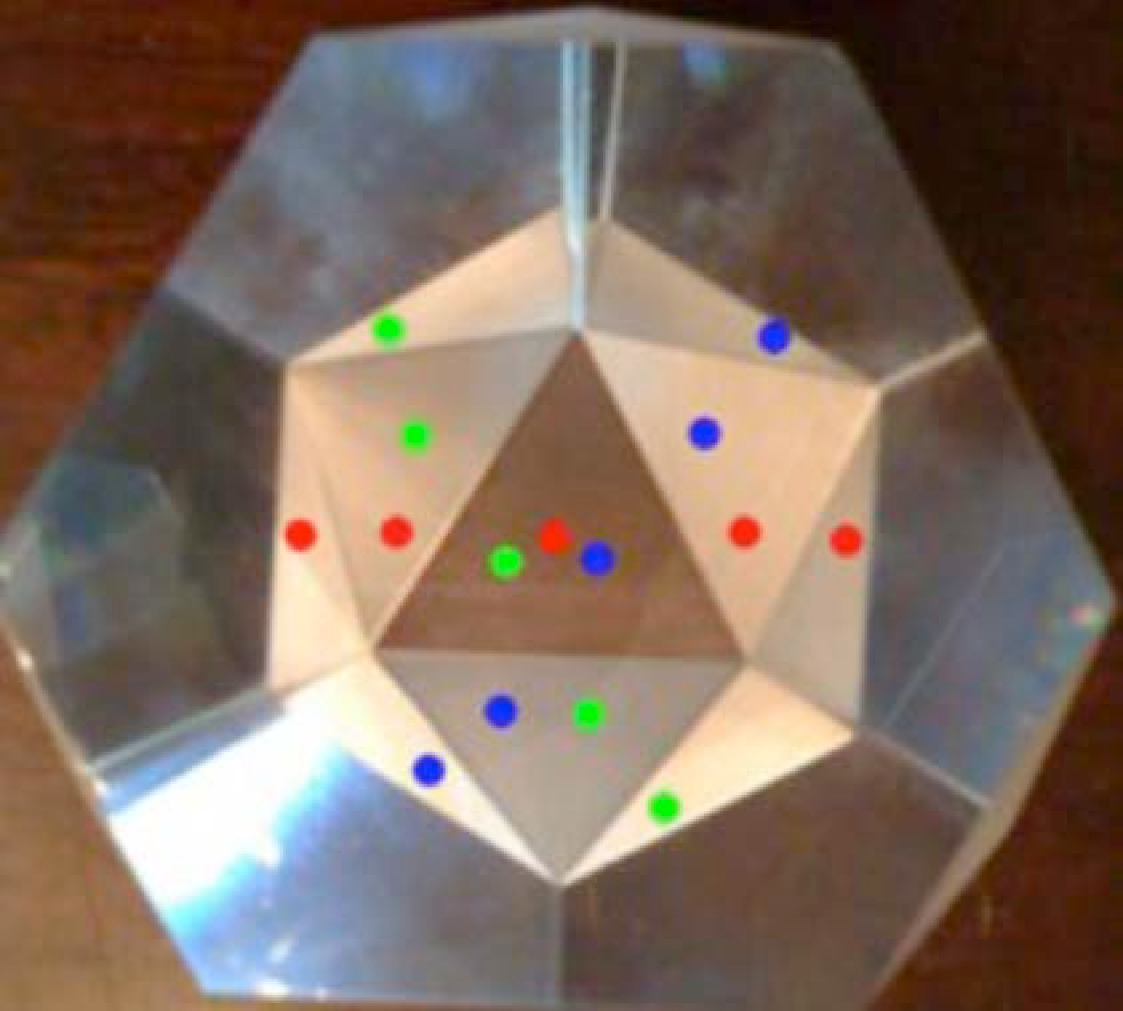
E8/H4 Coxeter planes	
E_8	H_4
	
4_{21}	600-cell

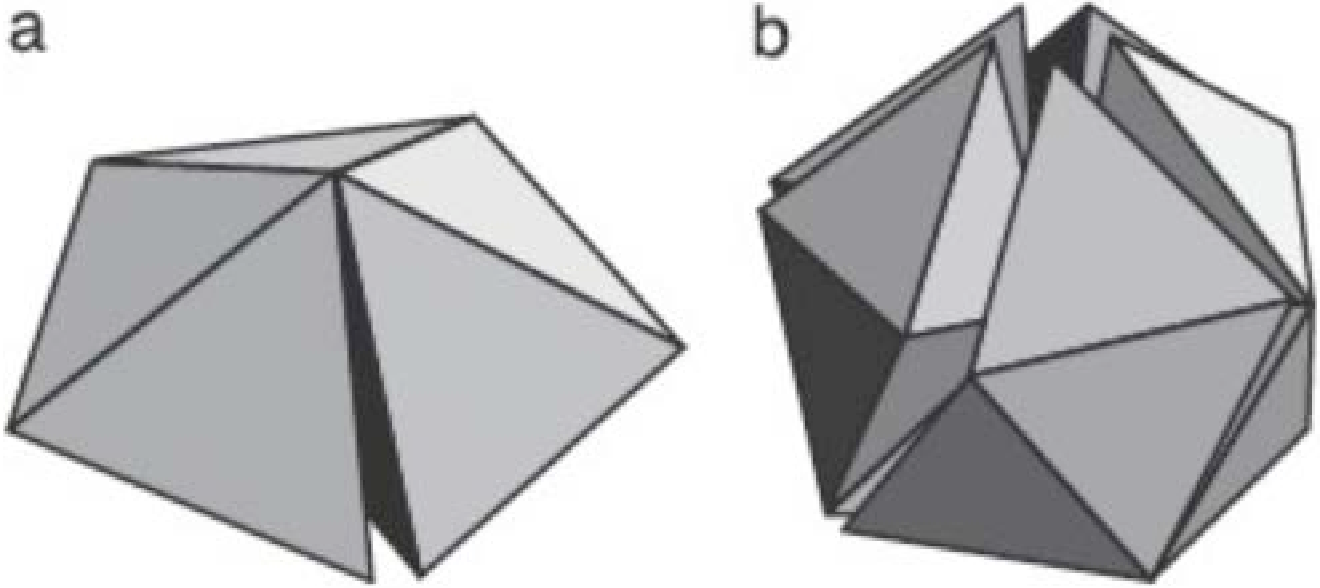


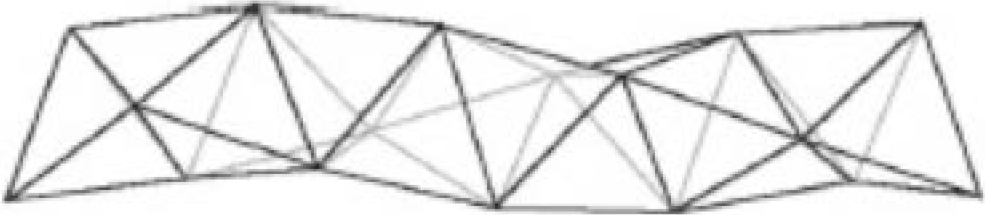


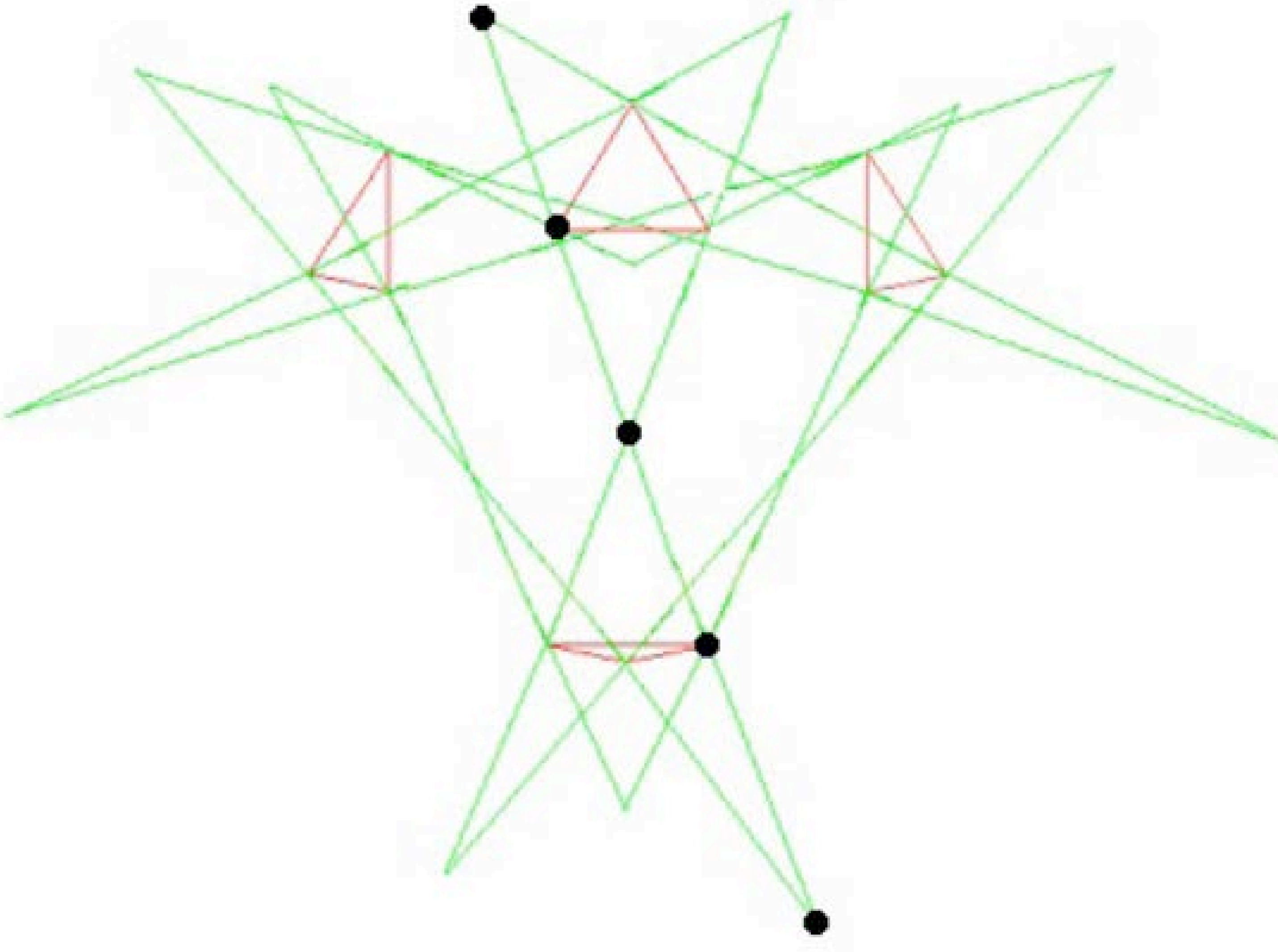


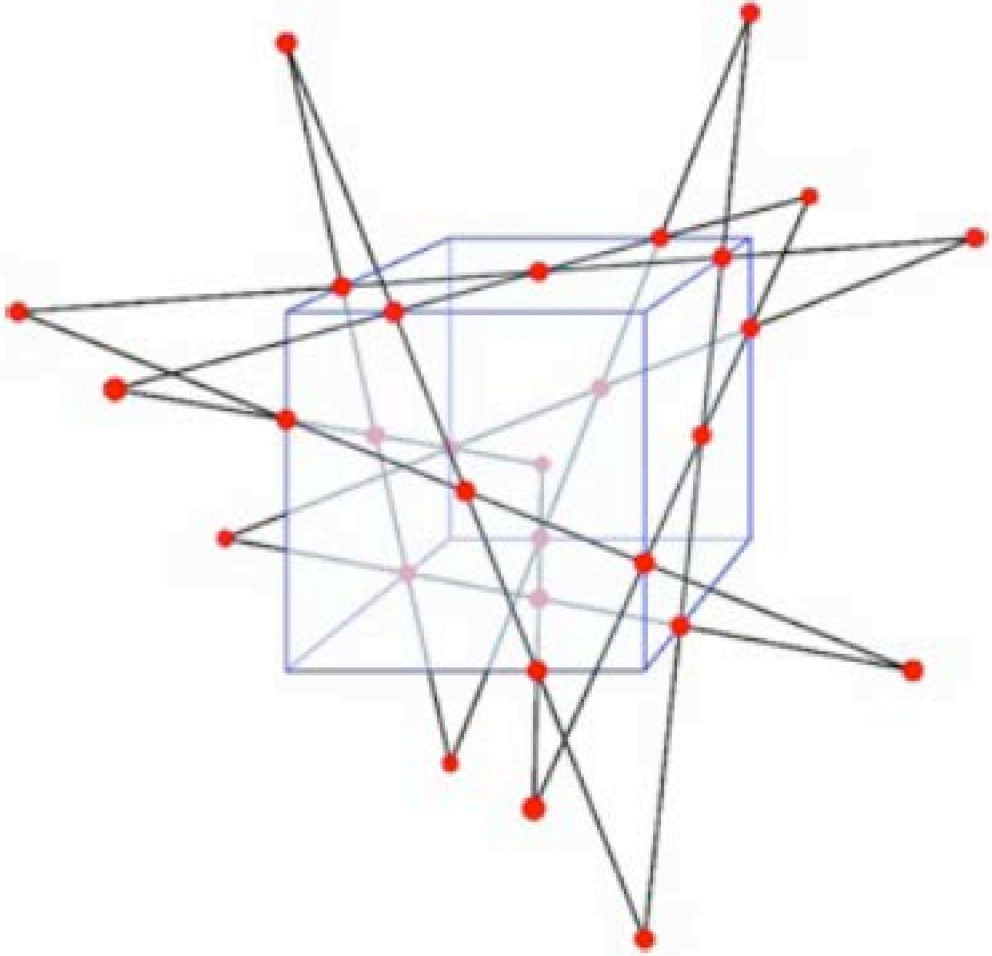




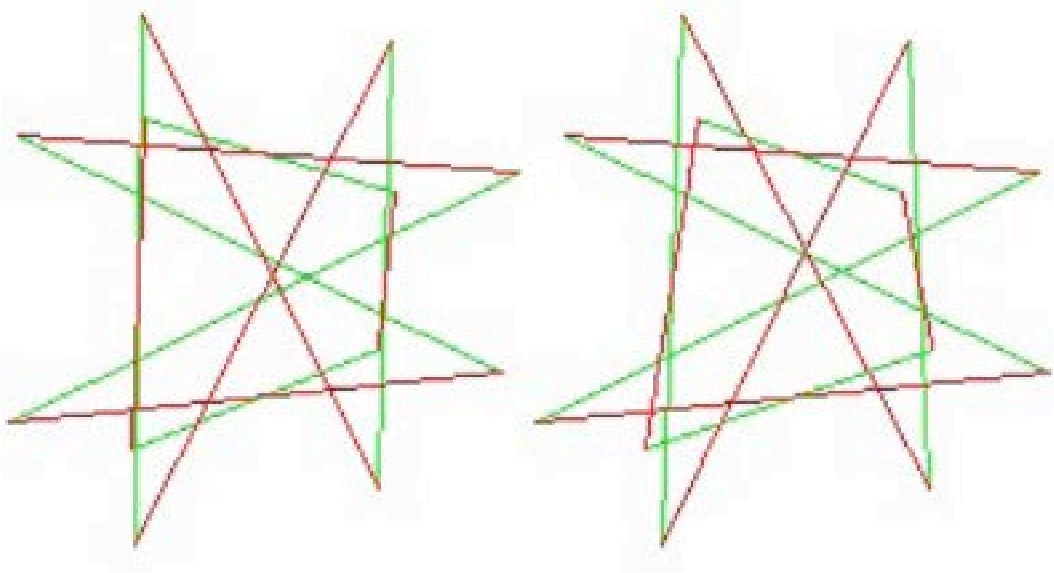

a
b

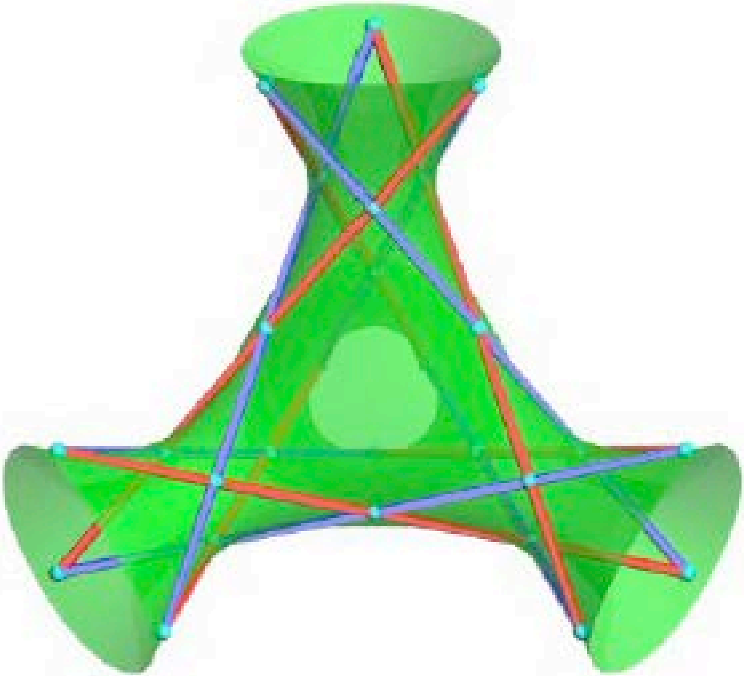






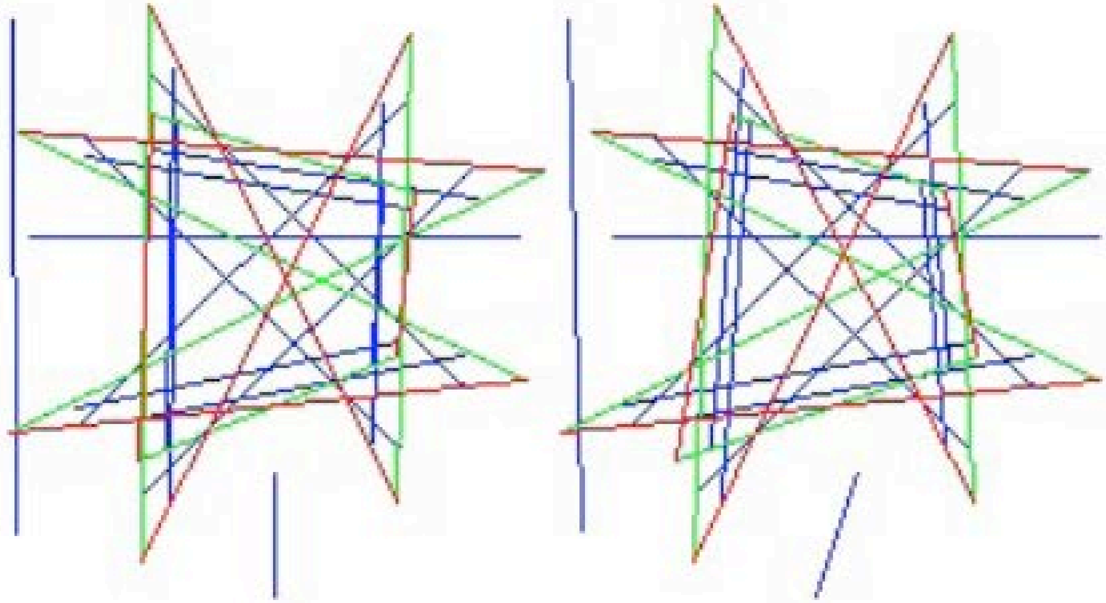
Crossings may be clearer in this stereo image



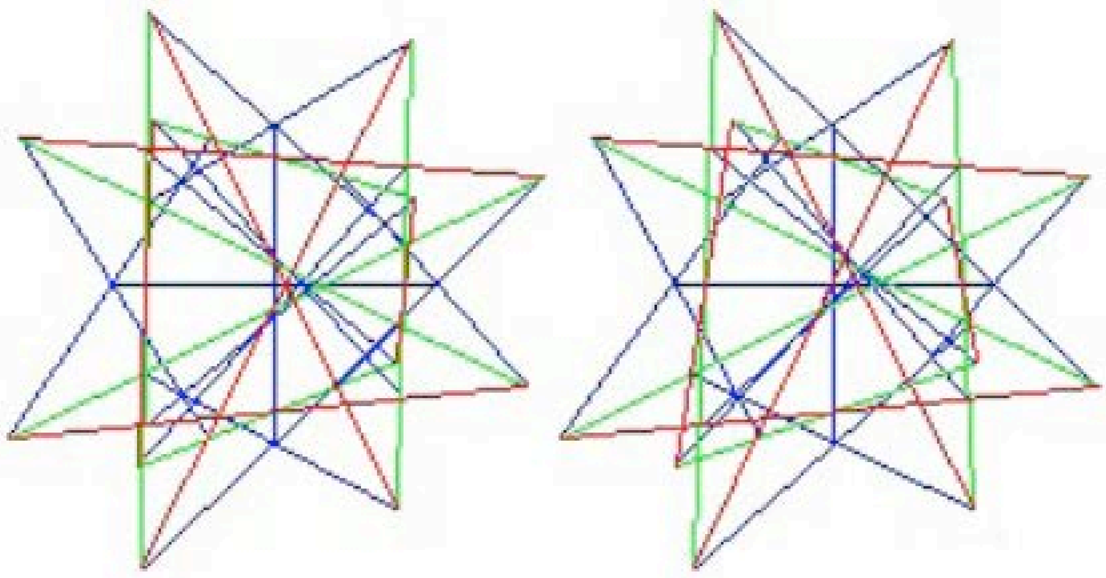


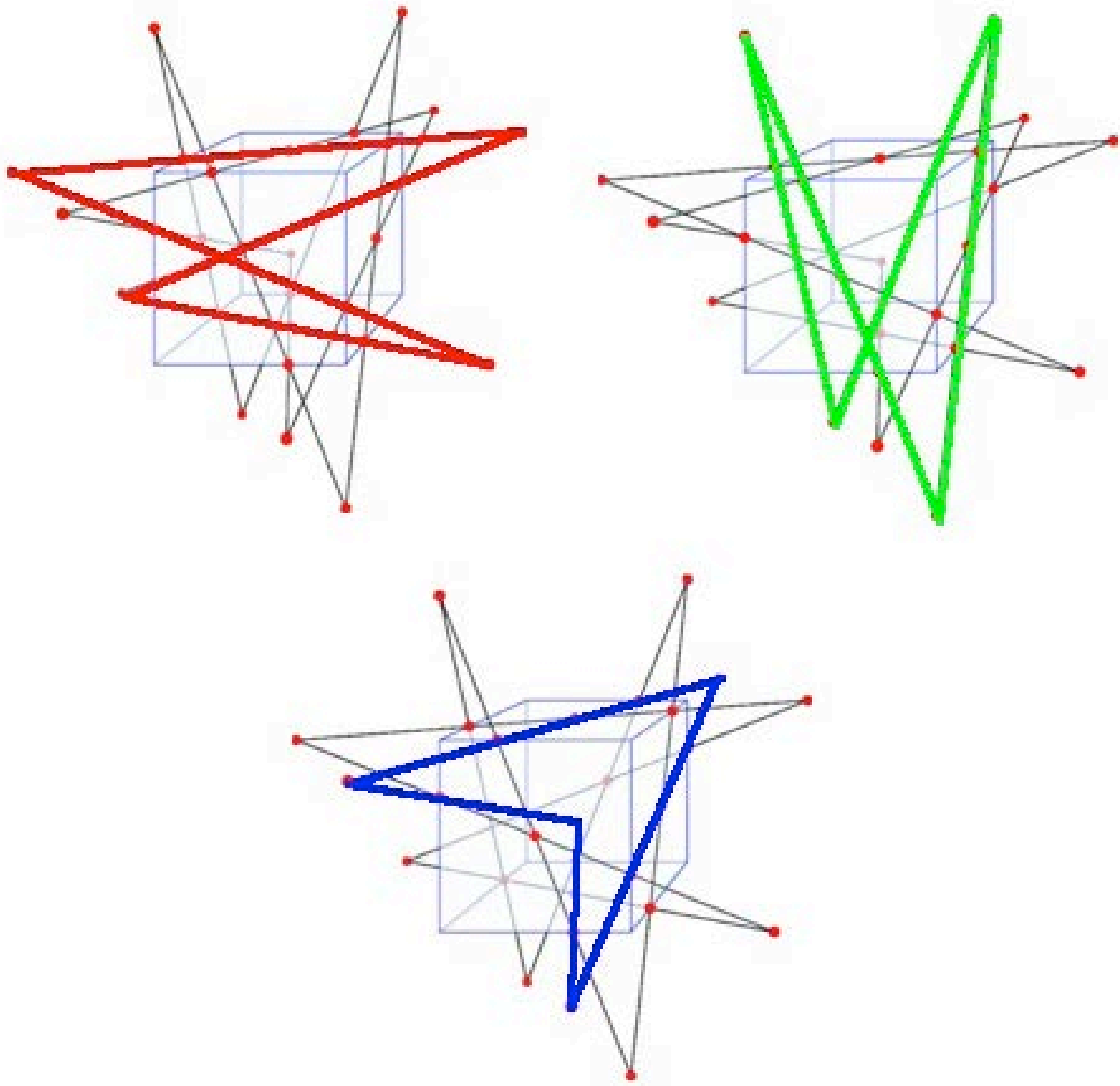
... Les 27 droites de cette surface sont ... les 12 ... plus les 15 droites ... (en jaune)

... ..."

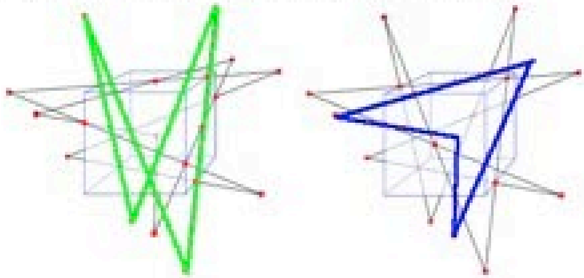


in which the 12 Double-6 lines are red and green and the other 15 are blue. Since each of the 12+15 = 27 lines have 5 points of crossing, the configuration has 27x5 = 135 points. In case it might help in visualization, here



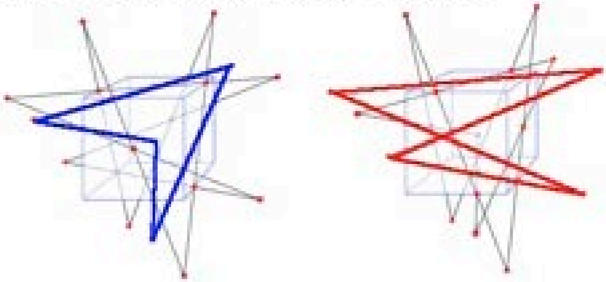


If both the Green and Blue Tetrahelix groups are active,



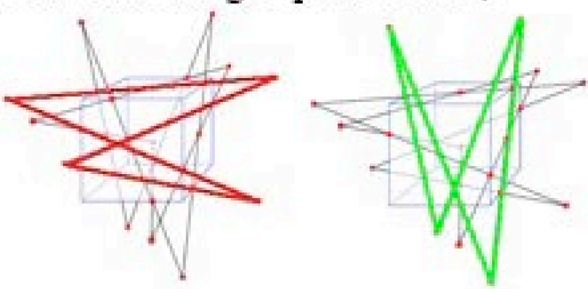
the the fermion is a Red Up Quark with electric charge +2/3
The sign changes because of the even number of active Tetrahelix groups, and the Red color is because it is the complement of Green and Blue.

If both the Blue and Red Tetrahelix groups are active,



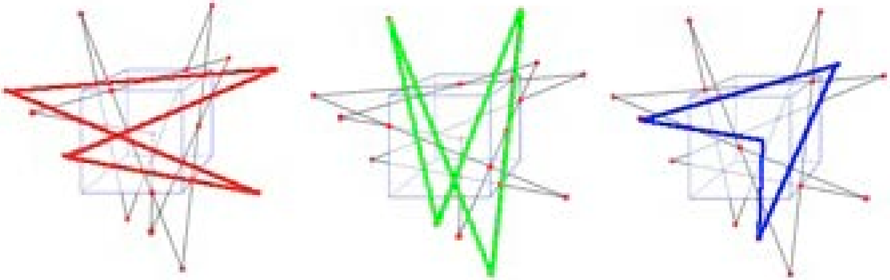
the the fermion is a Green Up Quark with electric charge +2/3
The sign changes because of the even number of active Tetrahelix groups, and the Green color is because it is the complement of Blue and Red.

If both the Red and Green Tetrahelix groups are active,

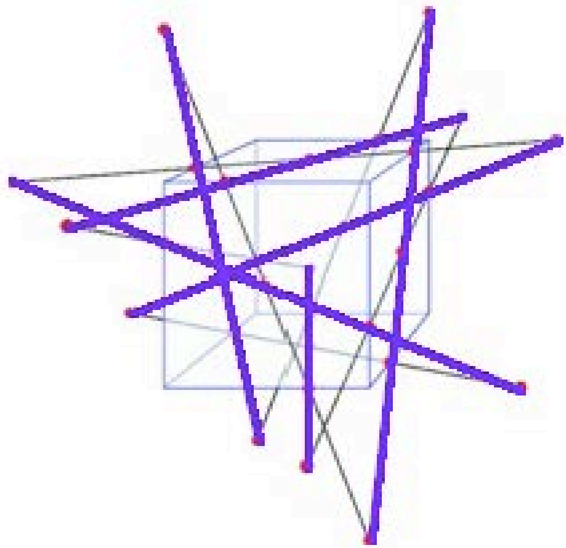


the the fermion is a Blue Up Quark with electric charge +2/3
The sign changes because of the even number of active Tetrahelix groups, and the Blue color is because it is the complement of Red and Green.

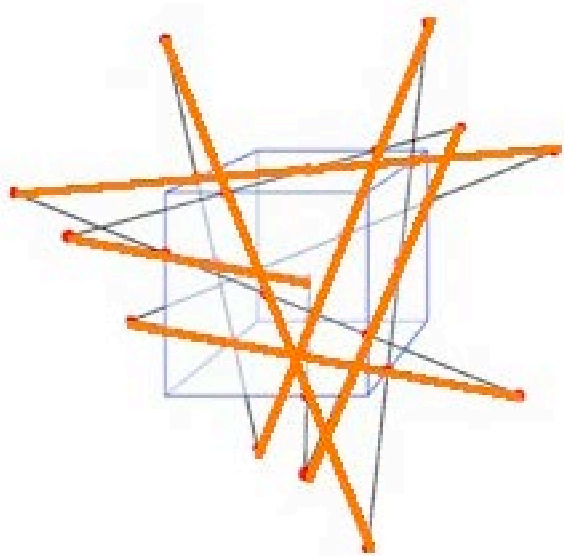
If all three color Tetrahelix groups are active,

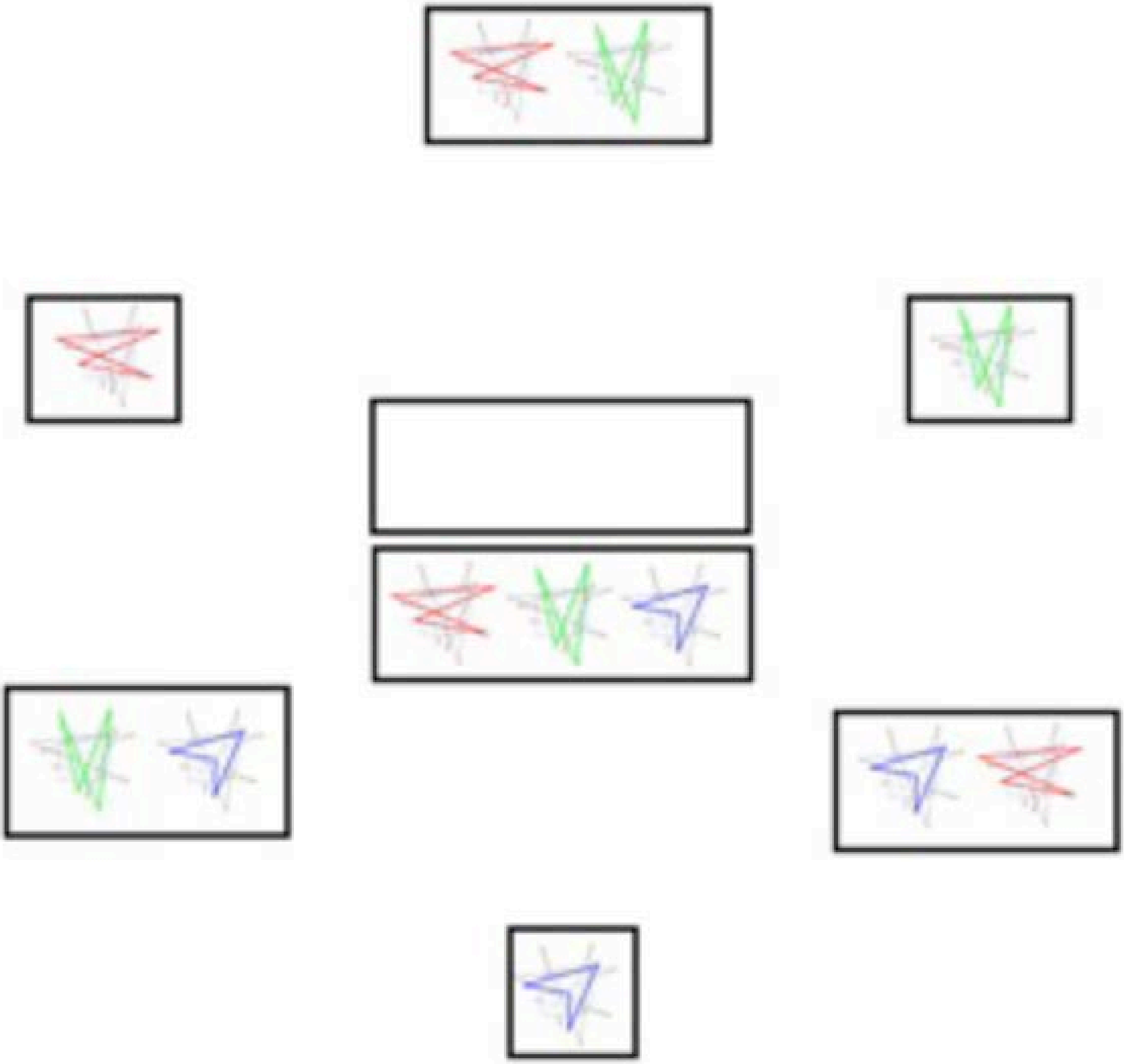


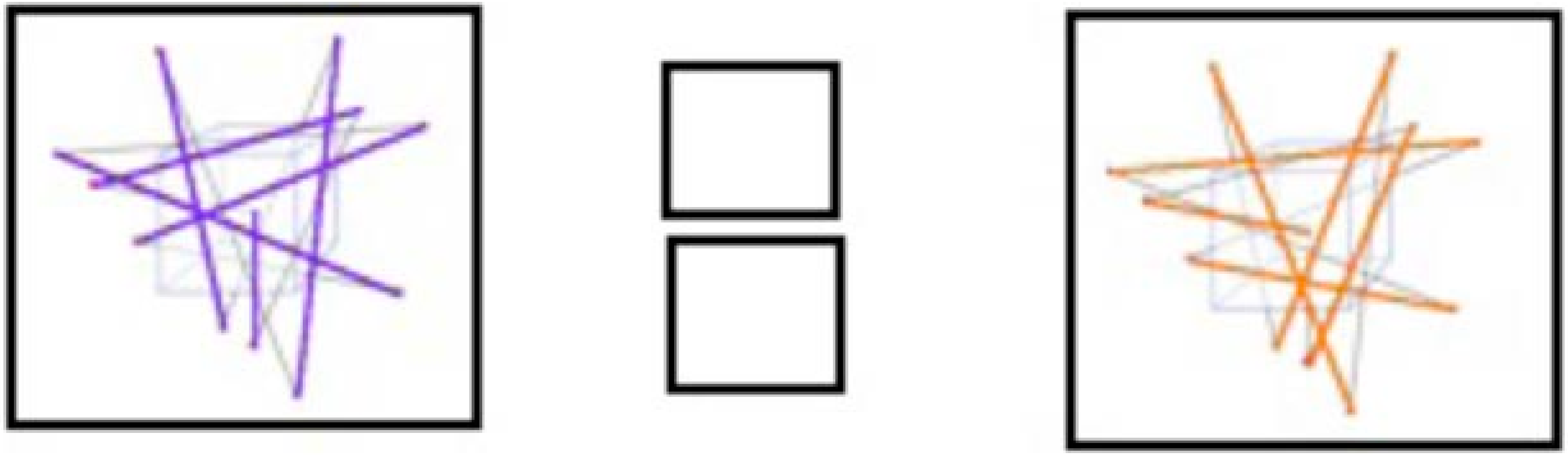
then the fermion is also color neutral but has mass, and is Electron with electric charge -1/3 + -1/3 + -/13 = -1 let the Clockwise represent fermion particles and color them Purple



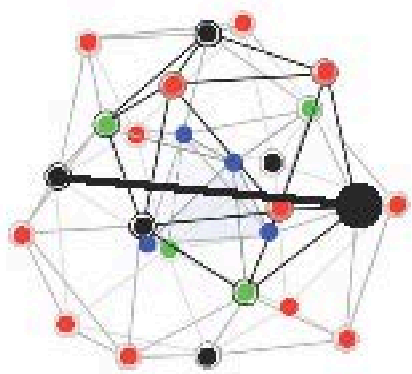
let the Counter Clockwise represent fermion antiparticles and color them Gold







Here is an identification of paths through a 57-group with particles:



- neutrino - no color charge - no electric charge
2 point path between 2 antipodal points with no intermediate points

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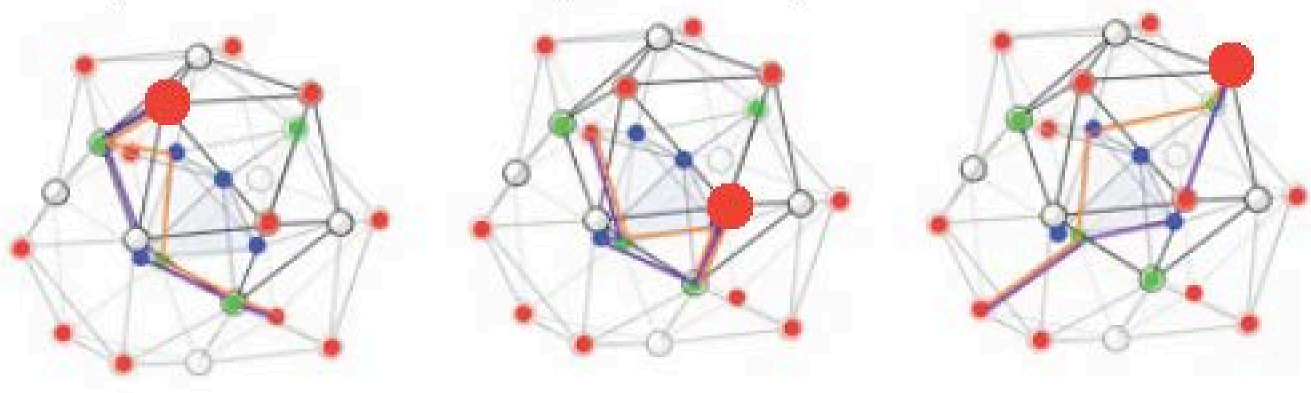
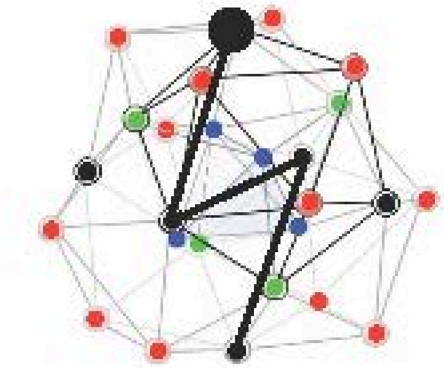
3 down quarks - one for each color charge - electric charge -1/3



two 5 point paths between 2 antipodal points with 3 intermediate points



electron - no color charge - electric charge -1

4 point path between 2 antipodal points with 2 intermediate points

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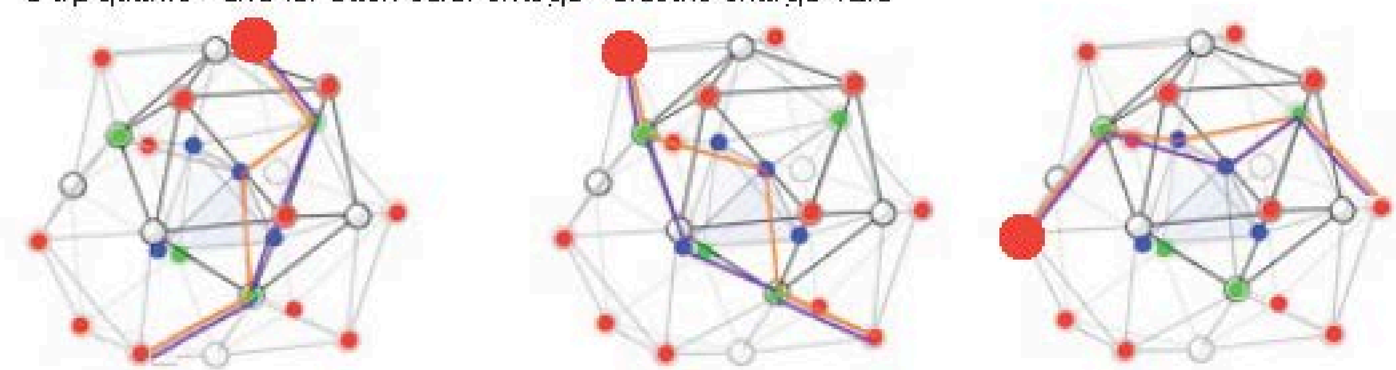
3 up quarks - one for each color charge - electric charge +2/3



two 5 point paths between 2 antipodal points with 3 intermediate points

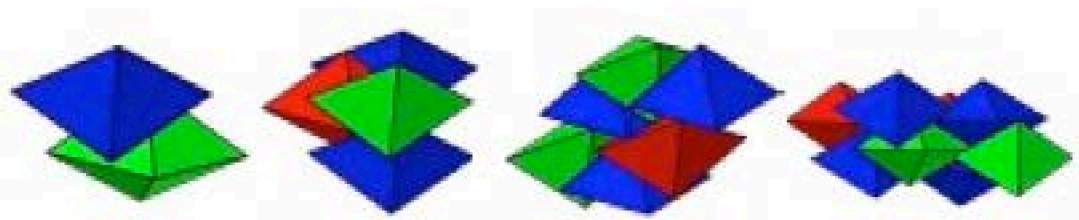
Each path is between a small-ball point and a large-ball point.

Path Flow is from the small-ball point to the large-ball point for Particles.

Path Flow is from the large-ball point to the small-ball point for Antiparticles.

What if you regard each tetrahedron in a QC dense-packing as being a 57G ?

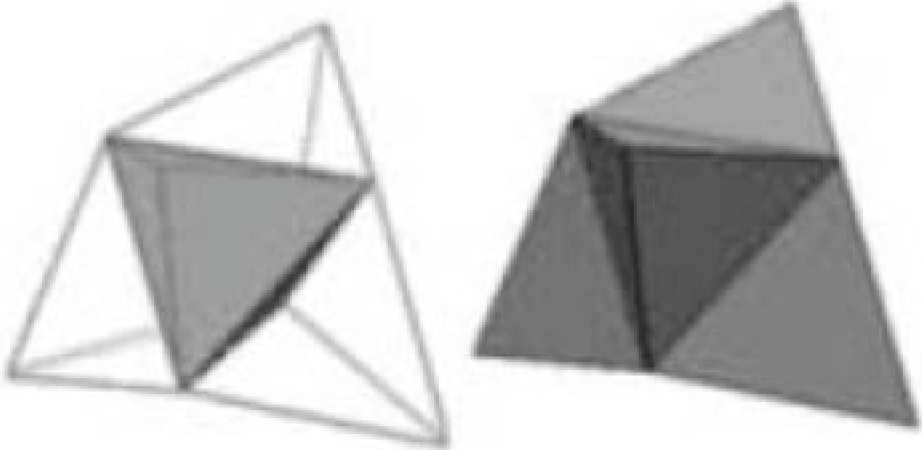
Since a 57G has the overall appearance of a tetrahedron,
make the QC by dense-packing a lot of 57G
using the method of Chen et al in arXiv 1001.0586
in which the 57G (playing the role of tetrahedra) form clusters that look like

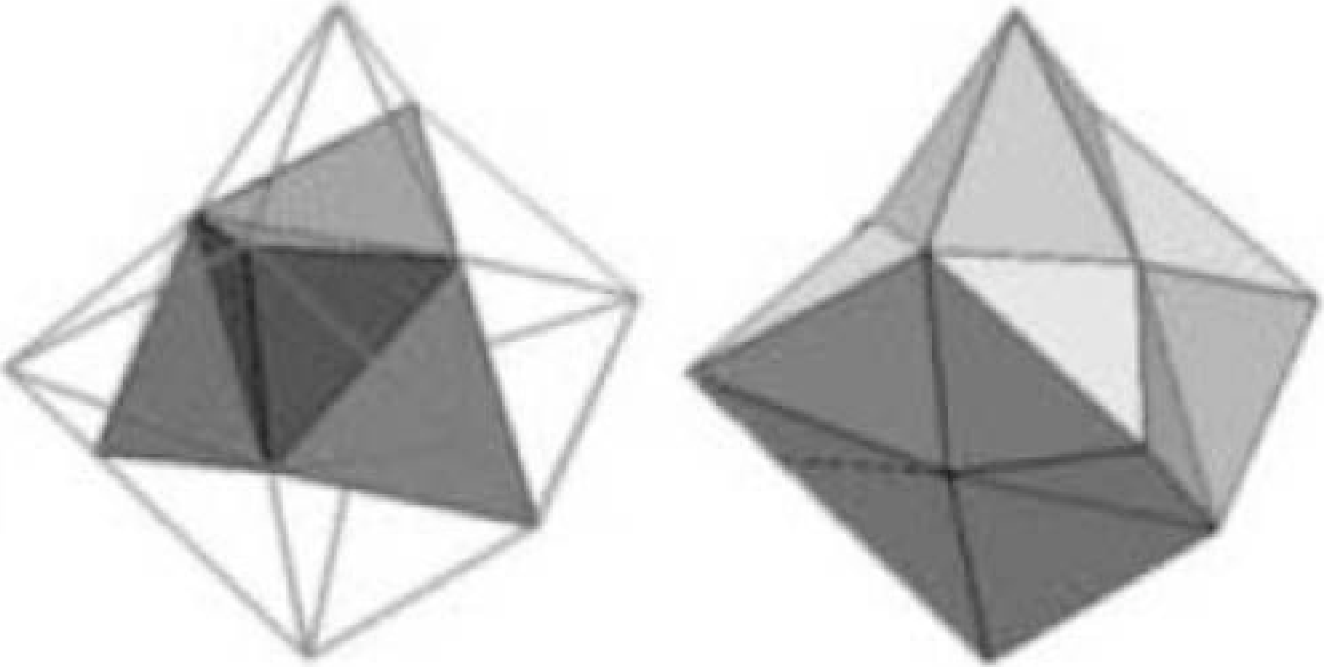


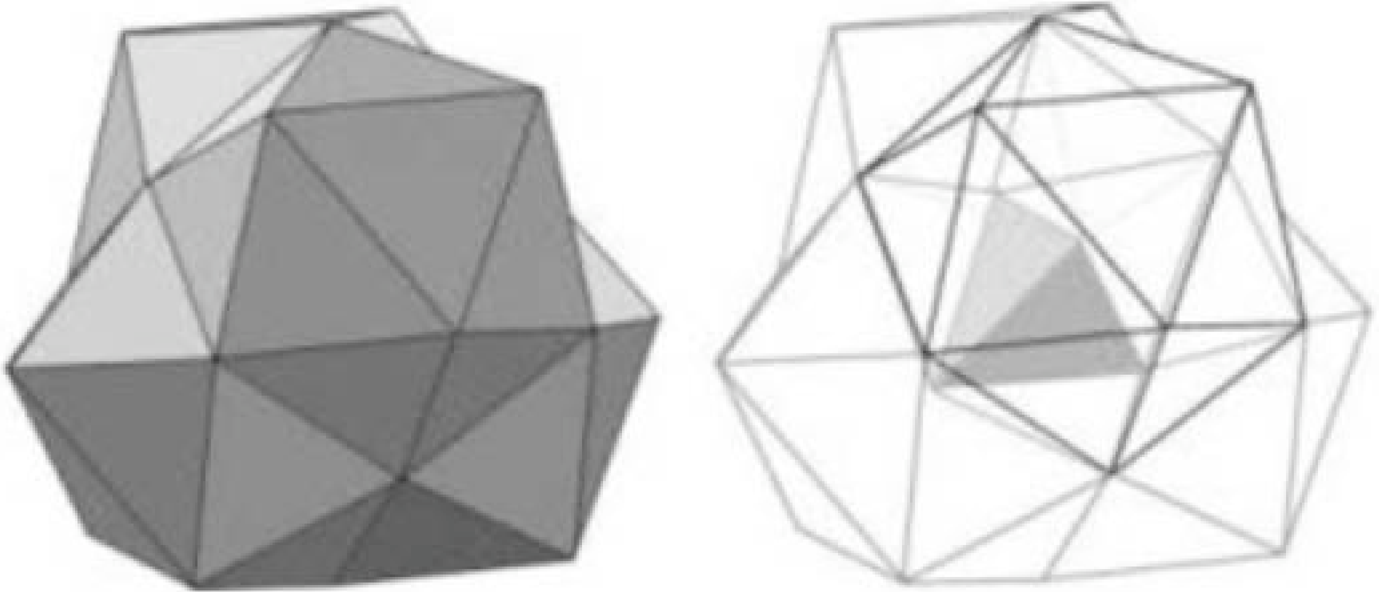
$N=4$ $N=8$ $N=12$ $N=16$

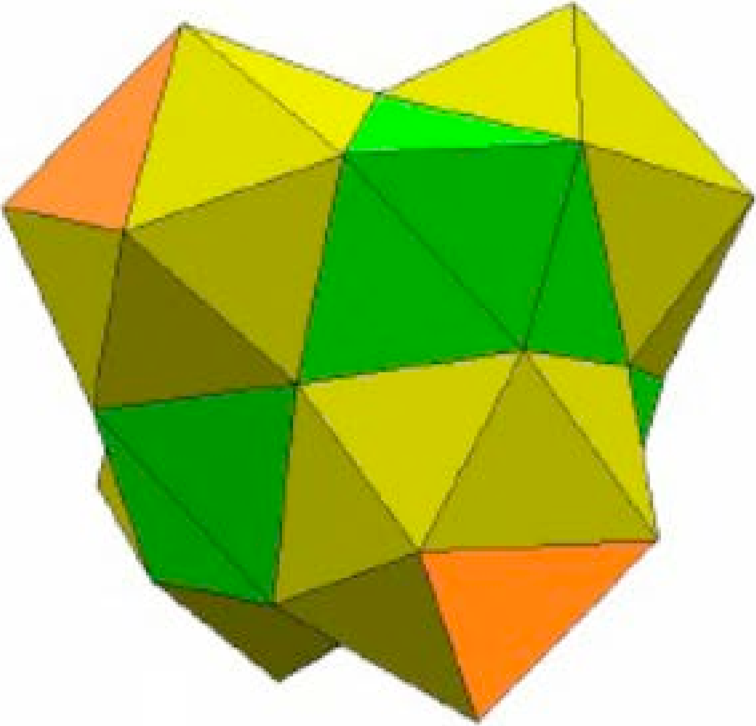
and have the same periodicity as Clifford algebras.

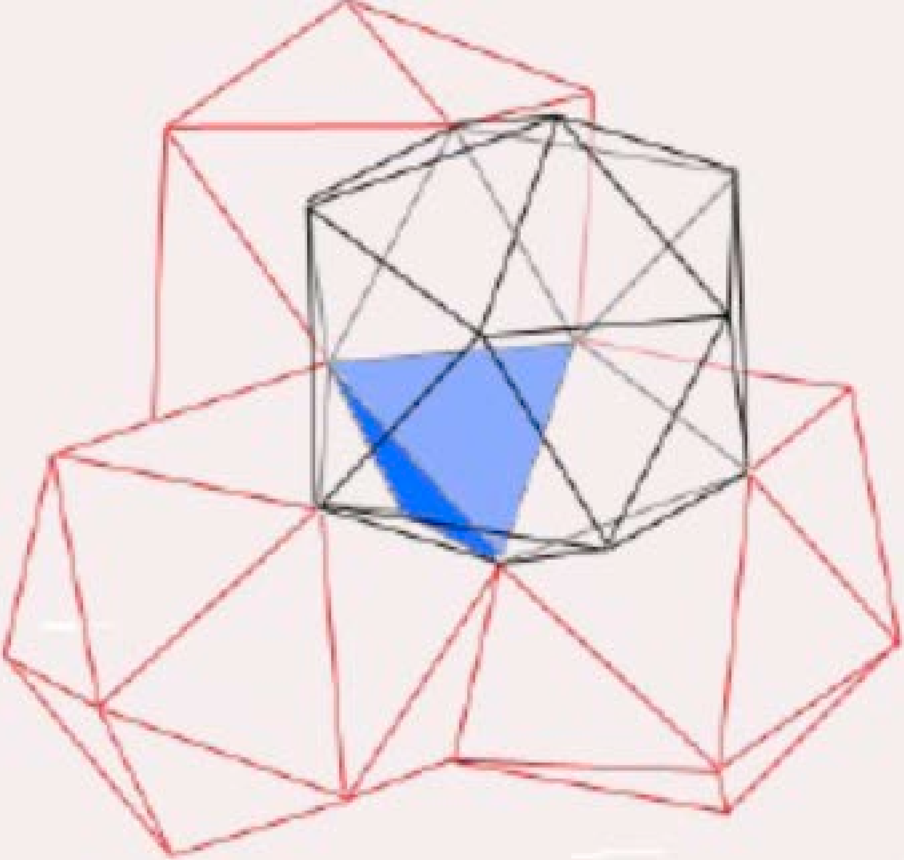
That would give you quantum theory from the Clifford algebras / QC dense packings
and
the fermions of the Standard Model from the paths / Philix in the 57G that
are being packed (playing the role of tetrahedra).

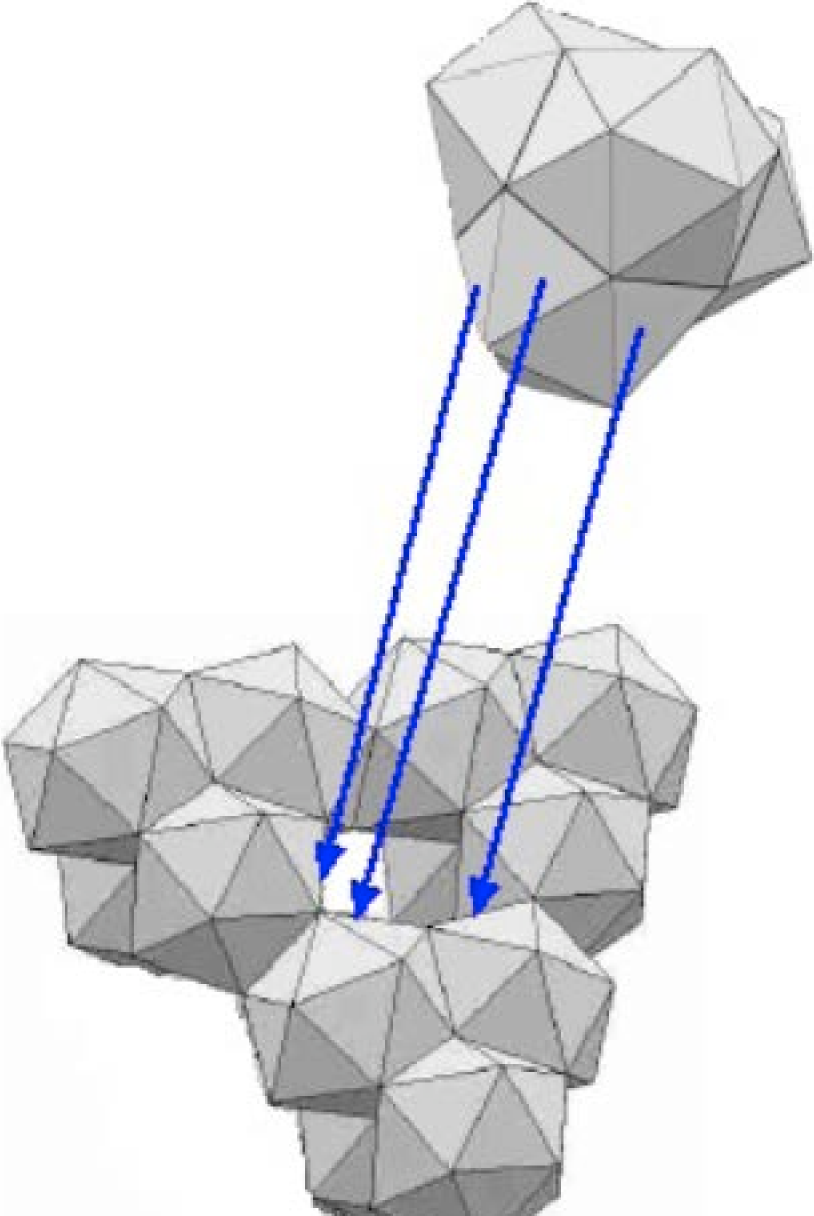


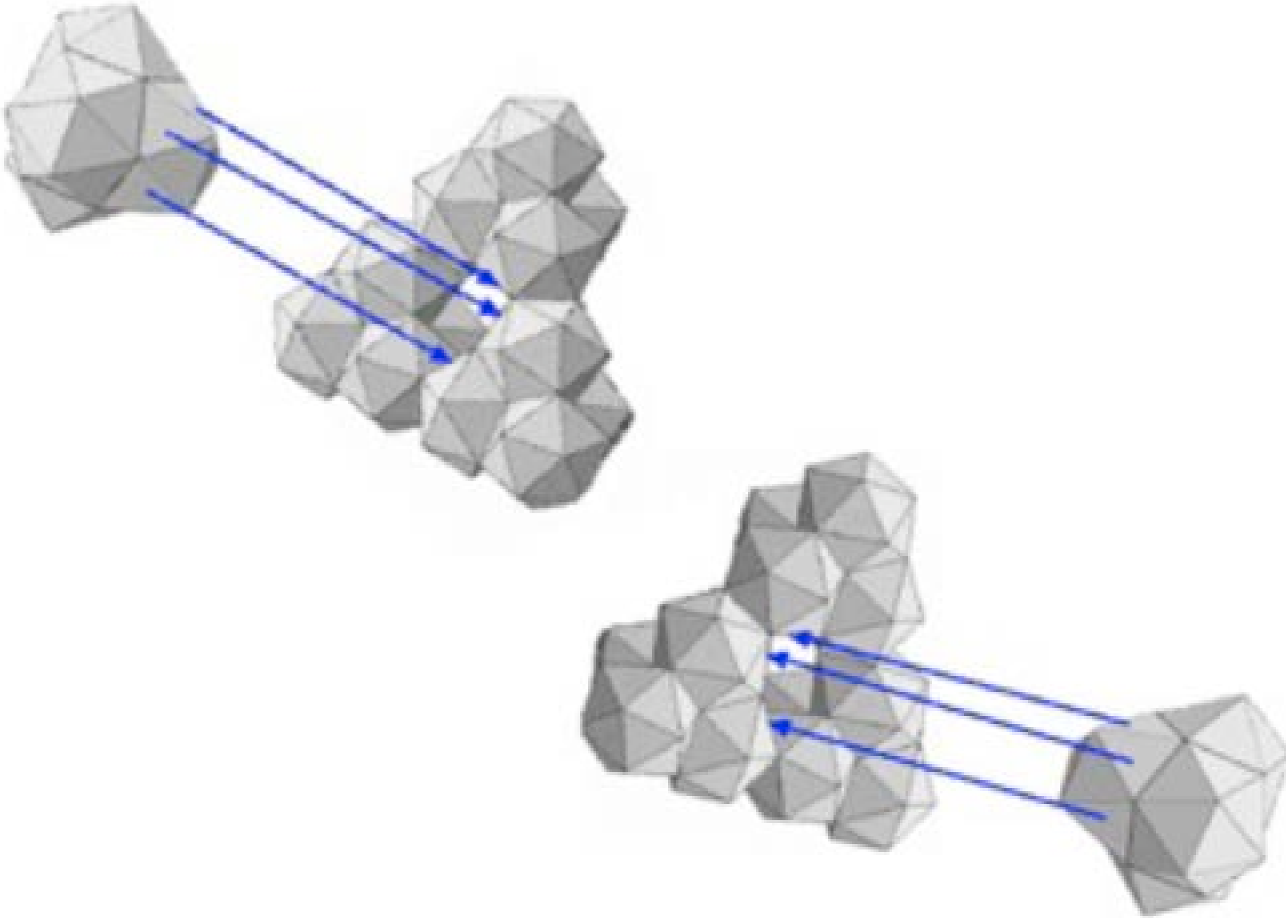


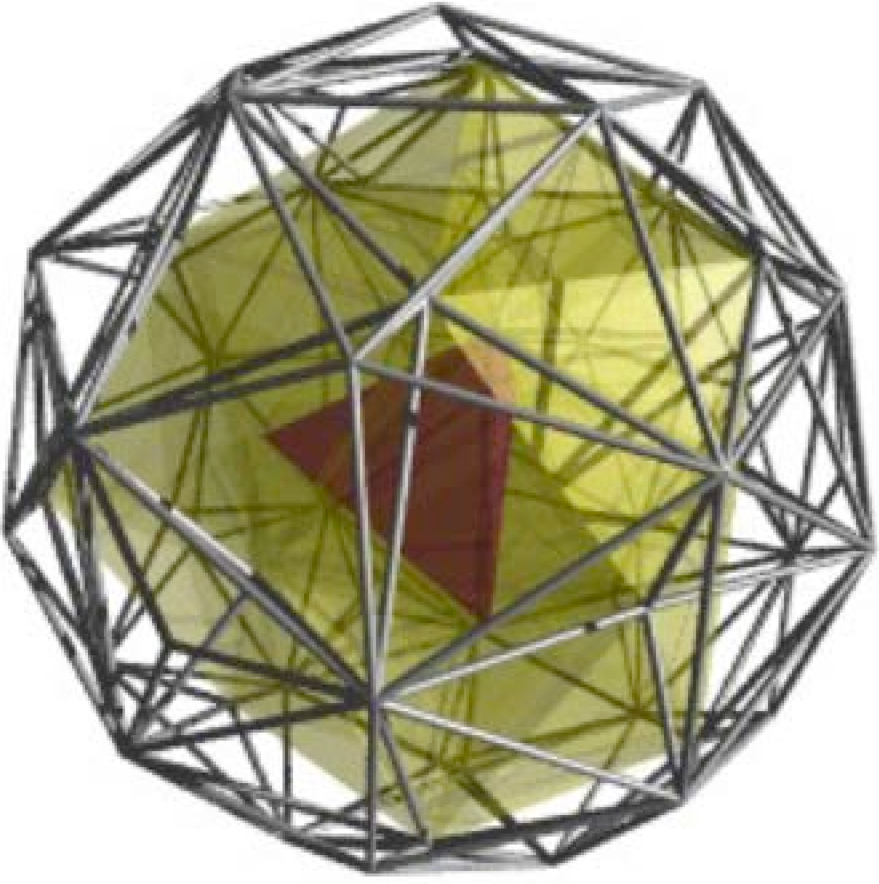












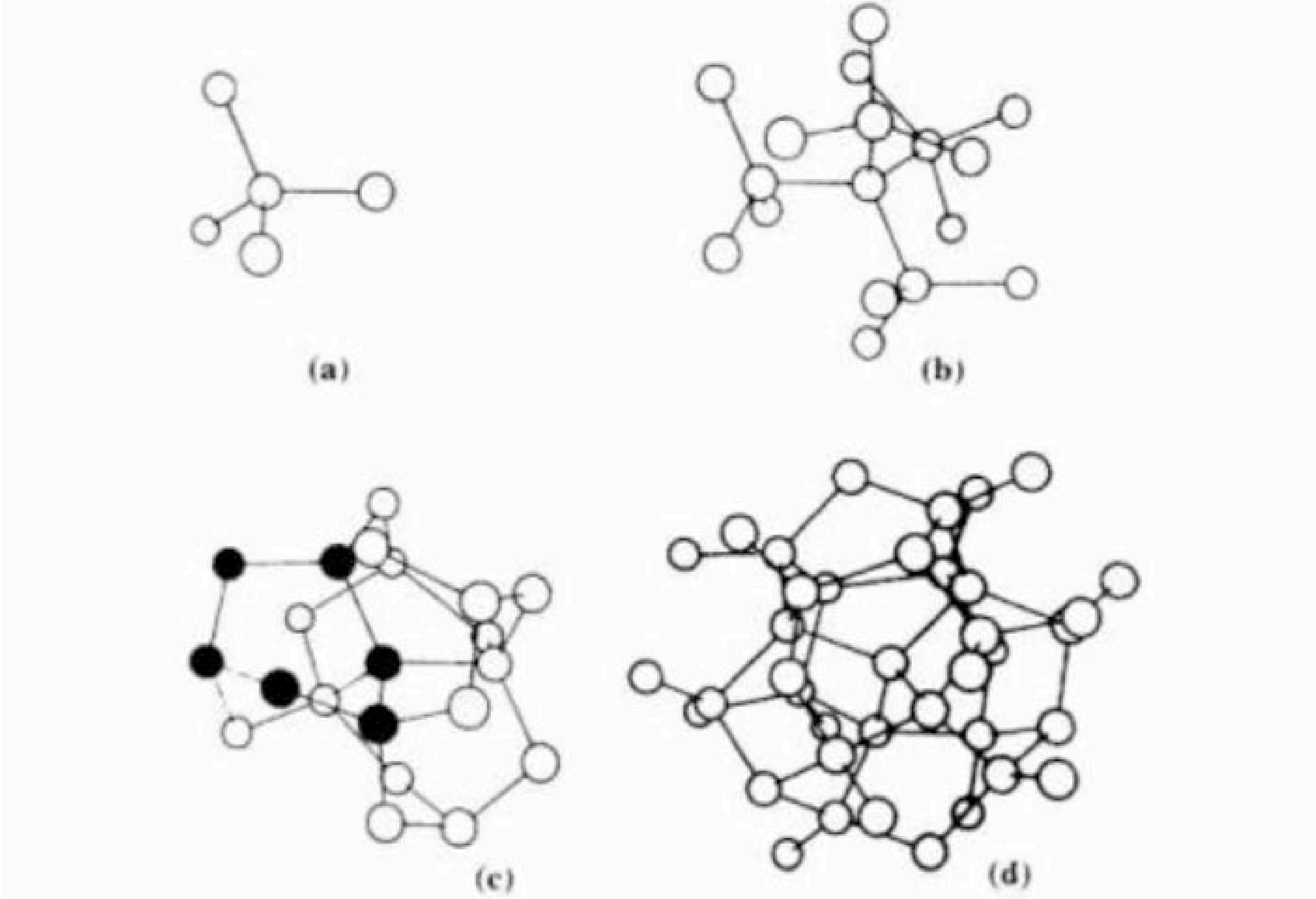
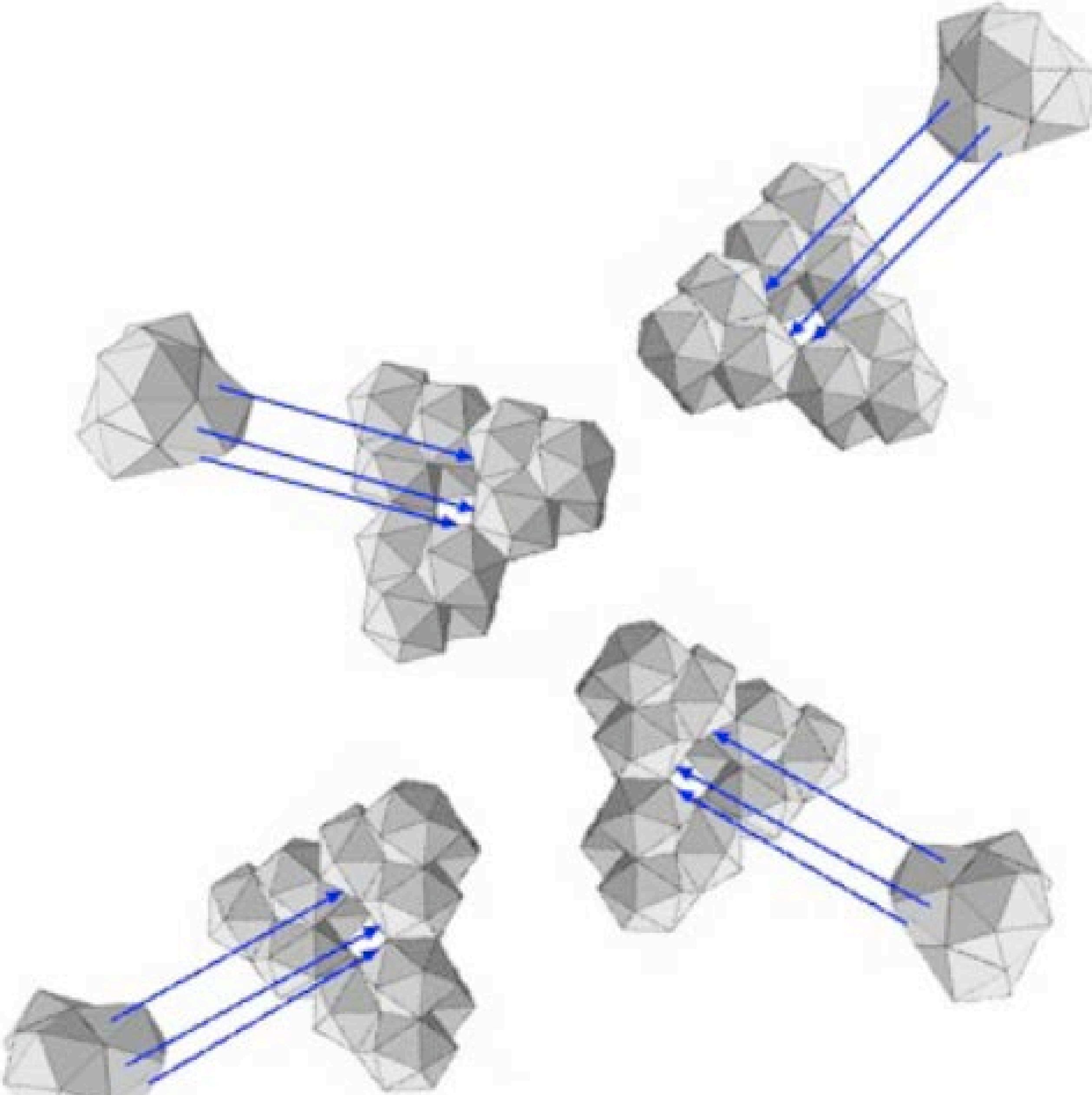
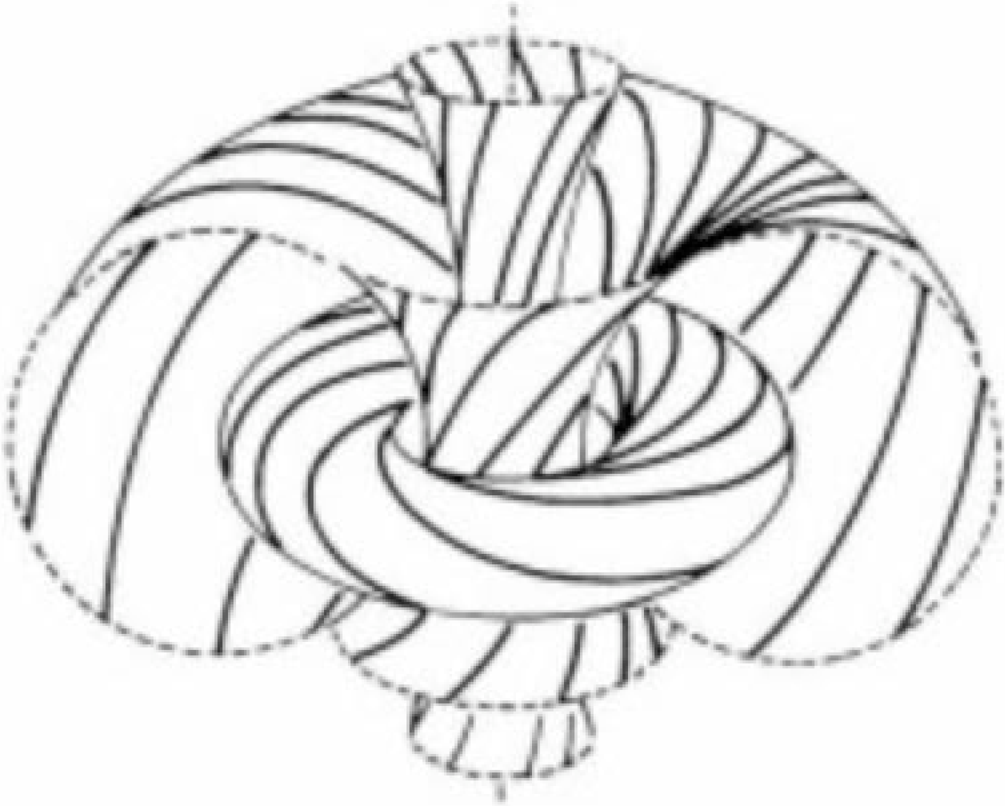
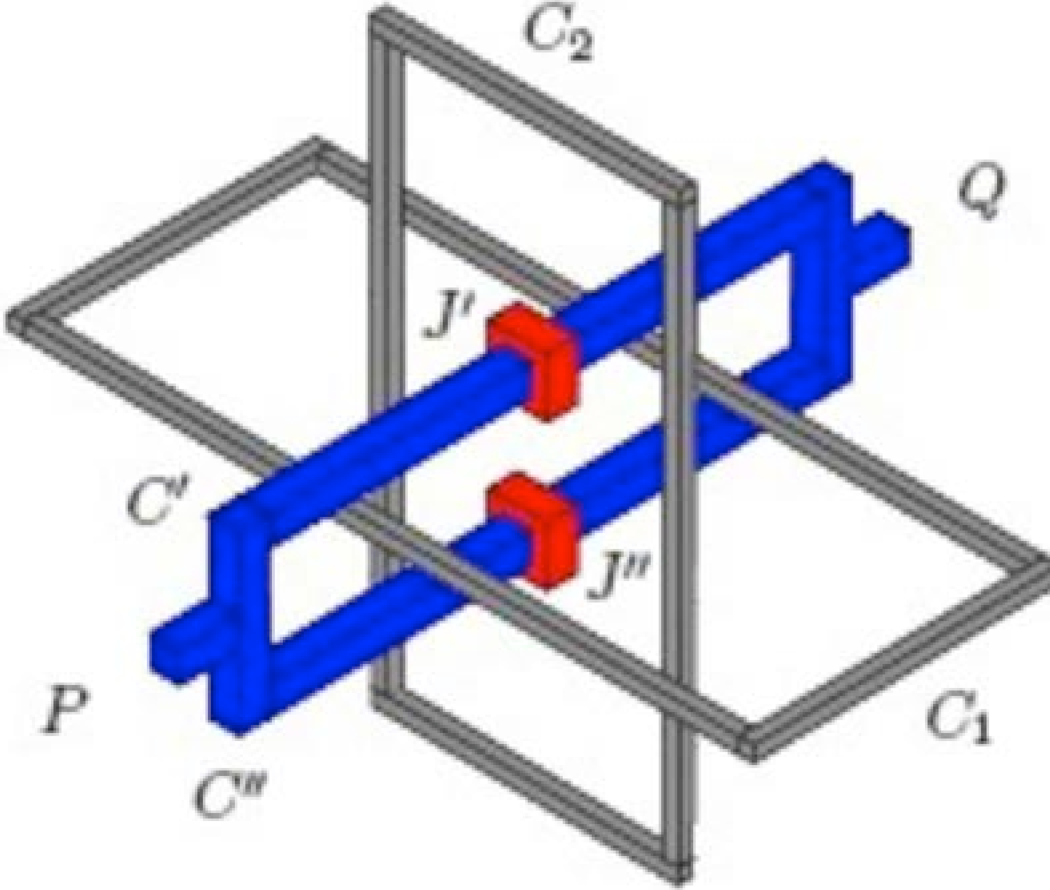


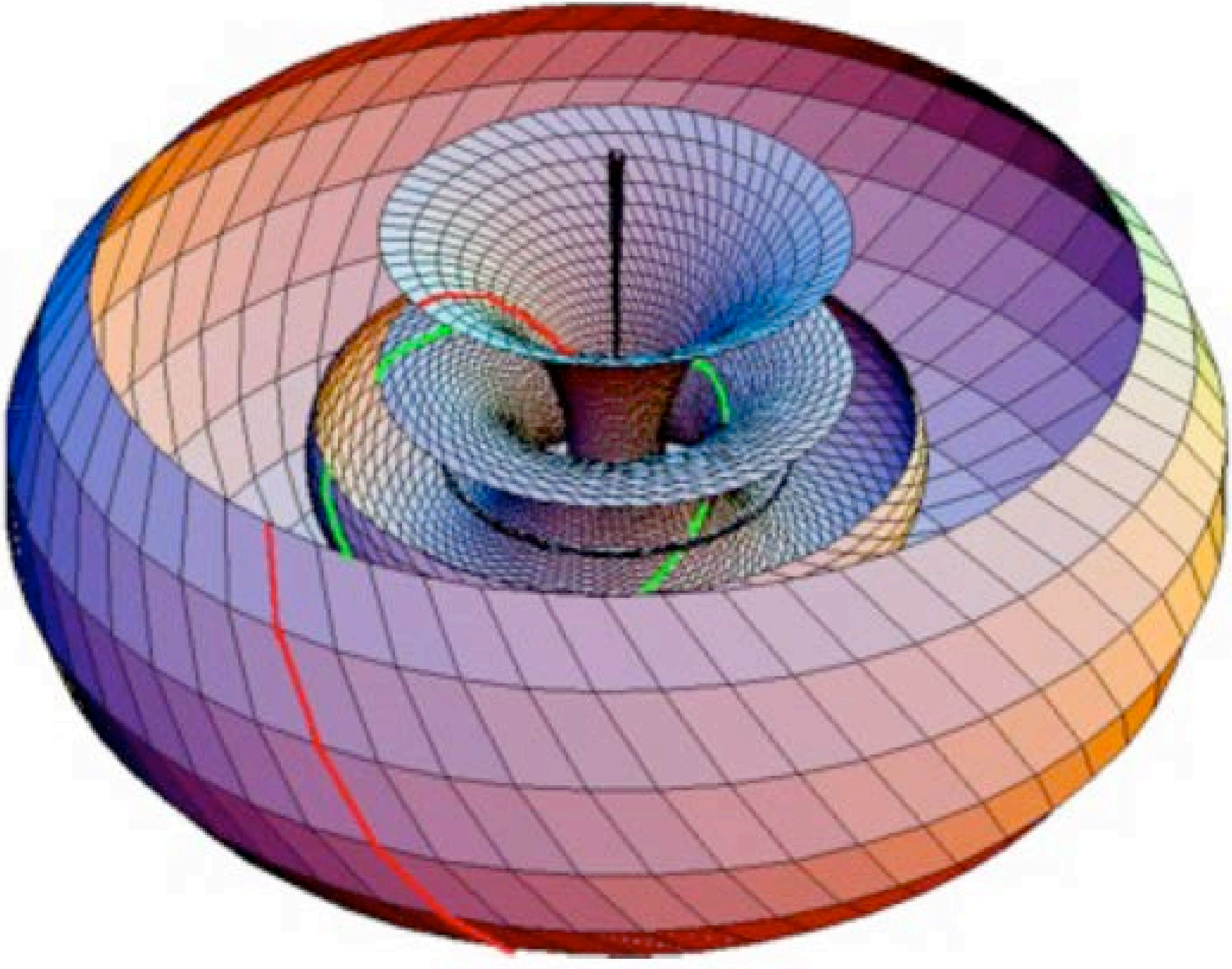
Fig. 2.10. Local view of the polytope '240'. (a) Five vertices, the tetrahedral symmetry is clearly visible; (b) 17 vertices; (c) 21 vertices, a six-fold ring is distinguished; (d) 39 vertices.

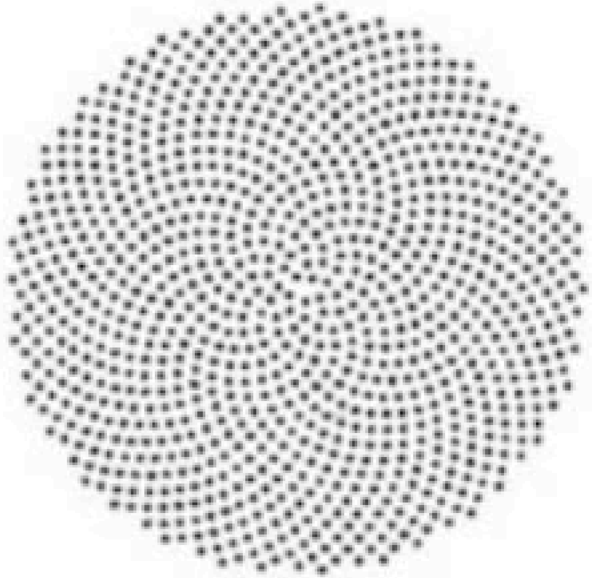






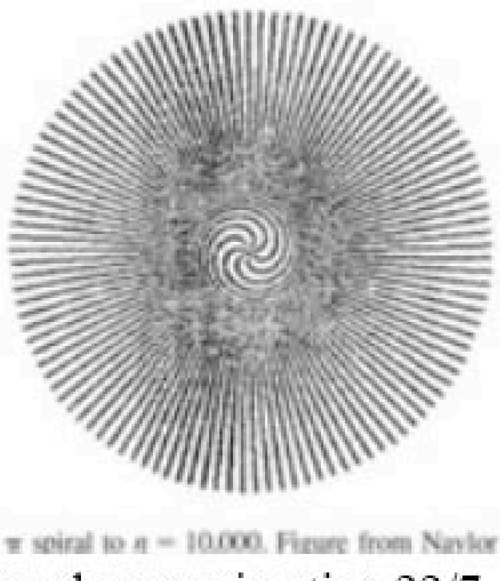
C_2
Q
J'
C'
J''
P
C_1
C''





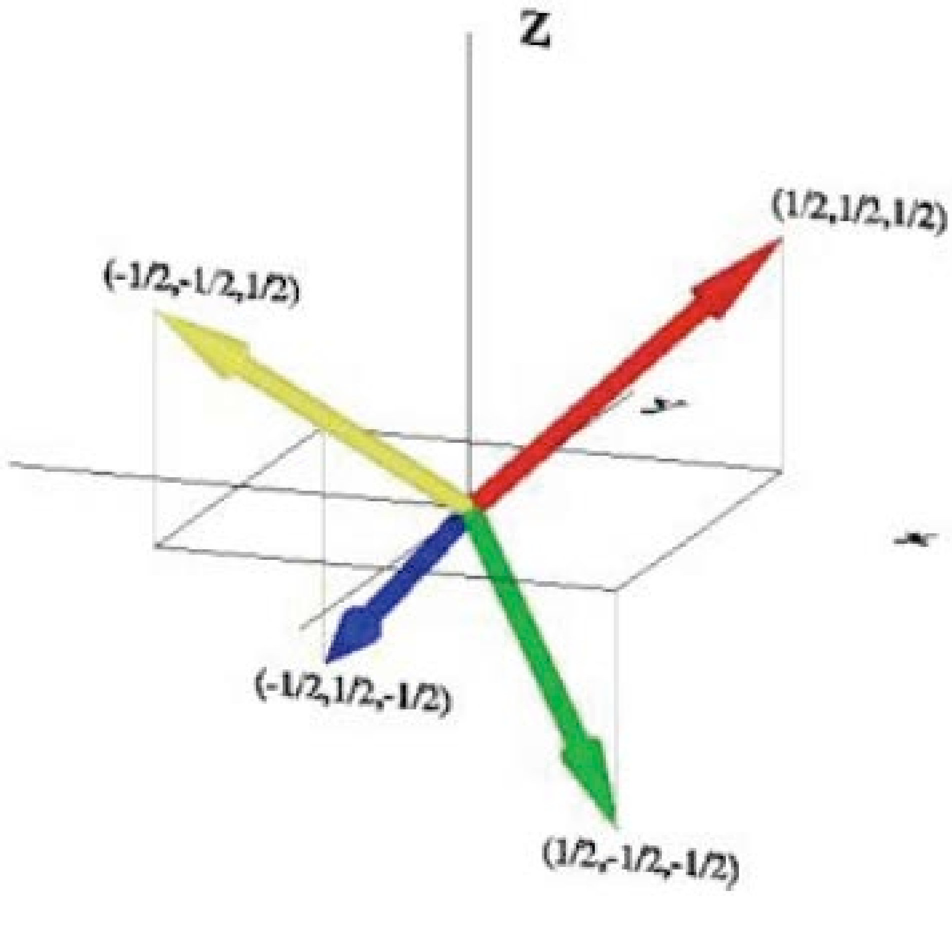
The Fibonacci spiral to n = 1000.

the uniformity of ... distribution ... of the arrangement of points in the Fibonacci spiral ... corresponds to a very efficient packing of identical subunits ... compared to the patterns produced by other angles ...
If ...[the angle]... is rational ... M/N,
then the (n+N)th point will like on the same radius as the nth point ...
the distribution ...[for]... pi ...

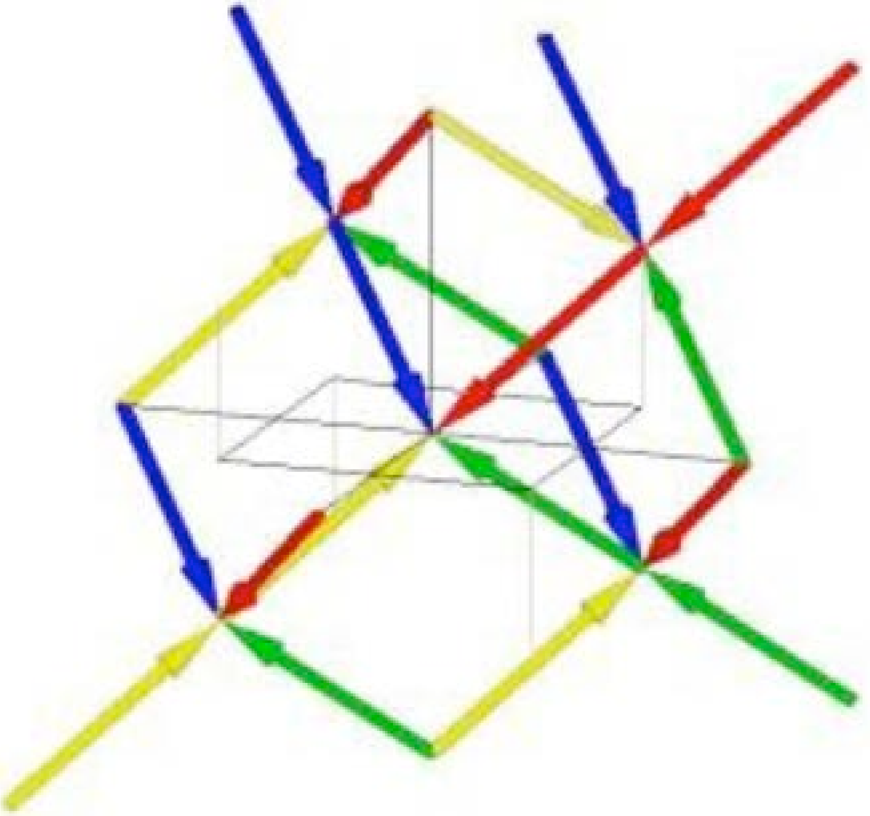


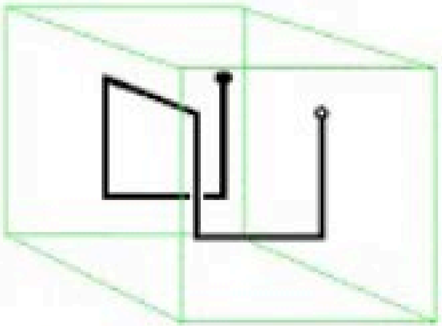
The π spiral to n = 10,000. Figure from Naylor (2002).

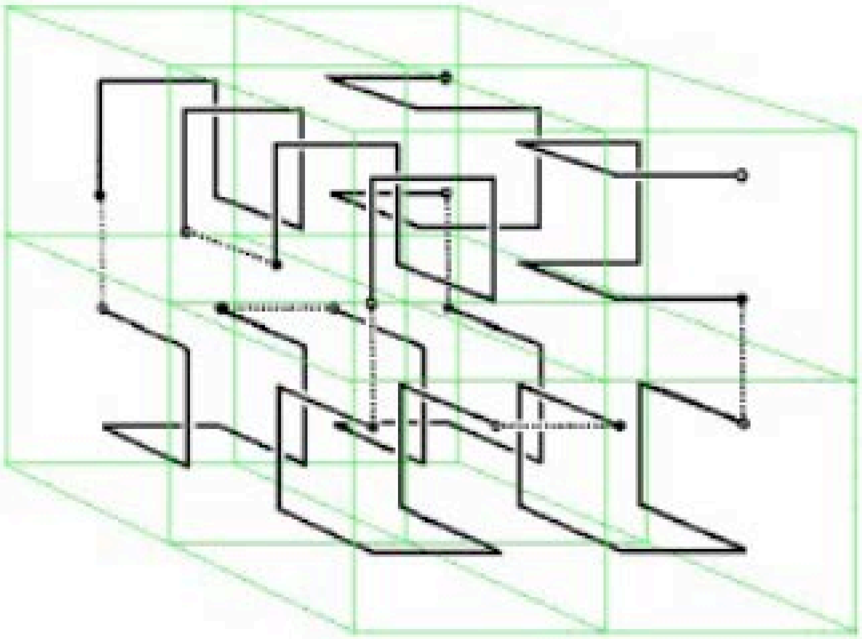
correspond[s]... to the ... rational approximation 22/7 ...".

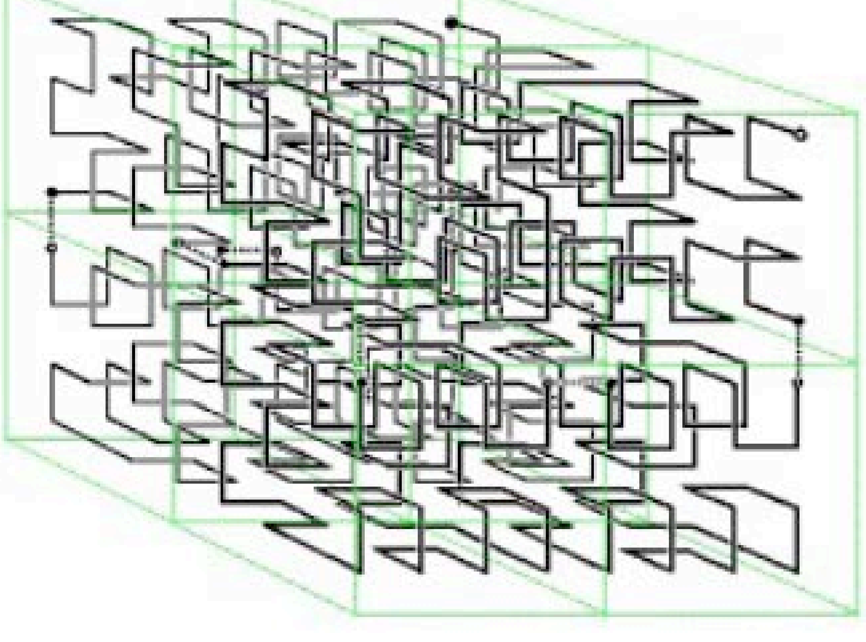


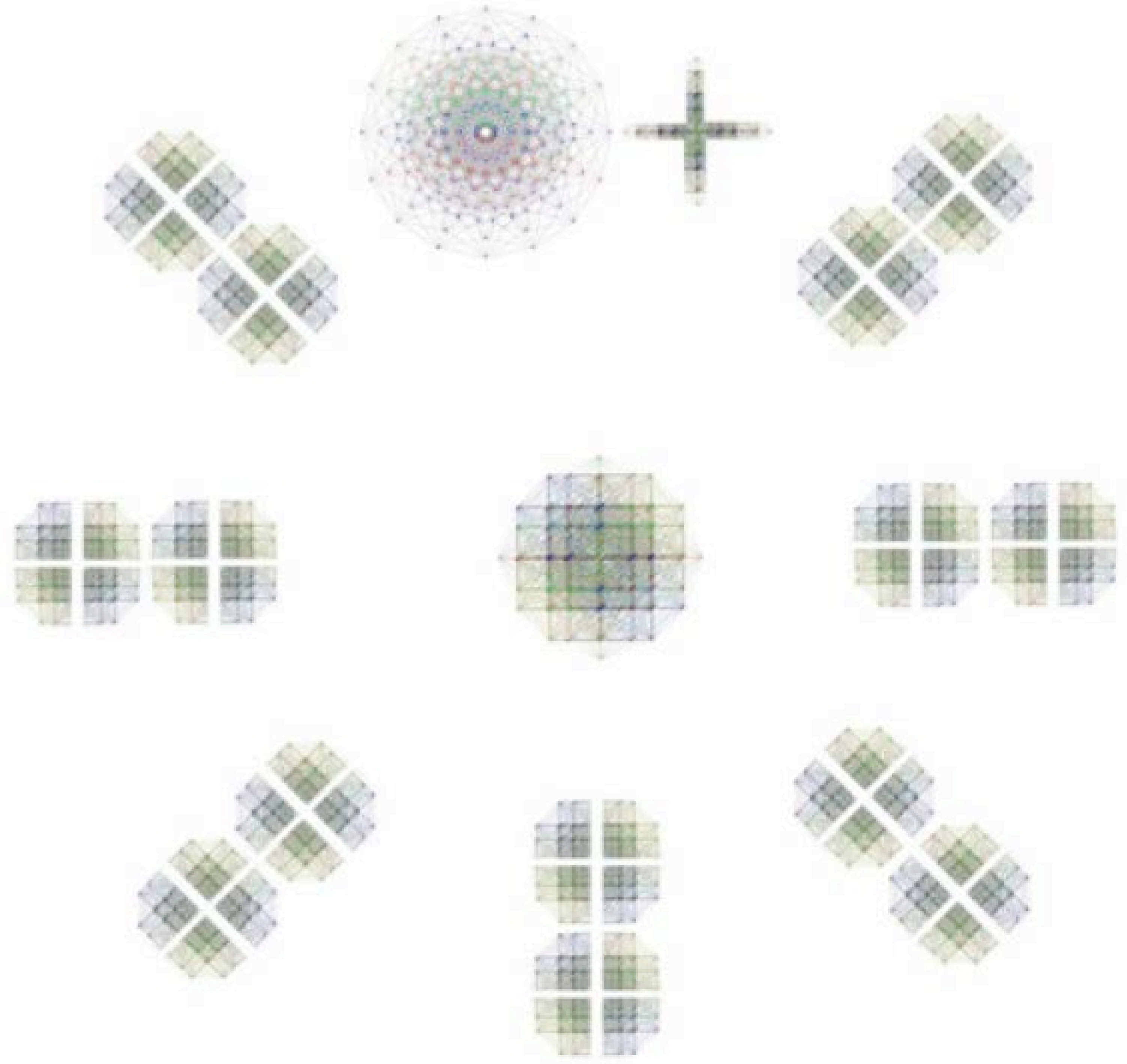
Z
(1/2,1/2,1/2)
(-1/2,-1/2,1/2)
(-1/2,1/2,-1/2)
(1/2,-1/2,-1/2)

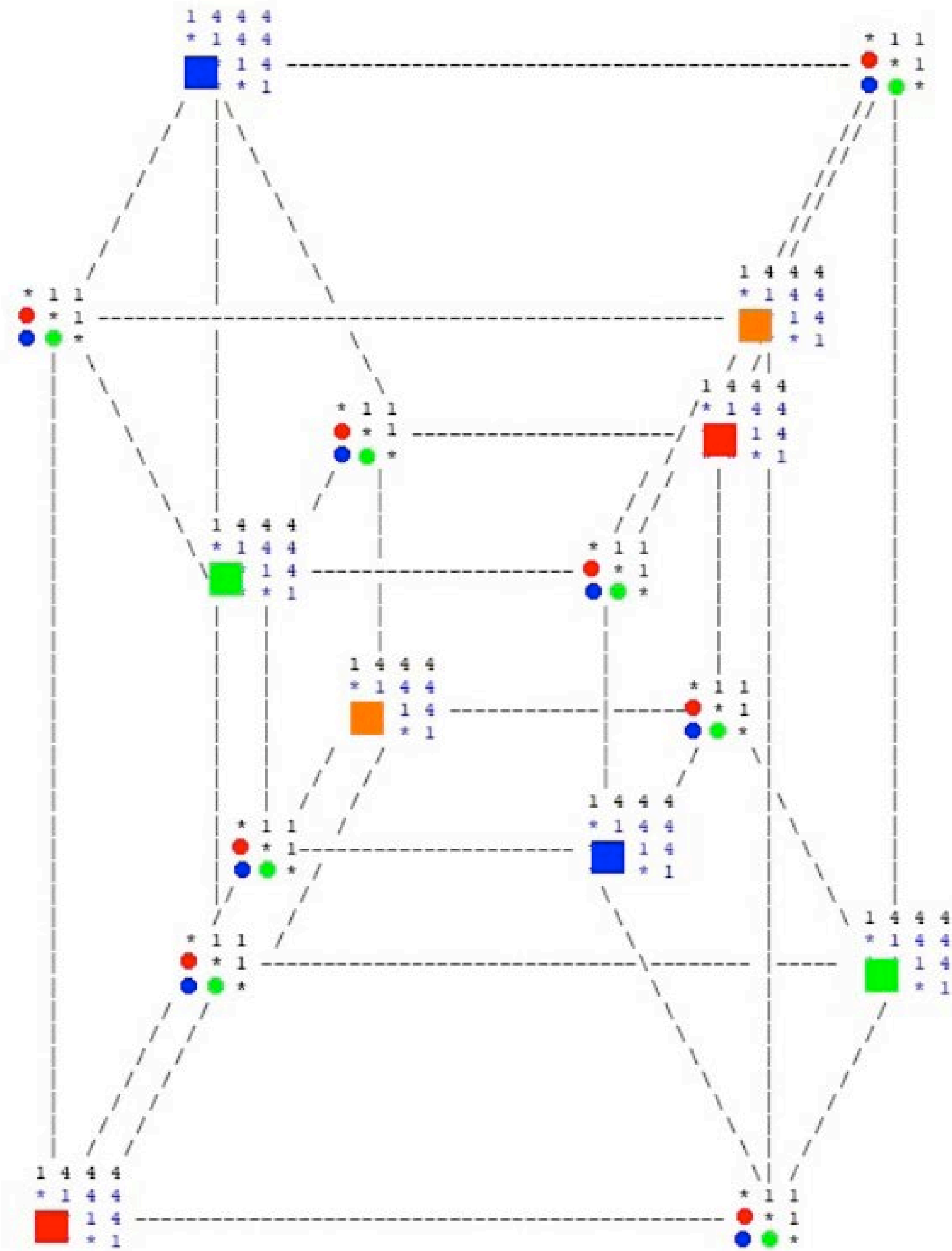


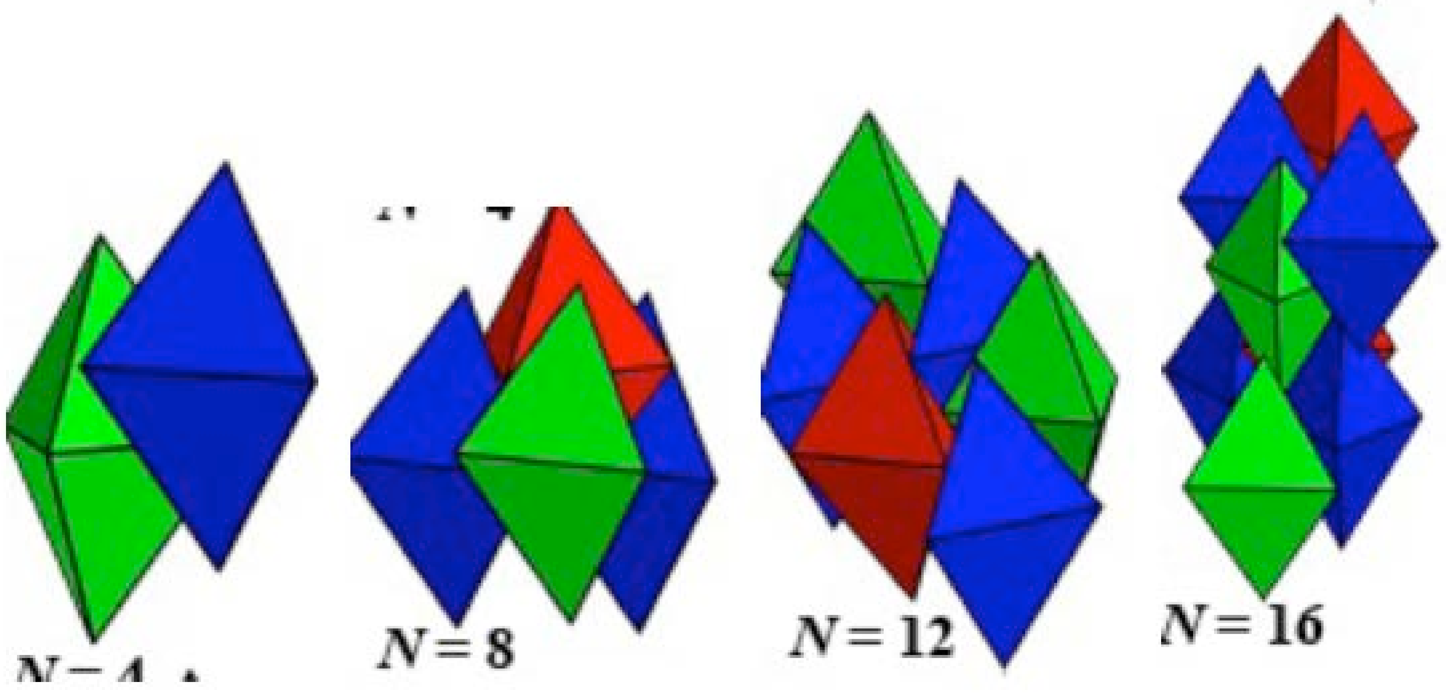











N = 8
N = 12
N = 16

If you regard a Tetrahedron as a pair of Binary Dipoles then the high (0.85+) density configurations have the same **8-periodicity property as the Real Clifford Algebras**:

#Binary Dipoles M	Maximum Density Numerical, $\hat{\phi}$	Maximum Density Analytical, ϕ	Success Rate	Motifs, Structural Description
2	0.367346	18/49	100%	1 monomer [11]
4	0.719486	ϕ_2	100%	2 monomers, transitive [22]
6	0.666665	2/3	21%	3 monomers, three-fold symmetric
8	0.856347	4000/4671	80%	2 dimers (positive + negative)
10	0.748096	ϕ_5	22%	1 pentamer, asymmetric
12	0.764058	ϕ_6	11%	2 dimers + 2 monomers
14	0.749304	3500/4671	15%	2×2 dimers minus 1 monomer
16	0.856347	4000/4671	44%	2×2 dimers, identical to $N = 4$
18	0.766081		—	1 pentagonal dipyramid + 2 dimers
20	0.829282	ϕ_{10}	2%	2 pentagonal dipyramids
22	0.794604		—	1 nonamer + 2 monomers
24	0.856347	4000/4671	3%	3×2 dimers, identical to $N = 4$
26	0.788728		4%	1 pentagonal dipyramid + 4 dimers
28	0.816834		3%	2 pentagonal dipyramids + 2 dimers
30	0.788693		—	Disordered, non-optimal
32	0.856342	4000/4671	< 1%	4×2 dimers, identical to $N = 4$
⋮	⋮			⋮
164x8	0.850267			Quasicrystal approximant [21]

which is consistent with regarding the 4 vertices of a Tetrahedron as the 4 elements of the Cl(2) Real Clifford Algebra, isomorphic to the Quaternions, with graded strucure 1+2+1, and so 4 tetrahedra as Cl(4x2) = Cl(8).

From that point of view, **the Large N Limit of 4N Tetra Clusters = = Completion of Union of All 4N Tetra Clusters would correspond to a generalized Hyperfinite II1 von Neumann factor that gives a natural Algebraic Quantum Field Theory structure to E8 Physics.**

Spinor Growth Sequence

Frank Dodd (Tony) Smith, Jr. - 2012

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0 = Integers

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1 = Real Numbers (basis = {1})

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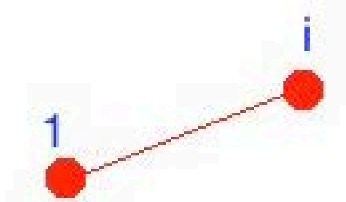
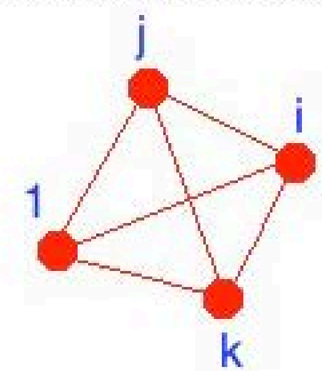
2 = Complex Numbers C (basis = {1,i}) = Cl(1) = half-spinors of Cl(4) Minkowski



These half-spinors are the basis of the conventional Fermionic Fock Space Hyperfinite II1 von Neumann Factor Algebraic Quantum Field Theory (AQFT)

----

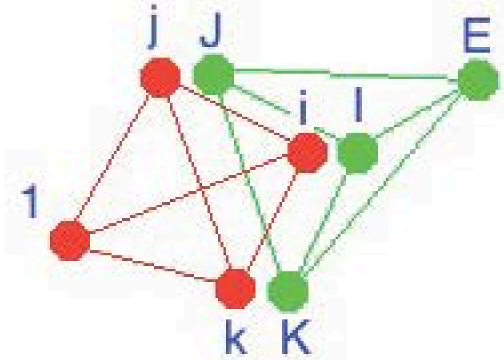
4 = Quaternions Q (basis = {1,i,j,k}) = Cl(2) = half-spinors of Cl(6) Conformal



WHICH CORRESPOND TO TETRAHEDRA

----

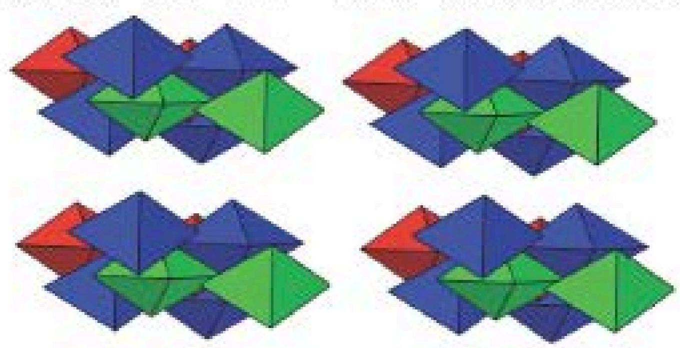
8 = Octonions O (basis = {1,i,j,k,I,J,K,E}) = half-spinors of Cl(8)



WHICH CORRESPOND TO
Chen-Engel-Glotzer (arXiv 1001.0586) DIMER PAIRS OF TETRAHEDRA

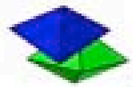
2^(8/2) = 2^4 = 16 = full spinors of Cl(8) = vectors of Cl(16)

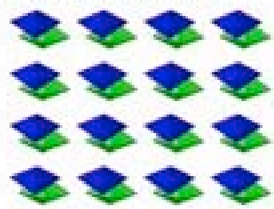
2^(16/2) = 2^8 = 256 = 4 x 64 = full spinors of Cl(16)

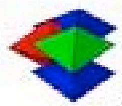


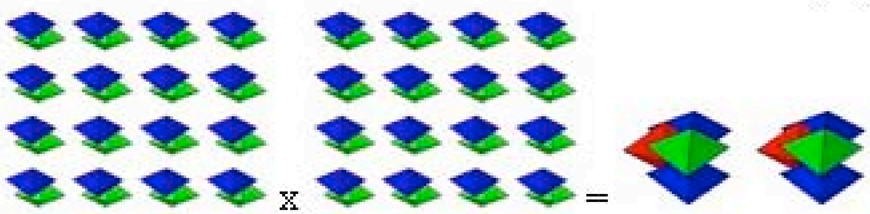
These are the basis of the unconventional generalization of
the Hyperfinite II1 von Neumann Factor
that I use for Algebraic Quantum Field Theory (AQFT)

2^(256/2) = 2^128 = 3.4 x 10^38 = full spinors of Cl(256)
Such a large number as 2^128 is useful in describing
the inflationary expansion of our universe
and the production of the large number of particles that it contains.

The 4-tetrahedra 2-dimer  corresponding to Cl(8)
has 16 vertices in each basic cell. It takes 16 of those cells to get enough vertices to represent the 256 = 16x16 elements of Cl(8):



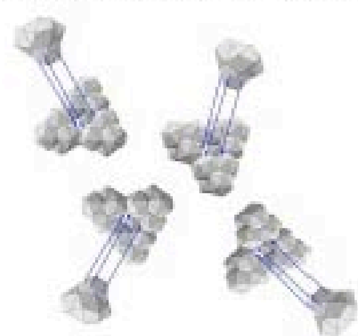
The 8-tetrahedra 4-dimer  corresponding to C(8)xCl(8) = Cl(16)
has 32 vertices in each basic cell. It takes 2048 of those cells to get enough vertices to represent the 65536 = 32x2048 = 256x256 elements of Cl(16):



... 2048 cells

The 8x2048 = 16384 tetrahedra whose 65536 vertices represent Cl(16) form a dense (85.63 %) packing of flat 3-dim space.

A much less dense diamond lattice  in flat 3-dim space can be formed from Pearce clusters. Combining Pearce structures with four 57-groups



gives a 240-polytope made up of two 600-cells that describe the E8 Lie algebra which has 248 elements, 240 of which are root vectors.

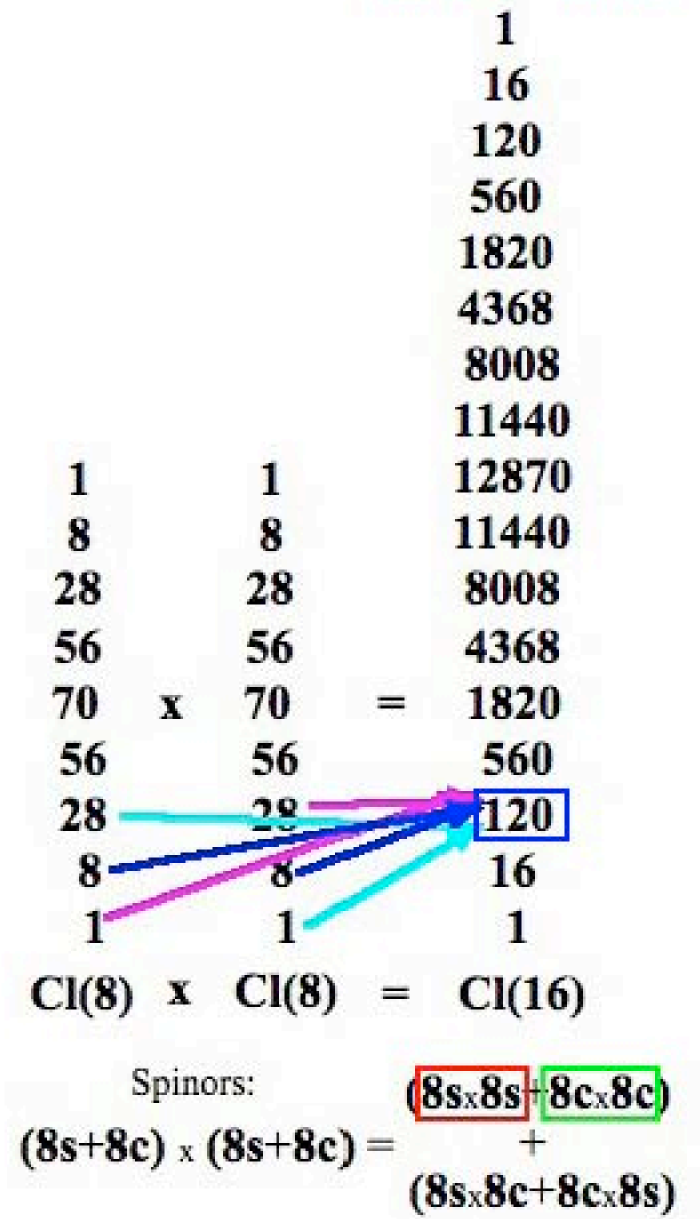
What part of the very dense 65536-dim Cl(16)
forms the very thin diamond lattice with 248-dim E8
whose symmetry describes a realistic physics model?

As shown by graded structure, 248-dim E8 is made up of

the bivector 120 of Cl(16)

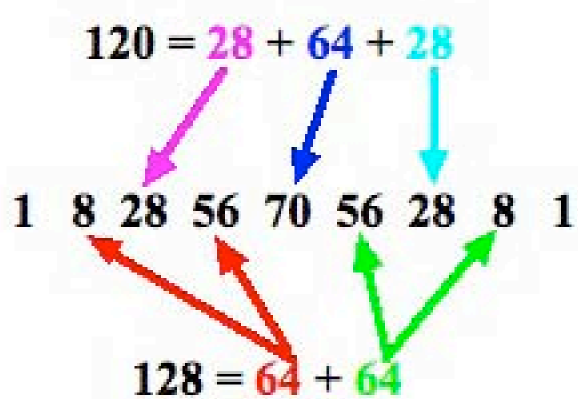
plus

a 128 Cl(16) half-spinor 8x8 = 64 + 8x8 = 64



so that only 120+128 = 248 of the 65536 elements of Cl(16) are used for E8.

In fact, **120+128 = 248-dim E8 can fit inside only one copy of 256-dim Cl(8)**



where the 1 scalar, 6 of 70 middle elements, and 1 pseudoscalar are not used
and where the physical interpretation of the structure is naturally realistic
(E8 fermions in Cl(8) odd part, E8 bosons + spacetime in Cl(8) even part).

The E8 grading **8 28 56 64 56 28 8** can be seen as

63
8 28 56 1 56 28 8

which as shown by
Rutwig Campoamor-Stursberg in Acta Physica Polonica B 41 (2010) 53-77
can be contracted to SL(8) + H92
where
SL(8) = 63 of 64 = 8x8 Position/Momentum combinations of 8-dim spacetime

H92 = Heisenberg Algebra with
gauge boson creation/annihilation operators in the even part 28 + 1 + 28
and
fermion creation/annihilation operators in the odd part 8+56 + 56+8

From the Clifford Algebra point of view:

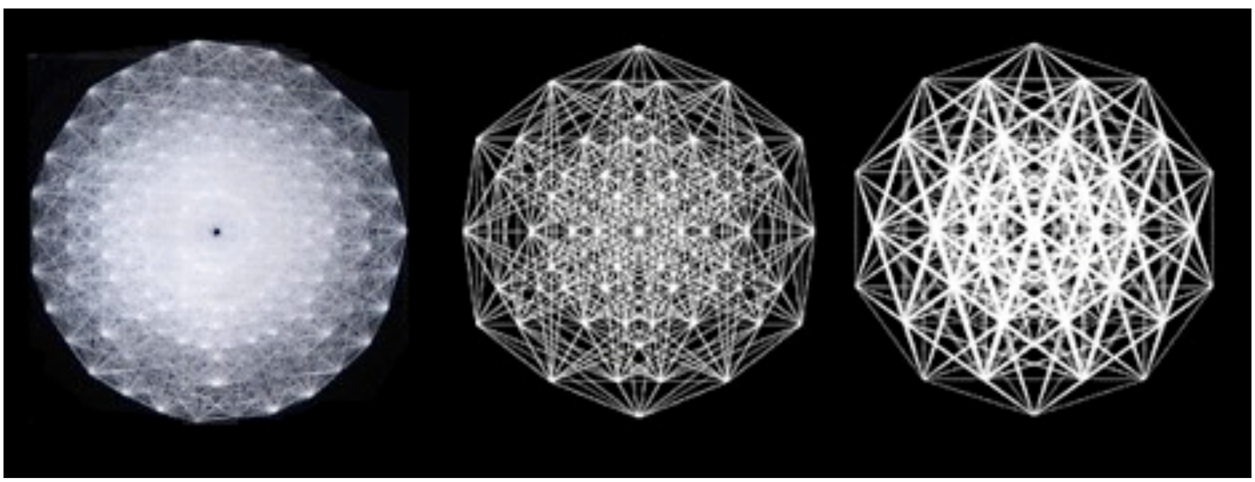
The loose E8 structure sits inside less than 1 / 256
of the dense packing of 256x256 = 65536-element Cl(16).

What is the physical interpretation of all that "extra" space ?

Since 4-dim HyperDiamond and 3-dim Diamond and 2-dim Feynman Checkerboard and 1-dim Line Segment lattices can be seen as sublattices or projections of the 8-dim E8 lattice structure
[Note - Quasicrystals in 4 and 3 and 2 and 1 dimension can be seen as irrational slices through the 8-dim E8 lattice structure,
especially by slicing by the most irrational number, the Golden Ratio,
thus producing Fibonacci Quasicrystal structure]

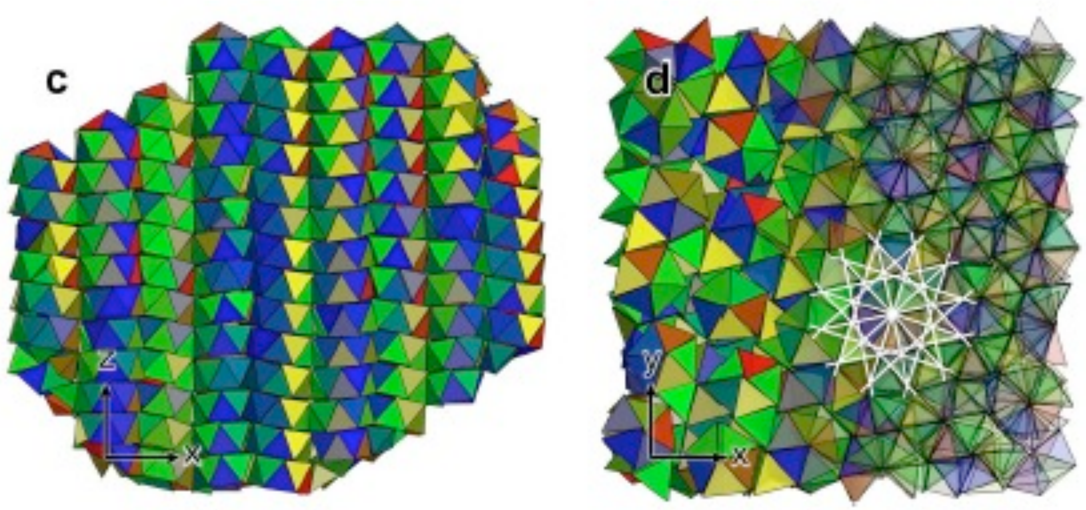
the physical interpretation of the vast "extra" space
covered by dense Large N 4N Tetra Packing
but not covered by loose Diamond Lattice Structure
will be discussed here in terms of E8 Lattice Structure.

Although the 240 root vectors of **E8 symmetry** are often shown with 30-fold symmetry as in the left image below from Bathsheba Grossman's web site



E8 can also be seen to have **12-fold** (center) and 10-fold (right) symmetries as can be seen by rotating Bathsheba Grossman's 3-dim glass E8 sculptures.

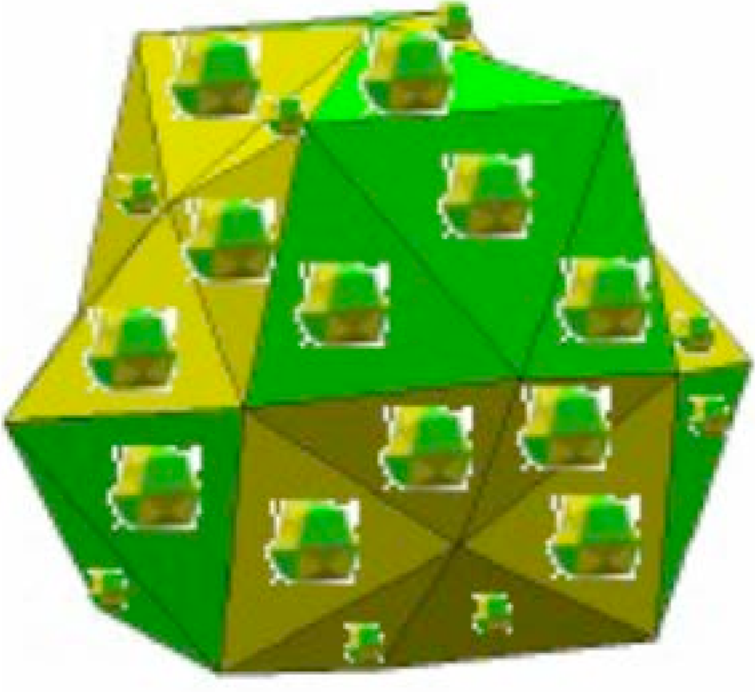
Such **12-fold symmetry is also characteristic of Tetra/Quasicrystal Packing** as discussed by Haji-Akbari1, Engel, Keys, Zheng, Petschek, Palffy-Muhoray, and Glotzer in arXiv 1012.5138 where they describe "... A quasicrystal with packing fraction φ = 0.8324 obtained by first equilibrating an initially disordered fluid of 13824 hard tetrahedra using Monte Carlo simulation and subsequent numerical compression ..." and say "... The images show ... opaque and translucent views of two rotated narrow slices (c)-(d). The white overlay in (d) shows the distinctive twelve-fold symmetry of the dodecagonal quasicrystal. ...



... Corrugated layers with normals along z are apparent in (c). The colouring of tetrahedra is based on orientation. ... By compressing a crystalline approximant of the quasicrystal, the highest packing fraction we obtain is φ = 0.8503. ...
Aside from studies of packing,
hard tetrahedra have been used to model the structure of water. ...”.

Just as water is the medium in which the structures of life live in Earth’s oceans,
the dense tetrahedra of the Large N 4N Tetra Packing
are the active vacuum/medium
necessary for
Quantum Phenomena in the thin Lattice of E8 HyperDiamond Physics.

As Schroer said in hep-th/9908021, in any interacting system "... **any compactly localized operator applied to the vacuum generates clouds of pairs of particle/antiparticles** ...".
The source of those clouds of pairs of particle/antiparticles is the active vacuum/medium of the dense Large N 4N Tetra Packing in which lives the thin Lattice of E8 HyperDiamond Physics.



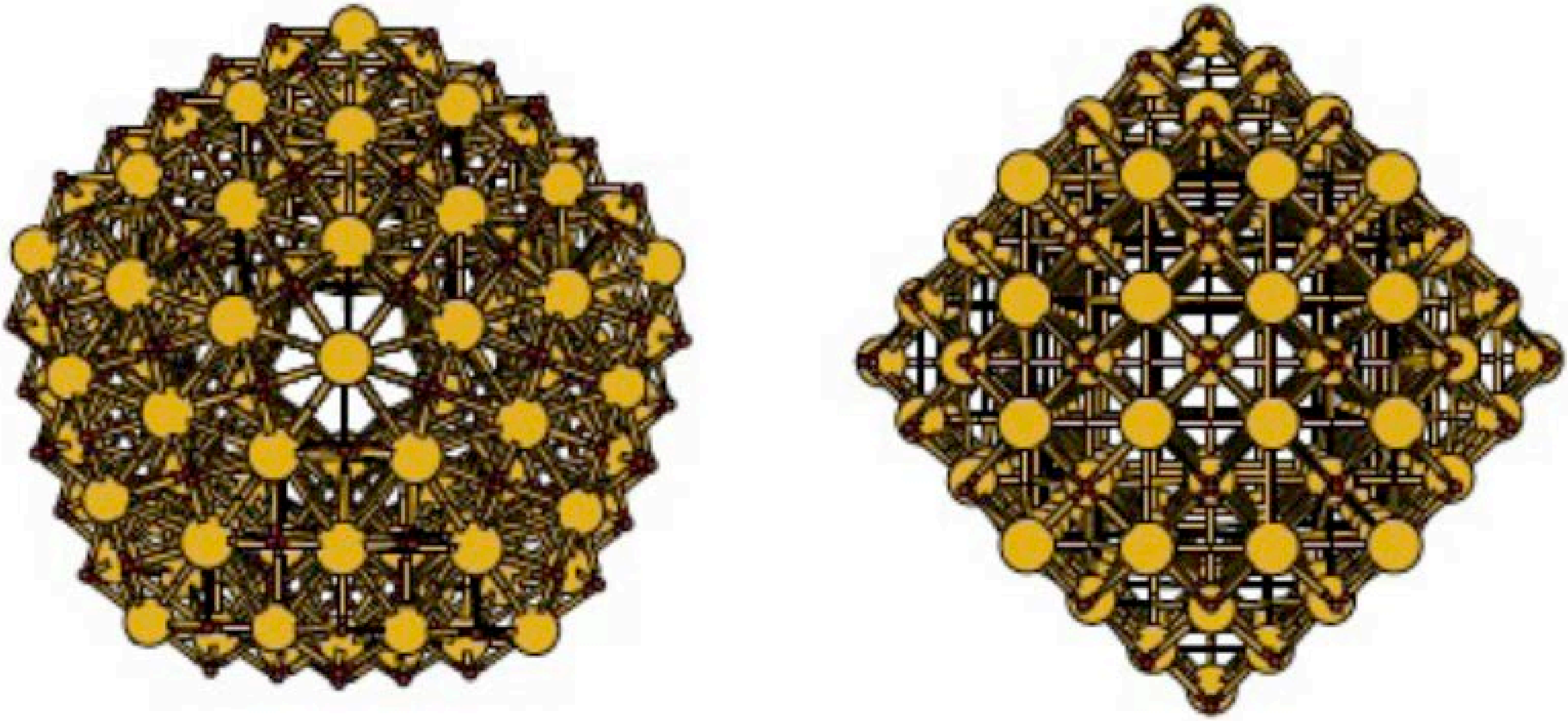


Figure 1. Palladium clusters fully loaded with hydrogen. (a) $Pd_{147}H_{200}$, I_h symmetry; (b) $Pd_{147}H_{164}$, O_h symmetry.

in terms of the Fuller Jitterbug Transformation

Pd D-D Fusion and Jitterbug Structure

Frank Dodd (Tony) Smith, Jr. - 2012

Clusters of Palladium atoms (also clusters of atoms of Nickel and similar elements) have two basic structures:

Icosahedral and Cuboctahedral

1 - Icosahedon <-> Cuboctahedron Jitterbug Transformation

2 - Palladium clusters with absorbed Deuterium (PdDx) have two states:

Icosahedral with Tetrahedral absorption sites

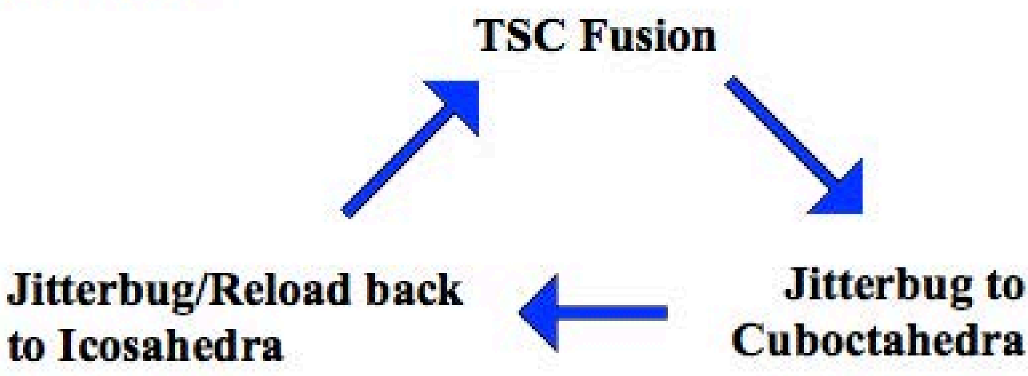
Cuboctahedral with Octahedral absorption sites

3 - Tetrahedral Symmetric Condensation (TSC) in PdDx produces Fusion.

4 - Icosahedra TSC Fusion Triggers Jitterbug to Cuboctahedra.

5 - Cuboctahedra Jitterbug back to Icosahedra and reload TSC sites.

6 - Repeat the Cycle:



Pd/Ni Clusters for D/H TSC Jitterbug Fusion

Frank Dodd (Tony) Smith Jr. - 2012

viXra 1209.0007

Clusters of Palladium atoms (also clusters of atoms of Nickel and similar elements) have two basic structures:

Icosahedral and Cuboctahedral

1 - Icosahedon <-> Cuboctahedron Jitterbug Transformation

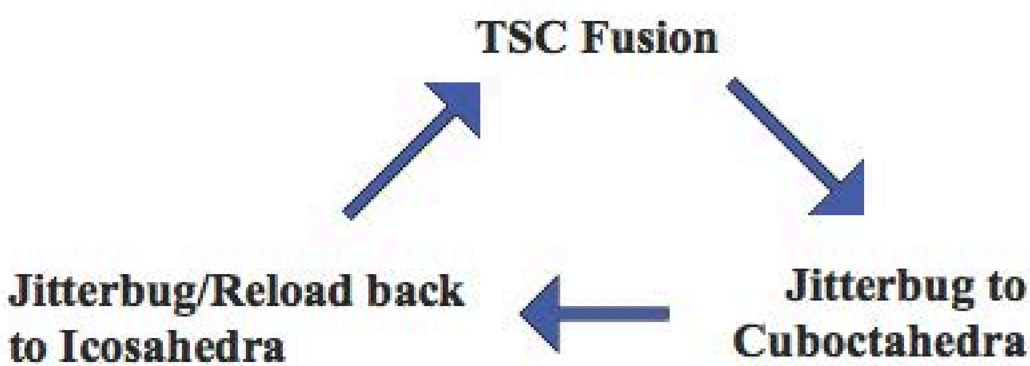
2 - Pd/Ni clusters with absorbed Deuterium or Hydrogen have two states:
Icosahedral with Tetrahedral absorption sites
Cuboctahedral with Octahedral absorption sites

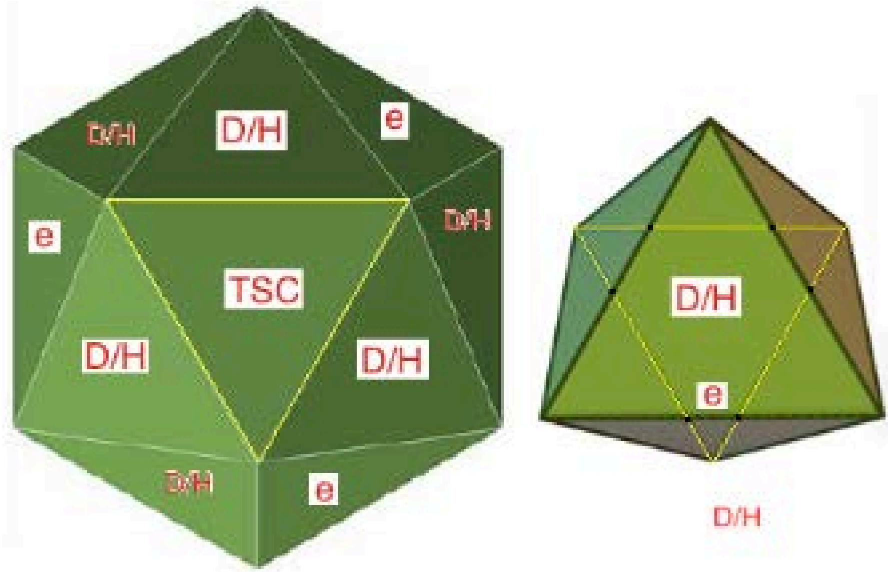
3 - Tetrahedral Symmetric Condensation (TSC) in PdDx produces Fusion.

4 - Icosahedra TSC Fusion Triggers Jitterbug to Cuboctahedra.

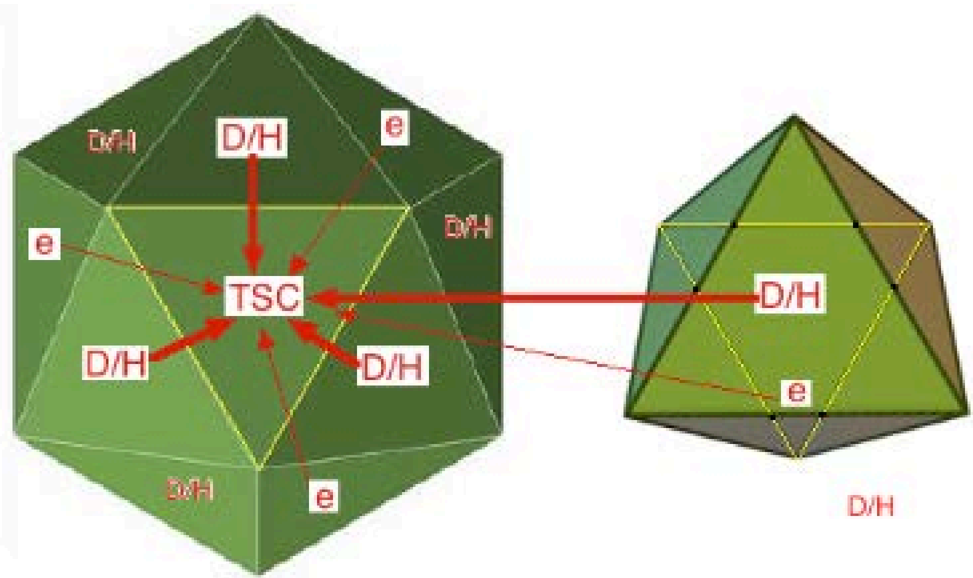
5 - Cuboctahedra Jitterbug back to Icosahedra and reload TSC sites.

6 - Repeat the Cycle:





D/H
D/H
e
e
D/H
TSC
D/H
D/H
D/H
e
D/H
e
D/H



D/H
D/H
e
e
D/H
TSC
D/H
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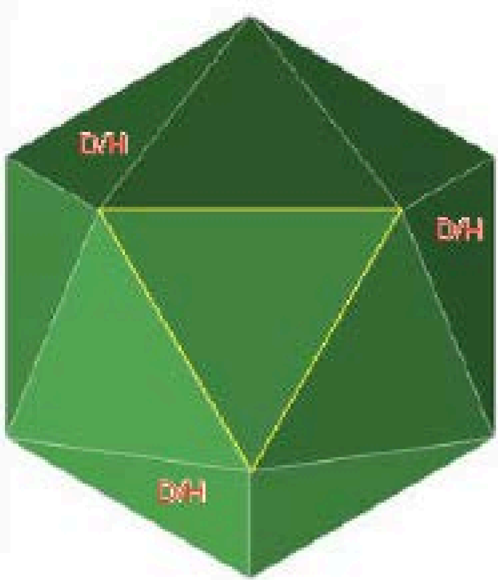
D/H


D/H
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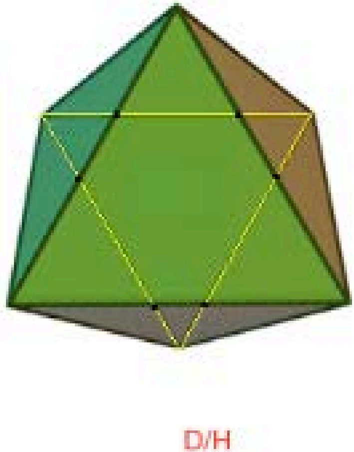
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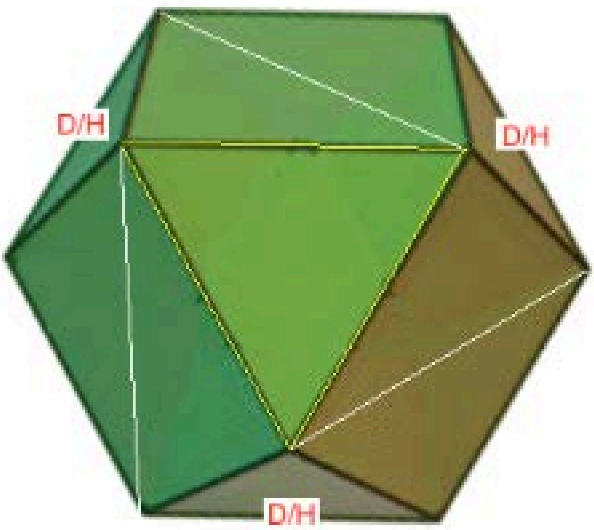
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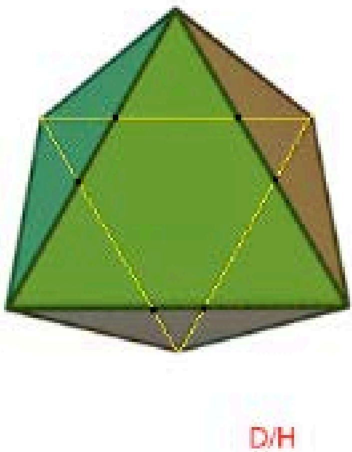
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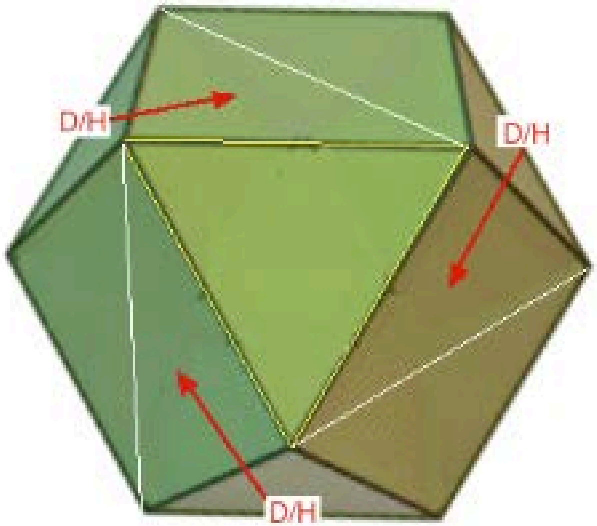
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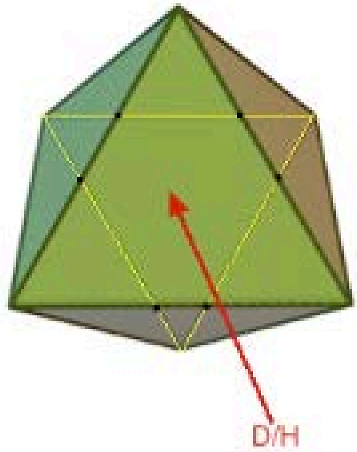
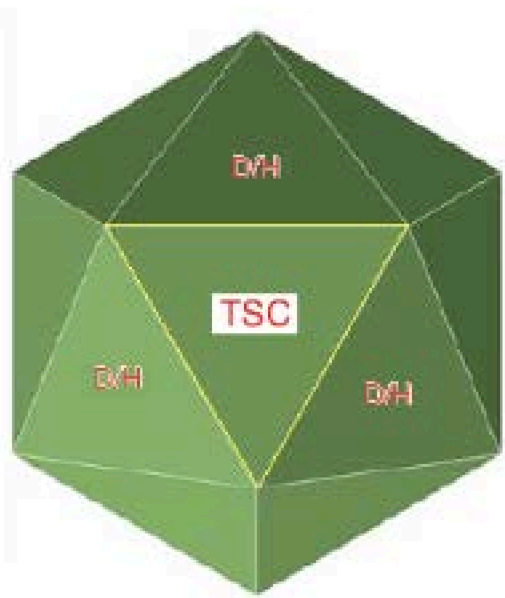
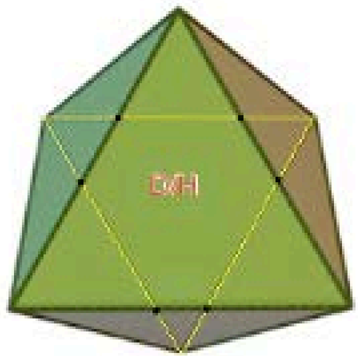
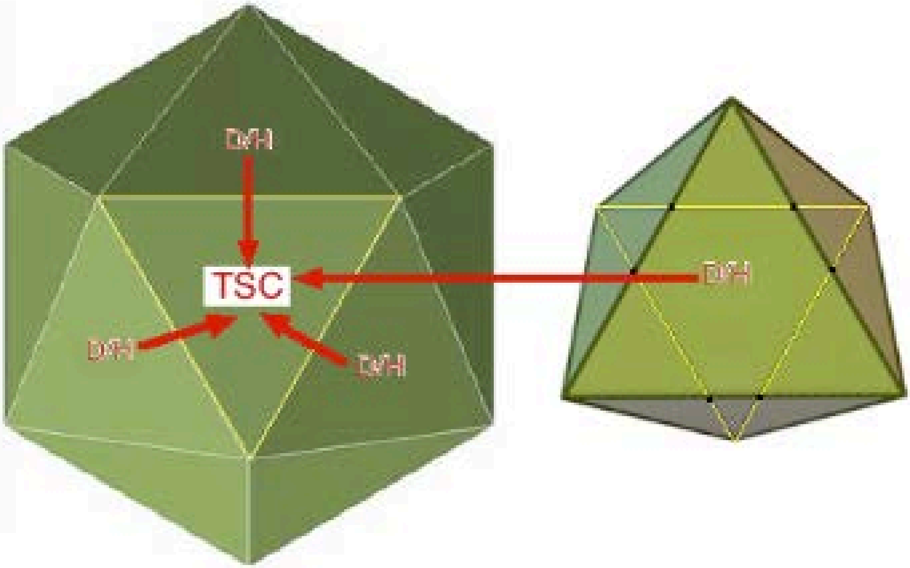

D/H


D/H
TSC
D/H
D/H


D/H



147-atom Pd clusters have diameter about 1.56 nm
according to 2003 Gottingen dissertation
of Mohammed A . M. Shtaya-Sulieman at
http://webdoc.sub.gwdg.de/diss/2004/shtaya-suleiman/

1.5 nm Pd clusters have been produced at Sandia National Laboratories
and University of New Mexico Center for Micro-Engineered Materials
according to a Journal of Catalysis article
"Facile, surfactant-free synthesis of Pd nanoparticles for heterogeneous catalysts"
at
http://www.flintbox.com/public/filedownload/2871/2011-038%20Science%20Direct%20Article
by Patrick D. Burton, Timothy J. Boyle, and Abhaya K. Datye.

I would like to see an experiment in which
1.5 nm Pd nanoparticle clusters from Sandia / U. New Mexico
are immersed in Deuterium to see whether or not TSC fusion takes place.

n = number of shells
N = number of Pd atom vertices
d = diameter of icosahedral configuration in nm
C = number of cells in icosahedral phase
CT = number of tetrahedral cells in icosahedral phase
CO = number of octahedral cells in icosahedral phase

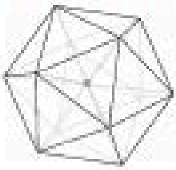
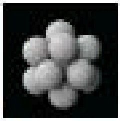
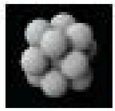
n N d C = CT + CO

0 1 0.27 0 = 0 + 0

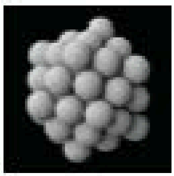
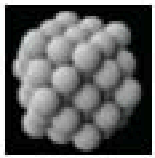
icosahedral


cuboctahedral

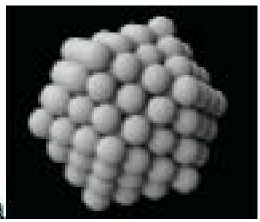
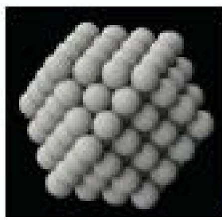
1 13 0.70 20 = 20 + 0


icosahedral


cuboctahedral

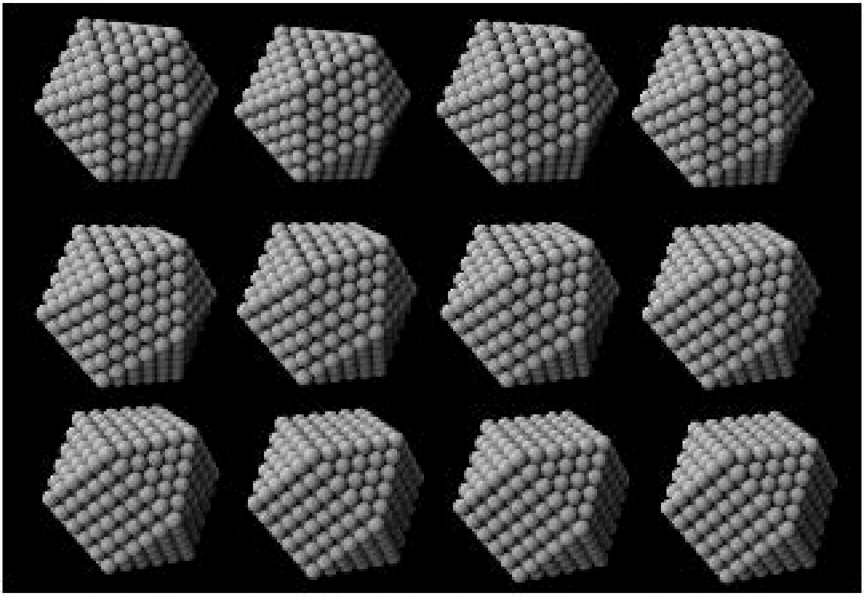
2 55 1.13 100 = 80 + 20


icosa


cubo

3 147 1.56 280 = 200 + 80


icosa


cubo

n	N	d(icosa)(nm)	
5	561	2.44	12 stages of Jitterbug between icosa (top left) and cubo (bottom right):



At the 5-shell level the Jitterbug transformation is harder to do than at lower levels.

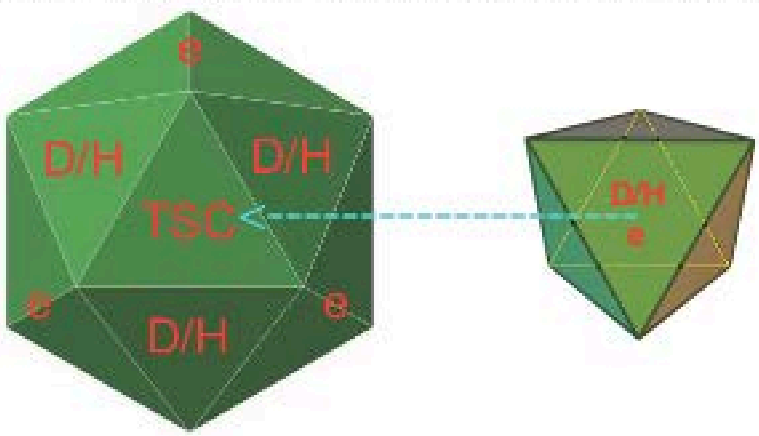
Also, as the shell level and number of atoms increases and the configurations become larger the icosahedral phase becomes less stable.

n	N	d(icosa)(nm)
6	923	2.88
7	1415	3.33
8	2057	3.77
9	2869	4.21
10	3871	4.65
11	5083	5.09
12	6525	5.53

Akito Takahashi has developed a Tetrahedral Symmetric Condensate (TSC) model for fusion D+D+D+D -> 8Be and H+H+H+H -> 4 He in Pd and Ni atomic clusters.

This paper describes the geometry of Pd/Ni atomic clusters and how it enables TSC fusion of D/H within the Pd/Ni clusters.
The basic TSC structure is a half-icosahedron with 10 approximate tetrahedra and approximate octahedron. The tetrahedra and octahedra are approximate because they do not fit together exactly within Pd/Ni atomic clusters because they must be slightly deformed from exactly regular tetrahedra and octahedra in order to fit together in our physical flat 3-dimensional space.
Details of the deformation are being studied by Klee Irwin and his coworkers Fang Fang, Julio Kovacs, and Garrett Sadler. Discussion with them led to the ideas descrtibed in this paper.

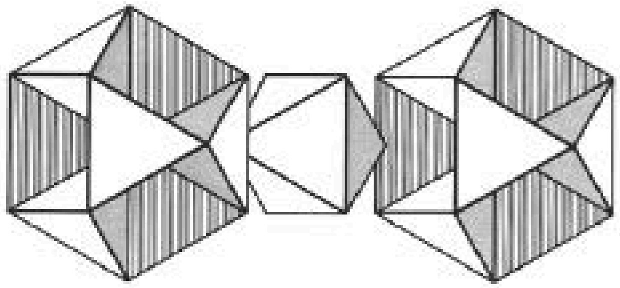
The vertices of the half-icosahedron and octahedron are positions of Pd/Ni atoms.
As to the half-icosahedron tetrahedral cells (images adapted from Wikipedia):
The central cell marked TSC is the cell in which the TSC fusion reaction takes place at the end of the TSC process. The 3 cells marked D/H initially (at the beginning of the TSC process) contain 3 of the 4 D or 4 H nuclei for TSC fusion.
The 3 pairs of cells marked e contain the electrons for those 3 D/H nuclei.



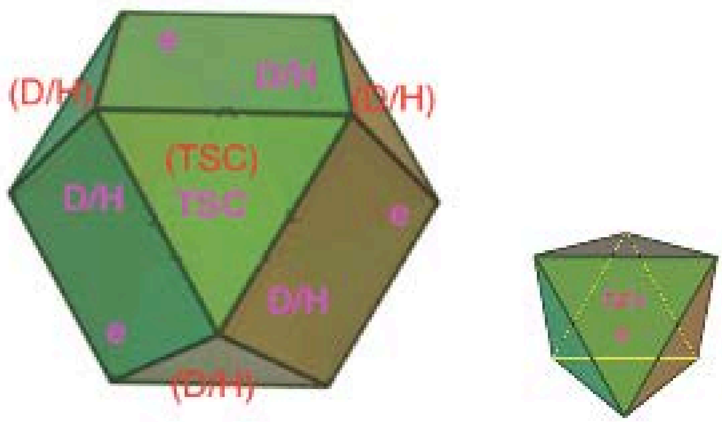
The octahedral cell marked D/H e is located in the atomic cluster directly above the TSC cell such that the TSC top face coincides with the bottom face of the octahedron containing the 4th of the 4 D/H nuclei for TSC fusion and its electron.

In TSC fusion the 4 D/H nuclei, Coulomb-shielded by their electron clouds, condense at the center of the TSC cell where their fusion produces 8 Be / 4 He.
The icosahedral state at the beginning of the TSC process
is the stable ground state for the Pd/Ni cluster.
When the TSC fusion energy is released, it drives the Pd/Ni cluster state

by a Jitterbug transformation to an expanded cuboctahedral state.
As Buckminster Fuller showed (Synergetics Macmillan 1975, 1982)



a cuboctahedron is made up of 8 tetrahedral and 6 half-octahedral cells.
Since cuboctahedra and octahedra tile flat 3-space, the cells are exactly regular Jitterbug expansions of the approximate tetrahedra and octahedra of the ground-state icosahedral TSC cluster. Note that 2 of the icosahedral tetrahedra correspond by Jitterbug to one of the cuboctahedral half-octahedra. In the image below (adapted from Wikipedia)



The old TSC fusion cell (marked red (TSC)) becomes the new TSC fusion cell (marked magenta TSC) remaining unchanged in its function.
Its adjoining 3 half-octahedral cells bring in 3 new D/H fusion fuel nuclei along with their corresponding 3 electrons (marked magenta D/H and e),
which 3 electrons spread into empty cells (marked red (D/H)) that initially contained 3 of the D/H nuclei that fuelled the initial TSC fusion reaction.
A 4th new D/H fuel nucleus and its electron (marked magenta D/H and e) move into the octahedron sharing a face with the TSC fusion cell.

After the energy of the first TSC fusion dissipates, the cluster falls back into the icosahedral ground state for the next round of TSC fusion cycle.

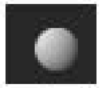
What is the overall structure of the Pd/Ni clusters ?

There are two basic structures that are Jitterbug Transforms of each other:

Icosahedral and Cuboctahedral

From vimeo.com/27662398 by Yan Liang (L2XY2) August 2011: "...

Icosahedral vertices Cuboctahedral



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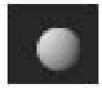
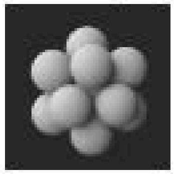
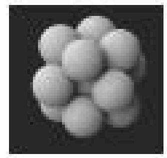
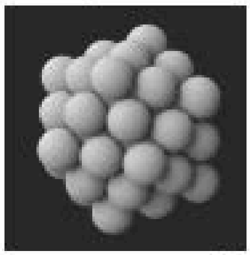


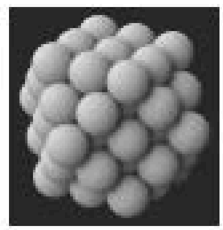


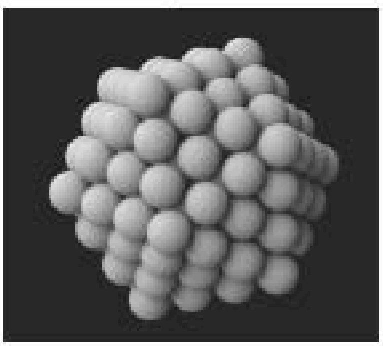
12+1 = 13



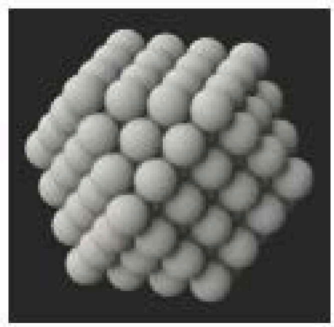


42+13 = 55





92+55 = 147



...".

How many TSC fusion sites are in a Pd/Ni cluster ?

A TSC fusion site has (icosahedral phase) a half-icosahedron plus an octahedron.

The 13-atom Pd/Ni cluster has a full icosahedron (two half-icosahedra) but does not have the necessary octahedron and so is not a TSC Fusion Cluster.

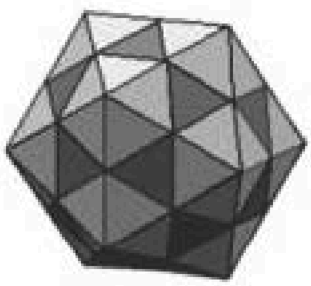
The 55-atom Pd/Ni cluster has a full icosahedron (two half-icosahedra) and two octahedra to form 2 TSC fusion sites, so it is a TSC Fusion Cluster of order 2.

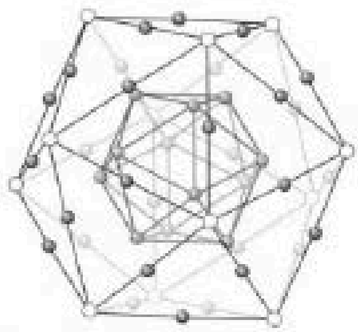
The 147-atom Pd/Ni cluster has the 2 TSC fusion sites of the 55-atom TSC cluster plus 12 more half-icosahedra in its outer shells along with octahedra for each, so it is a TSC Fusion Cluster of order 14.

How do the Icosahedral Clusters grow to 147 atoms ?

Eric A. Lord, Alan L. Mackay, and S. Ranganathan say in
"New Geometries for New Materials" (Cambridge 2006):
"... The Mackay icosahedron is obtained by packing tetrahedra and octahedra around an icosahedron [12 vertices]...
if an octahedron is placed on every face of an icosahedron, the angular gap between neighboring octahedra can be closed by a very small deformation, to bring them into face contact [12 + 20 x (6-3)/2 = 42 vertices]...

... The concave regions of the resulting polyhedron can be filled by five-rings of tetrahedra [42 + 12 = 54 vertices]...





... The 54-atom Mackay cluster ...[triangles: dark = octahedra; light = tetrahedra]...
The process can be continued ...[with octahedra on each of the 12x5 = 60 outer cell faces of 5-rings thus adding 60 x (2/2 + 1/3) = 80 vertices and creating
12 TSC structures similar to half-icosahedra at the 12 vertices of the cluster.
This also creates concave places for 30 pairs of tetrahedra adding no vertices plus 12 tetra-5-rings adding 12 vertices for a total of 54+80+12 = 146 vertices.

The 146-atom cluster  **has 12+2 = 14 TSC sites**]...".

Lord et al use 12, 54, and 146 atoms for Mackay clusters
while Liang uses 13, 55, and 147 atoms.
The difference is whether or not the center vertex is counted, that is,
not so much a real physical difference but a difference in math convention.

What about more than 147 atoms ?

As more layers are added, the deformations of tetrahedra and octahedra accumulate and eventually destabilize the structures necessary for the TSC fusion process.
The next Mackay cluster beyond 147 atoms has 147+162 = 309 atoms,
and it is my guess that **147 atoms is optimal for TSC fusion**:

55 atom clusters have only 2 TSC sites while 147 atom clusters have 2+12 = 14

and

309 (and larger) atom clusters may not be sufficiently stable.

Therefore, in a 147-atom Pd/Ni cluster:

each full set of TSC fusion events can consume 14x4 = 56 D/H nuclei.

How many D/H atoms can live in a 147-atom Pd/Ni cluster ?

F. Calvo and A. Carre say in Nanotechnology 17 (2006) 1292–1299
"Structural transitions and stabilization of palladium nanoparticles upon hydrogenation":
"... Cuboctahedra ...[and]... icosahedra ... contain exactly the same number of atoms. ... In the case of ... the 147-atom Pd cluster ... the favoured structure in the pure metal is the three-layer icosahedron.

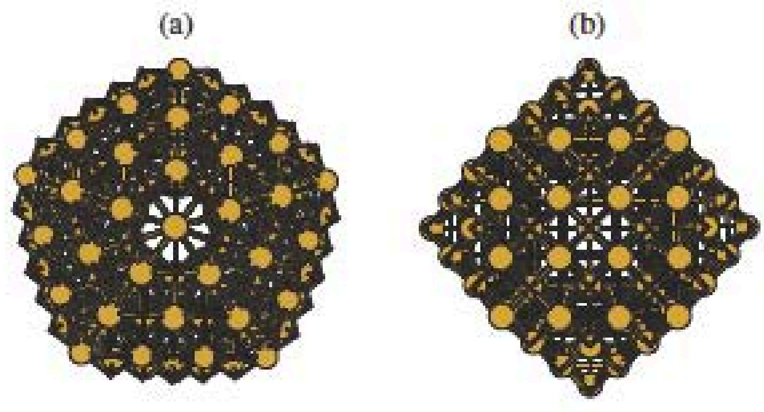
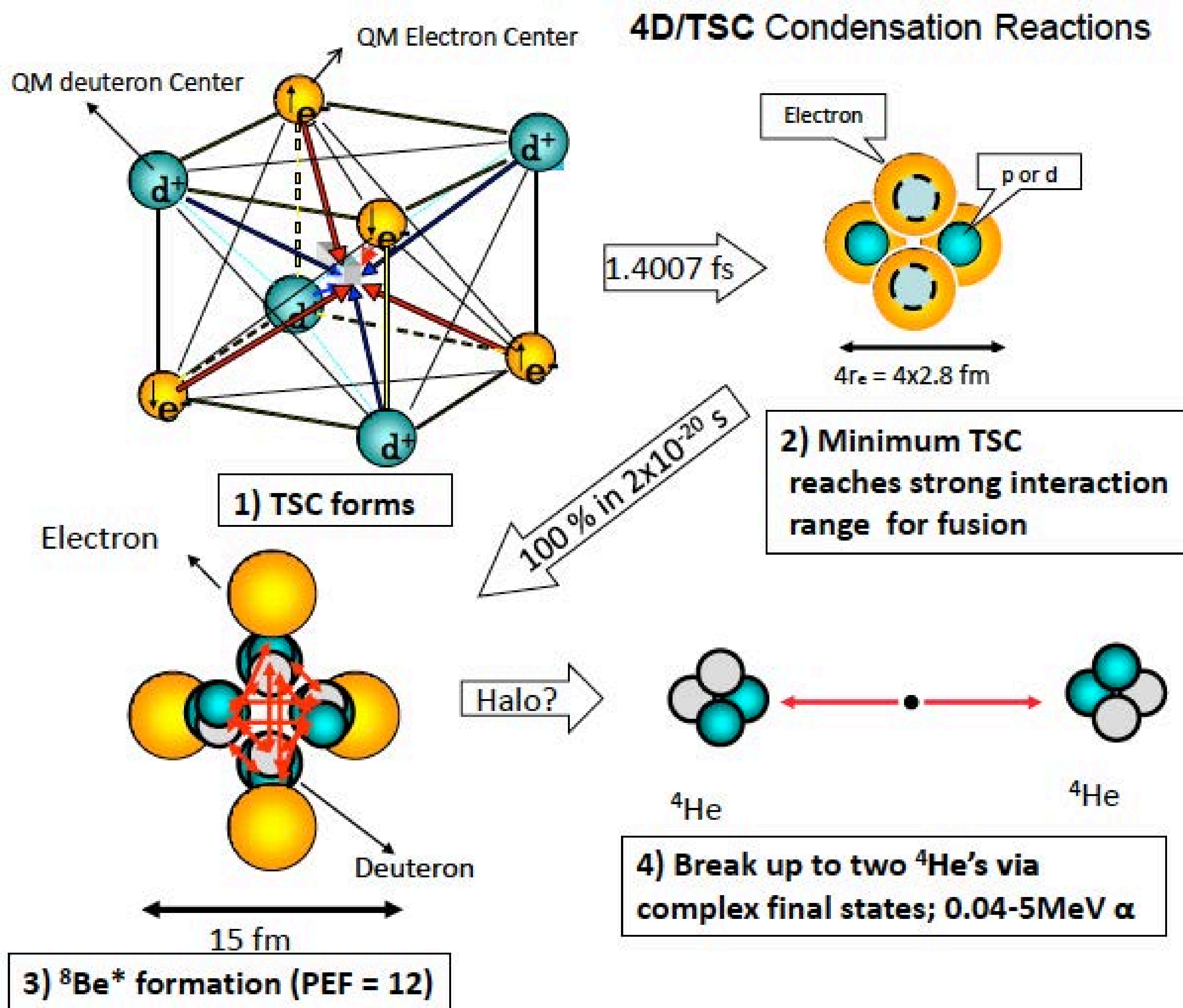
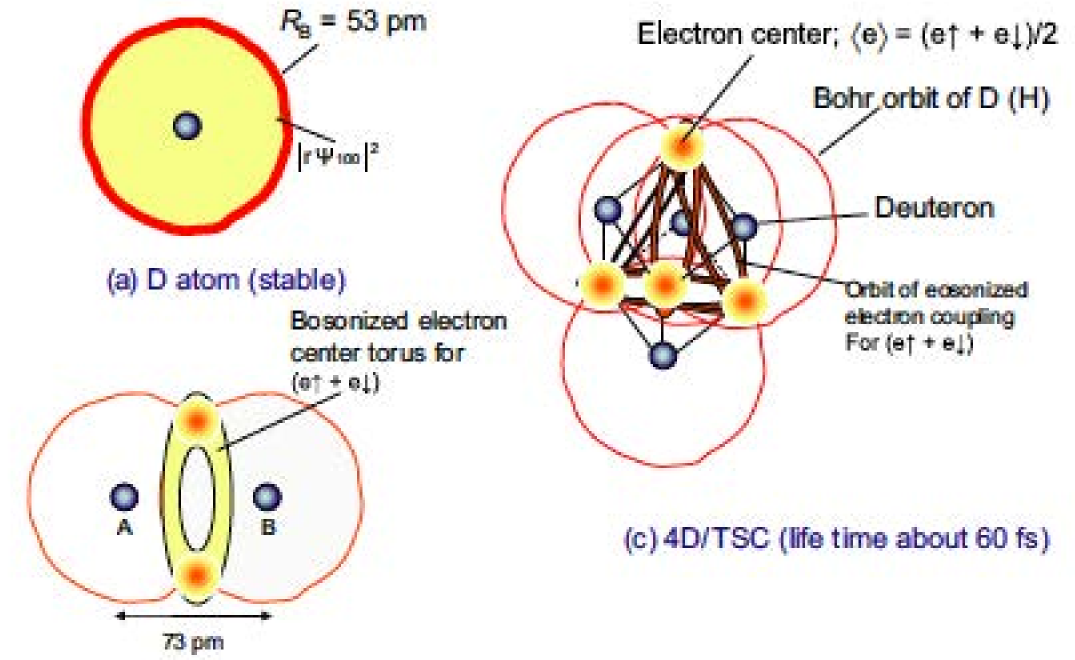


Figure 1. Palladium clusters fully loaded with hydrogen.
(a) $Pd_{147}H_{200}$, I_h symmetry; (b) $Pd_{147}H_{164}$, O_h symmetry. ...".

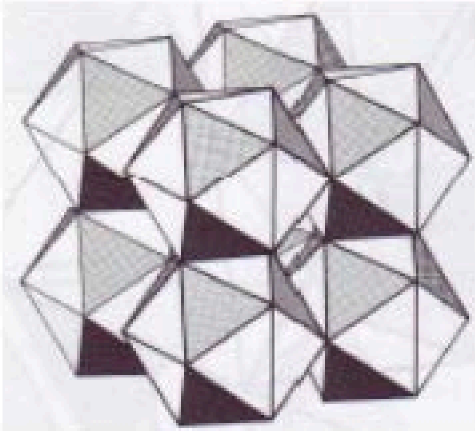
Since the minimum full load for Icosa or Cubocta Pd/Ni 147-atom clusters is 164 D/H atoms, no more than 3 cycles of full TSC fusion (each consuming 56 D/H nuclei) can occur without replenishment of D/H from the surroundings of the clusters (such as immersion of the clusters in D/H gas).

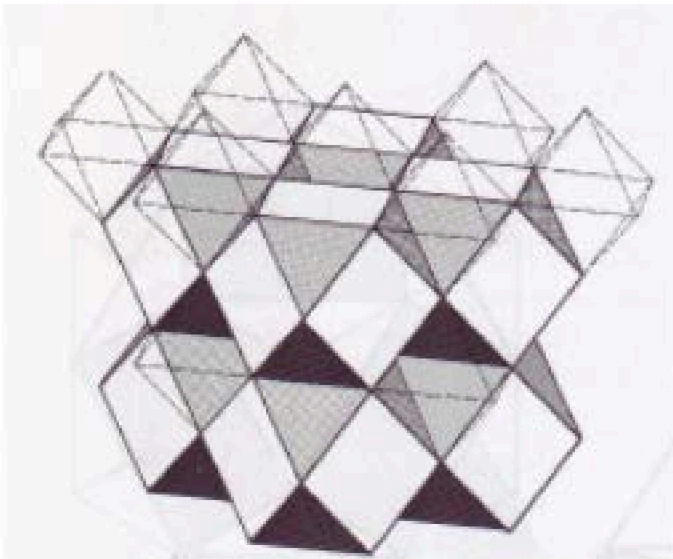

4D/TSC Condensation Reactions
QM Electron Center
QM deuteron Center
d+
e-
1.4007 fs
Electron
p or d
4re = 4x2.8 fm
1) TSC forms
100 % in 2x10-20 s
2) Minimum TSC
reaches strong interaction
range for fusion
Electron
Halo?
4He
4He
Deuteron
15 fm
4) Break up to two 4He's via
complex final states; 0.04-5MeV α
3) 8Be* formation (PEF = 12)



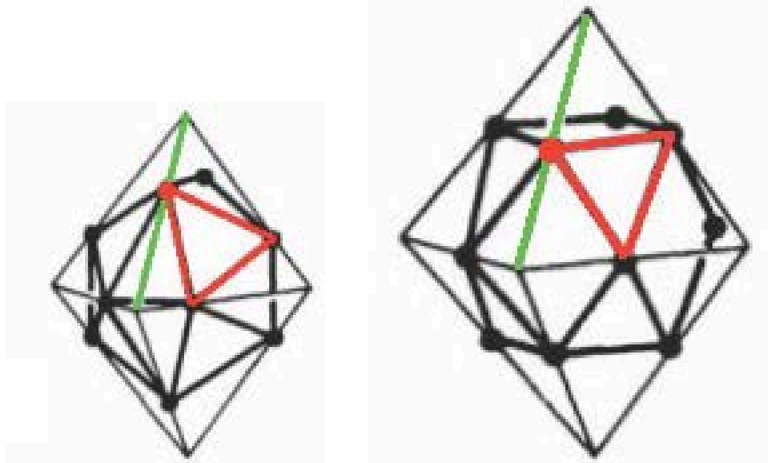
(b) D_2 molecule (stable): $\Psi_{2D} = (2+2\Delta)^{-1/2}[\Psi_{100}(r_{A1})\,\Psi_{100}(r_{B2}) + \Psi_{100}(r_{A2})\,\Psi_{100}(r_{B1})]X_s(S1,S2)$

Pd D-D Jitterbug Fusion:
Mechanical Analogy

The triangle faces of the Icosahedron/Cuboctahedron are rotated by a Golden Ratio



(images adapted from Geometrical Frustration by Sadoc and Mosseri (Cambridge 2006))

angle defined by
sliding Icosahedron vertices on the edges of a circumscribing Octahedron
from points dividing edges into Golden Ratio segments
to points dividing edges into two equal segments
so that the Octahedron then circumscribes a Cuboctahedron.
If the edge lengths of the Icosahedron/Cuboctahedron are kept the same
then the Octahedron surrounding the Cuboctahedron will be an expansion
of the Octahedron surrounding the Icosahedron.

Just as in the choice of a Cuboctahedron square diagonal to be compressed,
there are two ways in which the edge could be divided into Golden Ratio segments,
corresponding to the two possible orientations of an Icosahedron.

Choice of Golden Ratio segments for one edge forces (by requiring consistency)
the choices for all other edges.

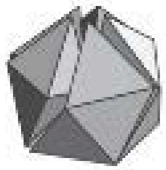
The volume expansion of the Jitterbug Transformation
from Icosahedron (unit edge) to Cuboctahedron (unit edge) is:

Icosahedron volume = (5/12) (3 + sqrt(5)) = 2.18169499
Cuboctahedron volume = (5/3) sqrt(2) = 2.3570226

Icosahedron/Cuboctahedron volume ratio = 0.9256147947

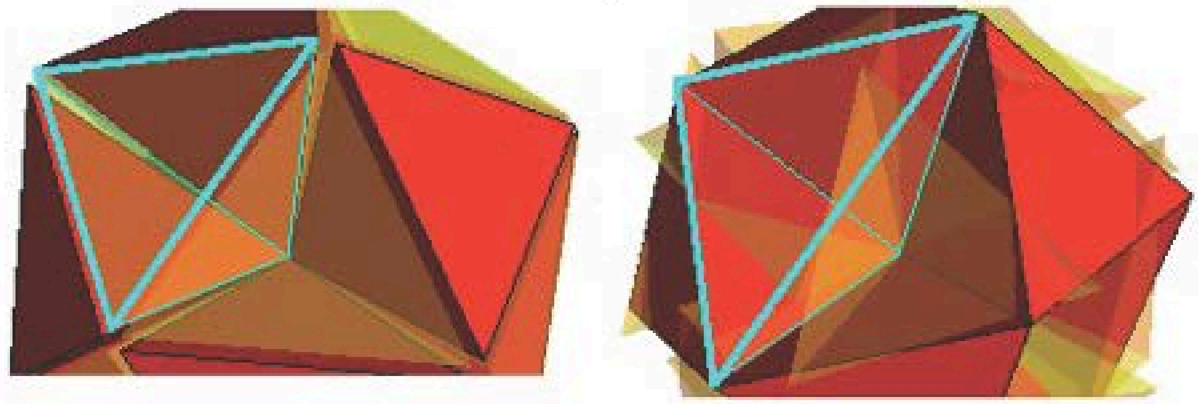
Cuboctahedron/Icosahedron volume ratio = 1.0803630254

20 exact tetrahedra volume = 20 x (sqrt(2) / 12) = 2.357 = cuboctahedron volume
and
20 exact tetrahedra do not make an exact icosahedron in flat 3-dim space



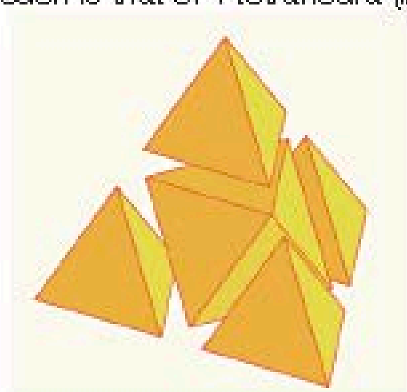
(image from Lord et al)

but have gaps totalling 1.54 steradians (1.54 / 4 pi = 1.54 / 12.57 = 12.25 %)
so
the 20-exact-tetrahedron stage of the Jitterbug is NOT an exact unit-edge icosahedron.

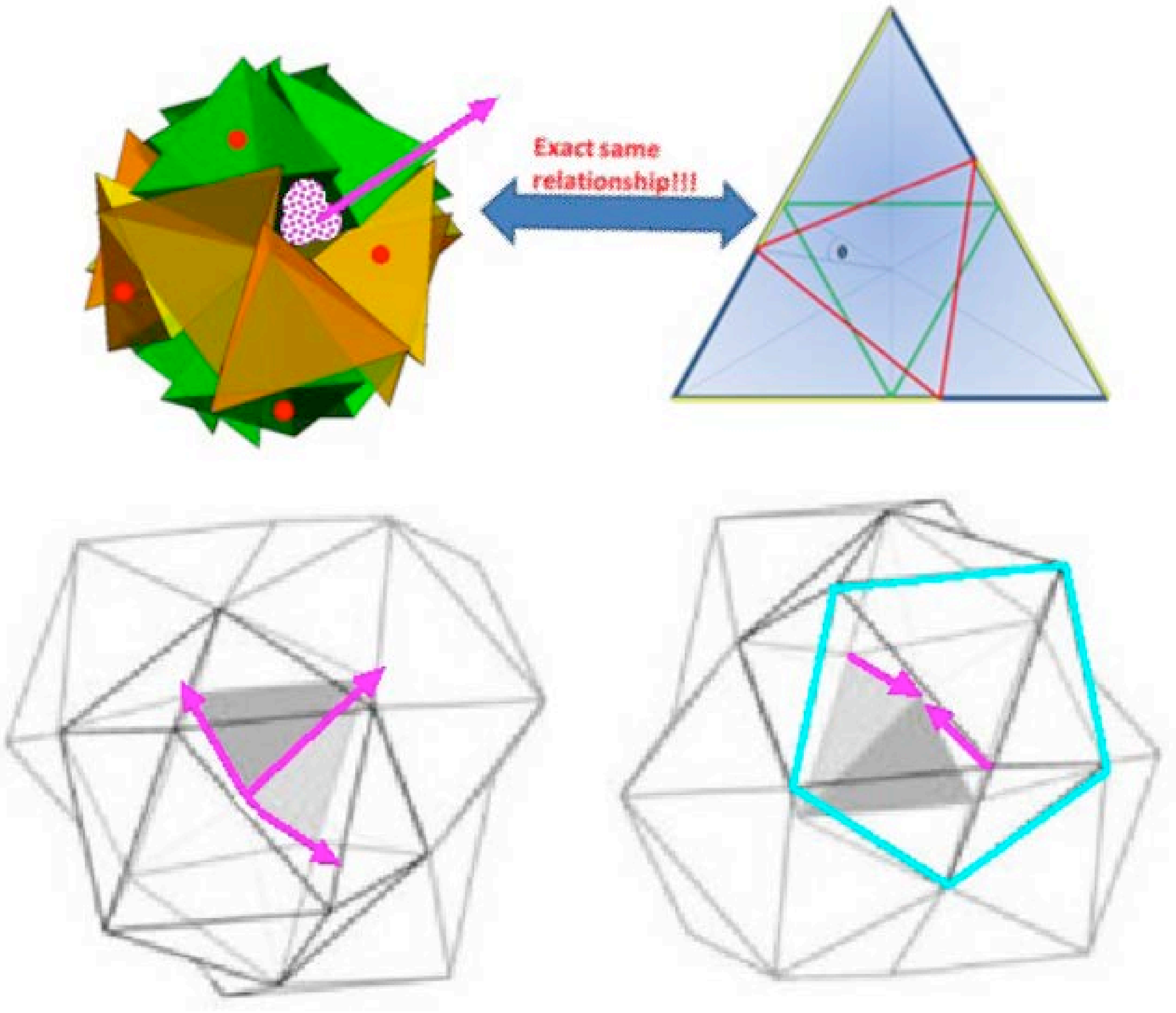


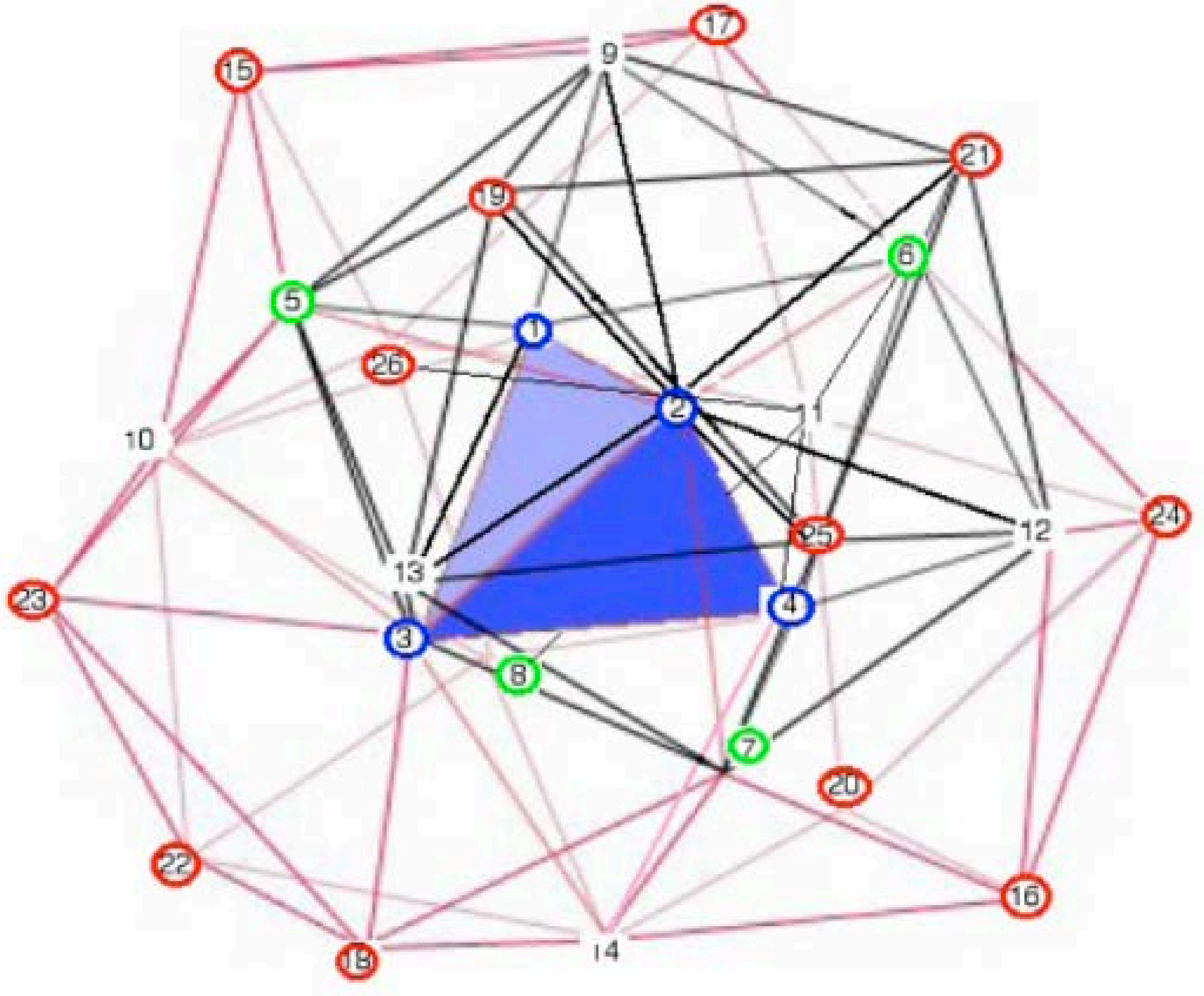
8 of the 20 tetrahedra are Golden Ratio rotated like the red one shown above.
12 of the 20 tetrahedra are transformed into half-half-octahedra.

cuboctahedron = 8 tetrahedra + 6 half-octahedra =
= 8 x (sqrt(2) / 12) + 6 x 2 x (sqrt(2) / 12) =
= ((2/3) +1) x sqrt(2) = 5sqrt(2) /3
Since the volume of an octahedon is that of 4 tetrahedra (image from matematicavisuales.com)



the volume of one exact (cyan-type) tetrahedron in the Jitterbug is the same
as the volume of the half-half-octahedron into which it is transformed.


Exact same
relationship!!!



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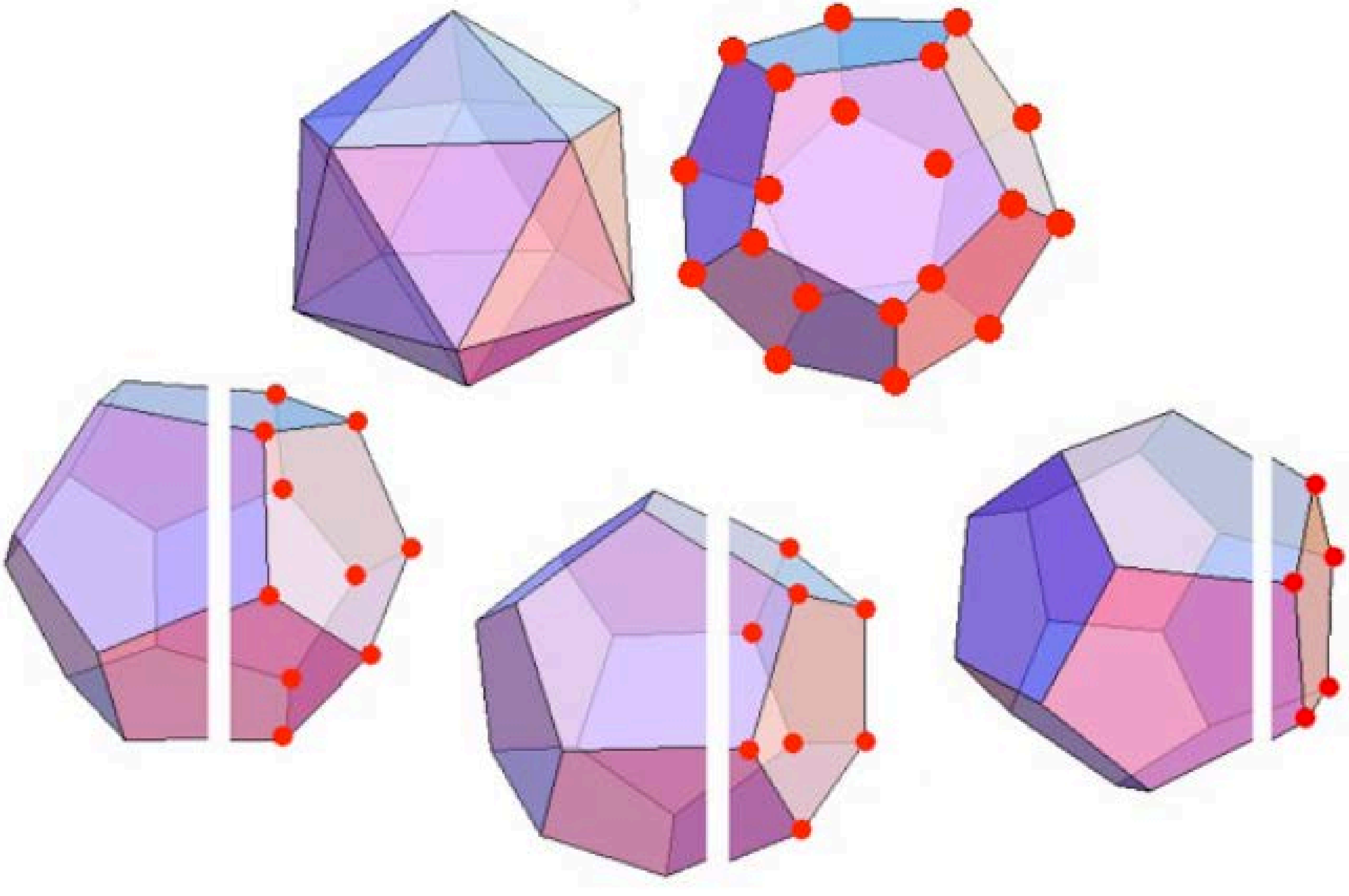
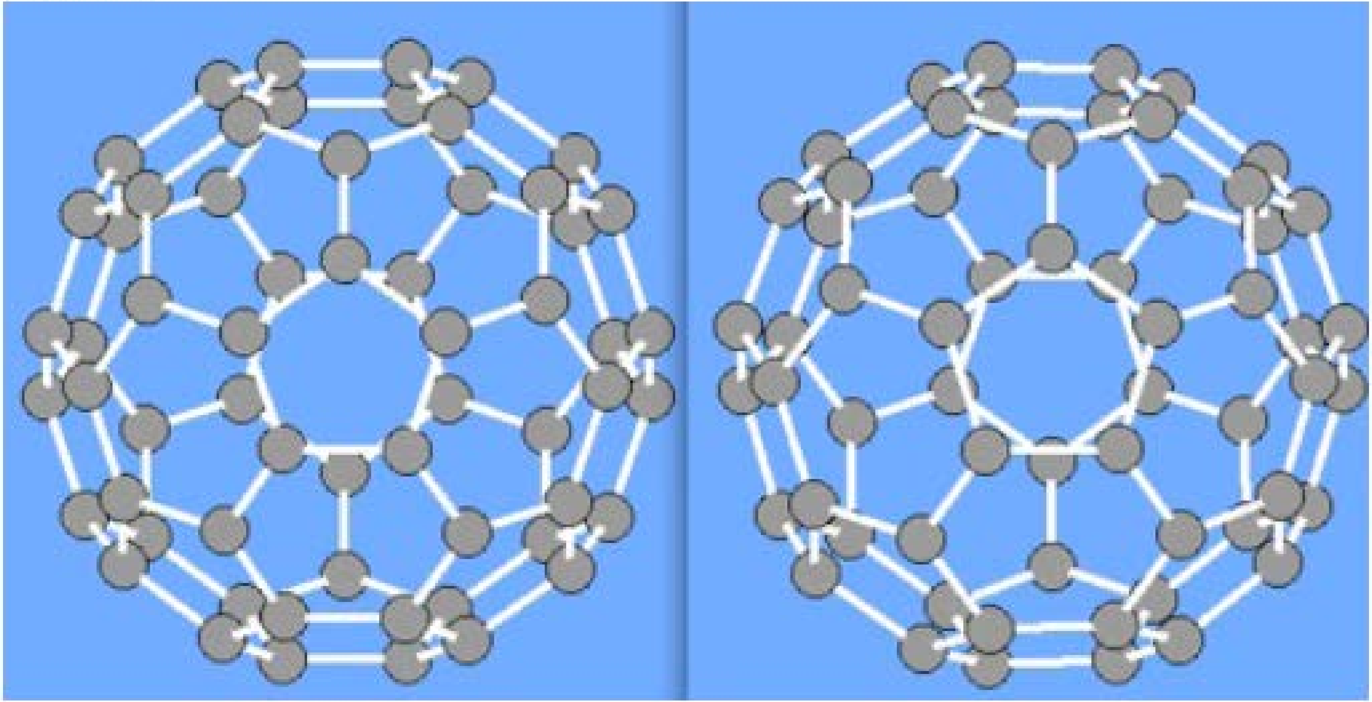
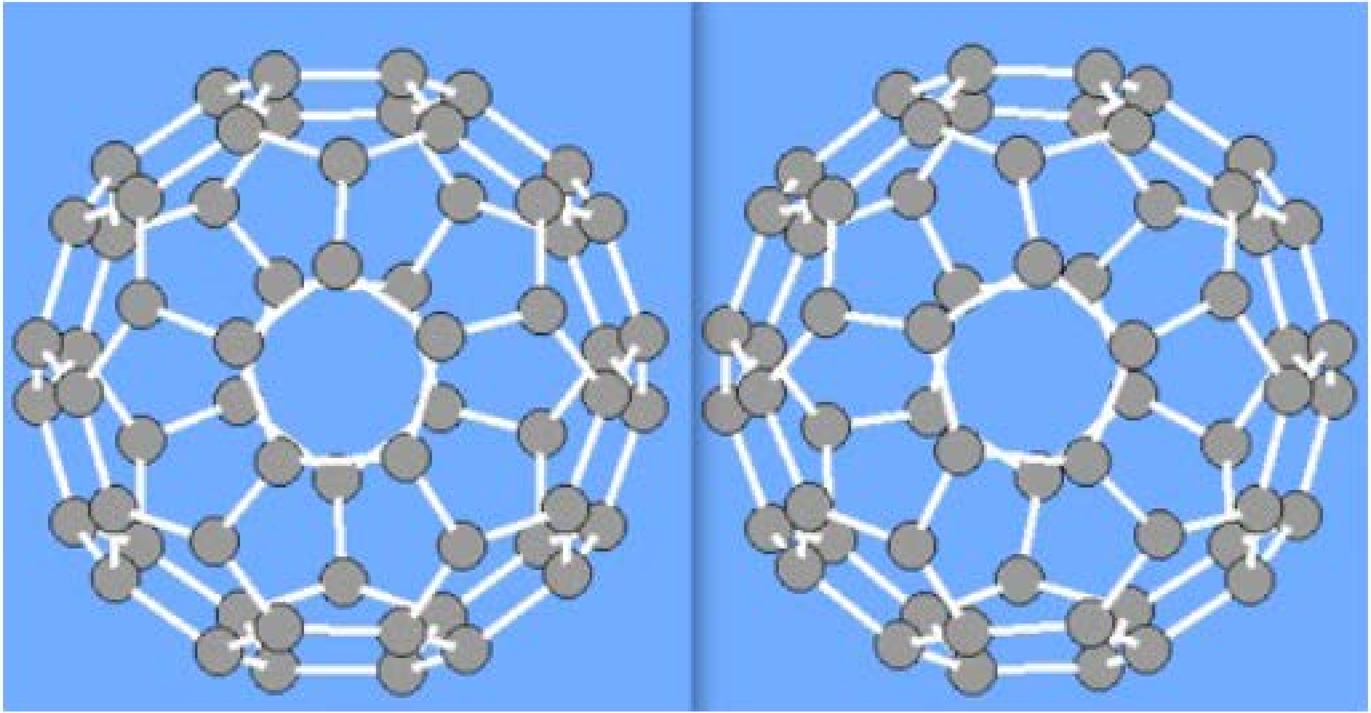


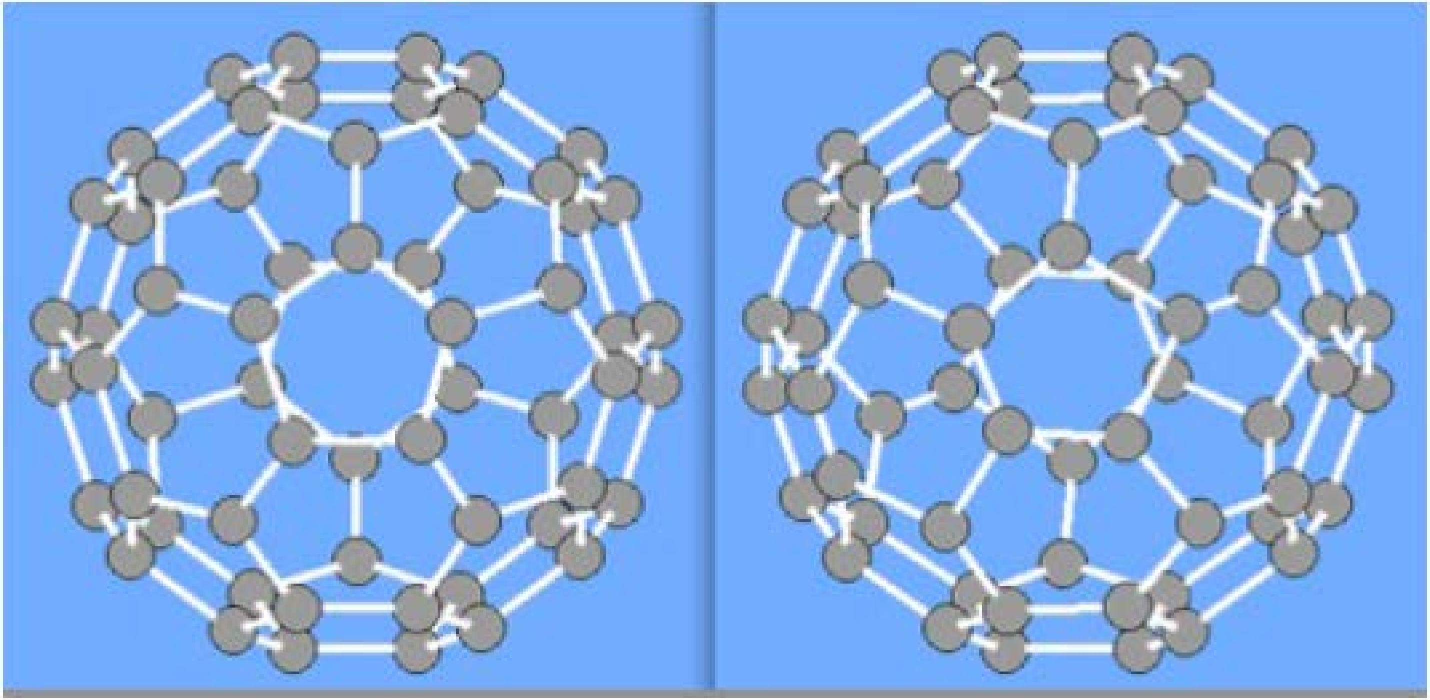
603 C60

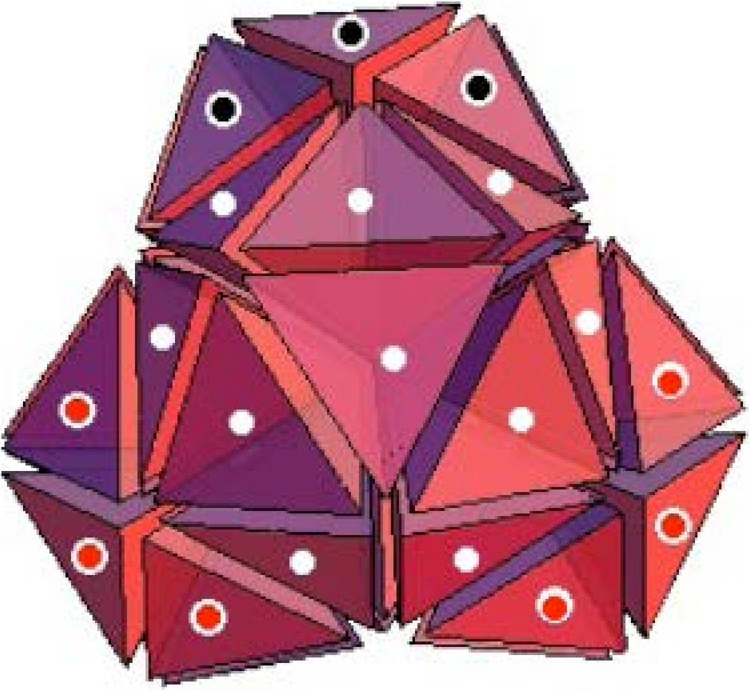


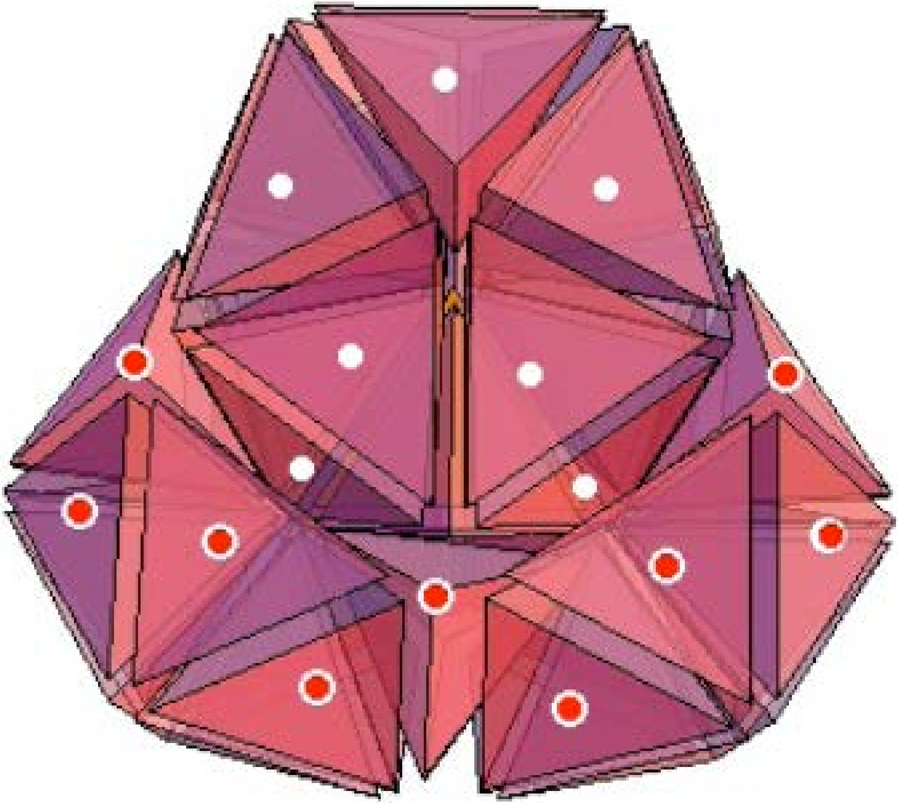
976 C60

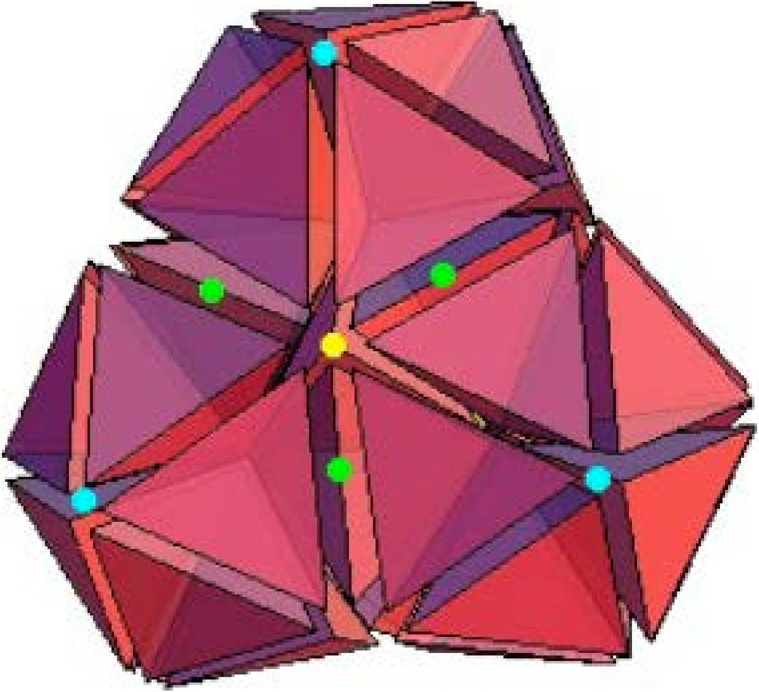


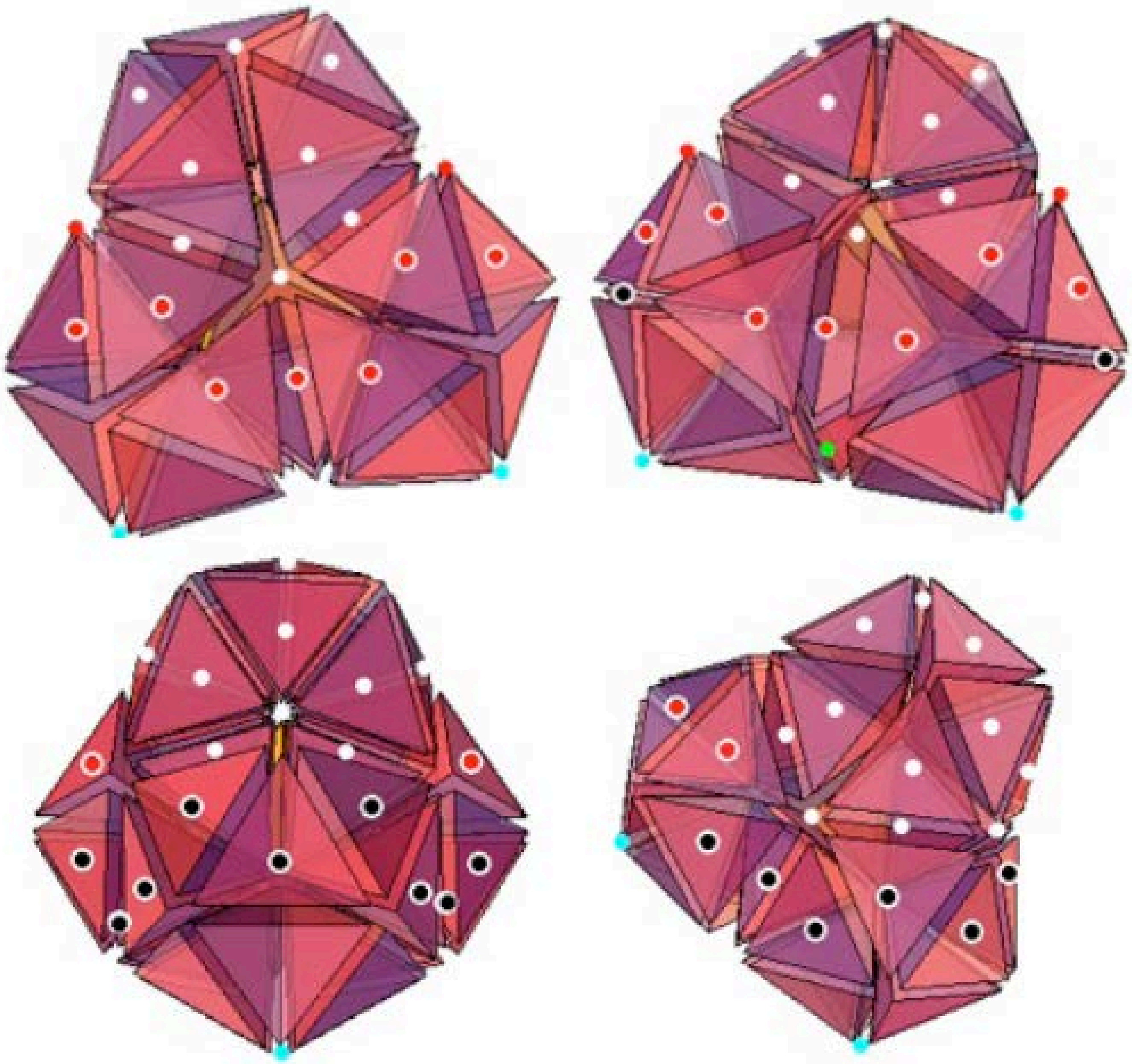
Stretch C60

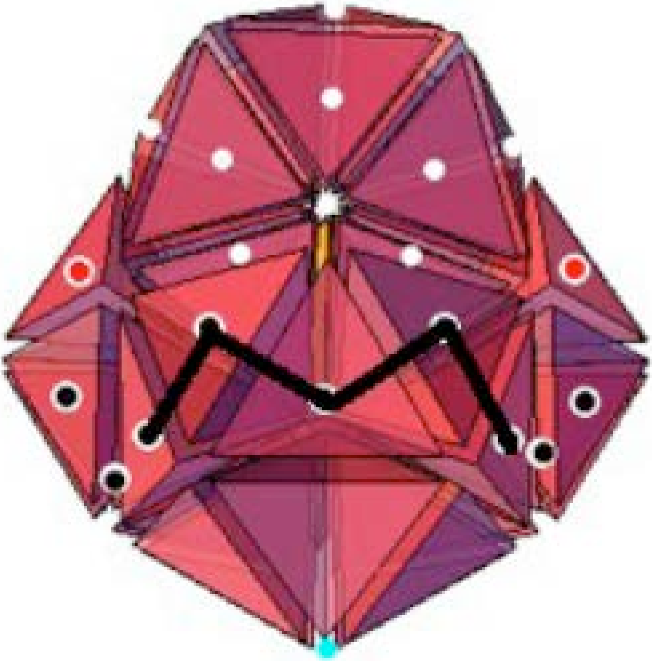


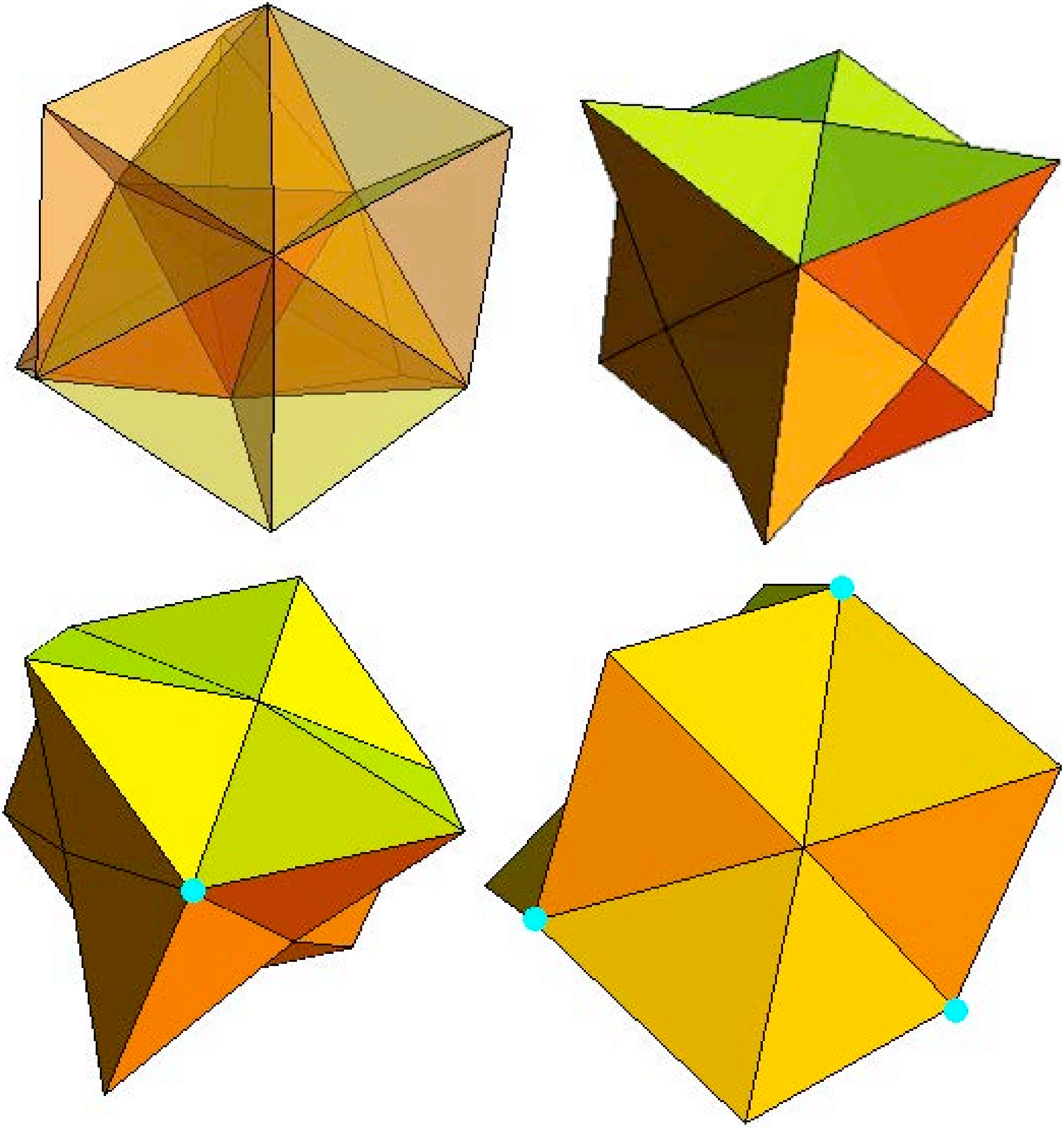


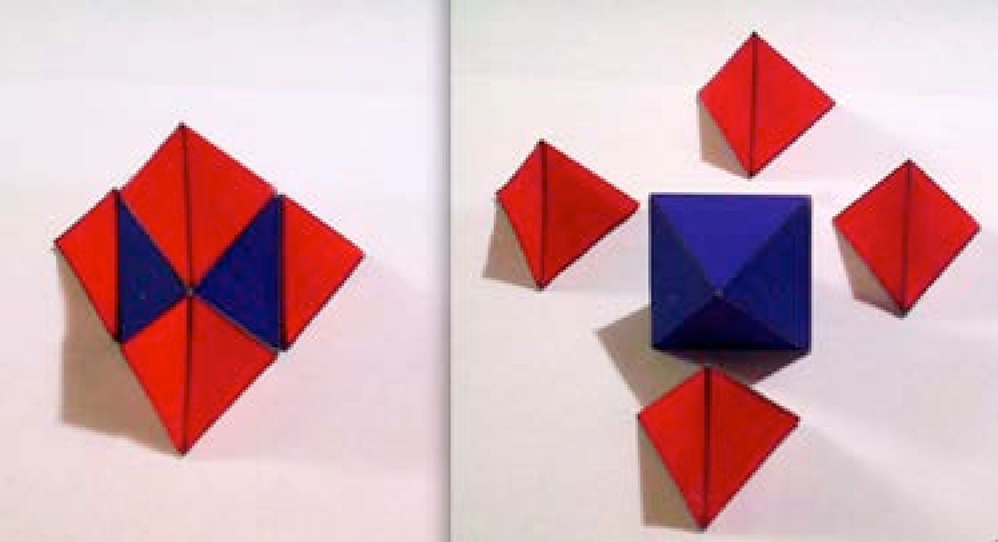




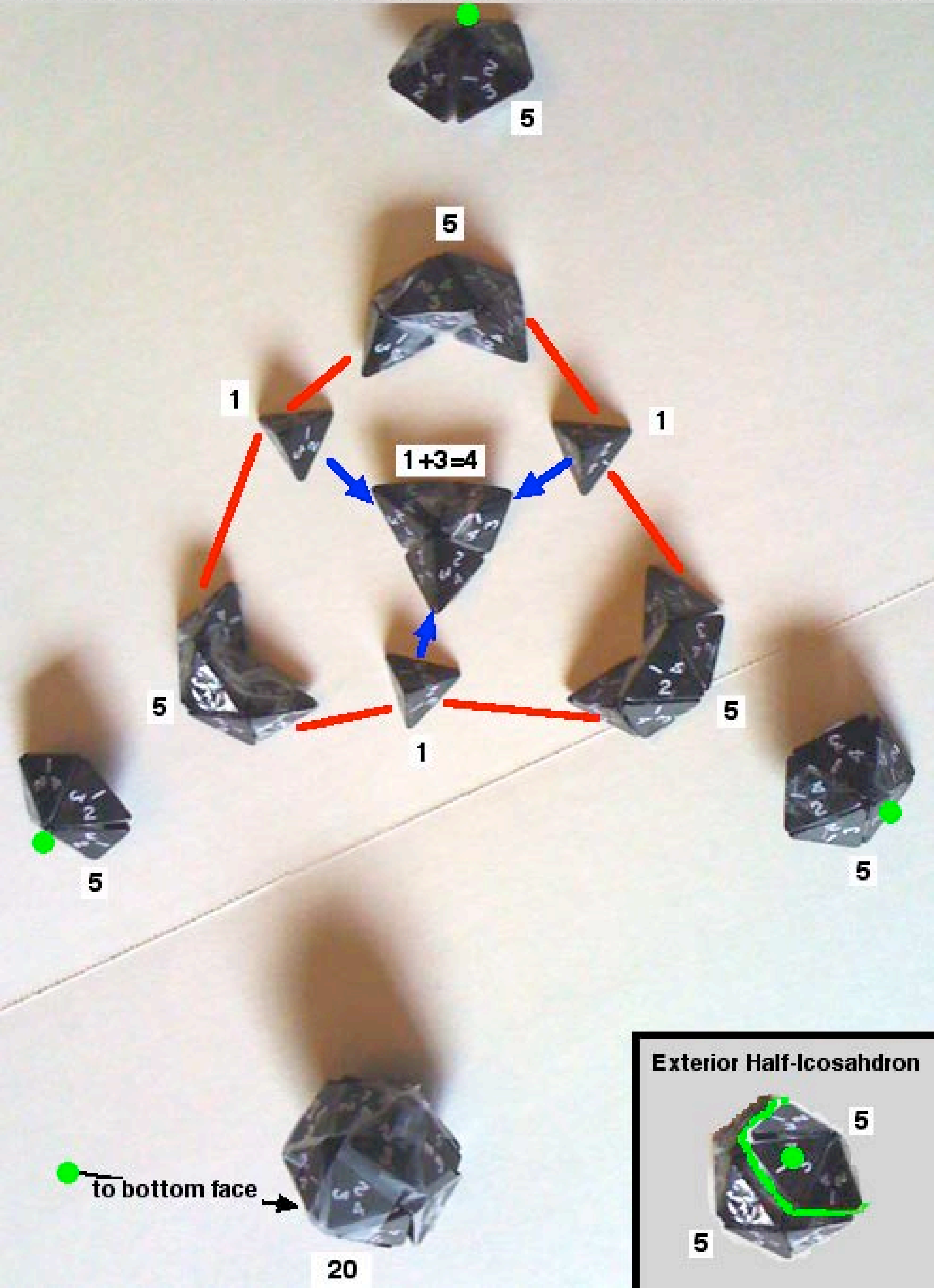


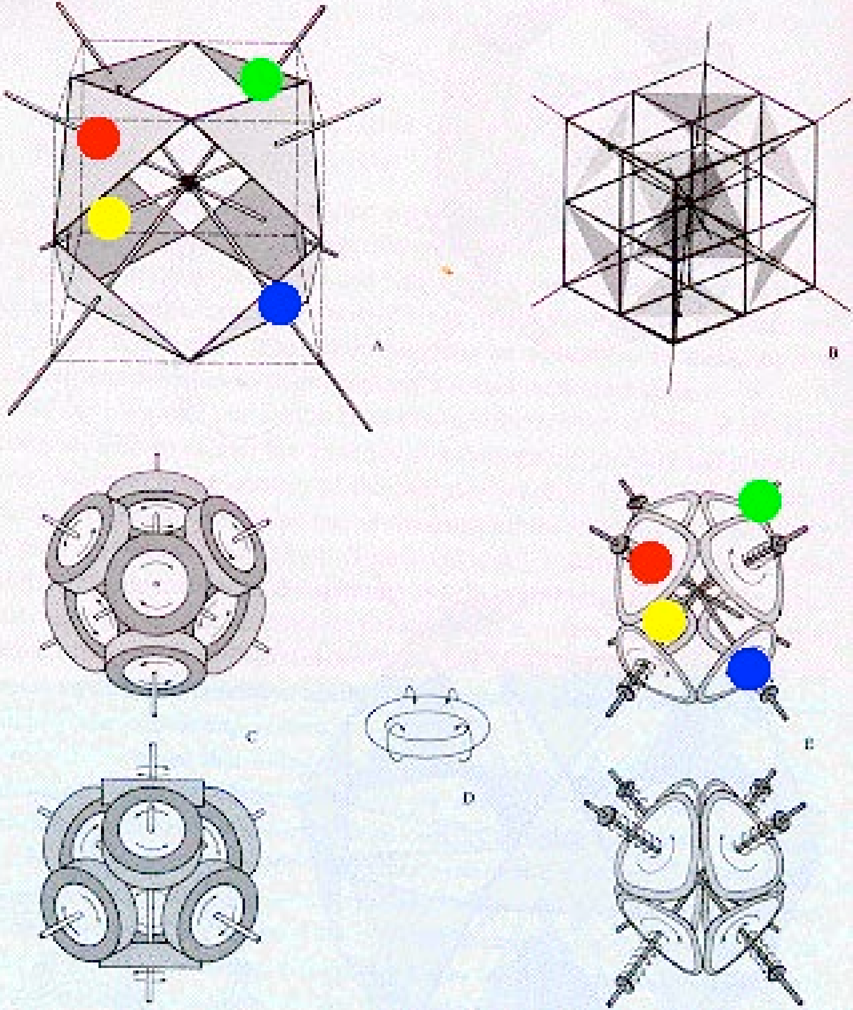


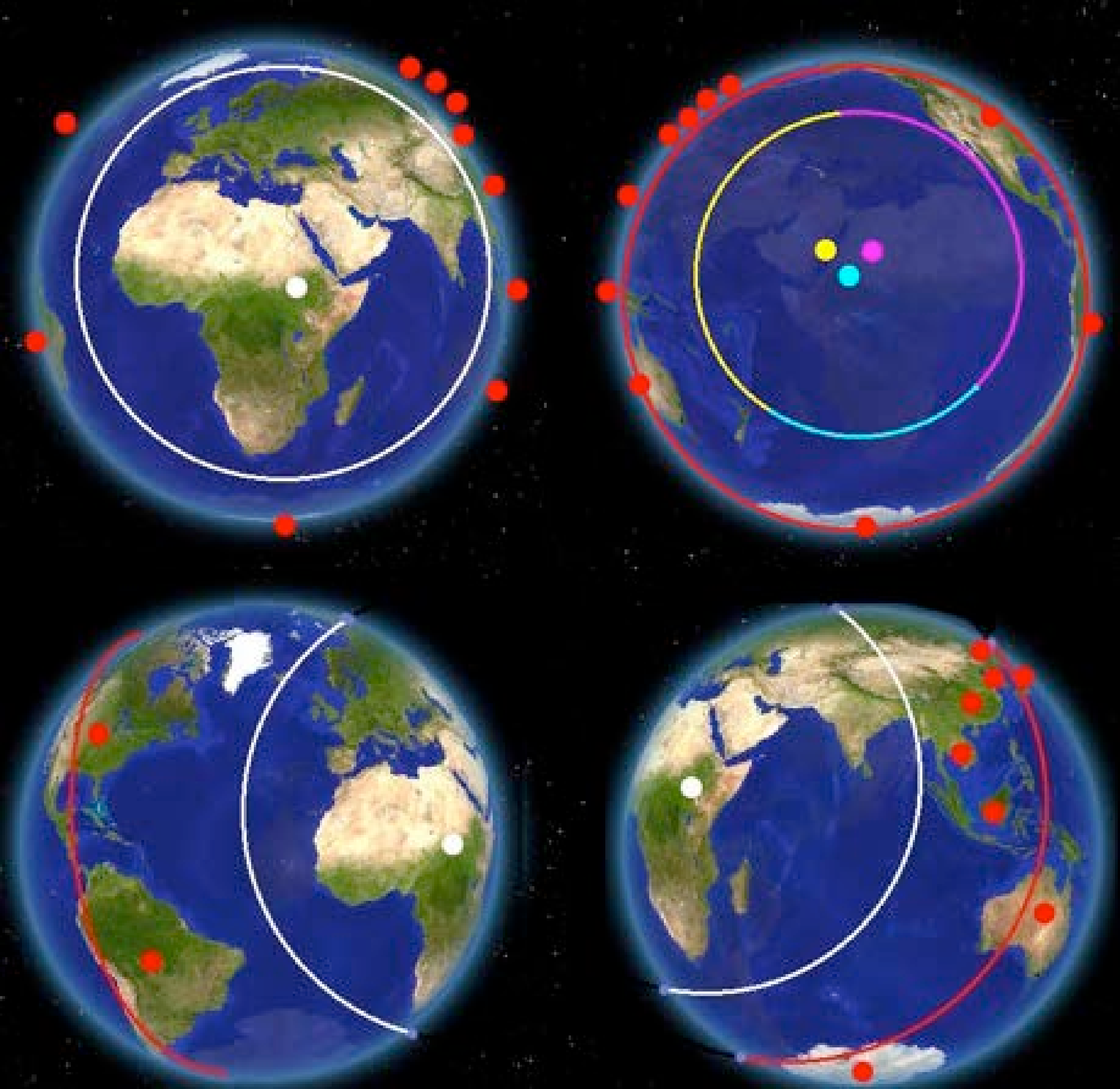


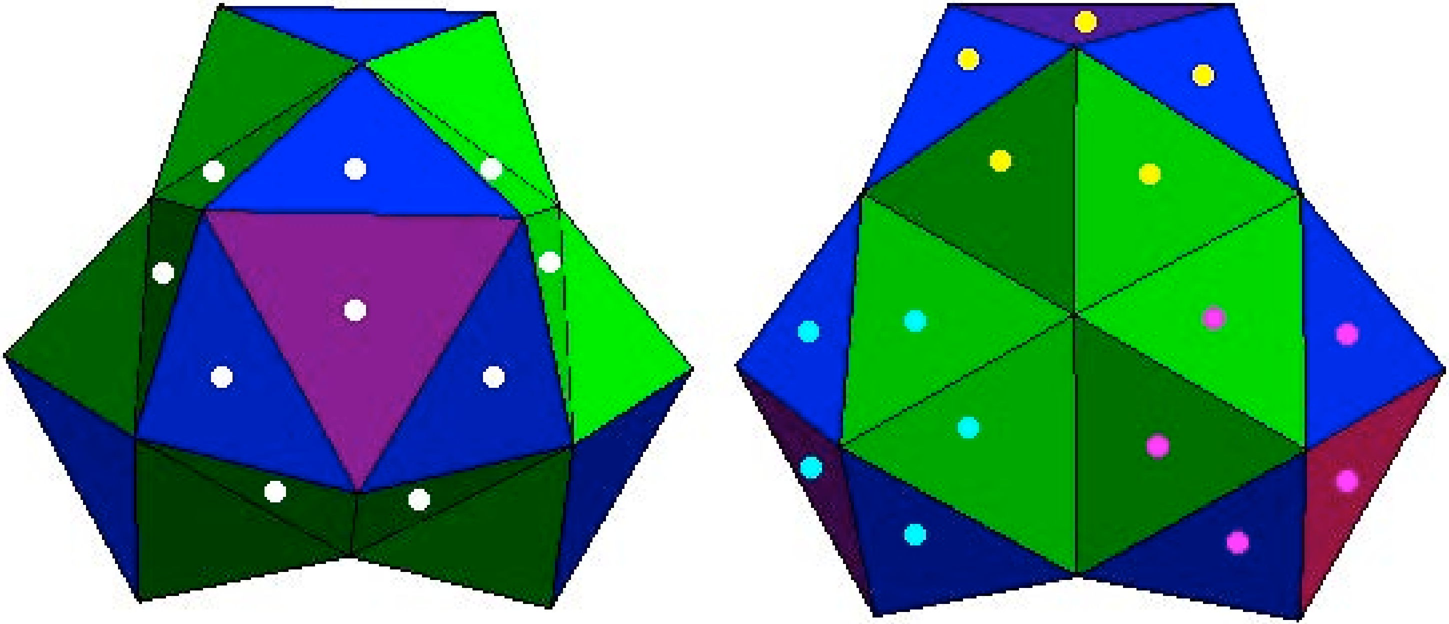


Green dots inidicate the 4 central exterior faces of the 4 icosahedra of the 57-group:

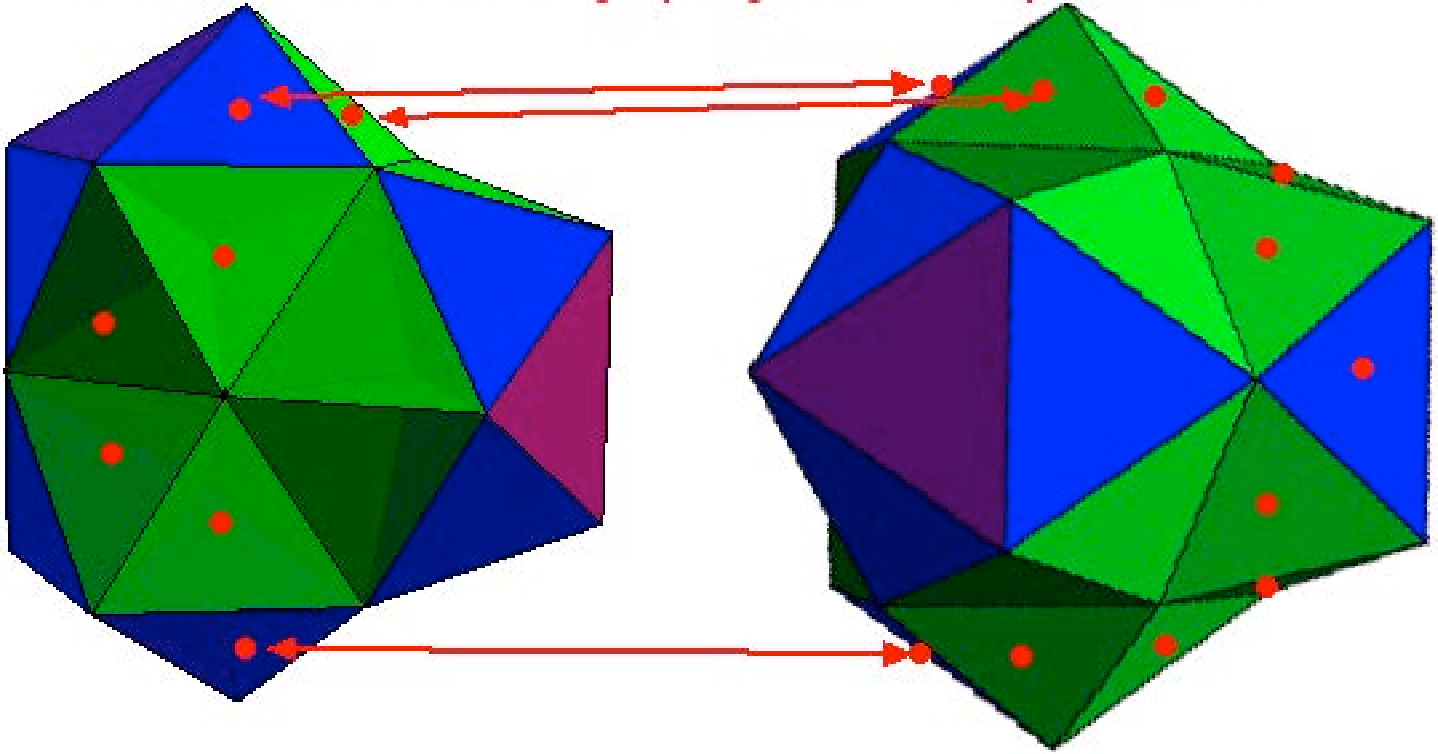



A
B
C
D
E

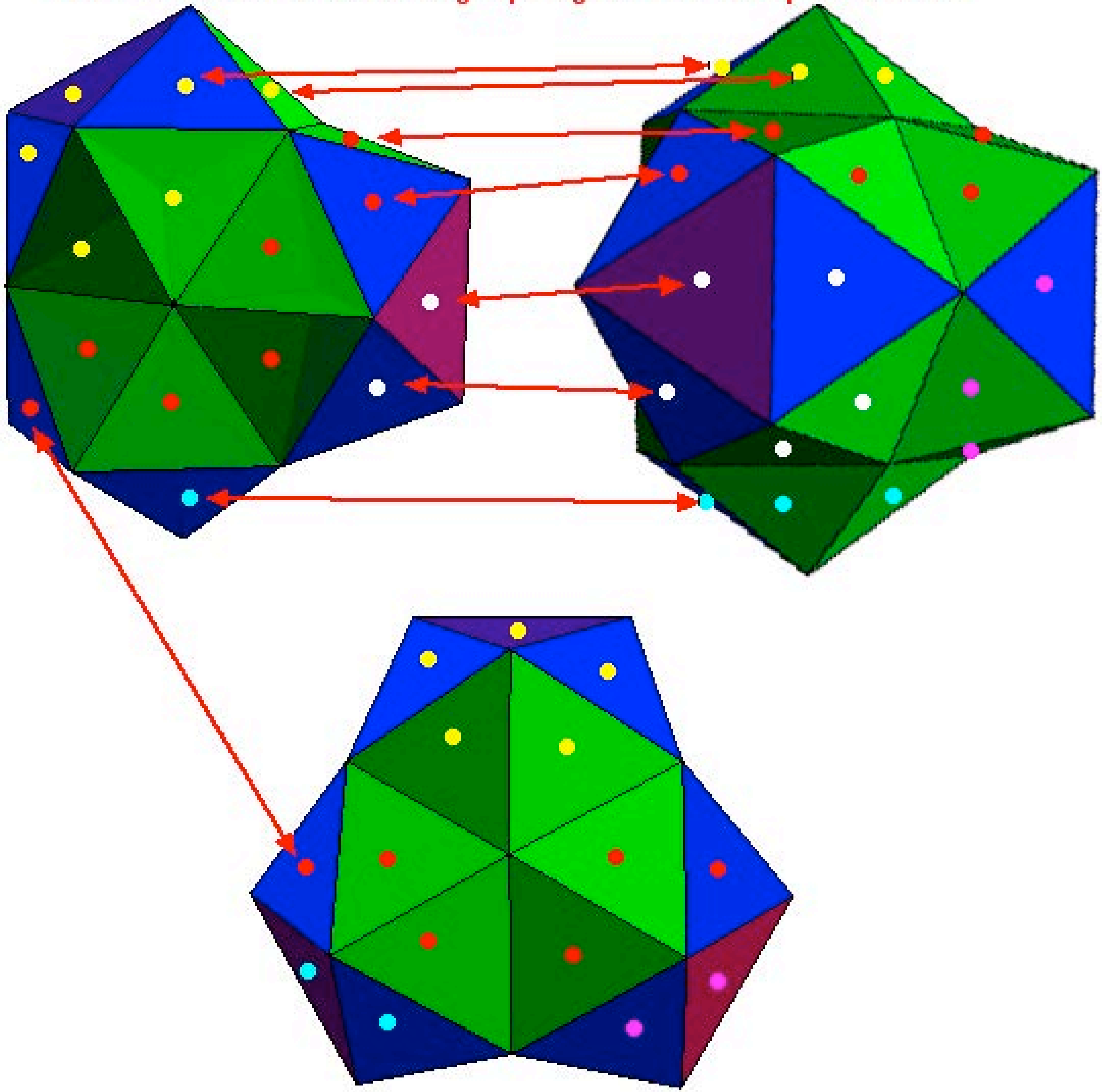


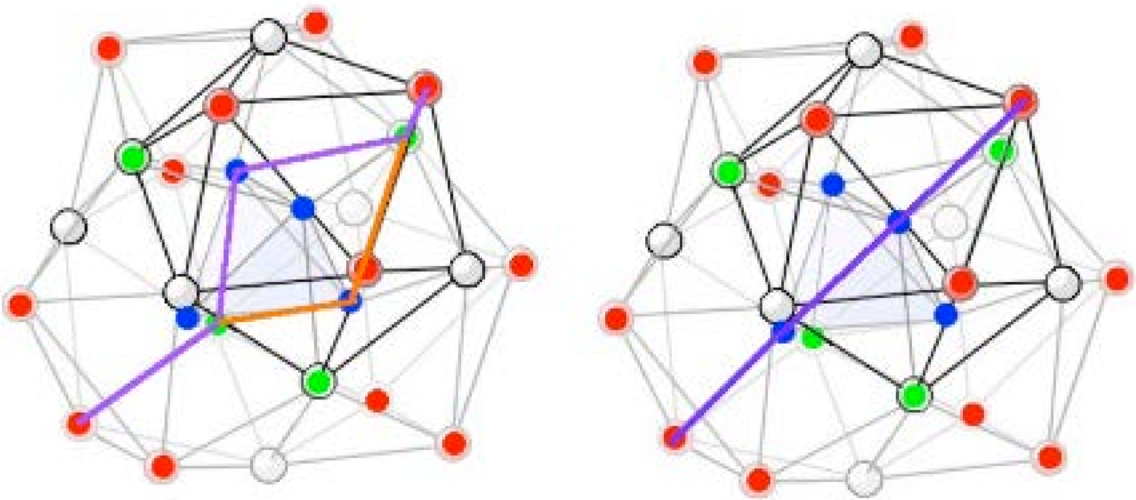


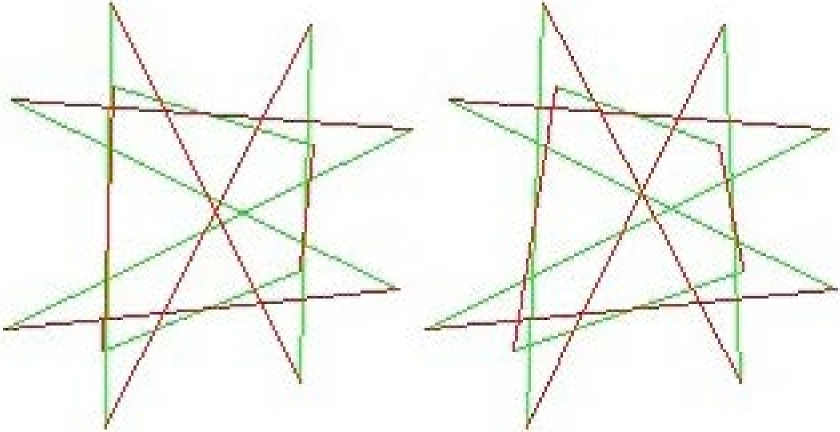
Arrows indicate same faces in 57-group images from different points of view.

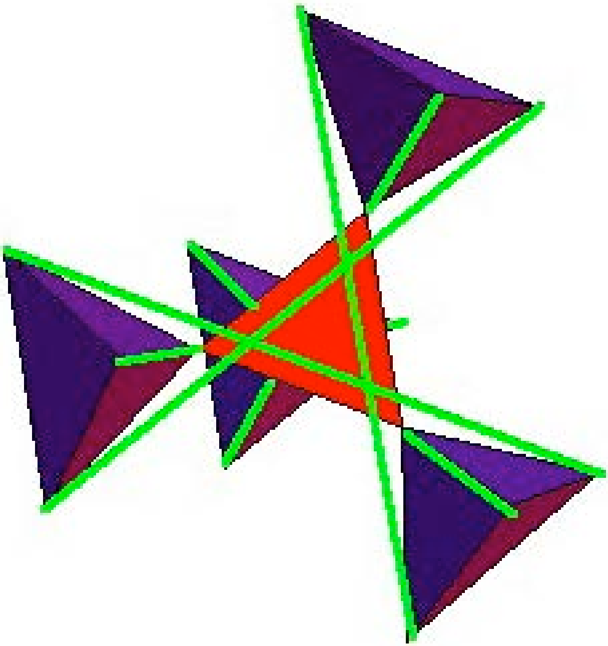


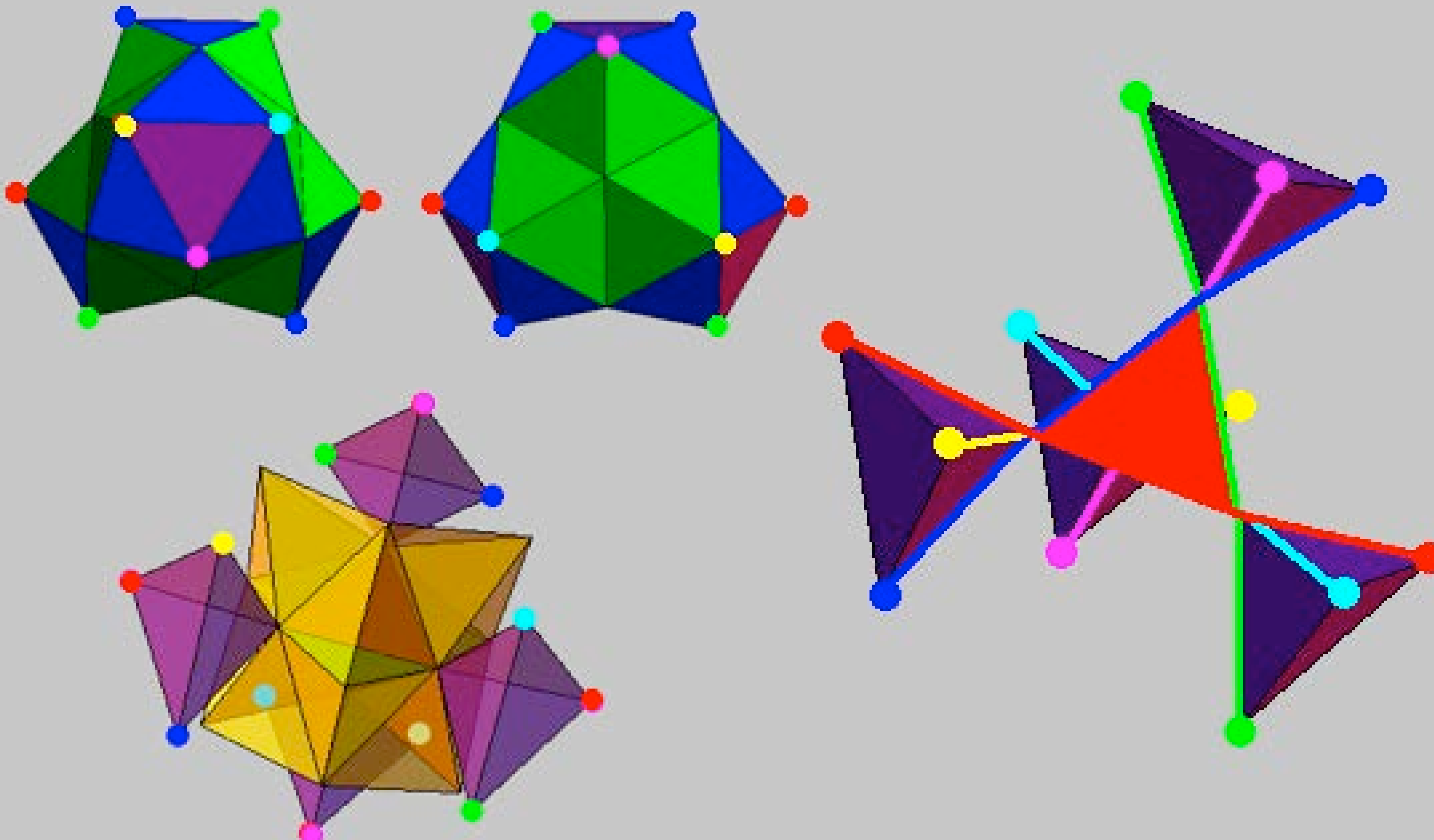
Arrows indicate same faces in 57-group images from different points of view.

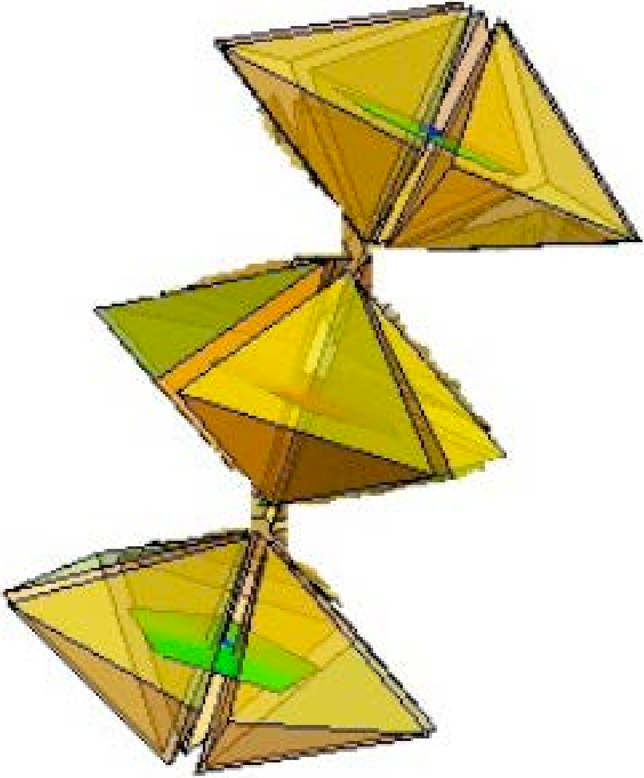


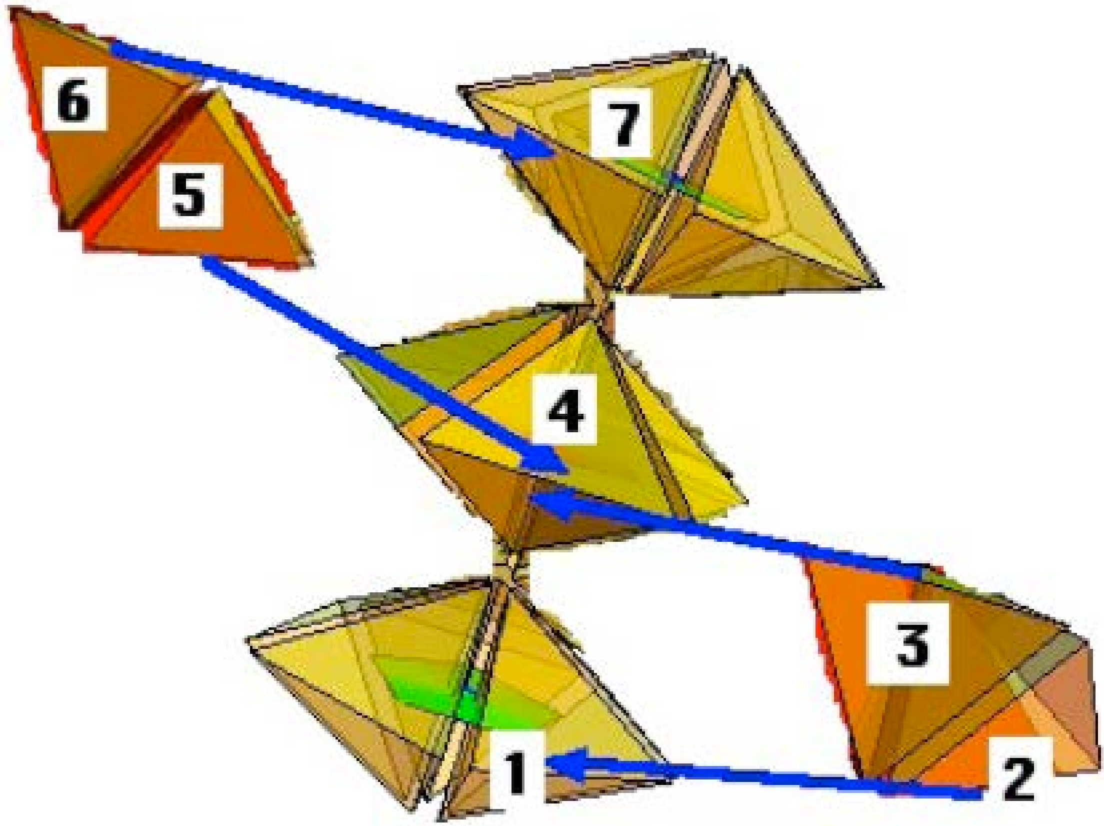











6
5
7
4
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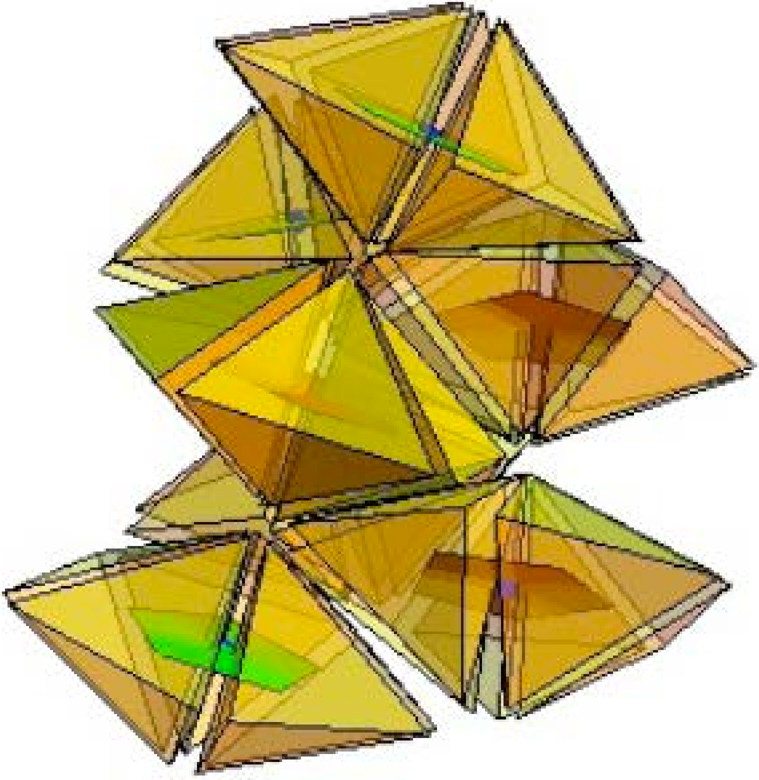
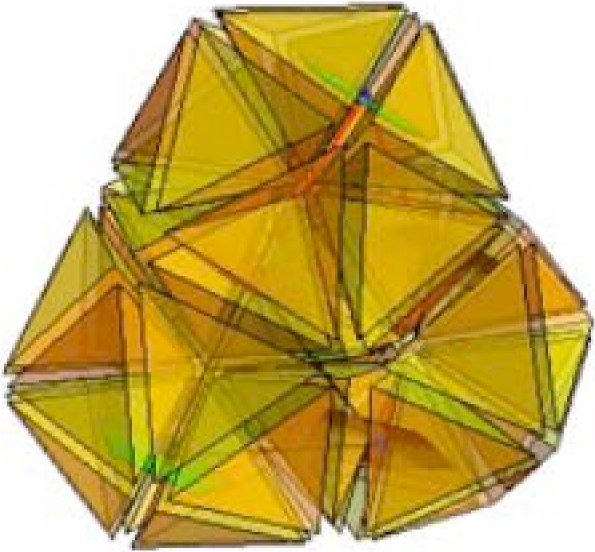
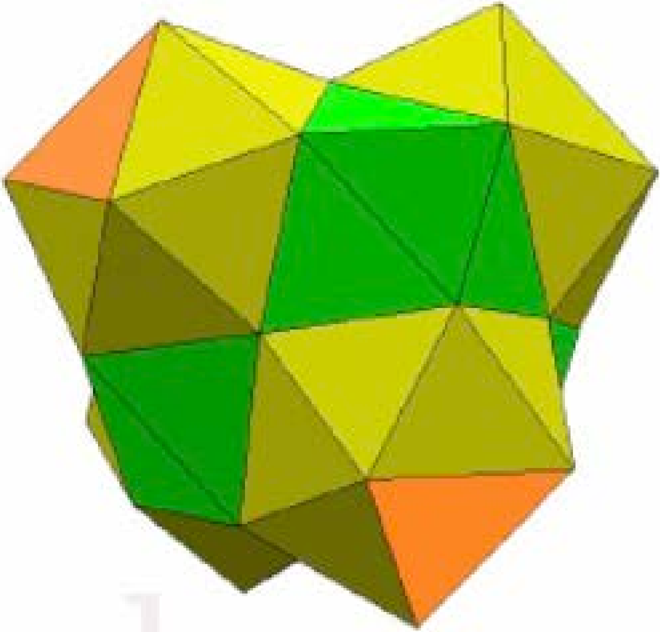
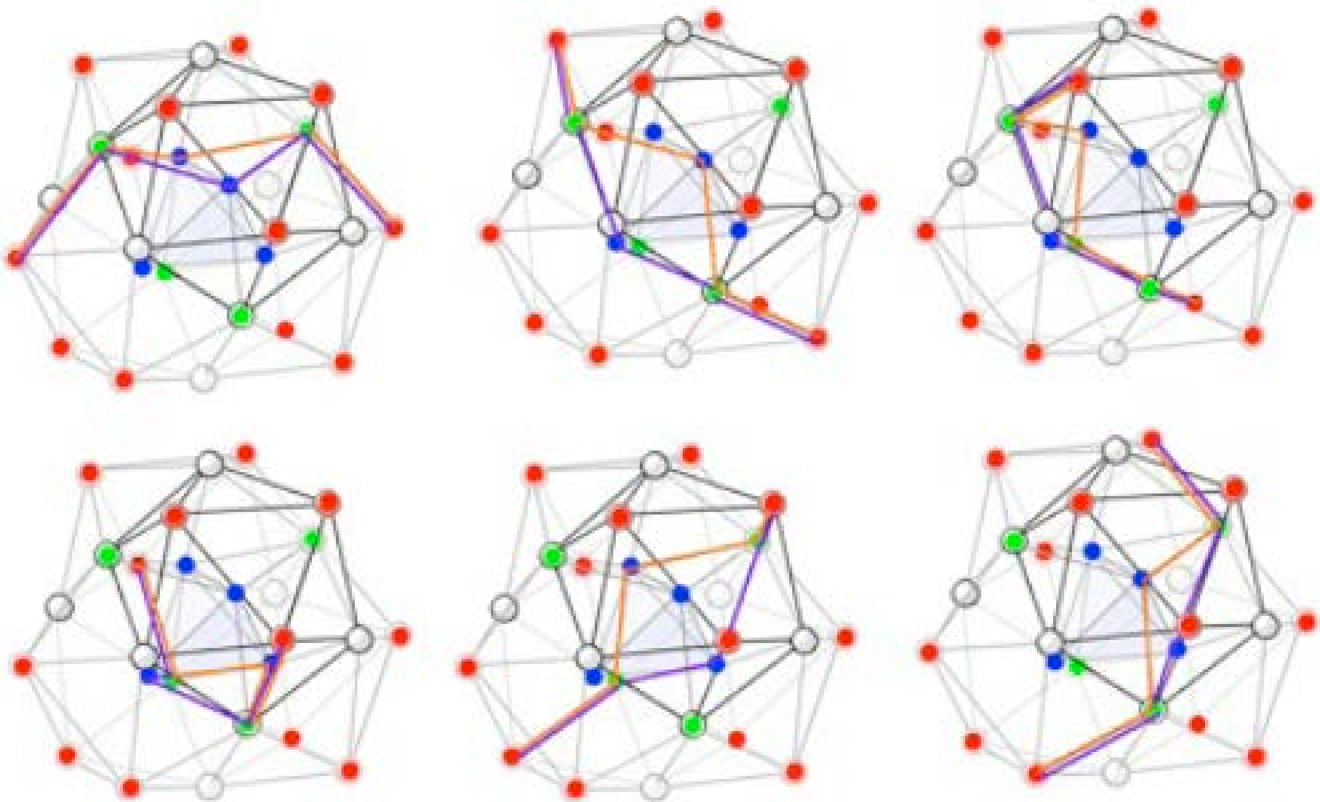
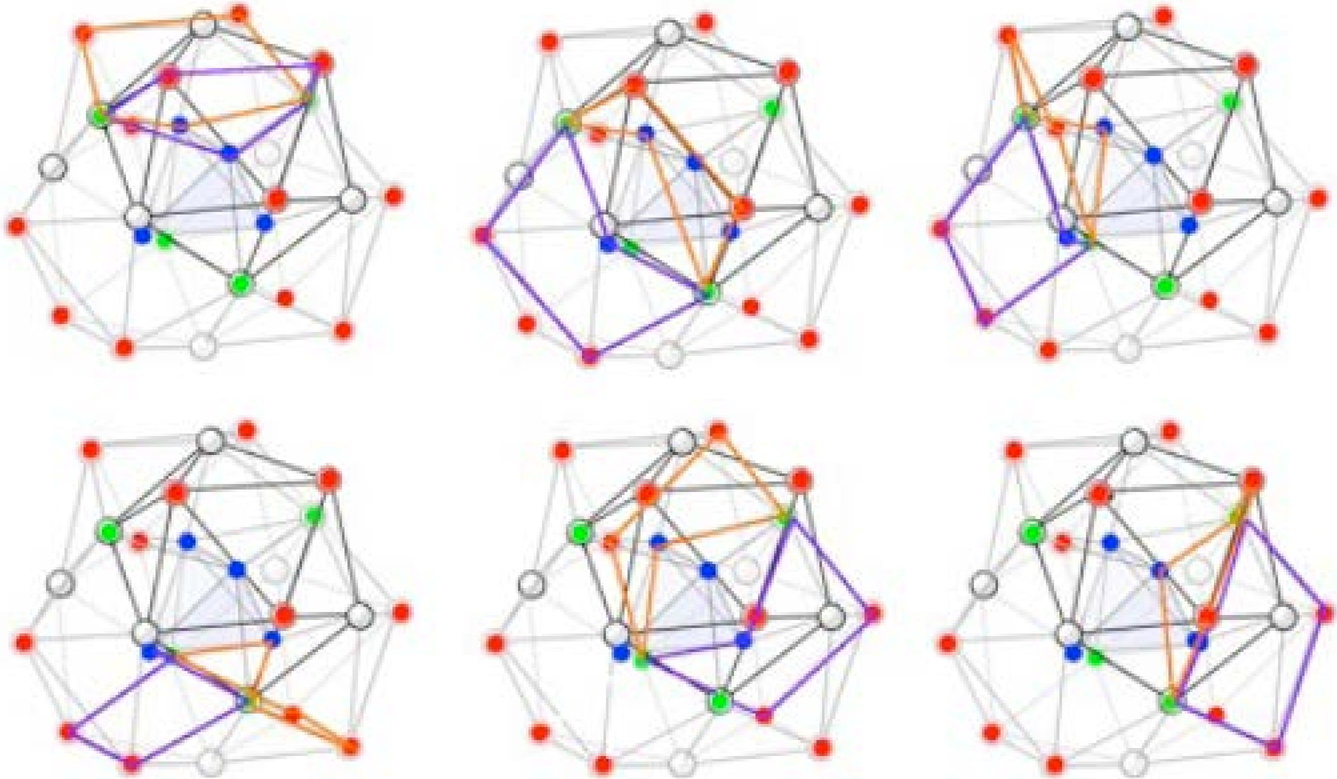
1
2

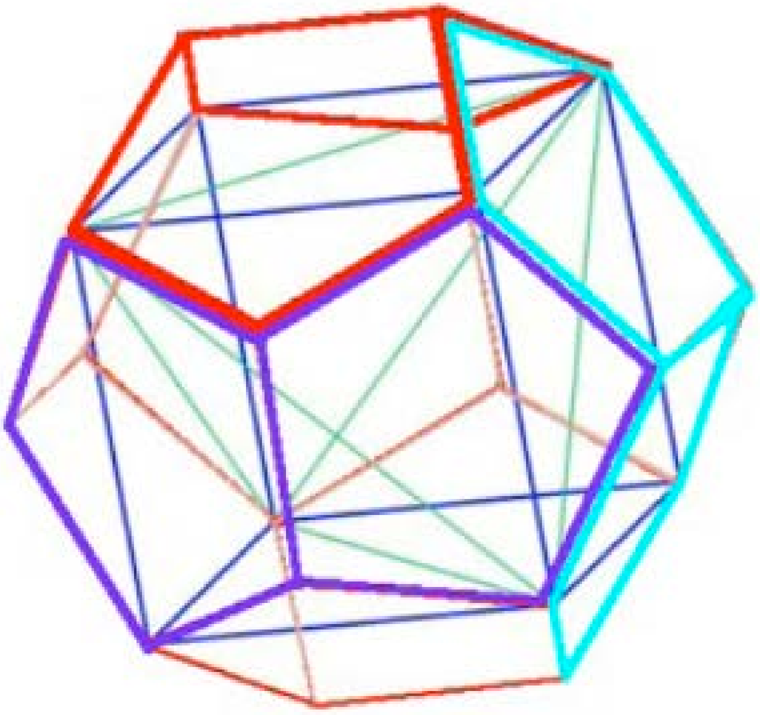


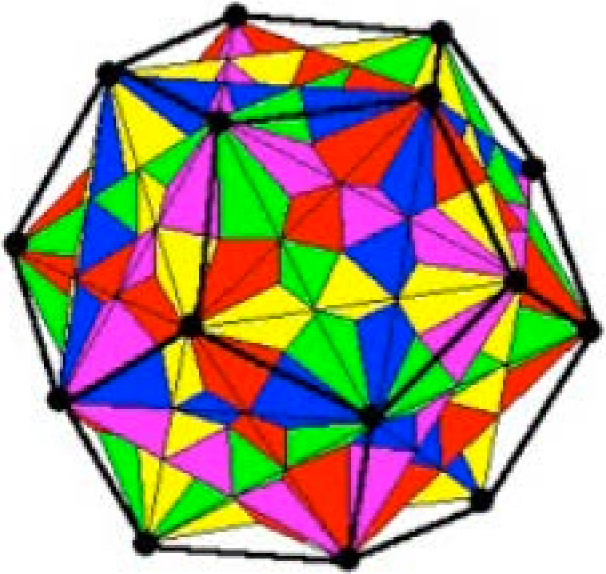


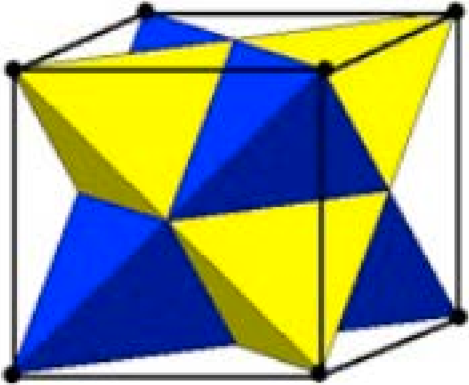


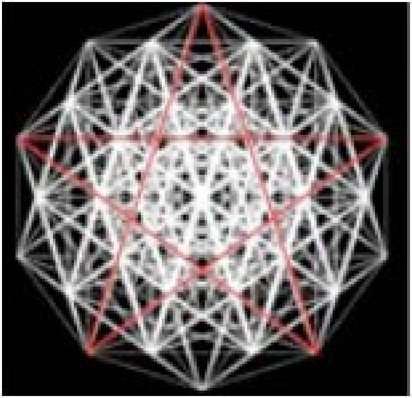


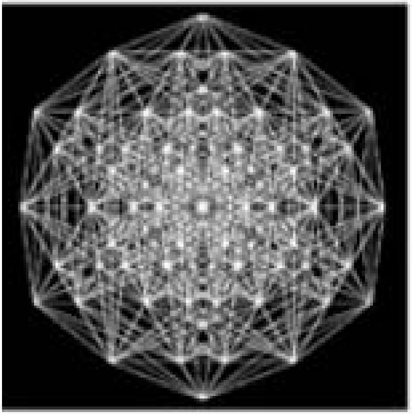


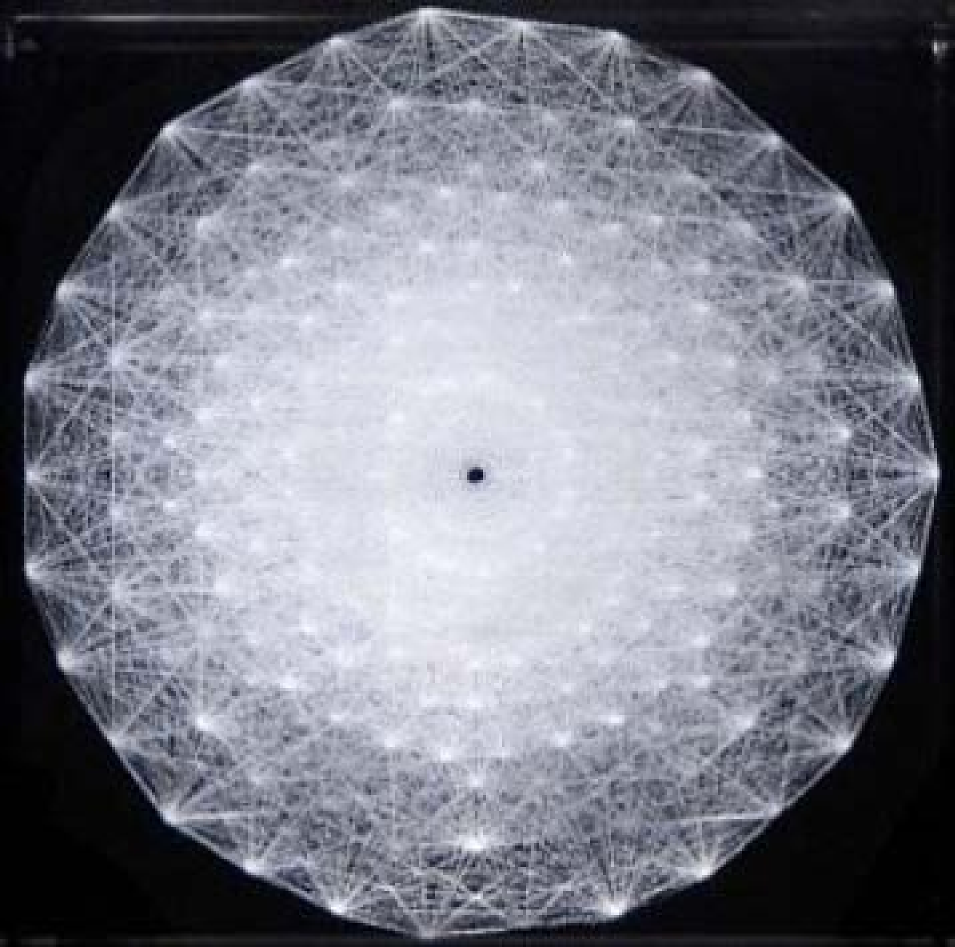












IFA, Adinkra, Llull, E8 and Physics

Frank Dodd (Tony) Smith, Jr. - 2011 - [My comments within quoted material are in red.]

IFA

At least as far back as 12,000 years ago, Africans had developed IFA Oracle divination based on the square of 16 = 16x16 = 256 = 2^8 corresponding to the vertices of an 8-dimensional hypercube and to the binary 2-choice Clifford algebra Cl(8) and so to related ones such as Cl(8)xCl(8) = Cl(16).

One IFA way to choose among the 2^8 possibilities is to cast an Opele Chain

(image from Folkcuba.com web site)

of 8 shells that when cast can land either up or down.

Since the number of sub-hypercubes in an 8-dimensional hypercube is 6,561 = 81x81 = 3^8, the IFA Oracle has N=8 ternary 3-structure as well as binary 2-structure:

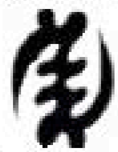
```
N    2^N              3^N
0                       1
1                     2   3
2                   4 =2x2  9 = 3x3
3                 8           27
4              16 = 4x4         81 = 9x9
5            32                   243
6          64 = 8x8                 729 = 27x27
7       128                           2187
8     256 = 16x16                       6561 = 81x81
```

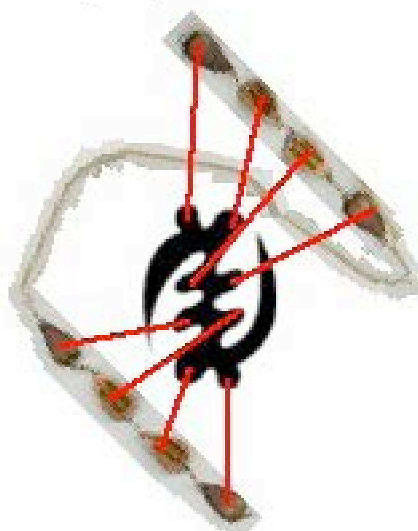
As ancient African games such as Owari show, binary 2- structure corresponds to static states and ternary 3- structure corresponds to dynamic states.

Mathematically, using binary 2-choice static states to define dynamics on 3 ternary neighbor states produces the 256 elements of Elementary Cellular Automata.

“... **Adinkra** ...

Adinkra are visual forms that ... integrate striking aesthetic power, evocative mathematical structures, and philosophical conceptions ... against the background of the cosmos. This cosmic framework is suggested by the Adinkra symbol Gye Nyame ... meaning ... “This great panorama of creation dates back to time immemorial, no one lives who saw its beginning and no one will live to see its end, except Nyame [= God]. ...” ...
similarities between Classical Andinkra and the mathematical technology ... are ... developed by James Gates and Michael Faux ... to model relationships between fundamental physical structures of the universe. ...”. (quote from The Oxford Encyclopedia of African Thought, Vol. 1, by F. Abiola Irele and Biodun Jeyifo)

The African Adinkra character Gye Nyame  looks like an Opele Chain



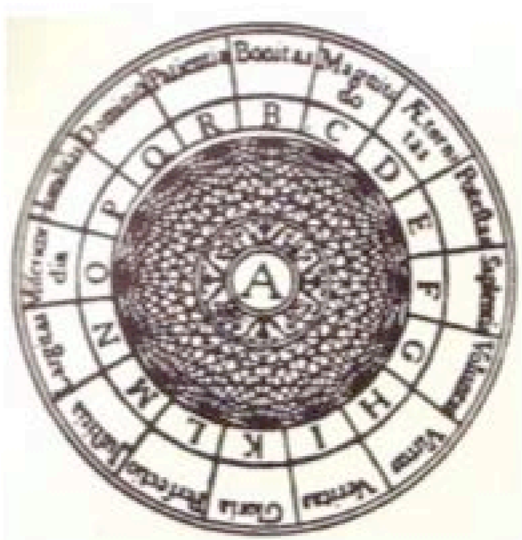
and also

 looks like the Chinese character meaning Law 

The Chinese character’s pronunciation FA was probably introduced into Mandarin after 1000 AD. It is possible that the similarity of the Chinese pronunciation FA and the African FA is a result of African influence on China through contact by Chinese ocean voyages around 1000 AD, and the role of IFA as Divination Law.

Llull

Near the end of the 13th century, Ramon Llull of Mallorca studied the 16 possibilities of IFA (in the Arabic form 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.

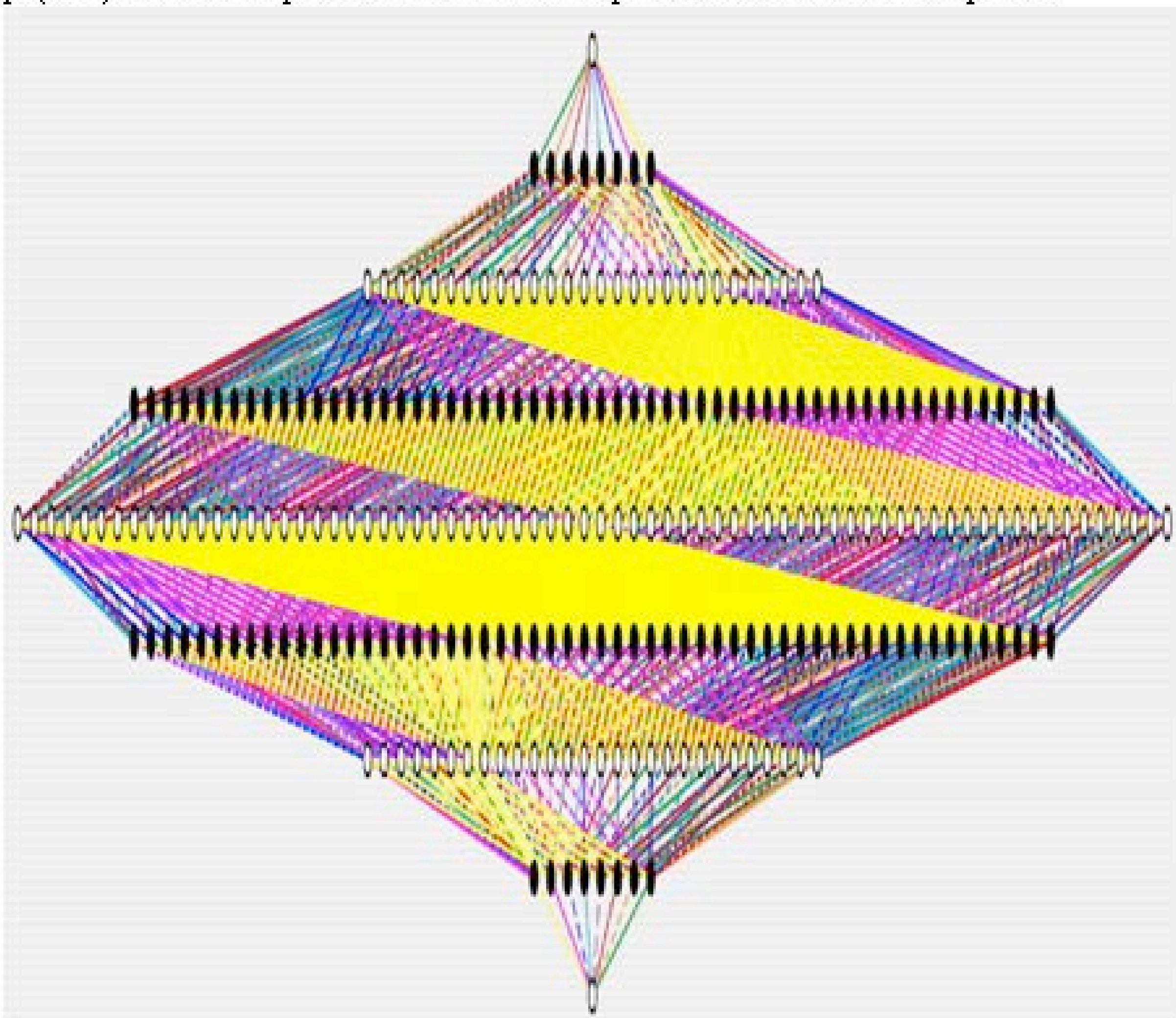


If the 16 vertices represented a 16-dimensional vector space, then the 120 lines connecting pairs of vectors represented 120-dimensional D8 bivectors of rotations in that 16-dimensional vector space. That total geometry is described by the Real Clifford Algebra Cl(16) with 16-dim vector space.
Some Llullian ideas seem to be encoded in Tarot, which was developed roughly contemporaneously with Llull, and whose cards correspond to the 78-dimensional E6 Lie algebra.

E8

The 120 D8 bivectors combine with 128 Cl(16) half-spinors to produce E8.
In 2007, Garrett Lisi used the 248-dim E8 Lie algebraas the basis for a Physics Model, but his model has been shown to have technical flaws.
However,
it is possible (as outlined in this paper) to construct a realistic E8 Physics Model which is free of such technical flaws.

N = 8 of real Clifford Algebra Cl(8) with 28-dim grade 2 = Spin(8)
and graded structure 1 + 8 + 28 + 56 + 70 + 56 + 28 + 8 + 1
with 2^8 = 256 elements and
sqrt(256) = 16-dim spinors = 8-dim +half-spinors and 8-dim -half-spinors



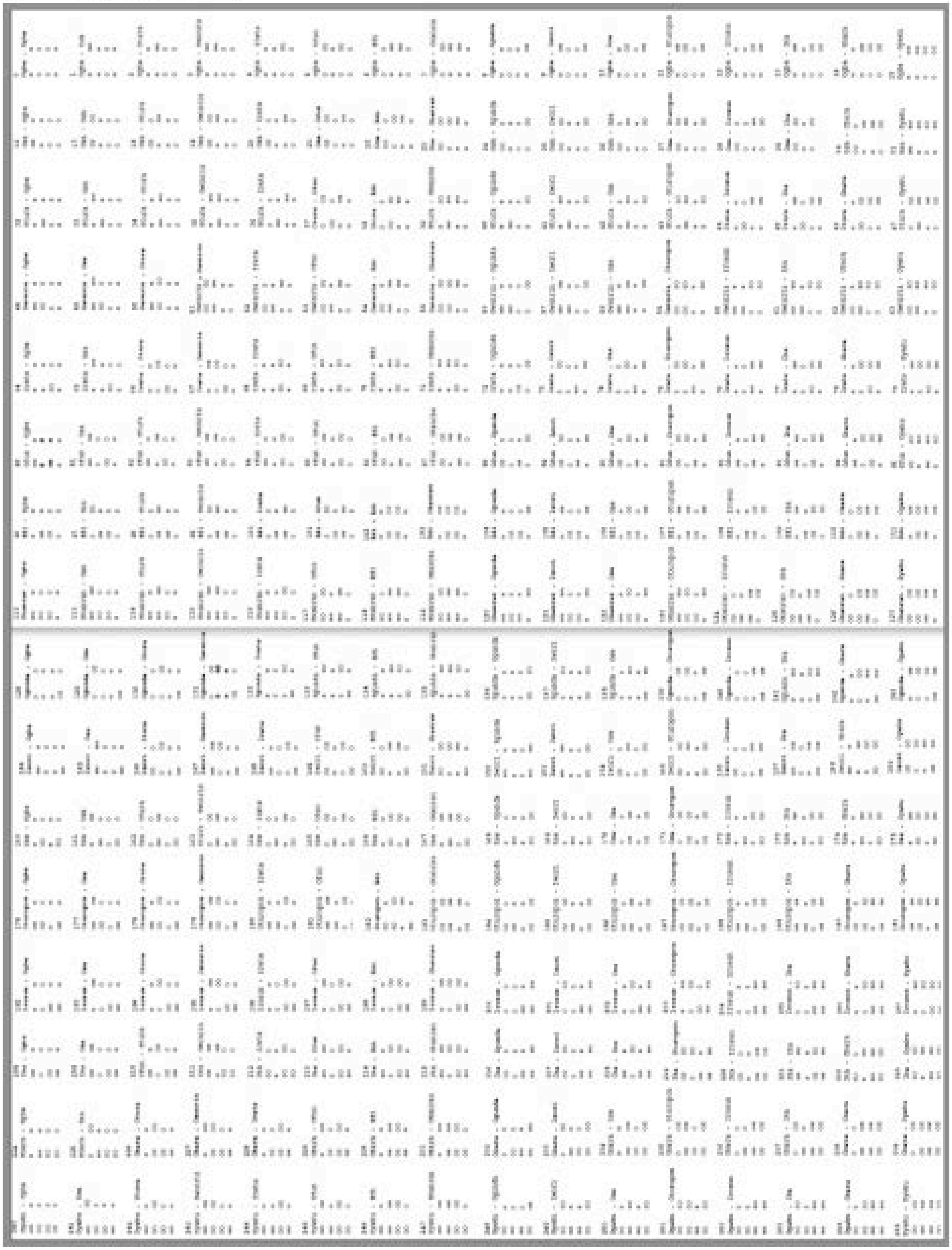
The 2^8 = 16x16 = 156 elements of Cl(8) correspond directly to:
the 256 vertices of an 8-dim hypercube;
the 256 Odu of IFA Divination;
the 256 fundamental Cellular Automata.

248 of the 256 correspond directly to the 248 generators of the E8 Lie algebra
and the physical elements of my E8 physics model.

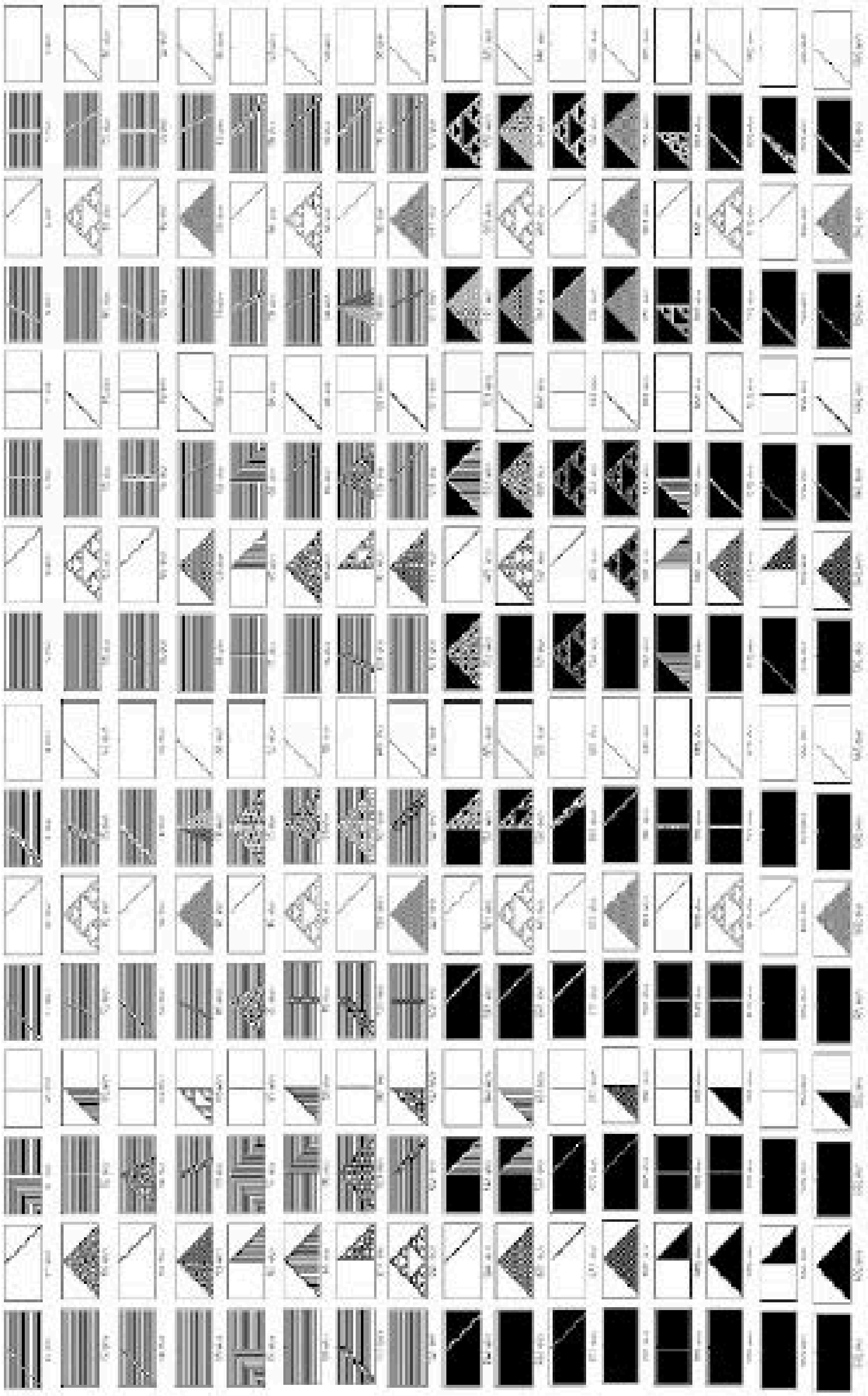
240 of the 256 correspond directly to the 240 Root Vectors of E8.

Here are some images showing some details of those correspondences:

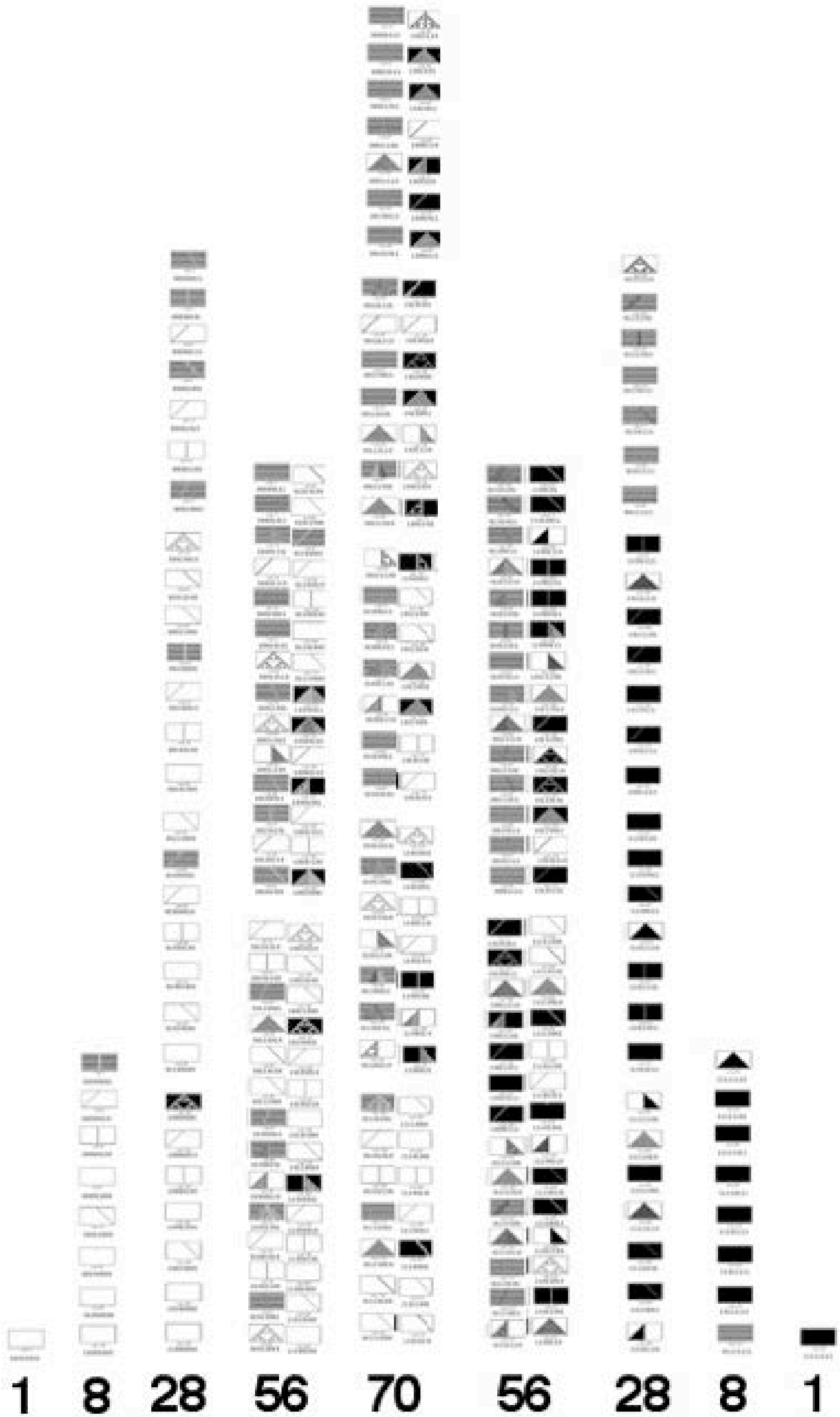
The 256 Odu of IFA:

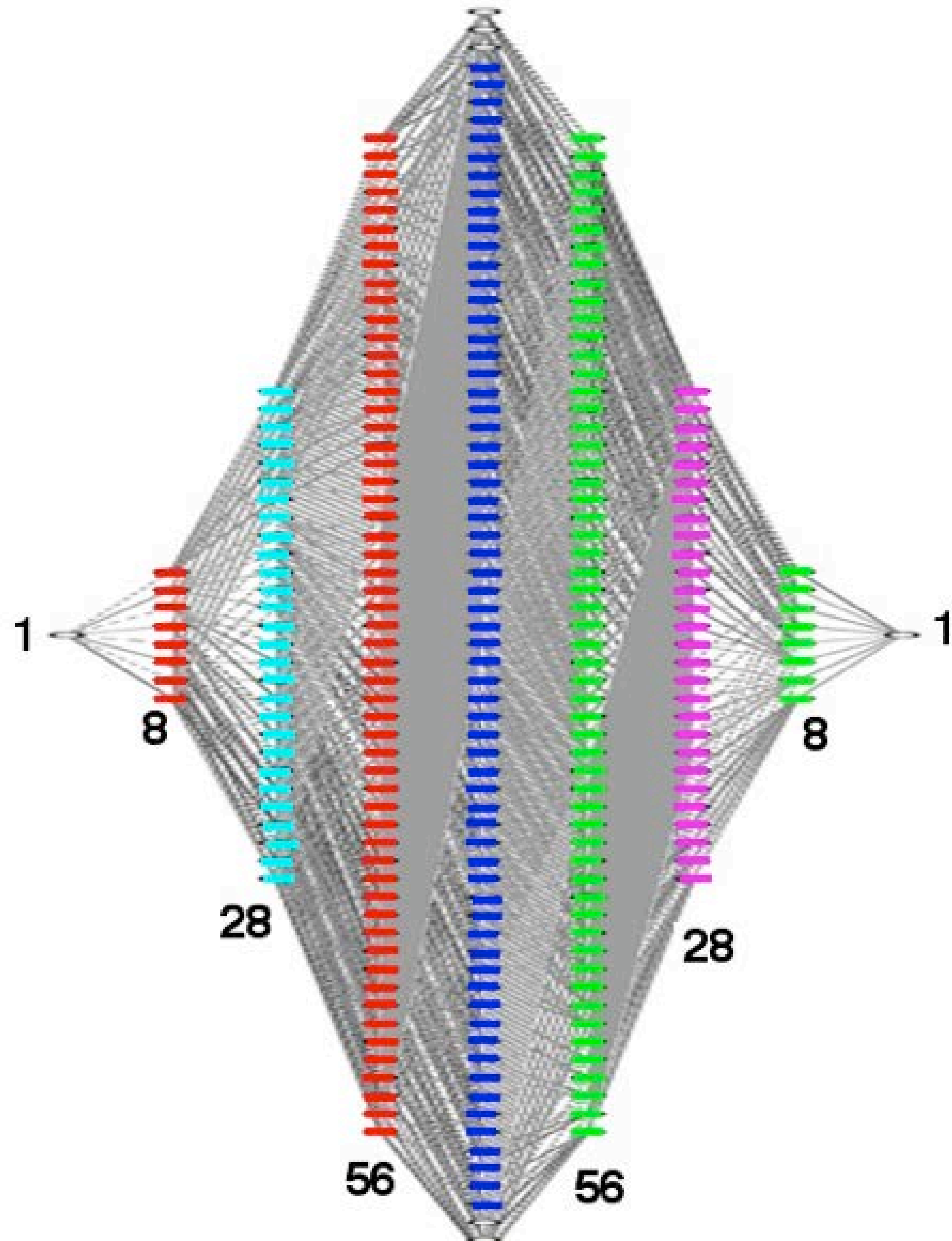


The 256 Fundamental Cellular Automata



have the same graded structure as the Cl(8) real Clifford algebra
and the 8-dimensional hypercube and the N = 8 MI^Ncubic Adinkra graph


1 8 28 56 70 56 28 8 1

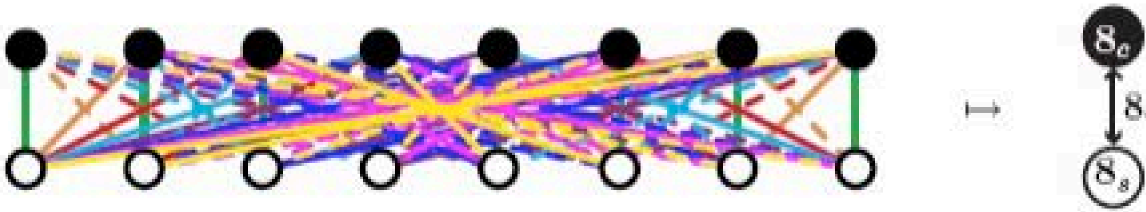

1
8
28
56
70
56
28
8
1

				1
				16
				120
				560
				1820
				4368
				8008
				11440
1		1		12870
8		8		11440
28		28		8008
56		56		4368
70	x	70	=	1820
56		56		560
28		28		120
8		8		16
1		1		1
Cl(8)	**x**	**Cl(8)**	**=**	**Cl(16)**

Spinors:

$$(8s+8c) \times (8s+8c) = \begin{array}{c}(8s \times 8s + 8c \times 8c) \\ + \\ (8s \times 8c + 8c \times 8s)\end{array}$$

Gates and co-authors Faux and Hubsch in arxiv 0904.4719 [hep-th] said:
"... A two-dimensional on-shell model under a compactification produces a one-dimensional off-shell model. ... An off-shell model in one bosonic dimension identifiable as the worldline, with N = 8 supersymmetry ... is the lowest N-extended supersymmetry where the minimal supermultiplet is ... unique in having eight bosons and eight fermions, transformed into each other by ...
Spin(8), and ... its Z2-extension, Pin(8) ...
the Pin(8) / Spin(8) = Z2 reflections swap the two spinors of Spin(8): 8s <--> 8c, and are the Z2 part of the ... unique triality ... S3 outer automorphism of Spin(8). ...
[acts on]... 8v ... 8s ... 8c ...



... relevant subgroup chains of Spin(8) ...[include]...

$Spin(8)$
$\mathbf{R}_Q = \mathbf{8}_v$
$\mathbf{R}_\phi = \mathbf{8}_s$
$\mathbf{R}_\psi = \mathbf{8}_c$

$Spin(6)\times Spin(2)$
$\mathbf{4}_{+1} \oplus \mathbf{4}^*_{-1}$ $Spin(2) = U(1)$
$\mathbf{6}_0 \oplus \mathbf{1}_{-2} \oplus \mathbf{1}_{+2}$
$\mathbf{4}_{-1} \oplus \mathbf{4}^*_{+1}$

Spin(2,4) = SU(2,2)

$Spin(6)$
$\mathbf{4} \oplus \mathbf{4}^*$
$(\mathbf{6} \oplus \mathbf{1}) \oplus \mathbf{1}$
$\mathbf{4} \oplus \mathbf{4}^*$

$Spin(6) = SU(4)$

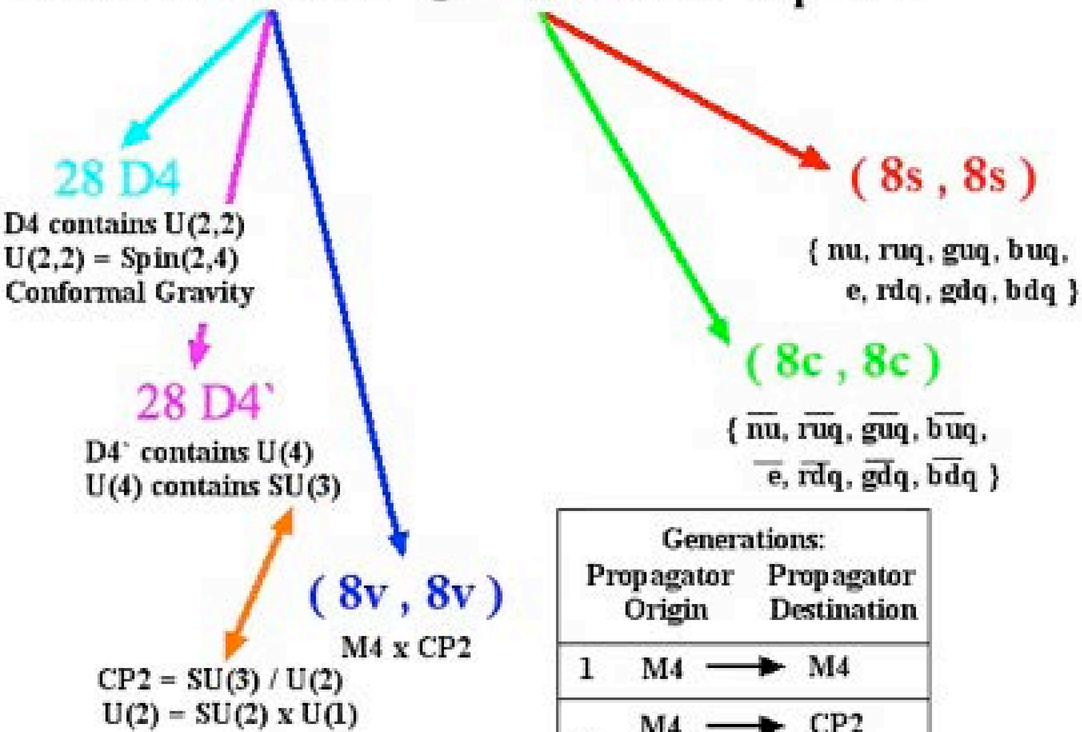
SU(4) contains SU(3)
CP2 = SU(3) / U(2)

$Spin(4)\times Spin(2) = Spin(3)\times Spin(3)\times Spin(2)$
$(\mathbf{2},\mathbf{2})_{+1} \oplus (\mathbf{2},\mathbf{2})_{-1}$
$(\mathbf{3},\mathbf{1})_0 \oplus (\mathbf{1},\mathbf{3})_0 \oplus (\mathbf{1},\mathbf{1})_{-2} \oplus (\mathbf{1},\mathbf{1})_{+2}$
$(\mathbf{2},\mathbf{2})_{-1} \oplus (\mathbf{2},\mathbf{2})_{+1}$

$Spin(3) = SU(2)$
$Spin(4)\times \mathbb{Z}_2^s = Spin(3)\times Spin(3)\times \mathbb{Z}_2^s$
$(\mathbf{2},\mathbf{2})_+ \oplus (\mathbf{2},\mathbf{2})_-$
$(\mathbf{3},\mathbf{1})_0 \oplus (\mathbf{1},\mathbf{3})_0 \oplus (\mathbf{1},\mathbf{1})_0 \oplus (\mathbf{1},\mathbf{1})_0$
$(\mathbf{2},\mathbf{2})_- \oplus (\mathbf{2},\mathbf{2})_+$

Spin(1,3) acts on M4
Minkowski SpaceTime

248 E8 = 120 D8 $\oplus$ 128 D8 Half Spinor

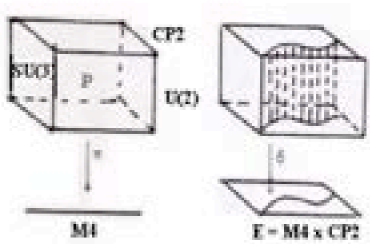


Generations:	Propagator Origin	Propagator Destination
1	M4 $\longrightarrow$	M4
2	M4 $\longrightarrow$ CP2 $\longrightarrow$	CP2 M4
3	CP2 $\longrightarrow$	CP2

Lagrangian:

$$\int_{\text{KKspacetime}} \text{gauge term} + \text{fermion term}$$

Higgs-Mayer:



Kobayashi-Nomizu:

THEOREM 11.7. *Assume in Theorem 11.5 that $\mathfrak{k}$ admits a subspace $\mathfrak{m}$ such that $\mathfrak{k} = \mathfrak{j} + \mathfrak{m}$ (direct sum) and $\mathrm{ad}(J)(\mathfrak{m}) = \mathfrak{m}$, where $\mathrm{ad}(J)$ is the adjoint representation of J in $\mathfrak{k}$. Then*

(1) *There is a 1:1 correspondence between the set of K-invariant connections in P and the set of linear mappings $\Lambda_{\mathfrak{m}}: \mathfrak{m} \to \mathfrak{g}$ such that*

$$\Lambda_{\mathfrak{m}}(\mathrm{ad}(j)(X)) = \mathrm{ad}(\lambda(j))(\Lambda_{\mathfrak{m}}(X)) \qquad \text{for } X \in \mathfrak{m} \text{ and } j \in J;$$

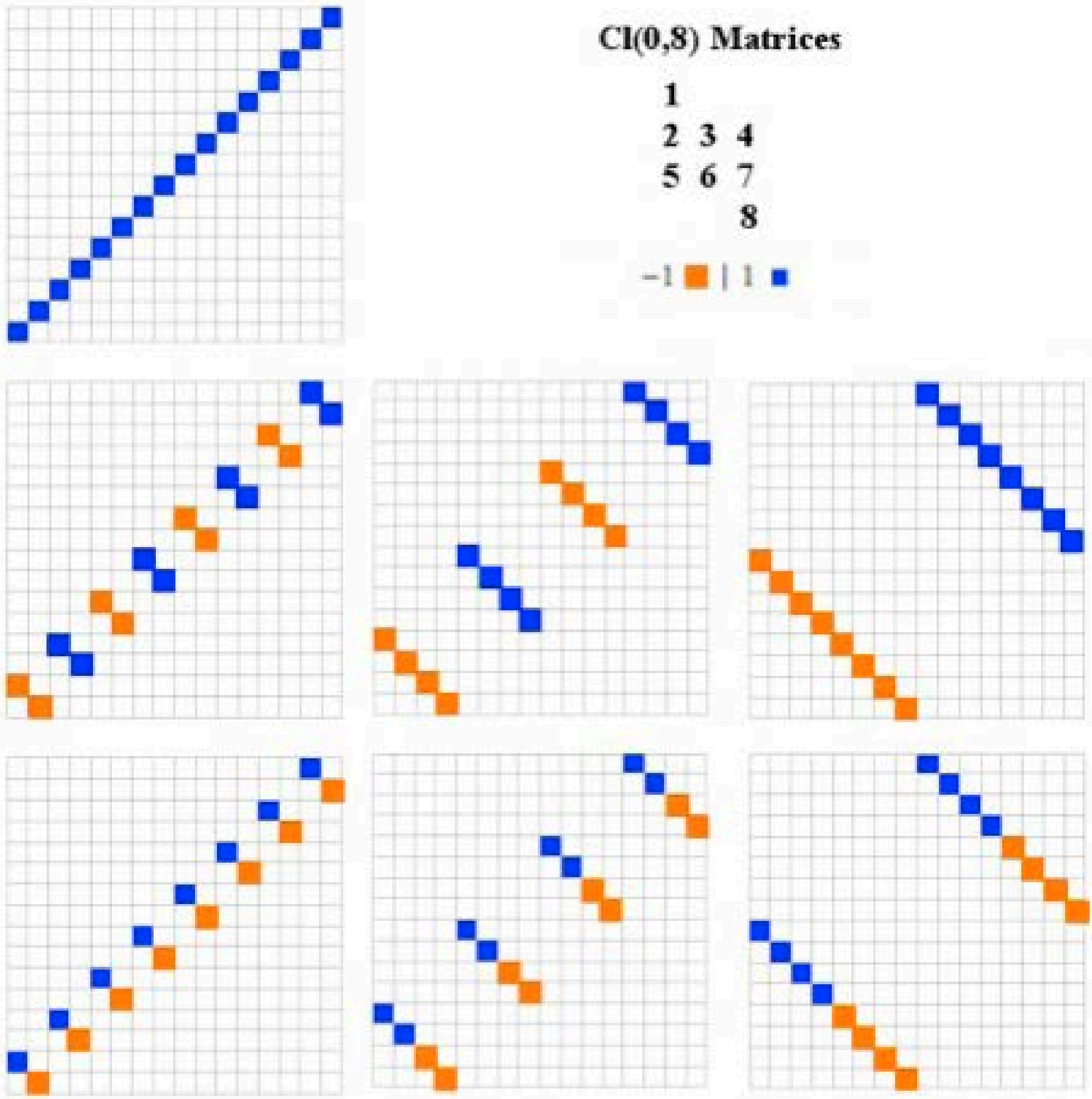
the correspondence is given via Theorem 11.5 by

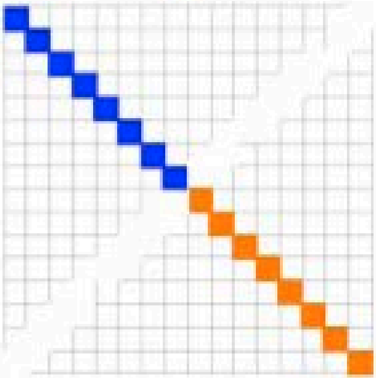
$$\Lambda(X) = \begin{cases} \lambda(X) & \text{if } X \in \mathfrak{j}, \\ \Lambda_{\mathfrak{m}}(X) & \text{if } X \in \mathfrak{m}. \end{cases}$$

(2) *The curvature form Ω of the K-invariant connection defined by $\Lambda_{\mathfrak{m}}$ satisfies the following condition:*

$$2\Omega_{u_0}(\tilde{X}, \tilde{Y}) = [\Lambda_{\mathfrak{m}}(X), \Lambda_{\mathfrak{m}}(Y)] - \Lambda_{\mathfrak{m}}([X, Y]_{\mathfrak{m}}) - \lambda([X, Y]_{\mathfrak{j}}) \qquad \text{for } X, Y \in \mathfrak{m},$$

The Higgs and the T-quark form a system in which the Higgs is effectively a T-quark condensate.





For odd dimensions, the additional generator (a generalization of γ^5) is

$$\Gamma_{2\nu+1} = (-i)^{\nu} \prod_{\alpha=1}^{2\nu} \Gamma_{\alpha} .$$

The Dirac matrices satisfy canonical anti-commutation relation $\Gamma_i \Gamma_j + \Gamma_j \Gamma_i = 2\delta_{i,j}$.

The above definition corresponds to the so-called "chiral basis," where Dirac matrices are block anti-diagonal.

Other bases are possible, and are related to the chiral basis by rotations.

The Dirac matrices generate Euclidean Clifford algebra.

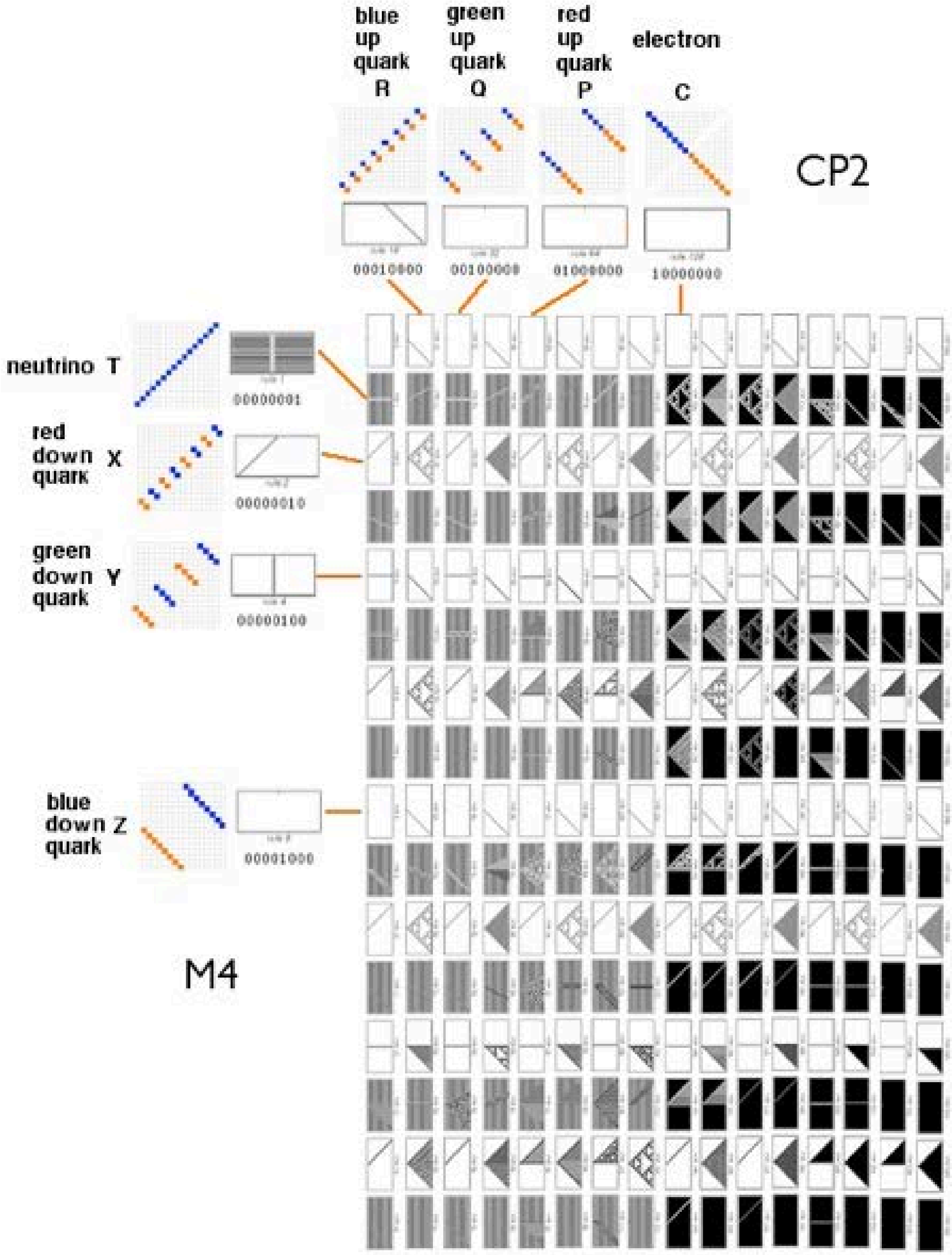
modified from:

Dirac Matrices in Higher Dimensions" from The Wolfram Demonstrations Project

http://demonstrations.wolfram.com/DiracMatricesInHigherDimensions/

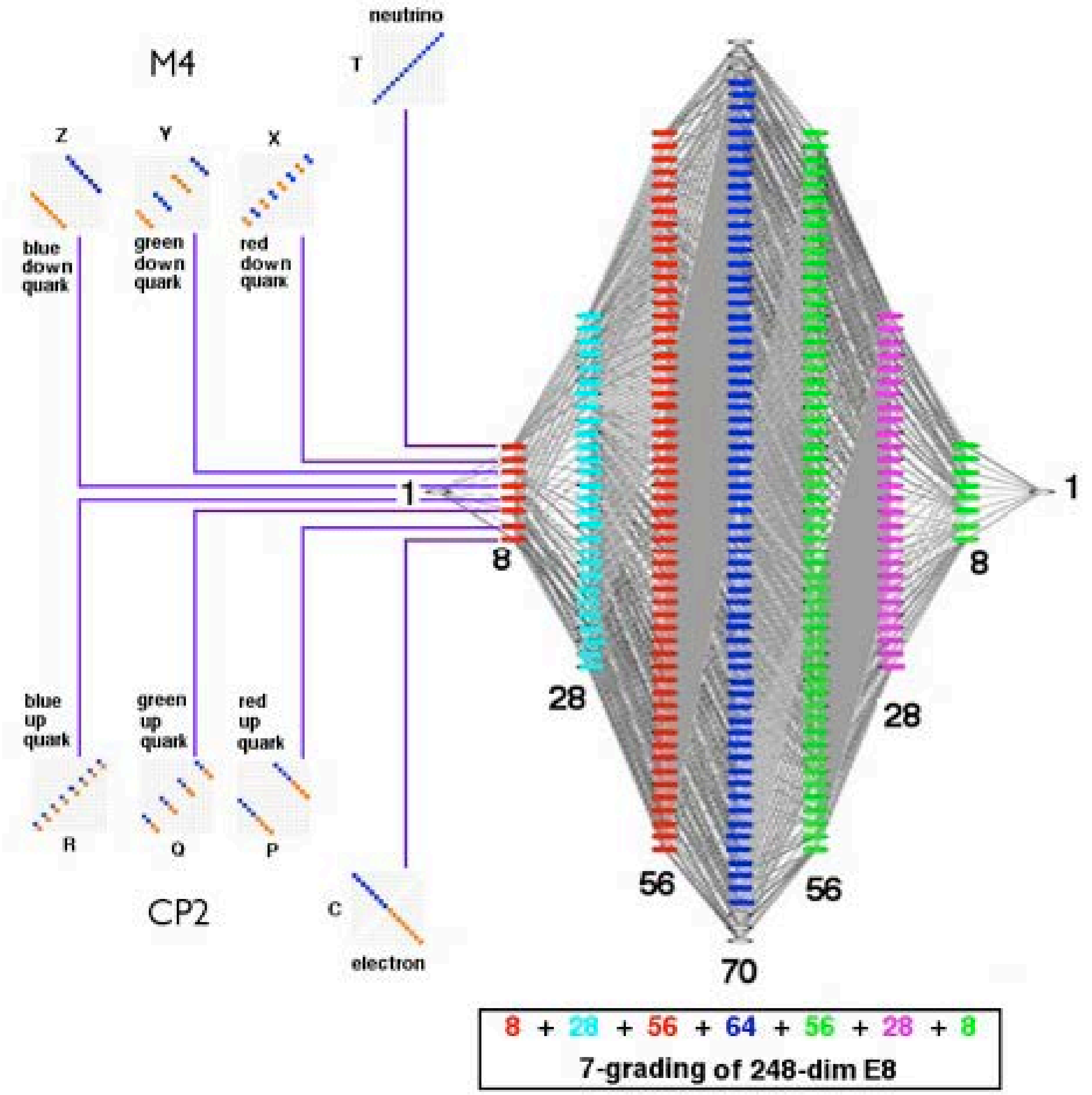
Contributed by: Enrique Zeleny

Here is how the 8 grade-1 elements fit among all 16x16 = 256 elements of Cl(8):



The correspondence between M4xCP2 spacetime and fermions is due to Triality.

In addition to the 16x16 = 256 element array shown above arranged in binary number order (similar to the Fu Xi ordering of the I Ching),
the 256 elements can also be arranged according to their Clifford Algebra graded strucure, and here is how the 8 grade-1 elements fit that way:



The colored elements are the 248 of the 256 that correspond to E8.

Triality makes the correspondence of Cl(8) with E8 consistent with physics.
Here is my current (somewhat conjectural) view of how that works:

The **8** of E8 represents the primary covariant component of 8 fermion particles
in 8-dim spacetime, and
the grade-1 8 of Cl(8) represents the 8-dim spacetime vector space,
which is OK by Triality between 8v and 8s;

The **8** of E8 represents the primary covariant component of 8 fermion anti-particles
in 8-dim spacetime, and
the grade-7 8 of Cl(8) represents the 8-dim pseudovectors,
which is OK by Triality between 8v and 8c;

The **56** of E8 represents 7 of the 8 covariant components of 8 fermion particles
in 8-dim spacetime, and
the grade-3 56 of Cl(8) represents the 8-dim spacetime vector space acted on by
the bivector spacetime transformations from the primary component to the other 7
covariant components of fermion particles in 8-dim spacetime,
which is OK by Triality between 8v and 8s;

The **56** of E8 represents 7 of the 8 covariant components of 8 fermion anti-particles
in 8-dim spacetime, and
the grade-5 56 of Cl(8) represents the 8-dim spacetime pseudovector space acted
on by dual of the transformations described with respect to **56**,
which is OK by Triality between 8v and 8c;

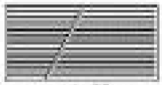
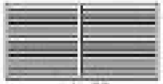
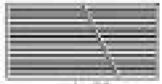
The **64** of E8 represents 8v x 8v of 8-dim spacetime, and
the grade-4 70 of Cl(8) contains 64 elements 8s x 8c,
which is OK by Triality between 8v and 8s and 8c;

The remaining 6 = 70 - **64** of grade-4 and 1 grade-0 and 1 grade-8 of Cl(8) are,
as indicated in the above chart, not included in E8.

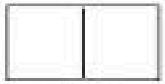
The 8 elements of the Cl(8) grading that are not directly included in E8 are:


rule 0
00000000

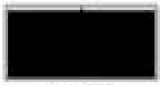
1 of grade-0 $+1$

  
rule 83 rule 29 rule 39
01010011 00011101 00100111

3 in grade-4 $- e_{5712} - e_{1345} - e_{6123}$

  
rule 226 rule 172 rule 216
11100010 10101100 11011000

3 in grade-4 $+ e_{6728} + e_{3468} + e_{4578}$ to


rule 255
11111111

1 of grade-8 $+ e_{12345678}$

They can be interpreted as 8 of the 16 components of
the Cl(8) primitive idempotent f =

$$= (1/2)(1 + e_{1248}) (1/2)(1 + e_{2358}) (1/2)(1 + e_{3468}) (1/2)(1 + e_{4578}) =$$

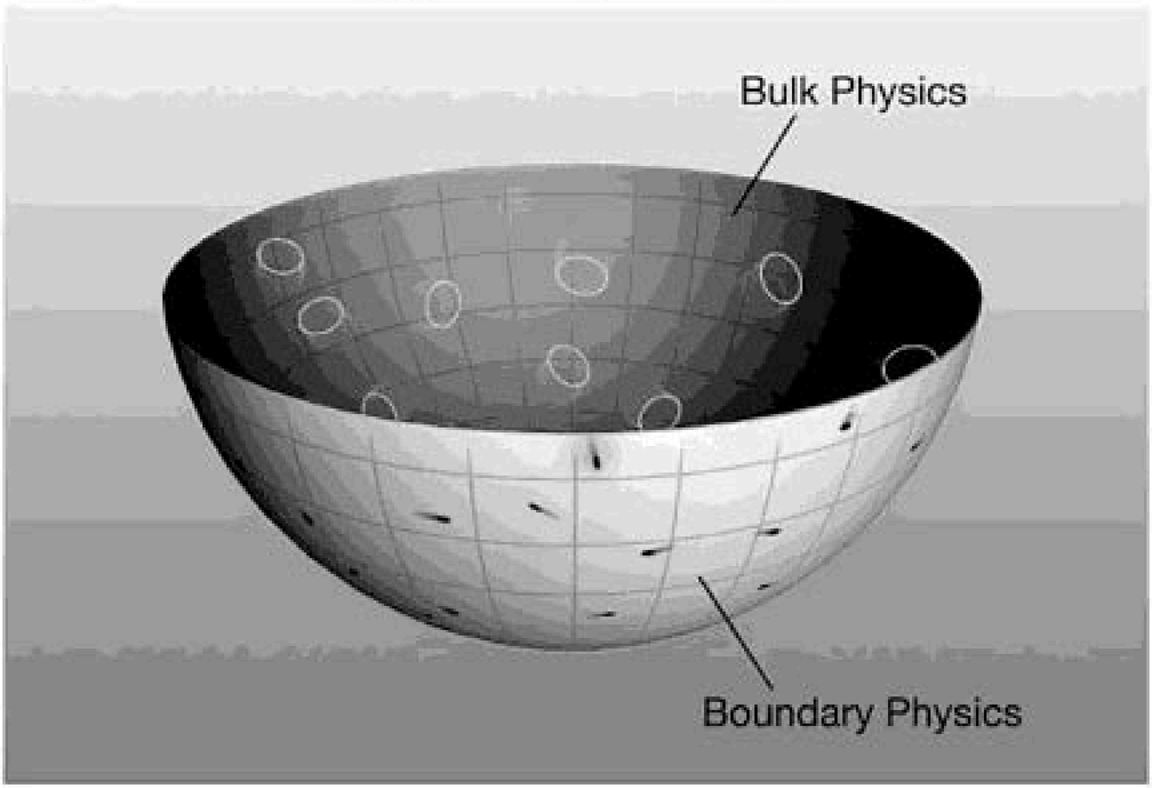
$$\begin{aligned} = (1/16)(1 \; & - e_{5712} - e_{1345} - e_{6123} \\ & - e_{4671} - e_{7234} - e_{2456} - e_{3567} \\ & + e_{2358} + e_{1248} + e_{5618} + e_{7138} \\ & + e_{6728} + e_{3468} + e_{4578} \qquad\qquad + e_J) \end{aligned}$$

which 8 components correspond to the 4-dim M4 physical spacetime part
of the 8-dim M4 x CP2 Kaluza-Klein spacetime of E8 physics.

Physics: Real Boundary - Quantum Bulk

Frank Dodd (Tony) Smith, Jr. - 2011

Brian Greene in his book "The Hidden Reality" (Knopf 2011) describes
"... an explicit link between physics taking place in a region ...



... and physics taking place on that region's boundary ... an explicit realization of holography. That's the basic idea. ...".
Brian Greene chooses to identify the Boundary-bulk physics as:

Boundary - Quantum Field Theory - "... four-dimensional supersymmetric conformally invariant quantum field theory ...".
Bulk - Superstring Theory - "... ten-dimensional string theory on AdS5xS5 ..."

On the other hand, I do not think that conventional supersymmetry is realistic, so I reject Brian Greene's choices for Bulk - Boundary physics and propose:

Real Boundary - their Shilov Boundaries - E8 Real Lagrangian Structure

Quantum Bulk - Bounded Complex Domains - H248 Quantum Structure

Real Boundary E8 Lagrangian

Lagrangian: $\int_{\text{KKspacetime}}$ gauge term + fermion term

8 Fundamental Fermion Particles (generations 2 and 3 emerge at low energies) are represented by a copy of the 8-real-dimensional Shilov Boundary RP1 x S7 of the 8-complex-dimensional Complex Bounded Domain that corresponds to the 16-real-dimensional Symmetric Space Spin(10) / Spin(8)xU(1) that by Triality represents 8s and 8c half-spinors as well as 8v of 8-dim Spacetime. Each of 8p Particles has 8cp components for a total of 8px8cp = 64.

8 Fundamental Fermion AntiParticles (generations 2 and 3 emerge at low energies) are represented by a copy of the 8-real-dimensional Shilov Boundary RP1 x S7 of the 8-complex-dimensional Complex Bounded Domain that corresponds to the 16-real-dimensional Symmetric Space Spin(10) / Spin(8)xU(1) that by Triality represents 8c and 8s half-spinors as well as 8v of 8-dim Spacetime. Each of 8p AntiParticles has 8cp components for a total of 8px8cp = 64.

8-dimensional Spacetime (reduces to M4 x CP2 Kaluza Klein at low energies) is a copy of the 8-real-dimensional Shilov Boundary RP1 x S7 of the 8-complex-dimensional Complex Bounded Domain that corresponds to the 16-real-dimensional Symmetric Space Spin(10) / Spin(8)xU(1). There are 8px8m = 64 combinations of 8pPosition/8mMomentum.

Conformal MacDowell-Mansouri Gravity Gauge Term uses 16 of the 28 generators of a copy of Spin(8).
Standard Model Term gets SU(3) from 16 of the 28 generators of a copy of Spin(8) and SU(2)xU(1) from the local symmetry of the CP2 of Kaluza-Klein.

These Real Components of the Lagrangian combine to form a copy of
248-real-dim E8 = 120-real-dim D8 + 128-real-dim D8 half-spinor:

```
 120-dim D8 =
= Spacetime 64
+ Gravity 28
+ Standard Model 28
```

```
128 half-spinor of D8 =
  = Particle 64
  + AntiParticle 64
```

Quantum Bulk H248 Structure

The Complex Quantum Bulk has twice the real dimensionality
of its Real Lagrangian Boundary, so look at a second copy of E8.
E8 can be contracted to D8 = Spin(16) and then further contracted to A7 = SU(8)
leading to the structure

H248 = SU(8) + h_92

h_92 is a 185-dimensional Heisenberg Lie algebra
for 92 sets of creation-annihilation operators:

64 Fermion Particle Creators + 64 Fermion AntiParticle Creators

28 Gravity Boson Creators + 28 Standard Model Boson Creators

plus

1 central Heisenberg Algebra element

The 63 generators of SU(8) plus the 1 central Heisenberg Algebra element
represent the 8px8m Position/Momentum combinations of 8-dim Spacetime.

H248 lives in the Quantum Bulk has graded structure

28 + 64 + (1+63) + 64 + 28

and

when combined with the Lagrangian E8 with graded structure

8 + 28 + 56 + 64 + 56 + 28 + 8

gives

a Quantum Theory that is equivalent to Path Integral Quantization of the Lagrangian Theory.

A naive construction of Hilbert space from creation and annihilation operators does not give a realistic quantum theory, but a generalized II1 hyperfinite II1 von Neumann factor algebra does give a realistic Algebraic Quantum Field Theory.
Miklos Redei in Studies in the History and Philosophy of Modern Physics 27 (1996) 493-510 said: "... John von Neumann ... [said that]... Hilbert space vectors ... represent the physical states ... redundantly ...
if we wish to gneralize the lattice of all linear closed subspaces from a Euclidean space to infinitely many dimensions,
then one does not obtain Hilbert space ... case I_∞,
but
... case II1 ... a type II1 (factor) von Neumann algebra ...".

Cl(16) Fundamental Quantum Structure of Nested Real Clifford Algebras:

Start with Empty Set = 0

1 = Cl(0)
\
1 + 1 = Cl(1) = Cl(Cl(0))
\
1 + 2 + 1 = Cl(2) = Cl(Cl(1)) = Cl(Cl(Cl(0)))
\
1 + 4 + 6 + 4 + 1 = Cl(4) = Cl(Cl(2)) = Cl(Cl(Cl(Cl(0))))
\
1 + 16 + 120 + ... = Cl(16) = Cl(Cl(4)) = Cl(Cl(Cl(Cl(Cl(0)))))
\
1 + 65,536 + ... = Cl(65,536) = Cl(Cl(16)) =
(by Real Clifford Algebra 8-Periodicity) = Cl(16) x...(16 times)...x Cl(16)

John von Neumann said (see "Why John von Neumann did not Like the Hilbert Space Formalism of Quantum Mechanics (and What he Liked Instead)" by Miklos Redei in Studies in the History and Philosophy of Modern Physics 27 (1996) 493-510):

"... if we wish to generalize the lattice of all linear closed subspaces
from a Euclidean space to infinitely many dimensions,
then one does not obtain Hilbert space ... our "case I_infinity" ...
but that configuration, which Murray and I called "case II1" ...".

Completion of the Union of All Finite Tensor Products of Cl(16) with itself
gives a generalized Hyperfinite II1 von Neumann Factor
that in turn gives a realistic Algebraic Quantum Field Theory (AQFT).

Since Cl(16) is the Fundamental Building Block of a realistic AQFT with the
structure of a generalized Hyperfinite II1 von Neumann Factor,

**in order to understand how realistic AQFT works in detail,
we must understand the Geometric Structure of Cl(16).**

Spinor Growth Sequence

Frank Dodd (Tony) Smith, Jr. - 2012

----

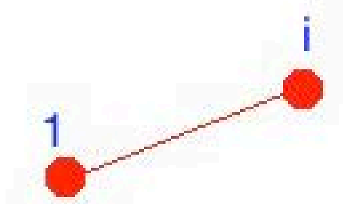
0 = Integers

----

1 = Real Numbers (basis = {1})

----

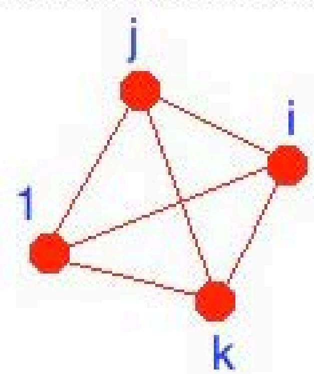
2 = Complex Numbers C (basis = {1,i}) = Cl(1) = half-spinors of Cl(4) Minkowski



These half-spinors are the basis of the conventional Fermionic Fock Space
Hyperfinite II1 von Neumann Factor Algebraic Quantum Field Theory (AQFT)

----

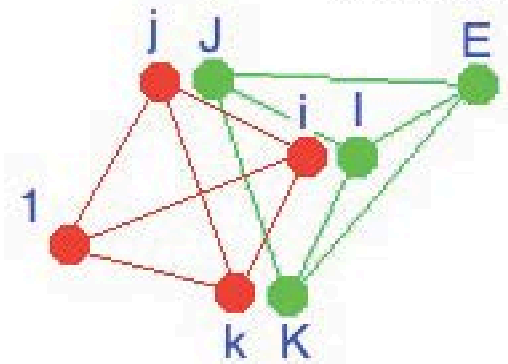
4 = Quaternions Q (basis = {1,i,j,k}) = Cl(2) = half-spinors of Cl(6) Conformal



WHICH CORRESPOND TO TETRAHEDRA

----

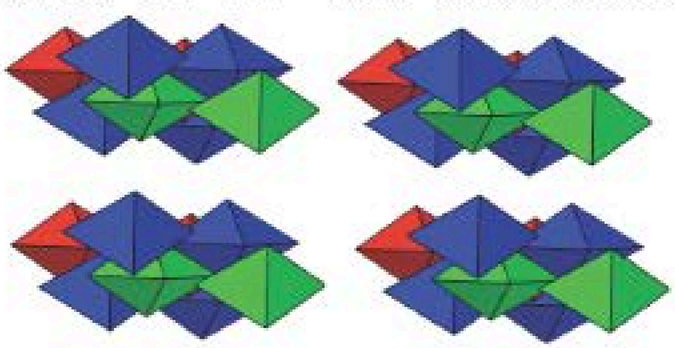
8 = Octonions O (basis = {1,i,j,k,I,J,K,E}) = half-spinors of Cl(8)



WHICH CORRESPOND TO
Chen-Engel-Glotzer (arXiv 1001.0586) DIMER PAIRS OF TETRAHEDRA

2^(8/2) = 2^4 = 16 = full spinors of Cl(8) = vectors of Cl(16)

2^(16/2) = 2^8 = 256 = 4 x 64 = full spinors of Cl(16)



These are the basis of the unconventional generalization of
the Hyperfinite II1 von Neumann Factor
that I use for Algebraic Quantum Field Theory (AQFT)

2^(256/2) = 2^128 = 3.4 x 10^38 = full spinors of Cl(256)
Such a large number as 2^128 is useful in describing
the inflationary expansion of our universe
and the production of the large number of particles that it contains.

Cl(16) has 2^16 = 65,536 elements with graded structure

1
16
120
560
1820
4368
8008
11440
12870
11440
8008
4368
1820
560
120
16
1

The 16-dim grade-1 Vectors of Cl(16) are D8 = Spin(16) Vectors
that are acted upon by the 120-dim grade-2 Bivectors of Cl(16)
which form the D8 = Spin(16) Lie algebra.

Cl(16) has, in addition to its 16-dim D8 Vector and 120-dim D8 Bivector
bosonic commutator structure, a **fermionic anticommutator structure**
related to its sqrt(65,536) = 256-dim spinors
which reduce to **128-dim D8 +half-spinors** plus 128-dim D8 -half-spinors.

Pierre Ramond in hep-th/0112261 said:
"... the coset F4 / SO(9) ... is the sixteen-dimensional Cayley projective plane ...
[represented by]... the SO(9) spinor operators [which] satisfy Bose-like
commutation relations ... Curiously,
if ...[the scalar and spinor 16 of F4 are both]... anticommuting,
the F4 algebra is still satisfied ...".
The same reasoning applies to other exceptional groups that
have octonionic structure and spinor component parts, including:
E6 = D5 + U(1) + 32-dim full spinor of D5
and
E8 = D8 + 128-dim half-spinor of D8.

The Maximal Lie Algebra Geometric Structure of Cl(16) is

248-dim E8 = 120-dim D8 Spin(16) + 128-dim D8 half-spinor

E8 has a Thomas Larsson 7-grading 8 + 28 + 56 + 64 + 56 + 28 + 8
with

odd part 8 + 56 + 56 + 8
128-dim D8 half-spinor = 64s + 64c
because
E8 / D8 = E8 / Spin(16) is a rank 8 symmetric space space of Type EVIII
with 248 - 120 = 128-dimensions, the octoctonionic projective plane (OxO)P2
that corresponds to a Cl(16) half-spinor representation of Spin(16) = D8

even part 28 + 64 + 28
120-dim D8 = 28-dim D4 + 64-dim (A7+1) + 28-dim D4
because
D8 / D4 x D4 = SO(16) / SO(8) x SO(8) is a rank 8 space of Type BDI
with 64 dimensions that corresponds to A7+1 = 64v
and
D8 / (A7+1) is a rank 4 symmetric space of Type DIII
with 28 + 28 = 56 dimensions
corresponding to the Type II(8) Bounded Complex Domain
whose 36-real-dimensional Shilov Boundary
is the symmetric unitary matrices of order 8

So:

E8 = 64s + 28 + (A7+1) + 28 + 64c =

= **A7 + (64s + 28 + 1 + 28 + 64c)**

is the Maximal Simple Lie Algebra Structure of Cl(16)

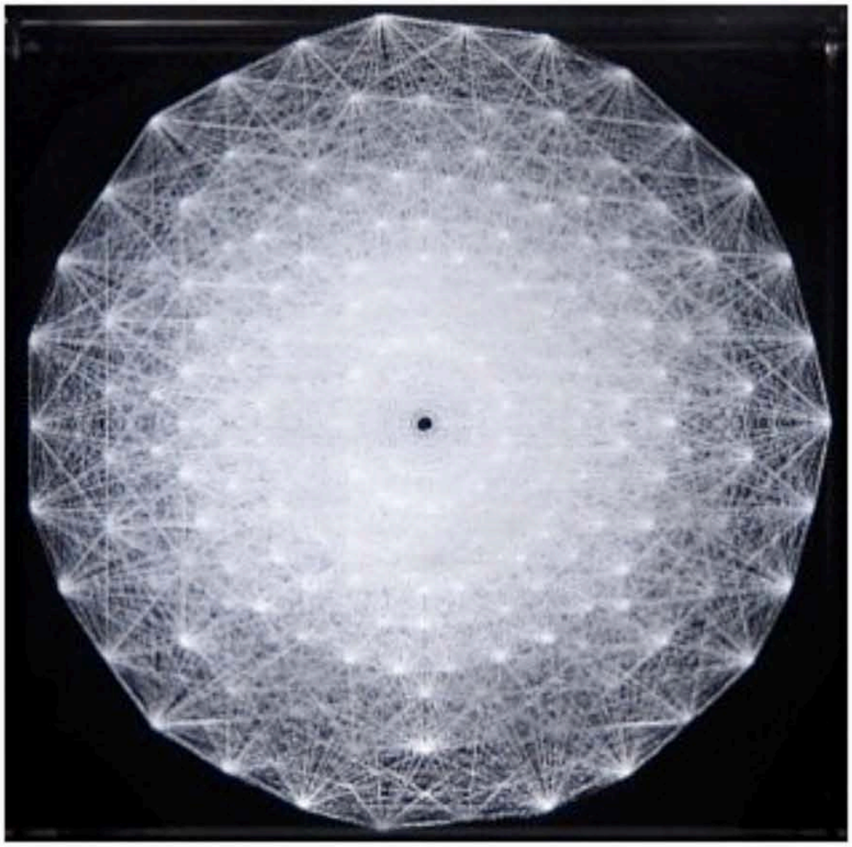
E8 Structure of Cl(16) determines a Lagrangian:

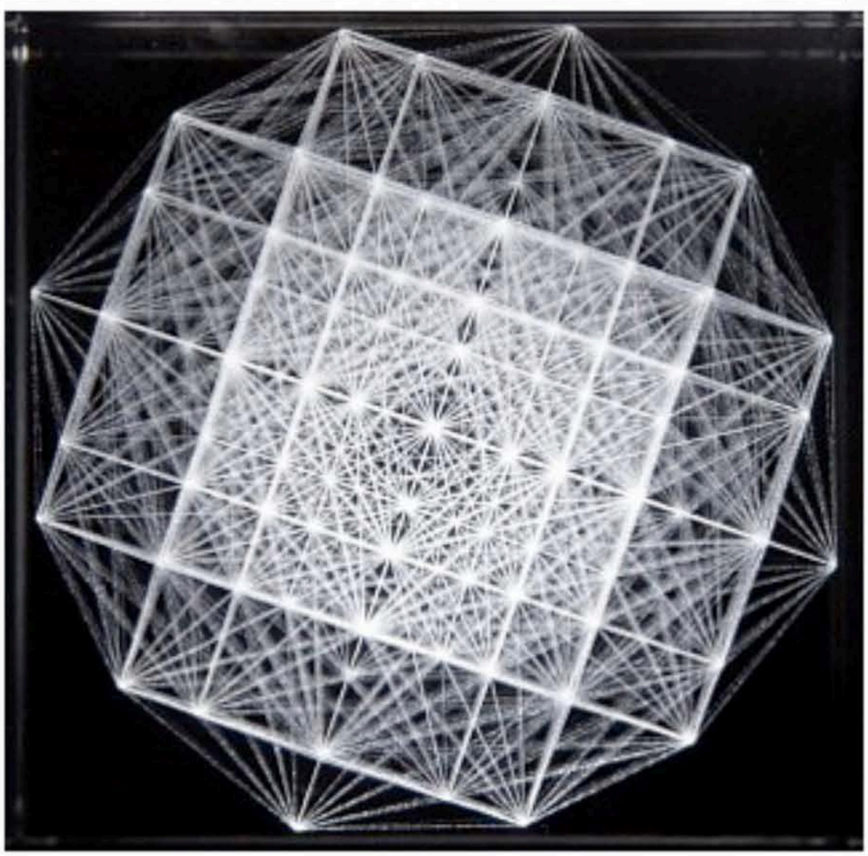
28 + 28 determine Gauge Boson Terms
for Gravity and the Standard Model

64s + 64c determine Dirac Fermion Terms
for
8 Components of 8 Particles
and
8 Components of 8 Antiparticles

A7+1 = Gl(8) determines 8-dim Spacetime 64v
and
A7 = Sl(8) determines 8-dim Volume
for
8-dim Spacetime Base Manifold
with 7 distinct E8 Lattice Structures.
Selecting One Particular E8 Lattice
effectively
Freezes Out a Quaternionic Subspace of E8 Spacetime
producing:
8-dim Kaluza-Klein M4xCP2
Second and Third Generation Fermions
Batakis Standard Model Gauge Groups
Mayer-Mechanism Higgs
3-Level Higgs-Tquark Condensate System

Here are two views of the 240 Root Vectors of E8:
(images from Bathsheba Grossman glass)





The Real Clifford Algebra 8-Periodicity factoring

				1
				16
				120
				560
				1820
				4368
				8008
				11440
1		1		12870
8		8		11440
28		28		8008
56		56		4368
70	x	70	=	1820
56		56		560
28		28		120
8		8		16
1		1		1

Cl(8) x Cl(8) = Cl(16)

gives the 16-dim D8 Vector of Cl(16) as 16 = 1x8 + 8x1
which is the sum of **two copies of the 8-dim D4 Vector of Cl(8) = RP1 x S7**
that is the 8-real dimensional Shilov Boundary
of the Type IV(8) Bounded Complex Domain
corresponding to the rank 2 Symmetric Space of Type BDI SO(10) / SO(8) x U(1)
which has 45-28-1 = 16 real dimensions (8 complex dimensions).

The Real Clifford Algebra 8-Periodicity factoring

				1
				16
				120
				560
				1820
				4368
				8008
				11440
1		1		12870
8		8		11440
28		28		8008
56		56		4368
70	x	70	=	1820
56		56		560
28		28		120
8		8		16
1		1		1
Cl(8)	x	Cl(8)	=	Cl(16)

gives the 120-dim Cl(16) grade-2 Bivectors as the sum of these tensor products:
Cl(8) grade-0 x Cl(8) grade-2 = 1 x 28 = 28
Cl(8) grade-1 x Cl(8) grade-1 = 8v x 8v = 64v
Cl(8) grade-2 x Cl(8) grade-0 = 28 x 1 = 28
so that **120-dim Cl(16) grade-2 Bivectors** = **28** + **64v** + **28**

The 120-dim D8 Spin(16) Bivector of Cl(16) is symmetry of the rank 2 Type BDI Symmetric Space SO(18) / SO(16) x U(1)
which has 153-120-1 = 32 real dimensions (16 complex dimensions)
and corresponds to the Type IV(16) 16-complex dim Bounded Complex Domain with 16-real dimensional Shilov Boundary RP1 x S15
RP1 x S15 = RP1 x S7 x S8 (due to Hopf Fibration S7 -> S15 -> S8)
RP1 x S15 = RP1 x S3 x S4 x S8 (due to Hopf Fibration S3 -> S7 -> S4)

The Real Clifford Algebra 8-Periodicity factoring, in terms of spinors,

Cl(8) x Cl(8) = Cl(16)

(16 = 8s+8c) x (16 = 8s+8c) = 256 = (8sx8s + 8cx8c) + (8sx8c + 8cx8s)
(8sx8s + 8cx8c) = 128 = 64s + 64c

gives 256-dim Cl(16) full spinors as the sum of these tensor products:
Cl(8) half-spinor 8s x Cl(8) half-spinor 8s
Cl(8) half-spinor 8s x Cl(8) half-spinor 8c
Cl(8) half-spinor 8c x Cl(8) half-spinor 8s
Cl(8) half-spinor 8c x Cl(8) half-spinor 8c
so the

128-dim Cl(16) half-spinor = 8s x 8s + 8c x 8c = 64s + 64c

E8 has triality transformations among 64v and 64s and 64c consistently inherited from Cl(8) Spin(8) D4 triality among 8v and 8s and 8c

By Contraction of E8 Cl(16) has a Maximal Nilpotent Heisenberg Algebra Structure:

David Finkelstein in a 2003 ZKM Karlsruhe presentation at
https://www.physics.gatech.edu/files/u9/publications/0006.pdf
said: "... We model the cosmos ... using a high-order Clifford algebra ...
algebra (or group) expansion ...[is]... a process that Segal discovered ...
To expand a Lie algebra or its group is to insert a small parameter p called the expansion parameter into the algebra multiplication table so that the algebra changes beyond isomorphism, no matter how small the parameter. ...
The expanded theory reduces to the unexpanded theory when the constant p goes to 0, **the process called contraction**. ...".

Rutwig Campoamor-Stursberg in Acta Physica Polonica B 41 (2010) 53-77 said:
"... We have classified all **contractions** of complex simple exceptional Lie algebras onto
semidirect products ... s + h_N ... of semisimple and Heisenberg algebras.
An analogous procedure holds for the real forms of the exceptional algebras ...
Contractions of E8 ... E8 contains D8 contains A7 ...[and for E8]... N = 92
... This reduction gives rise to the contraction ..."

248-dim E8 -> A7 + h_92 =

= A7 + (64s + 28 + 1 + 28 + 64c)

where
the Heisenberg algebra h_92 is made up of the central **1**
plus
a gauge boson commutator part 28 + 28
and
a fermion anti-commutator part 64s + 64c

Nilpotent Heisenberg Algebras:

Consider the h_92 Heisenberg part of H248 = SU(8) + h_92.

h_92 is a 92 + 1 + 92 = 185-dim algebra that is nilpotent
and describes
creation operators for 8px8cp = 64 fermion particle component states
and 8px8cp = 64 fermion antiparticle component states
(equivalent to creation and annihilation operators for fermion particles)
and
creation operators for 28 Gravity bosons and 28 Standard Model bosons
(equivalent, since bosons are their own antiparticles,
to creation operators for 16 Gravity + 12 Standard Model bosons
and annihilation operators for 16 Gravity + 12 Standard Model bosons)

Physical interpretation of SU(8):
Real Boundary Lagrangian E8 has graded structure

8s + 28 + 56 + 64 + 56 + 28 + 8c

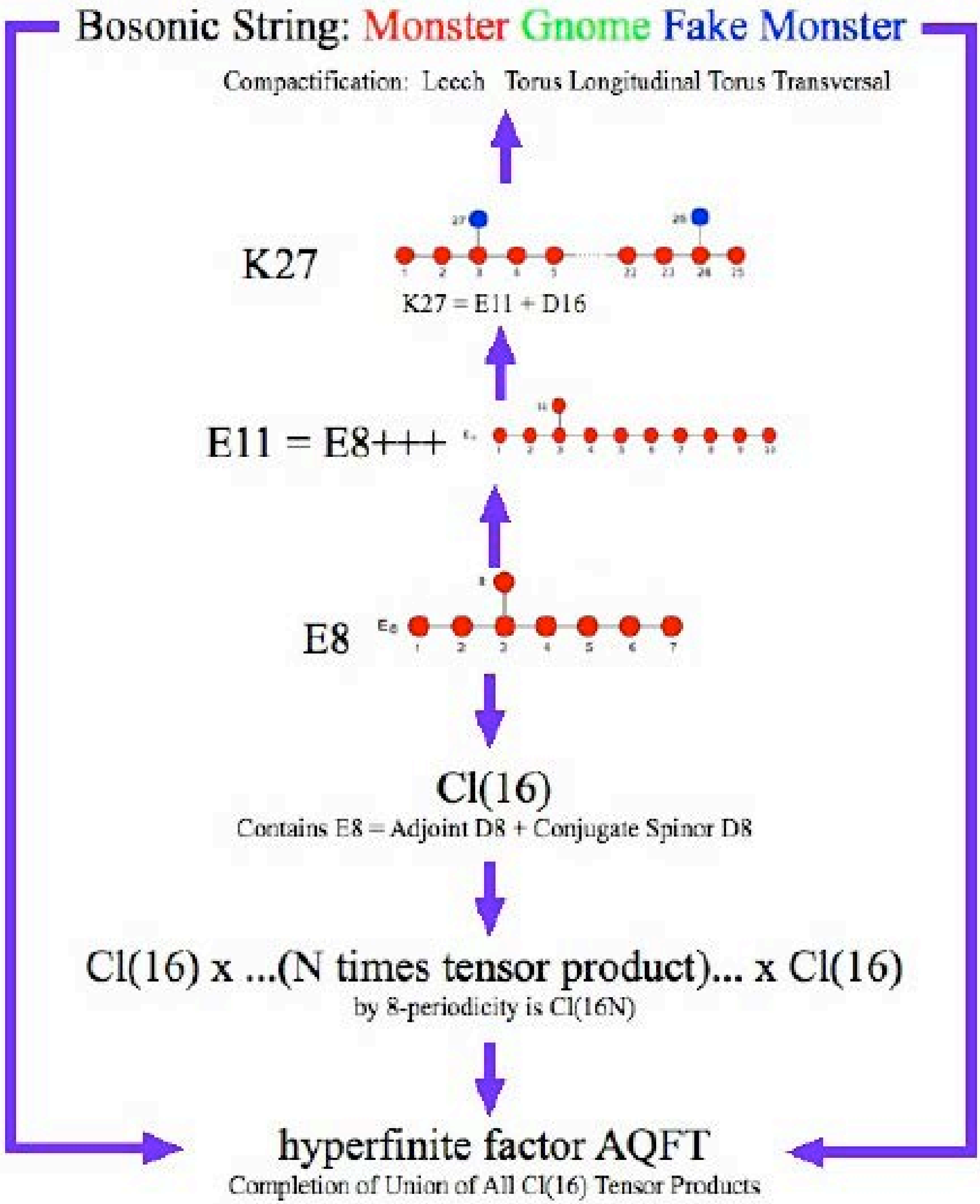
in which 8s and 8c are half-spinor representations of D4 = Spin(8).
Cl(8) Clifford Algebra has graded structure

1 + 8v + 28 + 56 + (70 = 8s + 6 + 48 + 8c) + 56 + 28 + 8v* + 1

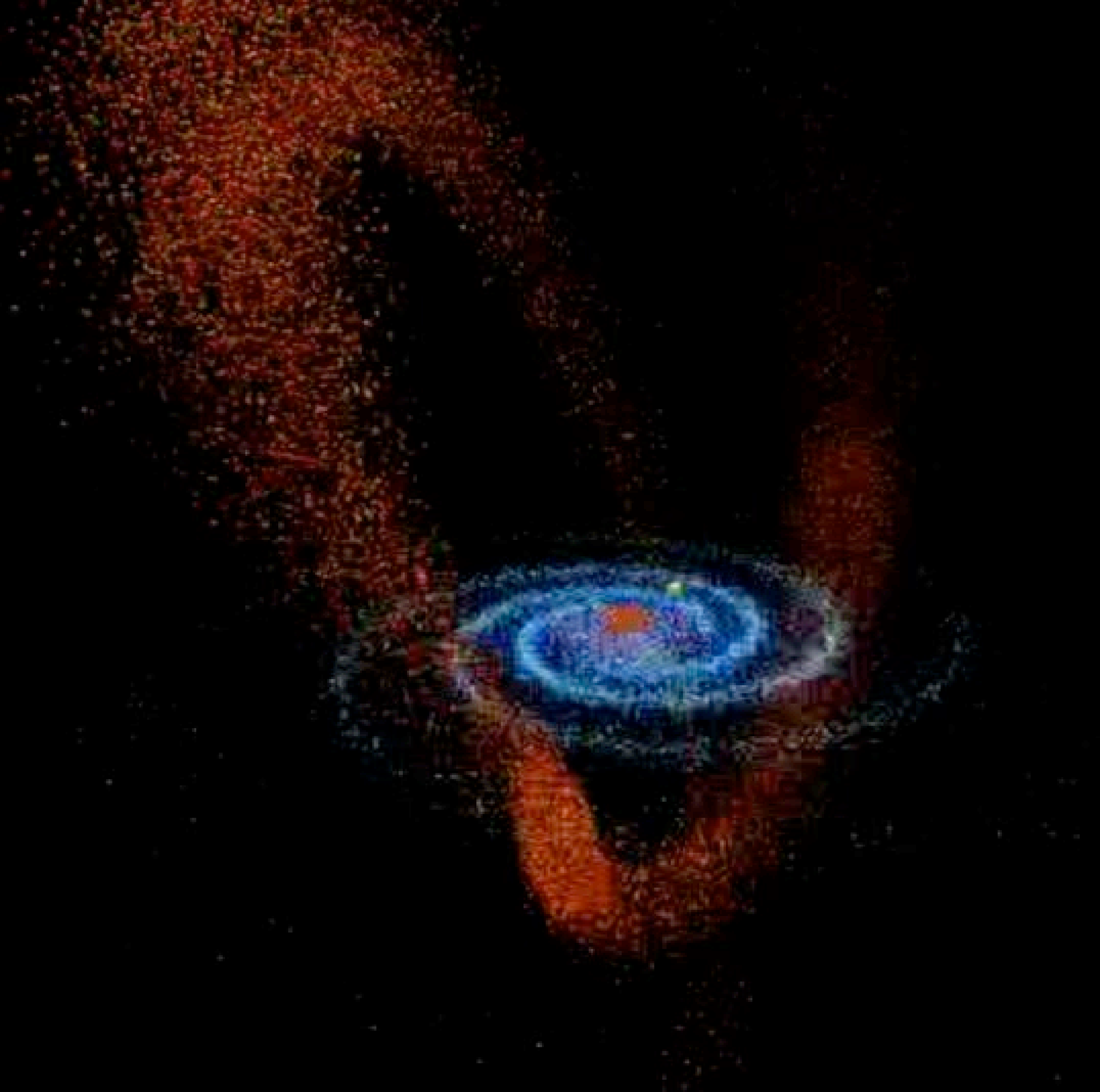
in which 8v is the D4 = Spin(8) vector position representation of 8-dim spacetime
and 8v* is the is the dual momentum representation of 8-dim spacetime.
By D4 = Spin(8) Triality and Position-Momentum Duality the four
entities 8s , 8c , 8v , 8v* are all isomorphic and effectively interchangeable,
so that E8 effectively lives inside Cl(8) and
the 8v and 8v* of Cl(8) can represent E8 8-dim position and 8-dim momentum.
The exterior algebra underlying the Cl(8) Clifford Algebra has graded structure

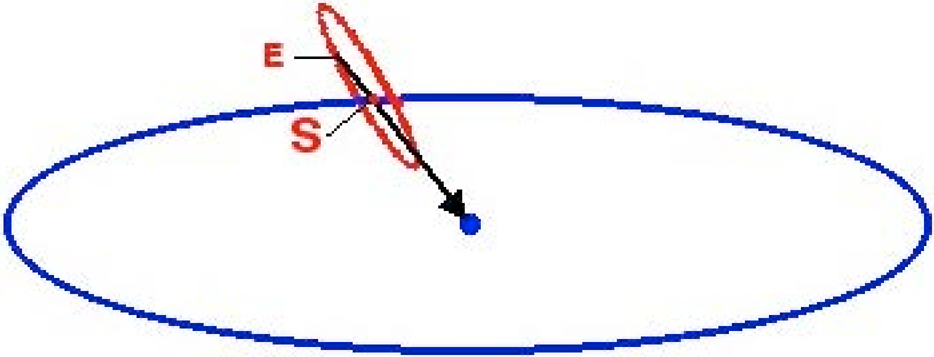
1 + 8v + 28 + 56 + 70 + 56 + 28 + 8v* + 1

so that 64-dim U(8) = SU(8) x U(1) represents the tensor product 8v x 8v*
and 63-dim SU(8) represents 8-dim spacetime position and momentum
combinations that have unit determinant.


Bosonic String: Monster Gnome Fake Monster
Compactification: Leech Torus Longitudinal Torus Transversal
K27
K27 = E11 + D16
E11 = E8+++
E8
Cl(16)
Contains E8 = Adjoint D8 + Conjugate Spinor D8
Cl(16) x ...(N times tensor product)... x Cl(16)
by 8-periodicity is Cl(16N)
hyperfinite factor AQFT
Completion of Union of All Cl(16) Tensor Products

Saturn
Jupiter
Nov
May
Venus
Mercury
Moon
Pluto
Sun
Uranus
Mar
Jan
Mars
Neptune




E
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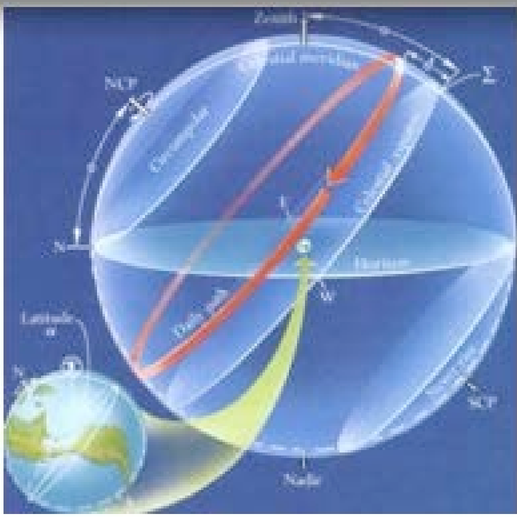
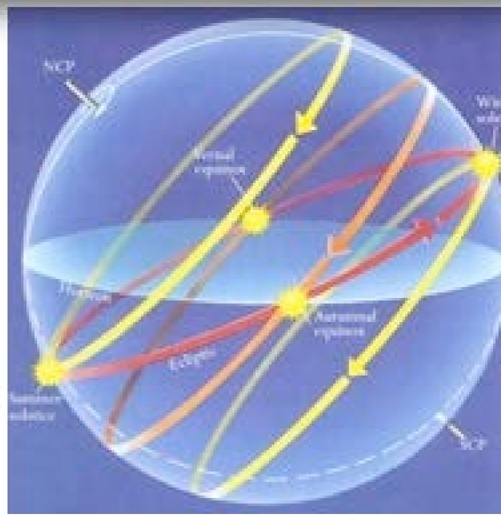
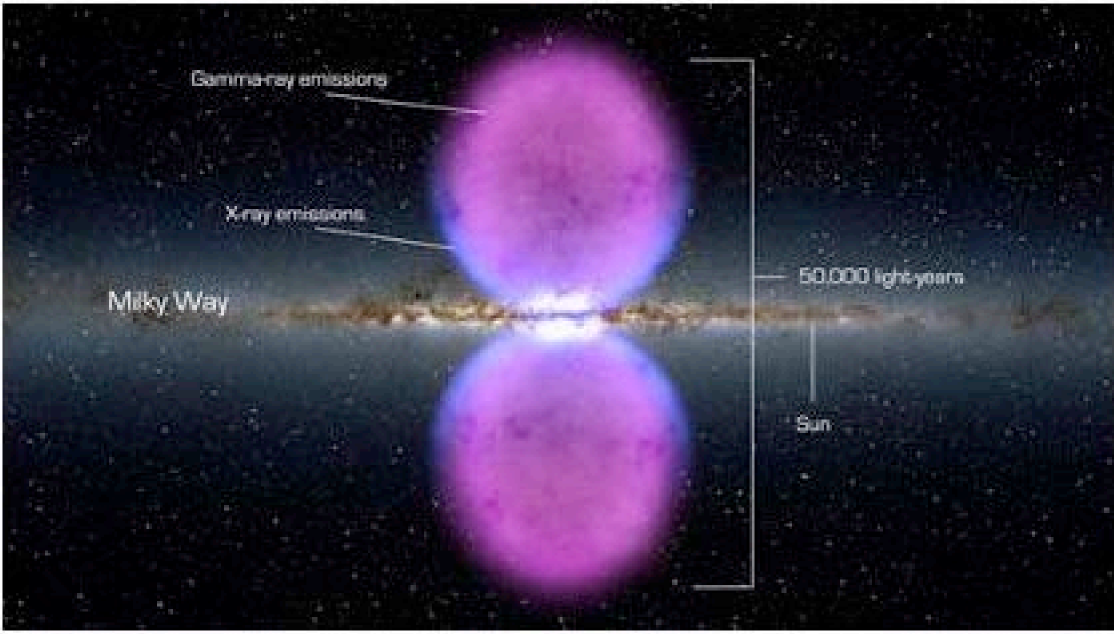
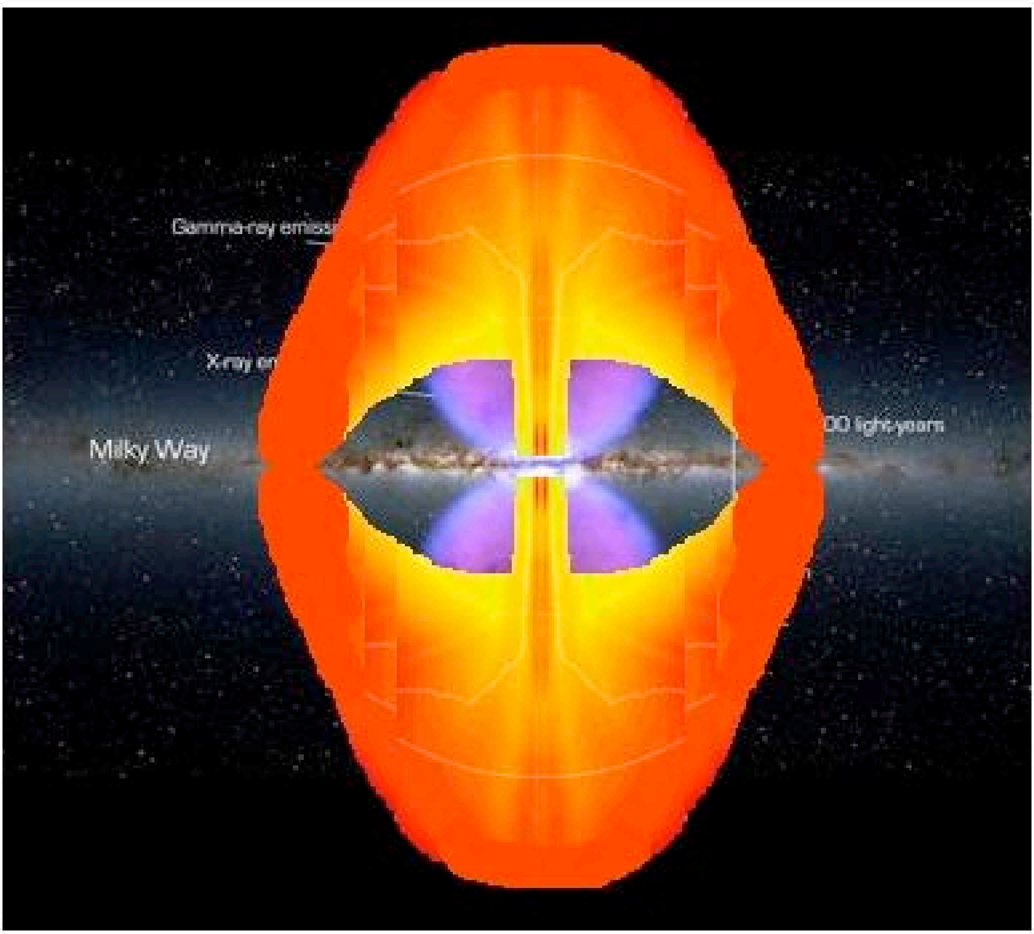

Zenith
NCP
N
Horizon
W
SCP
Nadir

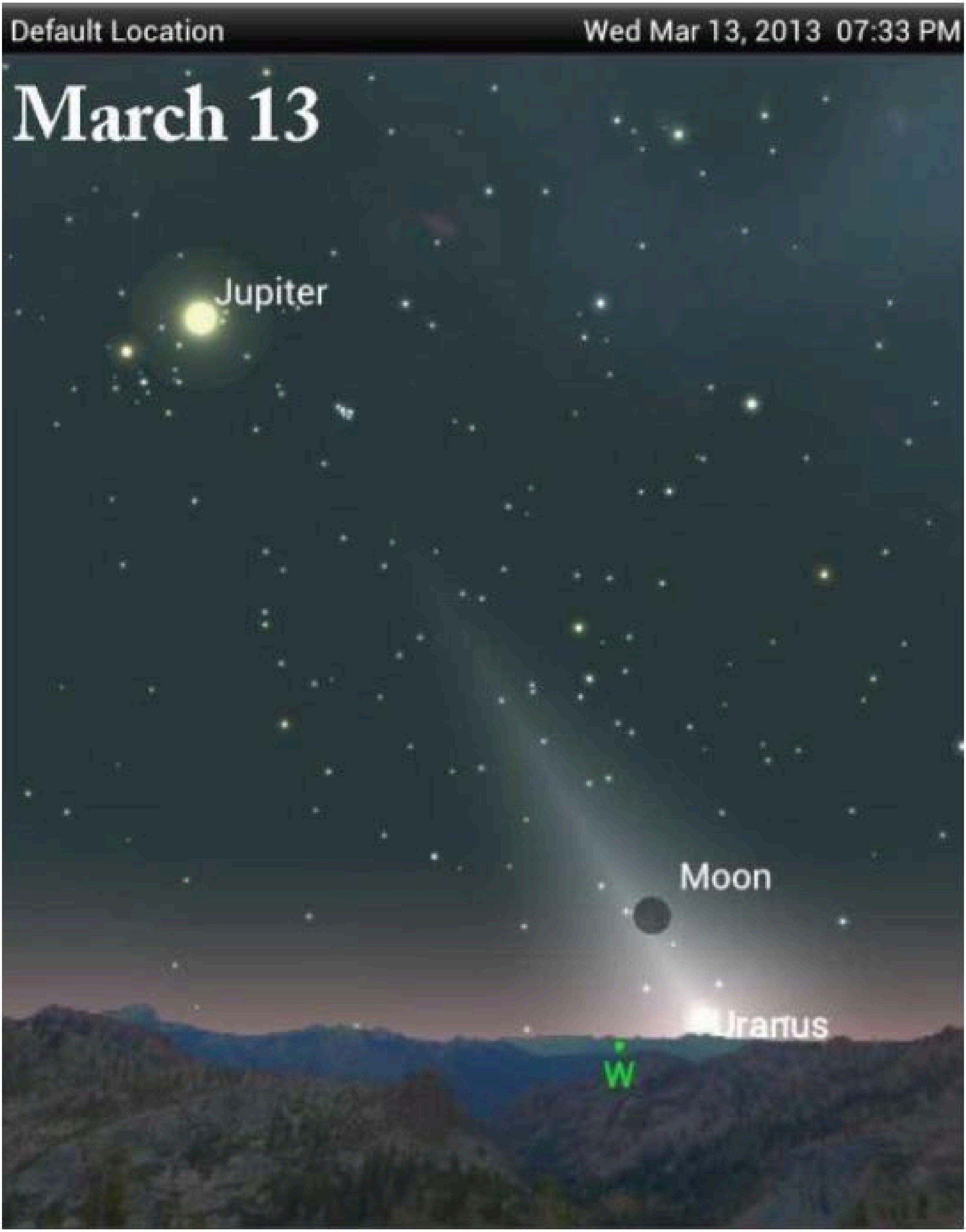

NCP
Autumnal equinox
SCP



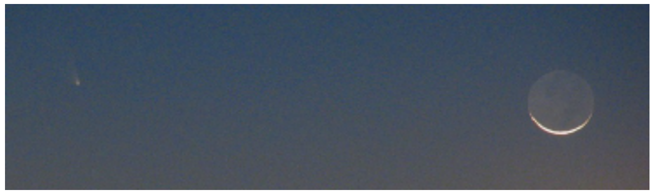
Gamma-ray emissions
X-ray emissions
Milky Way
50,000 light-years
Sun



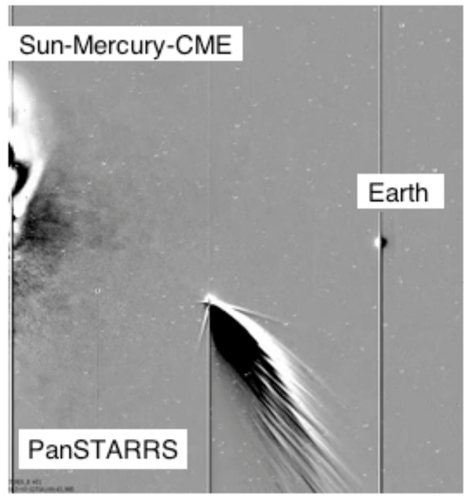
Milky Way


Default Location
Wed Mar 13, 2013 07:33 PM
March 13
Jupiter
Moon
W

Now that March 2013 is here, it is clear that Comet PANSTARRS is much less impressive than Comet Hale Bopp



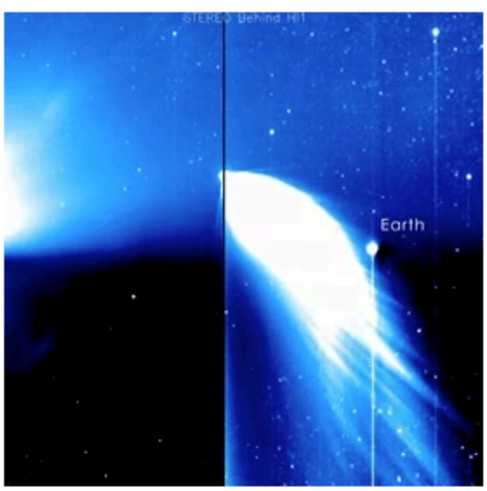
as seen from Earth as in this 13 March 2013 California image from Kronk Cometography in which the Comet is a faint dot far to the left of the Crescent Moon. However, an image from a NASA STEREO video during 9-12 March 2013

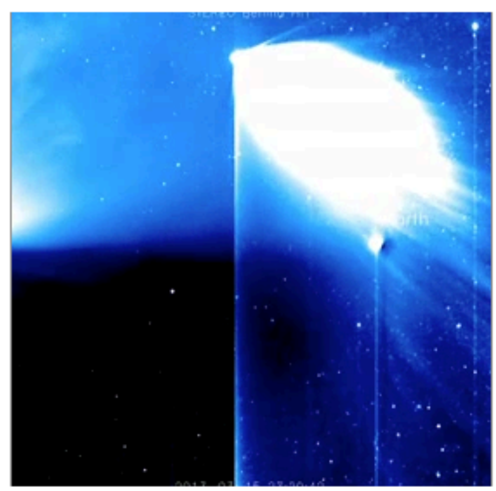


NASA STEREO-8 on 9-12 March 2013
(Solar TErrestrial RElations Observatory)

shows a Solar CME, Mercury, Comet PanSTARRS, and Earth to form an interesting system. NASA says:
"... the tail looks quite complex and it will take computer models to ... understand ... what's happening ...".

Here are NASA STEREO images during 10-15 March 2013





as to which NASA says "... While it appears from STEREO's point of view that the CME passes right by the comet, the two are not lying in the same plane ... the comet's tail didn't move or change in response to the CME's passage ...".