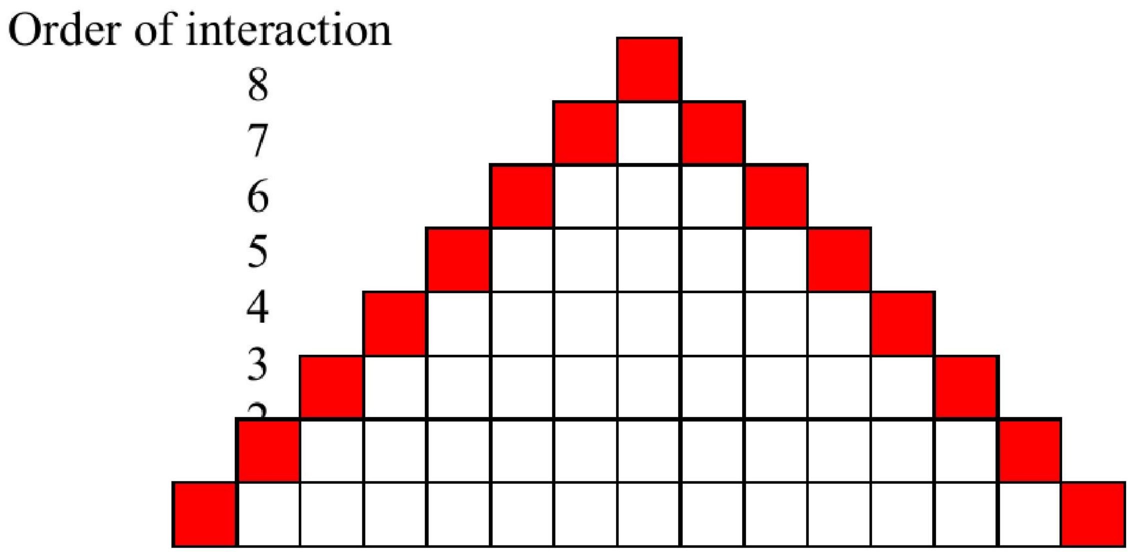
The Combinatorial Process and Pascal's Triangle Or Mount Meru



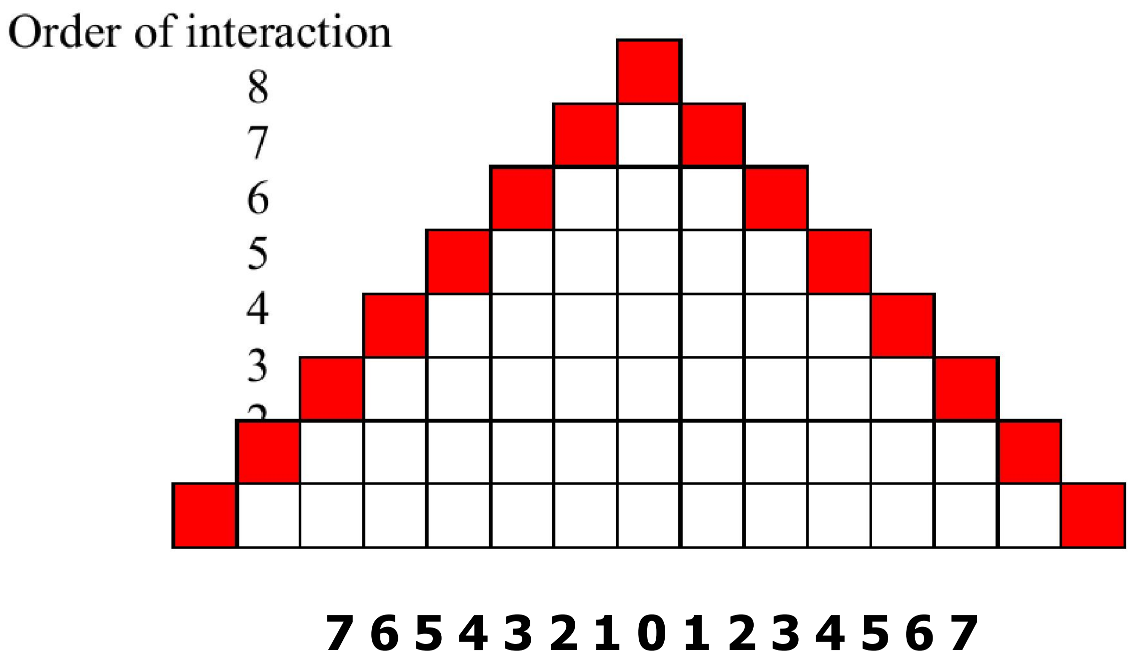
By John Frederick Sweeney

Abstract

In Vedic Physics, the combinatorial process by which counts are counted closely resembles the binomial triangle, or Pascal's Triangle, which was known to Ancient India and China as Mount Meru or Hui Zhang's triangle. This is not accidental, but instead reflects the numerical structure of the universe, as the pattern repeats itself in many types of numbers. Previous papers have discussed details of the counts; this paper focuses on the triangular relationships between numbers, especially those noted by Tony "Frank" Smith.

Table of Contents

Incremental States By Combinatorial Process



The following originated in a book about Vedic Physics; given the poorly written style of the book, this author has re-written and redacted the original for ease of presentation, comprehension and understanding. We hope that the original author's meaning rings clearly here.

In an odd count interaction, the only possible way of synchronizing is by combining with the next increment count rate, which provides the above sequence of numbers, from previous to present, and can be expressed as a formula where n = previous number.

Spread of Interaction

The cycle has 10 counts, and in 8 cycles, 80 counts reside in the same location, if there is no net displacement. The 70 counts occupy adjacent levels and indicate the super-positioning level.

The 70 counts are to be accounted for because the 8th is the original state and can never get lost. If the displacement is equal on both sides then the domain of activity remains centered, or else it moves by the net difference in the direction of retarded activity level.

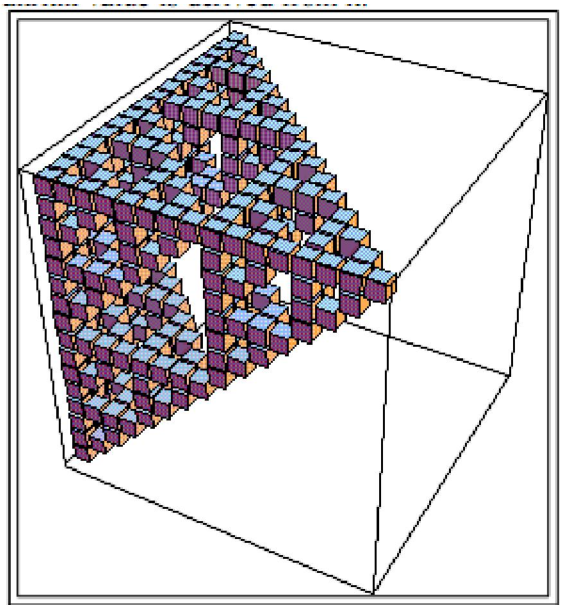
The observed spectrum of seven colours in light created by an accelerated photon, or the seven sound frequencies created by an impact in air are the consequences of the above explanation.

The substratum is in constant dynamic , self-similar interaction, but light is produced only when it is a colliding, accelerative or unbalanced interaction. Had it been otherwise, light would have been spontaneously emitted from the substratum.

The components of the substratum oscillate continuously at a rate of 296500000 interactions in a cycle but reacts only if there is imbalance. Similarly, the field of air molecules vibrate at the same proportionate self similar rate, but at a rate of 256 interactions for a unitary cycle .

The statement that there are so many interactions in a cycle means that not a single interaction is of the same value during that cycle. In light and in sound and in every spherical harmonic oscillator there exist seven incremental levels of changing values which repeat themselves. This situation is true only if the field functions remain in the normal SWABHAVA state of freedom from external influences.

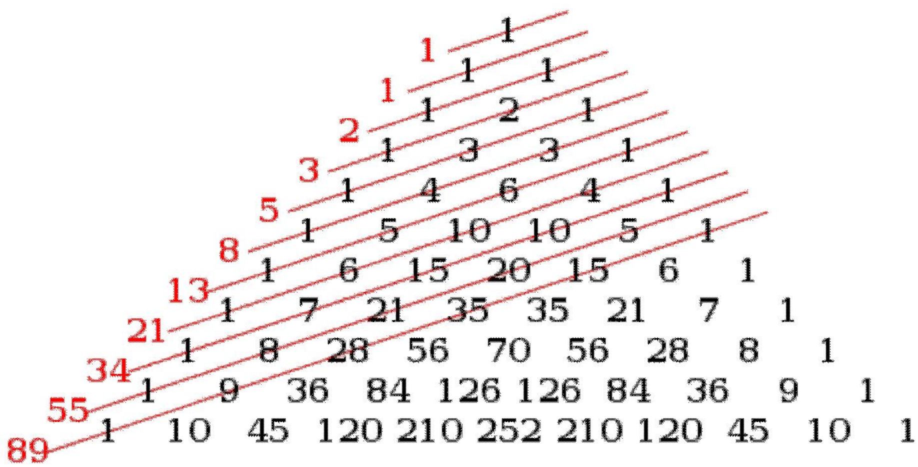
This concept of the binomial triangle is repeated within the same book:



The internal cycle is maintained by superposing according to the x series. The internal division can be extended to any level and the coefficients in this series, similar to those in the binomial theorem**, forms a Pascal triangle.**

The Golden Ratio

The original author fails to mention in these two passages that the Golden Ratio runs through these triangles, in the form of the Fibonacci Numbers. As is well known about the Binomial Triangle, the Fibonacci Numbers are directly related, and can be calculated horizontally as shown in the diagram:



We see that the Golden Ratio runs throughout the universe, and especially in the Qi Men Dun Jia Model, as shown in this series of papers. The Golden Ratio is thus present from the initial transformation of matter from the invisible substratum to manifestation in the Satwa and Raja states.

Tony Smith Website

Tony Smith has completed an extensive amount of work in demonstrating the widescale presence of the binomial triangle throughout mathematics. We re-publish some of the material from Tony's extensive website to emphasize the similar characteristics between the combinatorial triangle above and some of the many examples Tony has presented, which include Clifford Algebras and Octonions:

Halayudha was a Jaina mathematician (ca. 300-200 BC)
credited by John McLeish, author of The Story of Numbers,
published by Fawcett Columbine in 1991,
with discovering the Binomial Triangle
that is often called the Yang Hui triangle or Pascal's triangle.

Ernest G. McClain, author of The Myth of Invariance,
published by Nicolas-Hays in 1976,
says that Halayudha was actually only explaining what Pingala
had said about 200 BC, that the mathematical Binomial Triangle
represented Mount Meru, or Meru Prastara, the Holy Mountain,
and could be used to describe the number of forms
of long or short syllables that can be formed
from a given number of syllables.
It seems likely to me that the Binomial Triangle is
actually very much older than about 200 BC,
and that our discovery of written records
of it only (as of now) goes back that far.

The Nth row of the Binomial Triangle is the expansion of 2^N = (1+1)^N

The powers-of-2 triangle rows through N=3 are:

```
N

0                 1             2^0 = 1
1               1   1           2^1 = 2
2             1   2   1         2^2 = 4
3           1   3   3   1       2^3 = 8
```

The triangle of row N has the graded structure
of the exterior algebra underlying the Clifford algebra Cl(0,N)
of the Lie algebra Spin(0,N).

The Jth entry of row N is the number (N,J) = N! / (N-J)! J!
of J-dimensional sub-simplexes of an N-dimensional simplex,
or hypertetrahedron. Their total number is 2^N.

2^N is the dimension of the vector space of
the Clifford algebra Cl(0,2^N) with Lie algebra Spin(0,2^N).

Note that for N=3,
2^N = 2^3 = 8 = 6+2 = 2N+2.

Note that 1, 2, 4, and 8 are
the dimensions of the real division algebras:
Real Numbers; Complex Numbers; Quaternions; and Octonions.

Why 256

Our graded algebra /\V(n) has
the structure of the Yang Hui triangle
(also called the Meru-Prastera triangle
or the Pascal triangle). Here, it is shown up to n=8:

```
n                                    Total
                                   Dimension

0                 1                 2^0 =   1= 1x1
1               1   1               2^1 =   2= 1+1
2             1   2   1             2^2 =   4= 2x2
3           1   3   3   1           2^3 =   8= 4+4
4         1   4   6   4   1         2^4 =  16= 4x4
5       1   5  10  10   5   1       2^5 =  32=16+16
6     1   6  15  20  15   6   1     2^6 =  64= 8x8
7   1   7  21  35  35  21   7   1   2^7 = 128=64+64
8 1   8  28  56  70  56  28   8   1 2^8 = 256=16x16
```

so that the Clifford algebra Cl(n) has structure like:

```
n                                    Total
                                   Dimension
```

```
0                 1                 2^0 =   1= 1x1
1               1   1               2^1 =   2= 1+1
2             1   2   1             2^2 =   4= 2x2
3           1   3   3   1           2^3 =   8= 4+4
4         1   4   6   4   1         2^4 =  16= 4x4
5       1   5  10  10   5   1        2^5 =  32= 16+16
6     1   6  15  20  15   6   1      2^6 =  64= 8x8
7   1   7  21  35  35  21   7   1     2^7 = 128= 64+64
8  1   8  28  56  70  56  28   8   1   2^8 = 256= 16x16
9 1   9  36  84  126 126 84  36   9  1  2^9 = 512= 256+256
```

Well, here is a little table up to n = 8:

```
C_0  R
C_1  C
C_2  H
C_3  H + H
C_4  H(2)
C_5  C(4)
C_6  R(8)
C_7  R(8) + R(8)
C_8  R(16)
```

What do these entries mean?

Well, R(n) means the n x n matrices with real entries.
Similarly, C(n) means the n x n complex matrices,
and H(n) means the n x n quaternionic matrices.

All these become algebras with the usual matrix addition
and matrix multiplication.

Finally, if A is an algebra,
A + A means the algebra consisting of pairs of guys in A,
with the obvious rules for addition and multiplication:

For dimensions up to 8, here are the dimensions of spinors (with real structure) of the Clifford algebras:

```
n                                    Total           Spinor
                                   Dimension        Dimension

0                 1                 2^0 =   1= 1x1         1
1               1   1               2^1 =   2= 1+1         1
2             1   2   1             2^2 =   4= 2x2       2 = 1+1
3           1   3   3   1           2^3 =   8= 4+4         2
4         1   4   6   4   1         2^4 =  16= 4x4       4 = 2+2
5       1   5  10  10   5   1        2^5 =  32=16+16        4
6     1   6  15  20  15   6   1      2^6 =  64= 8x8       8 = 4+4
7   1   7  21  35  35  21   7   1     2^7 = 128=64+64        8
8  1   8  28  56  70  56  28   8   1   2^8 = 256=16x16     16 = 8+8
```

Now, look at the Yang Hui triangle.

The left-side border line is all 1's since there is only 1 dimension of scalars.

The next line is

```
          1
         2
        3
       4
      5
     6
    7
   8
```

the dimension of the vector space V(p,q) of the Clifford algebra Cl(p,q).

The next line is

```
          1
         3
        6
      10
     15
    21
   28
```

the dimension of the bivector subspace of the Clifford algebra.
The bivector subspace closes under the commutator
[a,b] = a.b - b.a operation, which defines the Lie algebra
of the Lie group Spin(p,q) of the Clifford algebra Cl(p,q).

Spin(p,q) is the simply connected (except for n=0,1,2)
2-1 covering group of the rotation group SO(p,q) of
the vector space V(p,q) underlying Cl(p,q).

EVERY REPRESENTATION OF Spin(p,q) CAN BE CONSTRUCTED FROM

the scalar graded subspace of Cl(p,q),
the vector graded subspace of Cl(p,q), and
the spinors (or two half-spinors, for even p+q)

BY USING THE OPERATIONS OF EXTERIOR /\ PRODUCT,
TENSOR PRODUCT, OR SUM or DIFFERENCE.

Pyramid D5 Spin etc Tarot

An alternative, but equally valid, way to build a
representation is to represent D5, not by nested hexagons,
but by the following triangle:

```
          1                     Spin(2)=U(1)
        2   3               Spin(3)=SU(2)=Sp(1)=S3
```

4 5 6	Spin(4)=Spin(3)xSpin(3)
7 8 9 10	Spin(5) = Sp(2)
11 12 13 14 15	Spin(6) = SU(4)
16 17 18 19 20 21	Spin(7)
Ks Kw Kc Kp Qs Qw Qc	Spin(8) = D4
Qp ks kw kc kp js jw jc	Spin(9)
jp 10s 10w 10c 0 10p 9s 9w 9c	Spin(10) = D5

Since E6 as used in the D4-D5-E6-E7 physics model
represents the two half-spinor representations of Spin(8),

For Spin(n) up to n = 8,
here are is their Clifford algebra structure
as shown by the Yang Hui (Pascal) triangle
and the dimensions of their spinor representations

n			Total Dimension	Spinor Dimension
0	1	2^0 =	1= 1x1	1
1	1 1	2^1 =	2= 1+1	1
2	1 2 1	2^2 =	4= 2x2	2 = 1+1
3	1 3 3 1	2^3 =	8= 4+4	2
4	1 4 6 4 1	2^4 =	16= 4x4	4 = 2+2
5	1 5 10 10 5 1	2^5 =	32=16+16	4
6	1 6 15 20 15 6 1	2^6 =	64= 8x8	8 = 4+4
7	1 7 21 35 35 21 7 1	2^7 =	128=64+64	8
8	1 8 28 56 70 56 28 8 1	2^8 =	256=16x16	16 = 8+8

Since each row of the Yang Hui (Pascal) triangle
corresponds to the graded structure of an exterior algebra
with a wedge product, call each row a wedge string.

In this pattern, the 28 and the 8 for n = 8 correspond
to the 28 gauge bosons of the D4 Lie algebra
and to the 8 spacetime (4 physical and 4 internal symmetry)
dimensions that are added when you go to the D5 Lie algebra.

The 8+8 = 16 fermions that are added when you go to E6,
corresponding to spinors, do not correspond to any single
grade of the n = 8 Clifford algebra with graded structure
1 8 28 56 70 56 28 8 1
but correspond to the entire Clifford algebra as a whole.

The total dimension of the Clifford algebra
is given by the Yang Hui (Pascal) triangle
pattern of binary expansion (1 + 1)^n,
which
corresponds to the number of vertices of
a hypercube of dimension n.

The spinors of the Clifford algebra of dimension n

are derived from the total matrix algebra of dimension 2^n
with pattern

```
n

0                   1
1                 2
2               4
3             8
4          16
5        32
6      64
7   128
8 256
```

This can be expanded to a pattern

```
n

0                   1
1                 2   1
2               4   2   1
3             8   4   2   1
4          16   8   4   2   1
5        32  16   8   4   2   1
6      64  32  16   8   4   2   1
7   128  64  32  16   8   4   2   1
8 256 128  64  32  16   8   4   2   1
```

in the same form as the Yang Hui (Pascal) triangle.

Call each row a spinor string.

```
(2^N, 2^(N-1),  2^(N-2), ... , 2^(N-J), ... ,    4,     2, 1)
(1 ,   N   , N(N-1)/2,...,N^k J^(N-k)/(k!(N-k)!)J),...,N(N-1)/2,N,1)
```

gives the rows of the ternary (1+2)^n power of 3 triangle

```
n

0                     1                          3^0 =     1
1                   2    1                       3^1 =     3
2                4    4    1                     3^2 =     9
3              8    12   6    1                  3^3 =    27
4          16   32   24    8    1                3^4 =    81
5        32   80   80   40   10    1             3^5 =   243
6      64  192  240  160   60   12    1          3^6 =   729
7    128  448  672  560  280   84   14    1      3^7 = 2,187
8  256 1024 1792 1792 1120  448  112   16    1   3^8 = 6,561
```

Just as the binary (1+1)^n triangle corresponds to the I Ching,

the ternary (1+2)^n triangle corresponds to the Tai Hsuan Ching.
The ternary triangle also describes
the sub-hypercube structure of a hypercube.

The ternary power of 3 triangle is not only
used in representations of the spinors in the D4-D5-E6-E7 model,
it was also by Plato in describing cosmogony and music.

The Alternative Division Algebras over the Real Numbers are:
(here a is nonzero)

```
R  - dimension 2^0 =  1  - real numbers,    with a^2 =  1;
C  - dimension 2^1 =  2  - complex numbers, with a^2 = -1;
Q  - dimension 2^2 =  4  - quaternions;
O  - dimension 2^3 =  8  - octonions.
```

The above Division Algebras have no Zero Divisors.
Similar Algebras in higher dimensions have Zero Divisors:
(here a and b are nonzero and noninfinite)

```
S  - dimension 2^4 =  16  - sedenions S     with ab =  0;
SC - dimension 2^5 =  32  - complexified S  with a0 =  b;
     dimension 2^6 =  64  - M(8,R)
     dimension 2^7 = 128  - M(8,R)+M(8,R)   with a^2 =  0;
     dimension 2^8 = 256  - M(16,R)         with a^4 =  0
                            and  a^2 =/= 0 and  a^3 =/= 0.
```

For S, normalized zero divisors are homeomorphic to G2 = Aut(O);
M(8,R)+M(8,R) has spinors that are not pure;
M(16,R) has half-spinors that are not pure, and
is the basis for all higher algebras,
because M(16,R) is based on Cl(8) and, by periodicity,
Cl(8N) = Cl(8) x...(N times)...x Cl(8)
and Cl(8N) is N tensor products of Cl(8)

Here is a chart of relationships between these algebras
and Clifford Algebras:

```
Cl(0)                 1                    1  R         a^2 =  1
Cl(1)               1   1                  2  C         a^2 = -1
Cl(2)             1   2   1                4  Q
Cl(3)           1   3   3   1              8  O
Cl(4)         1   4   6   4   1           16  S               ab=0
Cl(5)       1   5  10  10   5   1         32  SC              a0=b
Cl(6)     1   6  15  20  15   6   1       64  M(8,R)
Cl(7)   1   7  21  35  35  21   7   1    128  M(8,R)+M(8,R)  a^2=0
Cl(8) 1   8  28  56  70  56  28   8   1  256  M(16,R)        a^4=0
```

By Periodicity, dimension 7 corresponds to dimension -1.

Pure spinors in Cl(N) are those spinors that can be represented by simple exterior wedge products of vectors.

AS OP2 IS THE HIGHEST DIMENSIONAL OCTONION PROJECTIVE SPACE, THERE ARE NO HIGHER DIMENSIONAL STRUCTURES OF THAT TYPE.

There are only 3 Pairs of Interpenetrating Triangles, corresponding to

the Octonions.

the Sedenions (pairs of Octonions) and

the Leech Lattice (triples of Octonions).

For each Pair of Interpenetrating Triangles,
each Single Triangle corresponds to Mt. Meru:

```
     o
    /\
   /  \
  /    \
 /______\
```

	0			
Cl(0)	1	1	R	a^2 = 1
Cl(1)	1 1	2	C	a^2 = -1
Cl(2)	1 2 1	4	Q	
Cl(3)	1 3 3 1	8	O	
Cl(4)	1 4 6 4 1	16	S	ab=0
Cl(5)	1 5 10 10 5 1	32	SC	a0=b
Cl(6)	1 6 15 20 15 6 1	64	M(8,R)	
Cl(7)	1 7 21 35 35 21 7 1	128	M(8,R)+M(8,R)	a^2=0
Cl(8)	1 8 28 56 70 56 28 8 1	256	M(16,R)	a^4=0

Additional Occurrences

In addition to the representative sample shown above, Tony Smith has more such triangles in his extensive website, the above is by no means an exhaustive list.

Clifford Algebras may be arranged in the same triangular arrangement, as is done on a Wikipedia entry for them.

A table of this classification for $p + q \leq 8$ follows. Here $p + q$ runs vertically and $p - q$ runs horizontally (e.g. the algebra $C\ell_{1,3}(\mathbf{R}) \cong \mathbf{H}(2)$ is found in row 4, column −2).

	8	7	6	5	4	3	2	1	0	−1	−2	−3	−4	−5	−6	−7	−8
0									**R**								
1								$\mathbf{R}^2$		**C**							
2							**R**(2)		**R**(2)		**H**						
3						**C**(2)		$\mathbf{R}^2(2)$		**C**(2)		$\mathbf{H}^2$					
4					**H**(2)		**R**(4)		**R**(4)		**H**(2)		**H**(2)				
5				$\mathbf{H}^2(2)$		**C**(4)		$\mathbf{R}^2(4)$		**C**(4)		$\mathbf{H}^2(2)$		**C**(4)			
6			**H**(4)		**H**(4)		**R**(8)		**R**(8)		**H**(4)		**H**(4)		**R**(8)		
7		**C**(8)		$\mathbf{H}^2(4)$		**C**(8)		$\mathbf{R}^2(8)$		**C**(8)		$\mathbf{H}^2(4)$		**C**(8)		$\mathbf{R}^2(8)$	
8	**R**(16)		**H**(8)		**H**(8)		**R**(16)		**R**(6)		**H**(8)		**H**(8)		**R**(16)		**R**(16)
ω^2	+	−	−	+	+	−	−	+	+	−	−	+	+	−	−	+	+

The series of Exceptional Lie Algebras form a Magic Triangle, as shown by Pedrag Cvitonavich who gave up in frustration at trying to explain this arrangement:

						0 0	3 $\mathbf{A}_1$ 2
					0 0	1 $\mathbf{U}(1)$ 1	8 $\mathbf{A}_2$ 3
				0 0	0 1	3 $\mathbf{A}_1$ 3	14 $\mathbf{G}_2$ 7
			0 0	0 1	2 $2\mathbf{U}(1)$ 2	9 $3\mathbf{A}_1$ 4	28 $\mathbf{D}_4$ 8
		0 0	0 2	3 $\mathbf{A}_1$ 5	8 $\mathbf{A}_2$ 8	21 $\mathbf{C}_3$ 14	52 $\mathbf{F}_4$ 26
	0 0	0 1	2 $2\mathbf{U}(1)$ 3	8 $\mathbf{A}_2$ 6	16 $2\mathbf{A}_2$ 9	35 $\mathbf{A}_5$ 15	78 $\mathbf{E}_6$ 27
0 0	1 $\mathbf{U}(1)$ 2	3 $\mathbf{A}_1$ 4	9 $3\mathbf{A}_1$ 8	21 $\mathbf{C}_3$ 14	35 $\mathbf{A}_5$ 20	66 $\mathbf{D}_6$ 32	133 $\mathbf{E}_7$ 56
3 $\mathbf{A}_1$ 3	8 $\mathbf{A}_2$ 8	14 $\mathbf{G}_2$ 14	28 $\mathbf{D}_4$ 28	52 $\mathbf{F}_4$ 52	78 $\mathbf{E}_6$ 78	133 $\mathbf{E}_7$ 133	248 $\mathbf{E}_8$ 248

Tracks, Lie's, and Exceptional Magic

Another Indian mathematician apparently spent his last years trying to explain the same, but he died a few years ago before completing the work, his son, as well as his former colleague, proved unable to locate this paper for the author when requested in 2010.

SEXTONIONS AND THE MAGIC SQUARE

BRUCE W. WESTBURY

Abstract. Associated to any complex simple Lie algebra is a non-reductive complex Lie algebra which we call the intermediate Lie algebra. We propose that these algebras can be included in both the magic square and the magic triangle to give an additional row and column. The extra row and column in the magic square corresponds to the sextonions. This is a six dimensional subalgebra of the split octonions which contains the split quaternions.

(1)

A_1	A_2	C_3	$C_3.H_{14}$	F_4
A_2	$2A_2$	A_5	$A_5.H_{20}$	E_6
C_3	A_5	D_6	$D_6.H_{32}$	E_7
$C_3.H_{14}$	$A_5.H_{20}$	$D_6.H_{32}$	$D_6.H_{32}.H_{44}$	$E_7.H_{56}$
F_4	E_6	E_7	$E_7.H_{56}$	E_8

The notation in this table is that $G.H_n$ means that G has a representation V of dimension n with an invariant symplectic form, ω. Then H_n means the Heisenberg algebra of (V, ω) and $G.H_n$ means the semidirect

Date: 11 March 2005.

Barnes - Wall Lattices follow a similar shape:

d	$\|MinVec(L)\|$	*Prime Factorization*
0	2	2
1	4	2^2
2	24	$2^3 3$
3	240	$2^4 3.5$
4	4320	$2^5 3^3 5$
5	146880	$2^6 3^3 5.17$
6	9694080	$2^7 3^4 5.11.17$
7	1260230400	$2^8 3^4 5^2 11.13.17$
8	325139443200	$2^9 3^5 5^2 .11.13.17.43$
9	167121673804800	$2^{10} 3^5 5^2 11.13.17.43.257$
10	171466837323724800	$2^{11} 3^8 5^2 11.13.17.19.43.257$
11	351507016513635840000	$2^{12} 3^8 5^4 11.13.17.19.41.43.257$
12	1440475753672879672320000	$2^{13} 3^9 5^4 11.13.17.19.41.43.257.683$

Proof. Use 7.7, 8.7, 8.8 and induction. □

The $|u|u+v|$ construction suggests the following tableau of BW lattices. Here $D_4 = BW_4$, $E_8 = BW_8$, and $\Lambda_n = BW_n$ for $n = 2^{m+1} \geq 16$. Also, we use $R^2 = 2I_{2^m}$.

$\mathbb{Z}^2$								
	D_4							
$R\mathbb{Z}^2$		E_8						
	RD_4		Λ_{16}					
$2\mathbb{Z}^2$		RE_8		Λ_{32}				
	$2D_4$		$R\Lambda_{16}$		Λ_{64}			
$2R\mathbb{Z}^2$		$2E_8$		$R\Lambda_{32}$		Λ_{128}		
	$2RD_4$		$2\Lambda_{16}$		$R\Lambda_{64}$		Λ_{256}	
$4\mathbb{Z}^2$		$2RE_8$		$2\Lambda_{32}$		$R\Lambda_{128}$		Λ_{512}

Figure 4. *Tableau of Barnes-Wall lattices.*

In this tableau each BW lattice lies halfway between the two lattices of half the dimension that are used to construct it in the $|u|u+v|$ construction, from which we can immediately deduce its normalized volume.

Conclusion

The general presence of mathematical relationships illustrated in this paper demonstrates that this form is near - ubiquitous in nature, the universe, and mathematics, and this is not an anomaly, this has to do with the transformation of matter in a combinatorial universe. Neither is the presence of the Fibonacci Numbers an anomaly, for the Golden Ratio is closely related to the process of transformation of matter, as the author argues in this series of papers.

We note especially the presence of 256 interactions per cycle in the combinatorial model: this mirrors the Exceptional Lie Algebra of E8 and its relationships to the number 256, as noted by Tony Smith.

The original author of the Vedic Physics book argues that dimensions do not exist in a combinatorial universe. Perhaps it might prove useful to exchange the concept of "dimension" in mathematics for "cycle."

Mere coincidence fails to account for the widespread appearance of these relationships, and in a future paper we shall examine this numerical structure in greater detail to illustrate further relationships between numbers.

Contact

The author may be reached at Jaq2013 at outlook dot com

'Other people, he said, see things and say why? But I dream things that never were and I say, why not?"

Robert F. Kennedy, after George Bernard Shaw