Frank D. (Tony) Smith, Jr., Cartersville, GA USA, 9 November 2003

VoDou and Physics

VoDou = IFA divination begins with a binary choice:

To form a string of binary 1s and 0s,

let  = 1 and  = 0.

VoDou = IFA divination is based on 8 binary choices.

One way of divining is to cast a chain (Opele Chain) of 8 two-sided things, such as cowries or palm nuts. Here, I illustrate with a chain of 8 coins:

There are

2 x 2 x 2 x 2 x 2 x 2 x 2 x 2

= 2^8 = 256 possible outcomes

There is only 1 outcome with no 1s (all 0s):

There are 8 different outcomes with exactly one 1:  The 8 are, explicitly:

There are 28 different outcomes with exactly two 1s:

There are 56 different outcomes with exactly three 1s:

There are 70 different outcomes with exactly four 1s:

There are 56 different outcomes with exactly five 1s:

There are 28 different outcomes with exactly six 1s:

There are 8 different outcomes with exactly seven 1s:

There only one outcome with all eight 1s:

If we call the number of 1s in a given outcome the grade of that outcome,

then we can organize the 2^8 = 256 outcomes by grade from 0 to 8:

$$1 + 8 + 28 + 56 + 70 + 56 + 28 + 8 + 1 = 256 = 2^8$$

The Opele Chain Casting method of divining describes the graded structure of the 256 = 2^8 outcomes.

There is also an alternate method of VoDou and IFA divination.

It is equivalent to dividing the 8-element Opele Chain

into two 4-element halves:

and then casting each 4-element half separately,

so that each outcome is a pair of 4 binary choices.

Since 4 binary choices have 2^4 = 16 possible outcomes,

a pair of 4 binary choices has 16 x 16 = 256 possible outcomes,

which are the same 256 outcomes obtained by casting the whole 8-element Opele Chain.

Each of the 16 possible outcomes of 4 binary choiceds can be represented by Tetragrams. Here is a traditional Yoruba sequence of Tetragrams, with o representing the binary choice 0 and oo representing the binary choice 1:

1	2	3	4
o	oo	oo	o
o	oo	o	oo
o	oo	o	oo
o	oo	oo	o

5	6	7	8
o	oo	o	oo
o	oo	oo	oo
oo	o	oo	oo
oo	o	oo	o

9	10	11	12
o	oo	oo	oo
o	o	o	oo
o	o	oo	o
oo	o	oo	oo

13	14	15	16
o	o	o	oo
oo	o	oo	o
o	oo	o	oo
o	o	oo	o

The 16 Tetragrams can also be arranged in a binary number sequence

0	1	2	3	4	5	6	7
o	o	o	o	o	o	o	o
o	o	o	o	oo	oo	oo	oo
o	o	oo	oo	o	o	oo	oo
o	oo	o	oo	o	oo	o	oo

X

8	9	10	11	12	13	14	15
oo	oo	oo	oo	oo	oo	oo	oo
o	o	o	o	oo	oo	oo	oo
o	o	oo	oo	o	o	oo	oo
o	oo	o	oo	o	oo	o	oo

in which the first line of 8 Tetragrams (0-7) is the Mirror Image of the second line (15-8) under a reflection through the central point X that changes o to oo and oo to o.

The Tetragram method of divining describes the 256 = 16 x 16 outcomes in terms of 16 sets of 16 outcomes.

The 16 = 8 + 8 sets can be seen as two groups of 8 sets, with one group of 8 (call it <8) being a Mirror Image of the other (call it 8>).

Therefore,

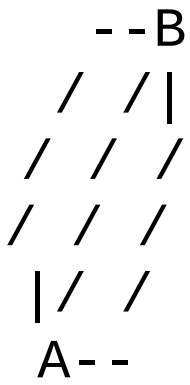
VoDou = AFA, through the Opele Chain Casting and Tetragram methods of divining, give this structure to the fundamental 256 outcomes:

$$1 + 8 + 28 + 56 + 70 + 56 + 28 + 8 + 1 = (<8 + 8>) \times 16$$

How can this structure be used to make a Physics model?

In order to make a model of Fundamental Particle Physics, you must describe the basic action by which

a Fundamental Particle moves from an Origin point A in SpaceTime to a Destination point B in SpaceTime.



As John Gribbin and Mary Gribbin say in their book Richard Feynman, A Life In Science (Dutton, Penguin, 1997, at pages 85-87):

"... A line ...[from A to B]... represents the history of a particle as it .... move[s] from A to B ... The insight Feynman had, while lying in bed one night,unable to sleep, was that

you had to consider every possible way in which a particle could go from A to B - every possible 'history'.

...[A Particle going]... from A to B is conceived as ... a sum ... of ... all of the possible paths that connect ... A to B ...

[Three of the possible paths are shown in the diagram above] ... For each possible way that a particle can go from one point to another in spacetime there is ...[an]...

amplitude ...[which]... has two parts, which can be thought of in terms of little arrows. An arrow has a certain length, and it points in a certain direction. ...".

As Richard Feynman says in his book QED: The Strange Theory of Light and Matter (Princeton, 1988, at pages 82-83, 91, 129):

"... an event [such as going from A to B] can be divided into alternative ways [paths] ...

each way [path] can be divided into successive steps ... the arrows for each step can be "multiplied" by successive shrinks and turns ...[to get an arrow for each alternative way]...

the arrow[s] for each [alternative] way can be "added" ... to obtain a final arrow, whose square is the probability of an observed physical event [such as going from A to B]...

...[another] basic action is:

[a particle] ... emits or absorbs ...[another particle]...

the amplitude ... to emit or absorb a ...[particle]...[is]... just a number ...[that describes the Strengths of Forces in Physics]...

... the amplitude for a real electron to emit or absorb a real photon ... has been a mystery ever since it was discovered, and all good theoretical physicists put this number up on their wall and worry about it. ... It's one of the greatest damn mysteries of physics ...

... There is no theory that adequately explains ... the observed masses of the particles ... We use the numbers in all our theories, but we don't understand them - what they are or where they come from. I believe that from a fundamental point of view, this is a very interesting and serious problem. ...".

The VoDou = IFA model of Fundamental Particle Physics

solves the mystery of the amplitudes for particles to emit or absorb other particles, which give Force Strengths,

and also

solves the problem of Particle Masses.

Since the answers to the mystery of Force Strengths and the problem of Particle Masses are numbers, we must see how

the VoDou = IFA structures correspond to the mathematical structures of Feynman's amplitude arrows.

What are the mathematical structures of Feynman's amplitude arrows?

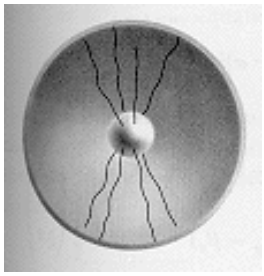
We need a **SpaceTime** so that Particles can move from point A to point B. In the simplest Standard Model and Gravity, **large-scale SpaceTime is 4-dimensional**.

We see that it might be useful to divide Particles into classes, based on how they are affected by rotating them around in SpaceTime:

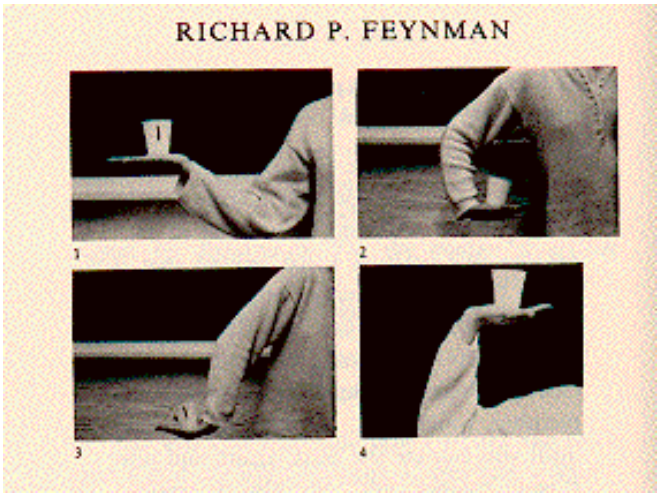
The simplest type of Particle is just a point, with no internal sense of direction in or connection to SpaceTime. It is called a **Scalar Particle**, or spin-0 particle. Particle physicists call it a **Higgs Scalar**. In the simplest Standard Model, there is **one Higgs scalar**;

Another type of Particle has an internal sense of direction in SpaceTime, so that if it is rotated one full turn of 360 degrees about an internal axis, it is back to how it was oriented when it started out. Since such Particles act like vectors in that a 360 degree rotation gets them back to where they started, they are called **Vector Particles**, or spin-1 particles. Particle physicists call them **Gauge Bosons**. In the simplest Standard Model of the electromagnetic, weak, and color forces, there are 12 Gauge Bosons. In the Conformal Group that produces Gravity by a generalized MacDowell-Mansouri mechanism, there are 16 Gauge Bosons. Therefore, **for the simplest Standard Model plus Gravity, there are 12+16 = 28 Gauge Bosons**;

A third type of Particle not only has an internal sense of direction, but also has a sense of how it is connected to the SpaceTime in which it lives. Louis H. Kauffman, in his book Knots and Physics (World Scientific Publishing Co. 1991), says that such a particle is like a ball attached to its surroundings by string, as in this picture from Gravitation, by Misner, Thorne, and Wheeler (Freeman 1972):



The orientation of the ball is related to the surrounding sphere by the tangle of the strings connecting them. If you rotate the ball 360 degrees, the strings are tangled, but if you go to 720 degrees, the strings get untangled. Here is a demonstration of how the 720 degree rotation works:



It is from Feynman's 1986 Dirac Memorial Lecture (Elementary Particles and the Laws of Physics, Cambridge Press 1987), and it shows a cup held by a dancer in one hand. Rotating the cup by 360 degrees gets the arm (which is connected to the shoulder of the dancer) twisted, but turning the cup another 360 degrees gets the arm back straight. In it, picture 1 is the start, picture 2 is 180 degrees, picture 3 is 360 degrees (note how the arm is twisted), picture 4 is 540 degrees, and picture 1 again is 720 degrees. - Such particles that have to be rotated twice to get back to where they started are called **Spinor Particles**, or spin-1/2 particles.

As Richard Feynman says in his article The Reason for AntiParticles (in the book Elementary Particles and the Laws of Physics, the 1986 Dirac Memorial Lectures, Cambridge, 1987, page10): for Spinor Particles "... there must be antiparticles ...[which look like]... particle[s] moving backwards in time ...". In other words, for each **Spinor Particle there must exist a Mirror Image Spinor AntiParticle** that looks like the original one moving backward in time. Particle physicists call them **Fermion Particles and Fermion AntiParticles**. In the simplest Standard Model, there are 3 sets of 8 Fermion Particles and 8 Fermion AntiParticles. Each of the 3 sets is called a generation, so that there are **8 first-generation Fermion Particles and 8 first-generation Fermion AntiParticles**.

In the VoDou = IFA structure of the fundamental 256 outcomes:

$$1 + 8 + 28 + 56 + 70 + 56 + 28 + 8 + 1 = (<8 + 8>) \times 16$$

8 corresponds to a 4+4 = 8-dimensional SpaceTime

1 corresponds to one Higgs Scalar

28 corresponds to 12+16 = 28 Gauge Bosons

<8 corresponds to 8 first-generation Fermion Particles

8> corresponds to 8 first-generation Fermion AntiParticles

At first glance, it looks like the VoDou = IFA structure matches the structure of particle physics, with two exceptions:

- a 4+4 = 8-dimensional SpaceTime and
- only the first generation of Fermion Particles and AntiParticles.

However, if the 8 SpaceTime dimensions are broken down into

- 4 dimensions that we see as the large-scale Physical SpaceTime of particle physics, plus
- a small 4-dimensional ball (called a CP2 space, or Internal Symmetry Space) at each point of the large-scale 4-dimensional spacetime

we can also see where the second and third generations of Fermion Particles and AntiParticles come from:

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If you reduce the original 8-dimensional spacetime
into 4-dimensional physical spacetime
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and 4-dimensional Internal Symmetry Space
then
if you look in the original 8-dimensional spacetime
at a fermion (First-generation represented by a single octonion)
propagating from one vertex to another
there are only 4 possibilities for the same propagation
after dimensional reduction:

1

The origin o and target x vertices are both
in the 4-dimensional large-scale physical spacetime

4-dim Internal Symmetry Space   --------------

4-dim Physical SpaceTime   ---o------x---

in which case the propagation is unchanged, and the
fermion remains a FIRST generation fermion.

2

The origin vertex o is in the large-scale physical spacetime
and the target vertex * in in the Internal Symmetry Space

4-dim Internal Symmetry Space   ----------*---

4-dim Physical SpaceTime   ---o----------

in which case there must be a new link from
the original target vertex * in the Internal Symmetry Space
to a new target vertex x in the large-scale physical spacetime

4-dim Internal Symmetry Space   ----------*---

4-dim Physical SpaceTime   ---o------x---

and a new vertex can be introduced at the original
target vertex in connection with the new link
so that the fermion can be regarded as a SECOND generation fermion.

3

The target vertex x is in the large-scale physical spacetime
and the origin vertex o in in the Internal Symmetry Space

4-dim Internal Symmetry Space   ---o----------

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4-dim Physical SpaceTime        ----------x---

in which case there must be a new link to
the original origin vertex o in the Internal Symmetry Space
from a new origin vertex * in the large-scale physical spacetime

4-dim Internal Symmetry Space   ---o----------


4-dim Physical SpaceTime        ---O------x---

so that a new vertex can be introduced at the new
origin vertex O in connection with the new link
so that the fermion can, as in case 2, be regarded as a SECOND generation fermion.
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4

Both the origin vertex o and the target vertex *
are in the Internal Symmetry Space,

4-dim Internal Symmetry Space   ---o------*---


4-dim Physical SpaceTime        --------------

in which case there must be a new link to
the original origin vertex o in the Internal Symmetry Space
from a new origin vertex O in the large-scale physical spacetime,
and a second new link from the original target vertex *
in the Internal Symmetry Space to a new target vertex x
in the associative spacetime

4-dim Internal Symmetry Space   ---o------*---


4-dim Physical SpaceTime        ---O------x---

so that a new vertex can be introduced at the new
origin vertex O in connection with the first new link,
and another new verterx can be introduced at the original
target vertex * in connection with the second new link,
so that the fermion can be regarded as a THIRD generation fermion.
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As there are no more possibilities, there are no more generations.
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Therefore the VoDou = IFA Structure of the fundamental 256 outcomes

$$1 + 8 + 28 + 56 + 70 + 56 + 28 + 8 + 1 = (<8 + 8>) \times 16$$

8 corresponds to a 4+4 = 8-dimensional SpaceTime

1 corresponds to one Higgs Scalar

28 corresponds to 1+3+8 + 16 = 28 Gauge Bosons

<8 corresponds to 8 first-generation Fermion Particles

8> corresponds to 8 first-generation Fermion AntiParticles

after breaking the 8-dimensional SpaceTime into 4 Large-Scale Physical SpaceTime dimensions plus 4 Internal Symmetry Space dimensions, with the consequent production of second and third generation Fermion Particles and AntiParticles, contains a representation of the simplest Standard Model plus Gravity.

So, given the correspondence between VoDou = IFA Structure and the Physics Structures of the simplest Standard Model plus Gravity,

how do we set up to calculate the numbers for the Amplitudes for Emission and Absorption of Particles (which are equivalent to Force Strengths and Charges) and the Masses of Particles ?

The mathematical structure used in such a calculation is called a **Lagrangian**, and it is of the form

$$\int_{8} (1 + 28 + \langle 8,8 \rangle)$$

where

- the 1 is a term involving the Higgs Scalar;
- the 28 is a term involving the Gauge Bosons;
- the <8,8> is a term involving the Fermion Particles and AntiParticles; and
- the INT over 8 means to sum (or integrate) the Higgs Scalar, Gauge Boson, and Fermion terms over the relevant region of SpaceTime.

The numerical structure form of the VoDou = IFA Structure comes from the correpondence of the fundamental 256 outcomes

$$1 + 8 + 28 + 56 + 70 + 56 + 28 + 8 + 1 = (\langle 8 + 8 \rangle) \times 16$$

with the Graded Structure and Spinor Structures of the 256-dimensional Cl(8) Clifford Algebra of 16x16 real matrices M(16,R):

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The black-colored 56 + 70 + 56 + 28 + 8 + 1 and 16 also have physical interpretations, some of which are related to the duality between position and momentum that is related to the Heisenberg Uncertainty Principle of Quantum Theory. Those interpretations are:

- The 16, which breaks down into 8 + 8, correspond to
  - a set of 8 matrices (called Dirac gamma matrices) that describe how Spinor Particles move in SpaceTime from the point of view of position in SpaceTime, and
  - another set of 8 matrices (also called Dirac gamma matrices) that describe how Spinor Particles move in SpaceTime from the point of view of momentum in SpaceTime.
- The 56 (corresponding to outcomes with three 1s) is fixed and not dynamically active after 8-dimensional SpaceTime is broken into 4-dimensional Physical Spacetime and 4-dimensional Internal Symmetry Space. At very high energies where the 8-dimensional SpaceTime is not broken, there may be some phenomena related to the 56, but such high energies (possibly Planck-level) are currently beyond the reach of human experiments and observations, such as some subtle phenomena related to Interactions among the World-Lines of Possible Histories in the Quantum Many-Worlds. Such Interactions can be described in terms of an M-theory with global symmetry of the exceptional Lie algebra E7, whose 56-dimensional representation corresponds to the 56.
- The 70 (corresponding to outcomes with four 1s) breaks down into 35 + 35. One 35 is fixed and not dynamically active after 8-dimensional SpaceTime is broken into 4-dimensional Physical Spacetime and 4-dimensional Internal Symmetry Space. At very high energies where the 8-dimensional SpaceTime is not broken, there may be some phenomena related to that 35, but such high energies (possibly Planck-level) are currently beyond the reach of human experiments and observations, such as some subtle phenomena related to the Higgs Scalar.
- The other 35 and the 56 + 28 + 8 + 1 are dual to the 1 + 8 + 28 + 56 and the first 35, and describe in terms of momentum the same physical phenomena that the 1 + 8 + 28 + 56 and the first 35 describe in terms of position.

Taken together, the 56 and 70 correspond to the 126 root vectors of the exceptional Lie algebra E7 that is the global symmetry group of an M-theory describing Interactions among the World-Lines of Possible Histories in the Quantum

Many-Worlds.

All 256 VoDou = IFA outcomes are closely related to the 240 root vectors of the exceptional Lie algebra E8 that is the global symmetry group of an F-theory describing Interactions among the World-Lines of Possible Histories in the Quantum Many-Worlds.

Of course, our Universe and its Quantum Many-Worlds is very big and one set of 256 VoDou = IFA outcomes, that is, one copy of the 256-dimensional Cl(8) Clifford algebra, describes only one small part, or one Event. To describe such very big things, you need a very big Clifford algebra, say Cl(8N) where N can be as large a number as you want. What makes VoDou = IFA effective for such very big things is the fact that any very big Clifford algebra Cl(8N) can be factored into N copies of the basic 256-element VoDou = IFA Cl(8) Clifford algebra:

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

Therefore,

our entire Universe and its Quantum Many-Worlds can be described completely in terms of the 256 VoDou = IFA outcomes.

Further,

the VoDou = IFA model can be used to describe Quantum Consciousness, not only on the level of Human Consciousness, but also of our entire Universe, and to give us a framework within which to consider our Future History and our possible Fates.

Details of calculations of Force Strengths and Particle Masses, including comparison with experimental results and further related math and physics structures, are contained in a paper that can be found at these links:

- local html
- local pdf
- web html
- web pdf

It is clear that the VoDou Physics Model meets Einstein's Criterion for a good fundamental physics model, as it is a structure which is based only upon

"... a faith in the simplicity, i.e., intelligibility, of nature: there are no arbitrary constants ... that

is to say, nature is so constituted that it is possible logically to lay down such strongly determined laws that within these laws only rationally completely determined constants occur (not constants, therefore, whose numerical value could be changed without destroying the theory). ...".

Tony Smith's Home Page

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