987.400 **Interactions of Symmetries: Secondary Great-circle Sets**

987.410 **Icosa Phase of Rationality**

987.411 The 96 secondary great circles of the VE divide the chorded edge of the VE (which is the unit vector radius of synergetics) into rational linear fractions of the edge length—i.e., 1/2, 3/10, 1/4, 1/6, 1/10—and these fractions embrace all the intercombinings of the first four prime numbers 1, 2, 3, and 5.

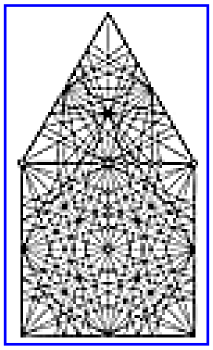

Fig. 987.412

987.412 For an illustration of how the four VE great circles of 60-degree central angles subdivide the central-angle chord increments, see Fig. 987.412.

987.413 Next recalling the jitterbug transformation of the VE into the icosa with its inherent incommensurability brought about by the 2:sqrt(2) = sqrt(2):1 transformation ratio, and recognizing that the transformation was experimentally demonstrable by the constantly symmetrical contracting jitterbugging, we proceed to fractionate the icosahedron by the successive l5 great circles, six great circles (icosa type), and 10 great circles whose self-fractionation produces the S Modules[8] as well as the T and E Modules.

(Footnote 8: See Sec. 988.)

987.414 But it must be recalled that the experimentally demonstrable jitterbug model of transformation from VE to icosa can be accomplished through either a clockwise or counterclockwise twisting, which brings about 30 similar but positive and 30 negative omniintertriangulated vector edge results.

987.415 The midpoints of each of these two sets of 30 vertexes in turn provide the two alternate sets of 30 poles for the spin-halving of the 15 great circles of Symmetry #6, whose spinning in turn generates the 120 right spherical triangles (60 positive, 60 negative) of the icosahedral system.

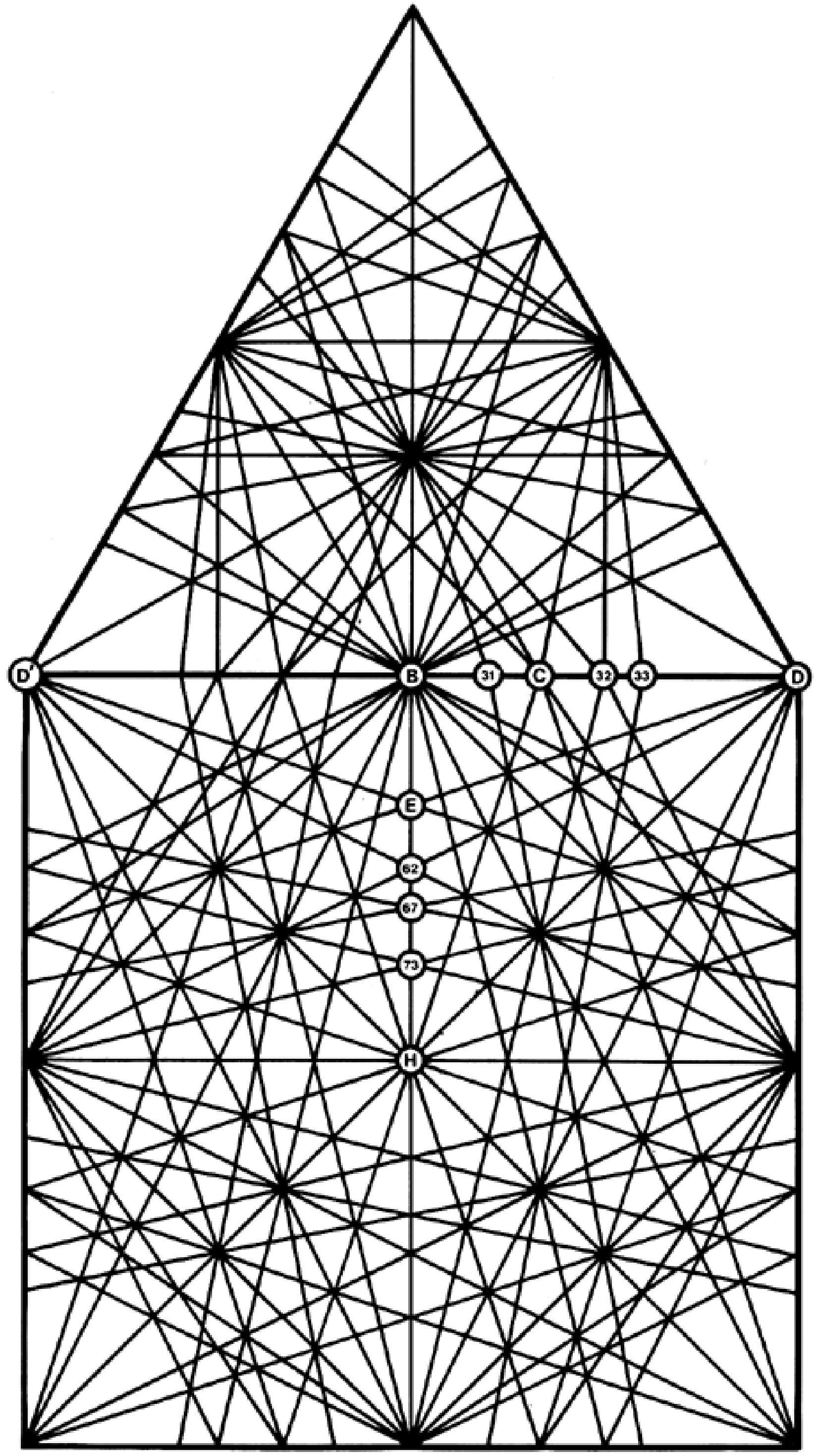

Fig. 987.412 Rational Fraction Edge Increments of 60-degree Great-circle Subdividings of Vector Equilibrium: When these secondary VE great-circle sets are projected upon the planar VE they reveal the following rational fraction edge increments:

D' - D = 1 VE edge	D' - D = 1 VE radius
(B - 31) / (D' - D) = 1/10	(B - D) / (D' - D) = 1/2
(B - 73) / (D' - D) = 3/8	(B - C) / (D' - D) = 1/6
(B - E) / (D' - D) = 1/6	(B - H) / (D' - D) = 1/2
(B - 32) / (D' - D) = 1/4	(B - 62) / (D' - D) = 1/4
(B - 33) / (D' - D) = 3/10	(B - 67) / (D' - D) = 3/10

987.416 The 120 right triangles, evenly grouped into 30 spherical diamonds, are transformed into 30 planar diamonds of central angles identical to those of the 30 spherical diamonds of the 15 great circles of the icosa. When the radius to the center of the face of the rhombic triacontahedron equals 0.9994833324.... of the unit vector radius of Synergetics (1.000), the rhombic triacontahedron has a tetravolume of 5 and each of its 120 T Quanta Modules has a volume of one A Module. When the radius equals 1, the volume of the rhombic triacontahedron is slightly larger (5.007758029), and the corresponding E Module has a volume of 1.001551606 of the A Module. (See Sec. 986.540)

988.00 **Icosahedron and Octahedron: S Quanta Module**

988.100 **Octa-icosa Matrix**

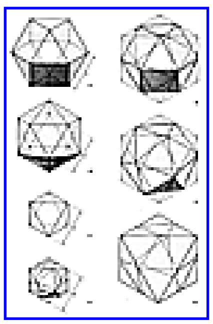

Fig. 988.00

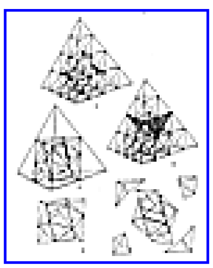

Fig. 988.100

988.110 The icosahedron positioned in the octahedron describes the S Quanta Modules. (See Fig. 988.100.) Other references to the S Quanta Modules may be found at Secs. 100.105, 100.322, Table 987.121, and 987.413.

988.111 As skewed off the octa-icosa matrix, they are the volumetric counterpart of the A and B Quanta Modules as manifest in the nonnucleated icosahedron. They also correspond to the 1/120th tetrahedron of which the triacontahedron is composed. For their foldable angles and edge-length ratios see Figs. 988.111A-B.

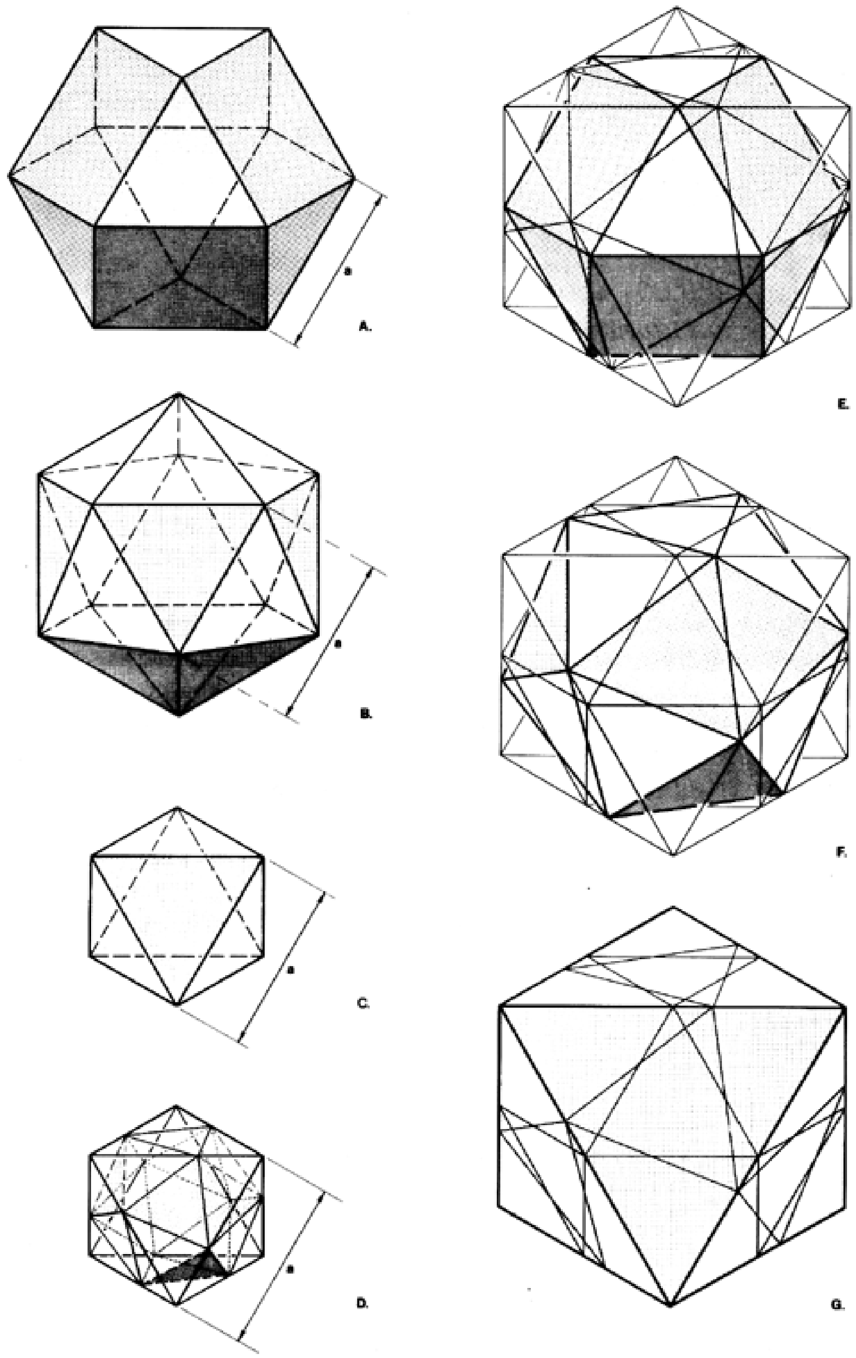

Fig. 988.00 Polyhedral Evolution: S Quanta Module: Comparisons of skew polyhedra.

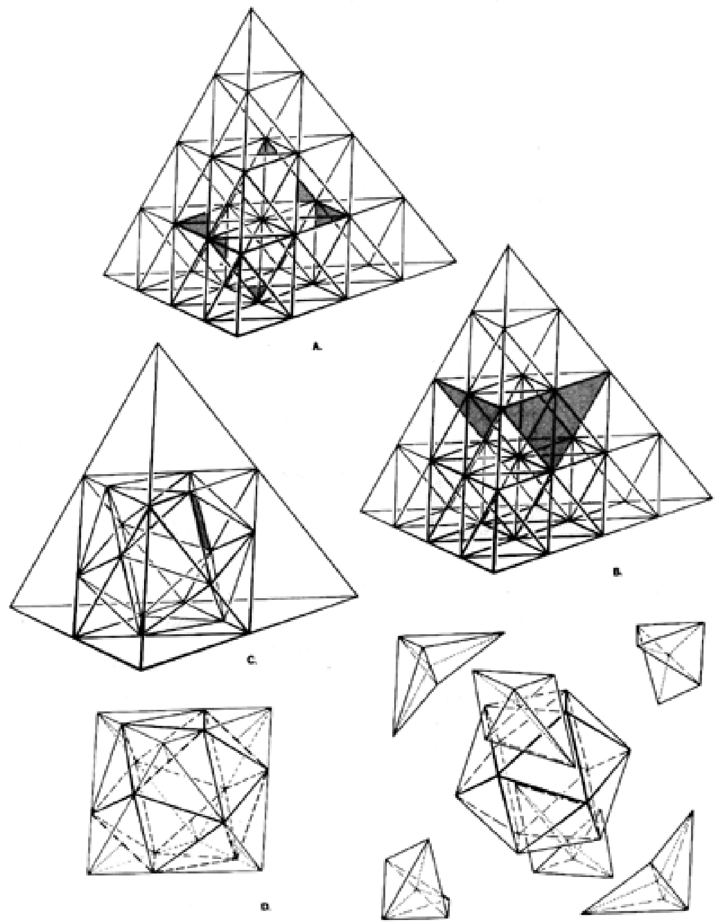

Fig. 988.100 Octa-Icosa Matrix: Emergence of S Quanta Module:

A. Vector equilibrium inscribed in four-frequency tetrahedral grid.
B. Octahedron inscribed in four-frequency tetrahedral grid.
C. Partial removal of grid reveals icosahedron inscribed within octahedron.
D. Further subdivision defines modular spaces between octahedron and icosahedron.
E. Exploded view of six pairs of asymmetric tetrahedra that make up the space intervening between octa and icosa. Each pair is further subdivided into 24 S Quanta Modules. Twenty-four S Quanta Modules are added to the icosahedron to produce the octahedron.

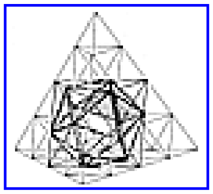
Fig. 988.12

988.12 The icosahedron inscribed within the octahedron is shown at Fig. 988.12.

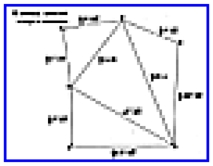
Fig. 988.13A

988.13 The edge lengths of the S Quanta Module are shown at Fig. 988.13A.

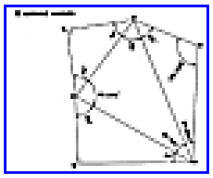
Fig. 988.13B

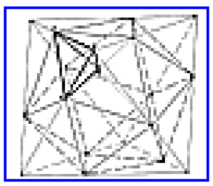
Fig. 988.13C

988.14 The angles and foldability of the S Quanta Module are shown at Fig. 988.13B.

988.20 **Table: Volume-area Ratios of Modules and Polyhedra of the Primitive Hierarchy:**

	Volume	Area	Volume/Area	Area/Volume
A Module	1*	1*		
T "	1	1.0032	0.9968	1.0032
E "	1.0016	1.0042	0.9974	1.0026
S "	1.0820	1.0480	1.0325	0.9685
B "	1	1.2122	0.8249	1.2122

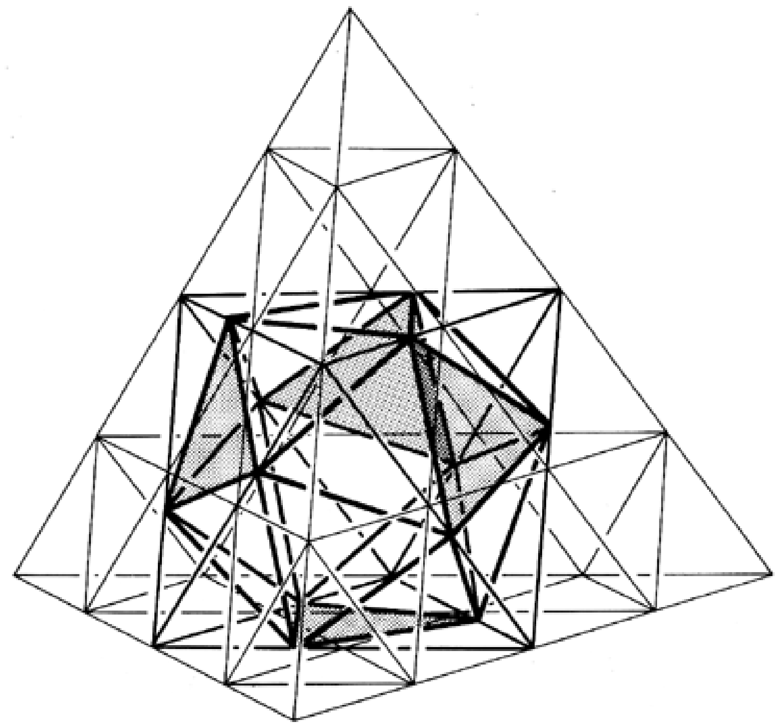

Fig. 988.12 Icosahedron Inscribed Within Octahedron: The four-frequency tetrahedron inscribes an internal octahedron within which may be inscribed a skew icosahedron. Of the icosahedron's 20 equiangular triangle faces, four are congruent with the plane of the tetra's faces (and with four external faces of the inscribed octahedron). Four of the icosahedron's other faces are congruent with the remaining four internal faces of the icosahedron. Two-fifths of the icosa faces are congruent with the octa faces. It requires 24 S Quanta Modules to fill in the void between the octa and the icosa.

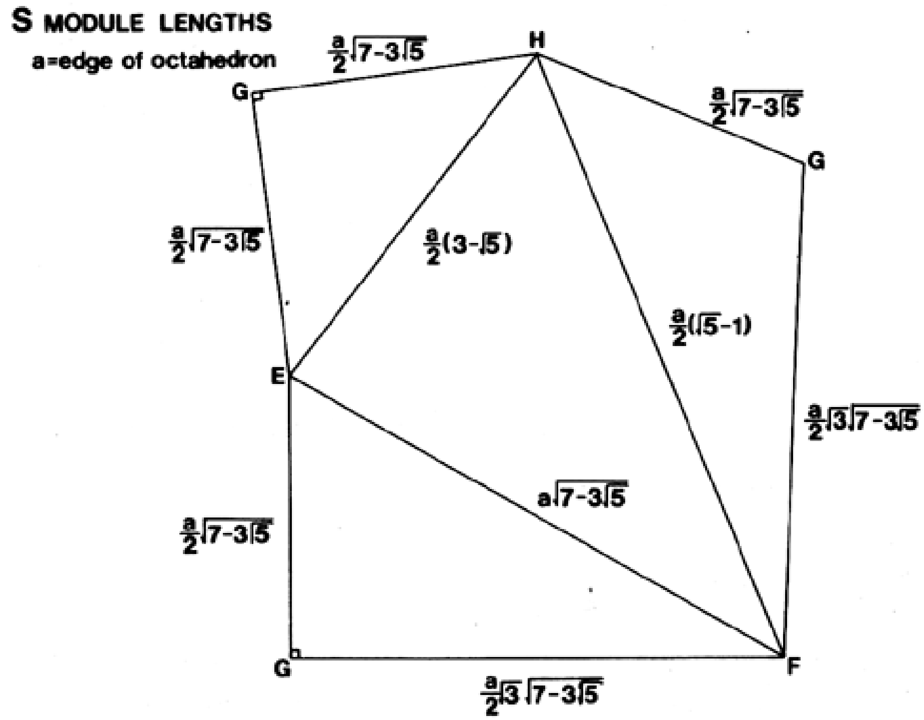

Fig. 988.13A S Quanta Module Edge Lengths: This plane net for the S Quanta Module shows the edge lengths ratioed to the unit octa edge (octa edge = tetra edge.)

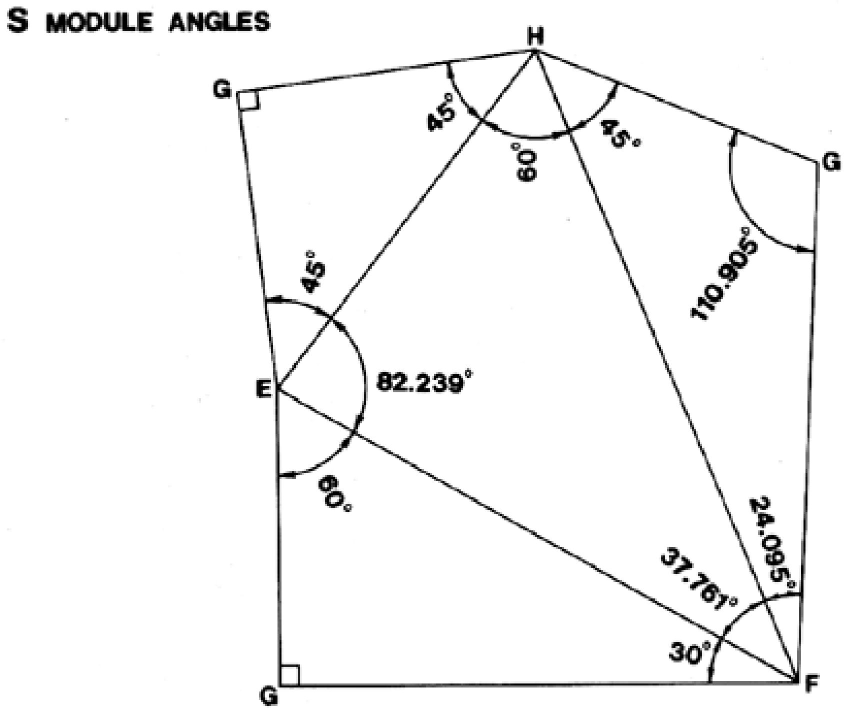

Fig. 988.13B S Quanta Module Angles: This plane net shows the angles and foldability of the S Quanta Module.

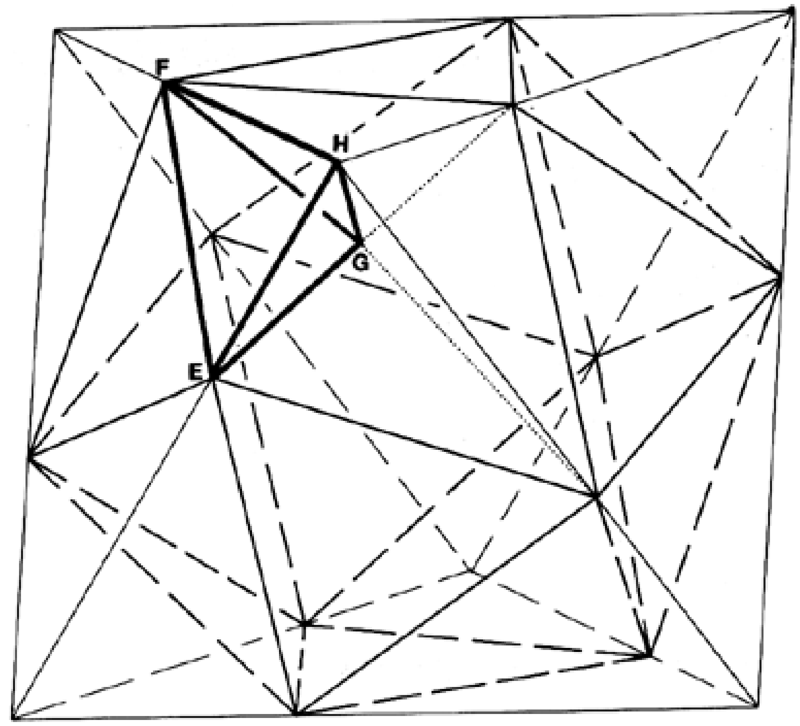

Fig. 988.13C S Quanta Module in Context of Icosahedron and Octahedron

Tetrahedron	24	6.9576	3.4495	0.2899
Icosahedron **	70.0311	10.5129	6.6615	0.1501
Cube	72	12.0508	5.9747	0.1674
Octahedron	96	13.9151	6.8990	0.1449
Rhombic dodecahedron	144	17.6501	8.1586	0.1226
Icosahedron	444.2951	36.0281	12.3319	0.0811

* Volume and area of A Module considered as unity.
** Icosahedron inside octahedron.

990.00 **Triangular and Tetrahedral Accounting**

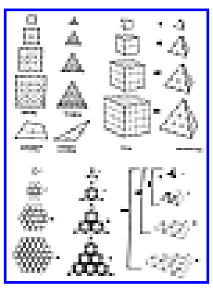
Fig. 990.01

990.01 All scientists as yet say "X squared," when they encounter the expression "X^2," and "X cubed," when they encounter "X^3" But the number of squares enclosed by equimodule-edged subdivisions of large gridded squares is the same as the number of triangles enclosed by equimodule-edged subdivisions of large gridded triangles. This remains true regardless of the grid frequency, except that the triangular grids take up less space. Thus we may say "triangling" instead of "squaring" and arrive at identical arithmetic results, but with more economical geometrical and spatial results. (See Illus. 990.01 and also 415.23.)

990.02 Corresponding large, symmetrical agglomerations of cubes or tetrahedra of equimodular subdivisions of their edges or faces demonstrate the same rate of third-power progression in their symmetrical growth (1, 8, 27, 64, etc.). This is also true when divided into small tetrahedral components for each large tetrahedron or in terms of small cubical components of each large cube. So we may also say "tetrahedroning" instead of "cubing" with the same arithmetical but more economical geometrical and spatial results.

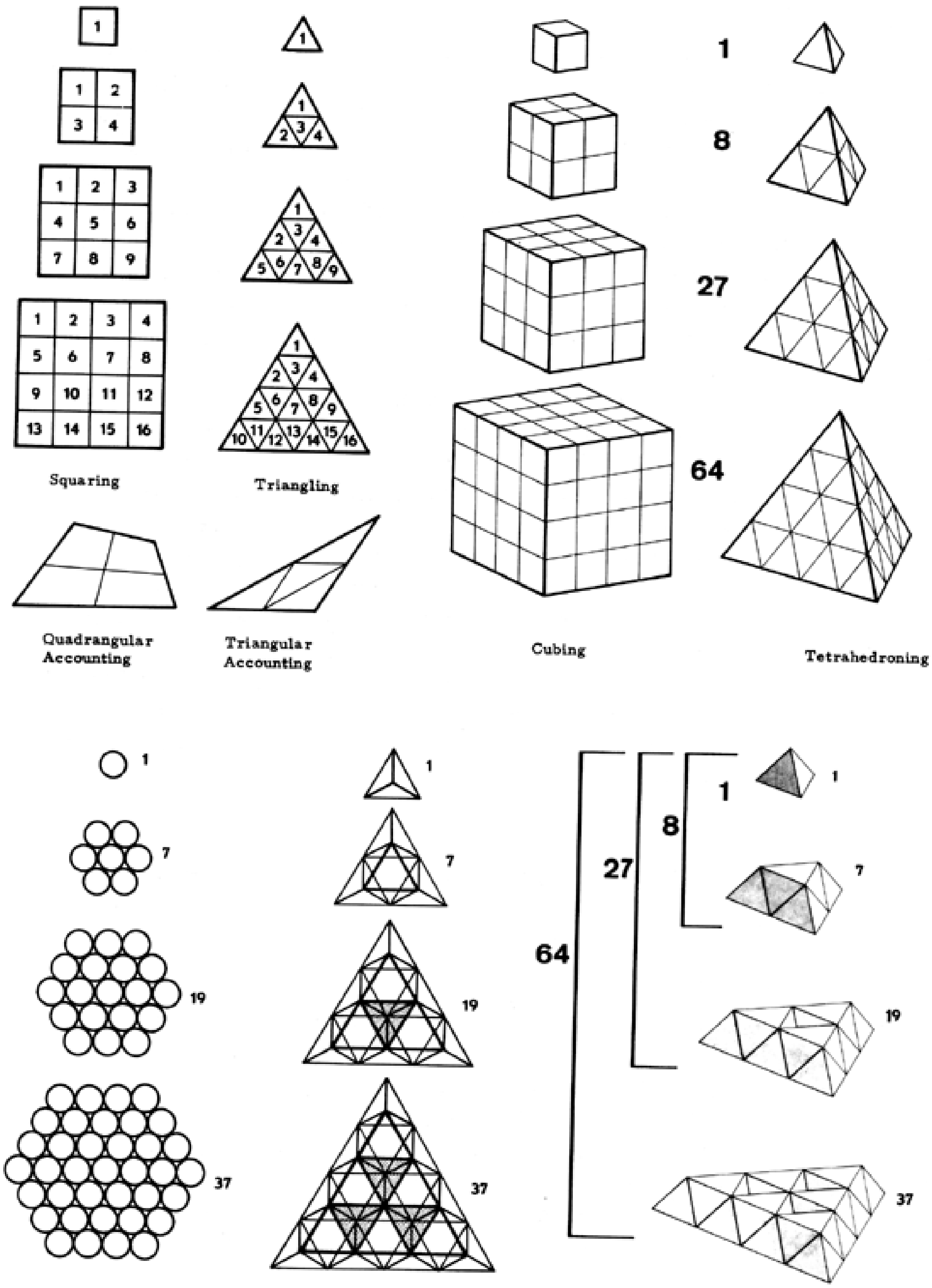
Squaring
Triangling
Quadrangular Accounting
Triangular Accounting
Cubing
Tetrahedroning
1
8
27
64
1
7
19
37

Fig. 990.01.

990.03 We may now say "one to the second power equals one," and identify that arithmetic with the triangle as the geometrical unit. Two to the second power equals four: four triangles. And nine triangles and 16 triangles, and so forth. Nature needs only triangles to identify arithmetical "powering" for the self-multiplication of numbers. Every square consists of two triangles. Therefore, "triangling" is twice as efficient as "squaring." This is what nature does because the triangle is the only structure. If we wish to learn how nature always operates in the most economical ways, we must give up "squaring" and learn to say "triangling," or use the more generalized "powering."

990.04 There is another very trustworthy characteristic of synergetic accounting. If we prospectively look at any quadrilateral figure that does not have equal edges, and if we bisect and interconnect those mid-edges, we always produce four dissimilar quadrangles. But when we bisect and interconnect the mid-edges of any arbitrary triangle—equilateral, isosceles, or scalene—four smaller similar and equisized triangles will always result. There is no way we can either bisect or uniformly subdivide and then interconnect all the edge division points of any symmetrical or asymmetrical triangle and not come out with omni- identical triangular subdivisions. There is no way we can uniformly subdivide and interconnect the edge division points of any asymmetrical quadrangle (or any other different-edge-length polygons) and produce omnisimilar polygonal subdivisions. Triangling is not only more economical; it is always reliable. These characteristics are not available in quadrangular or orthogonal accounting.

990.05 The increasingly vast, comprehensive, and rational order of arithmetical, geometrical, and vectorial coordination that we recognize as synergetics can reduce the dichotomy, the chasm between the sciences and the humanities, which occurred in the mid-nineteenth century when science gave up models because the generalized case of exclusively three-dimensional models did not seem to accommodate the scientists' energy- experiment discoveries. Now we suddenly find elegant field modelability and conceptuality returning. We have learned that all local systems are conceptual. Because science had a fixation on the "square," the "cube," and the 90-degree angle as the exclusive forms of "unity," most of its constants are *irrational*. This is only because they entered nature's structural system by the wrong portal. If we use the cube as volumetric unity, the tetrahedron and octahedron have irrational number volumes.

995.00 **Vector Models of Magic Numbers**

995.01 **Magic Numbers**

995.02 The magic numbers are the high abundance points in the atomic-isotope occurrences. They are 2, 8, 20, 50, 82, 126, ..., ! For every nonpolar vertex, there are three vector edges in every triangulated structural system. The Magic Numbers are the nonpolar vertexes. (See Illus. 995.31.)

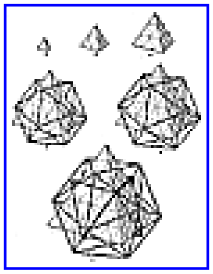

Fig. 995.03

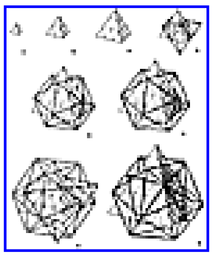

Fig. 995.03A

995.03 In the structure of atomic nuclei, the Magic Numbers of neutrons and protons correspond to the states of increased stability. Synergetics provides a symmetrical, vector-model system to account for the Magic Numbers based on combinations of the three omnitriangulated structures: tetrahedron, octahedron, and icosahedron. In this model system, all the vectors have the value of one-third. The Magic Numbers of the atomic nuclei are accounted for by summing up the total number of external and internal vectors in each set of successive frequency models, then dividing the total by three, there being three vectors in Universe for every nonpolar vertex.

995.10 **Sequence**

995.11A The sequence is as follows:

One-frequency tetrahedron:	(Magic Numbers)
6 vectors times 1/3	= 2
Two-frequency tetrahedron:	
24 vectors times 1/3	= 8
Three-frequency tetrahedron:	
60 vectors times 1/3	= 20
Three frequency tetrahedron + two-frequency tetrahedron:	

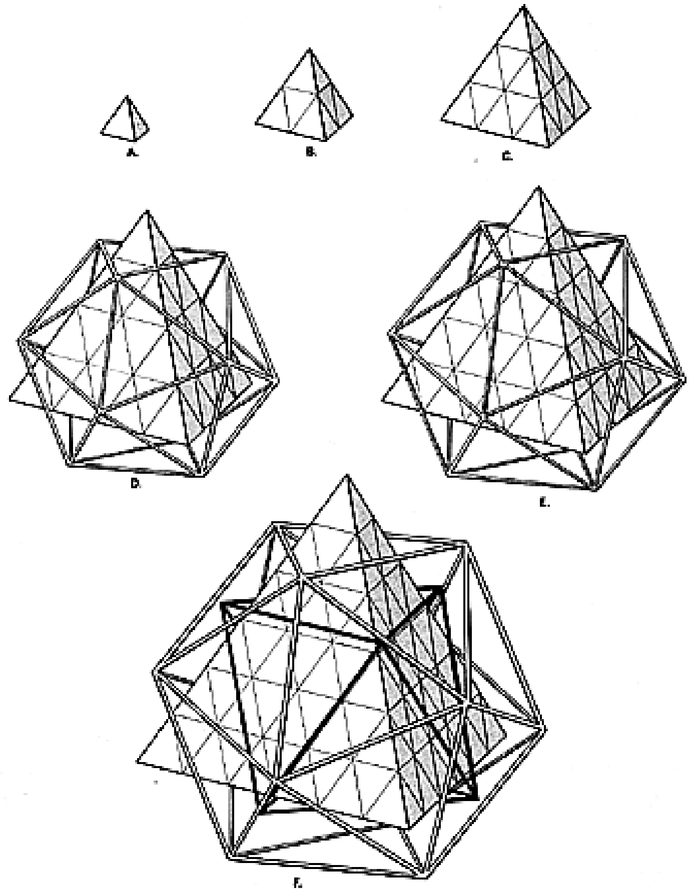

Fig. 995.03 Vector Models of Atomic Nuclei: Magic Numbers: In the structure of atomic nuclei there are certain numbers of neutrons and protons which correspond to states of increased stability. These numbers are known as the magic numbers and have the following values: 2, 8, 20, 50, 82, and 126. A vector model is proposed to account for these numbers based on combinations of the three fundamental omnitriangulated structures: the tetrahedron, octahedron, and icosahedron. In this system all vectors have a value of one-third. The magic numbers are accounted for by summing the total number of vectors in each set and multiplying the total by 1/3. Note that although the tetrahedra are shown as opaque, nevertheless all the internal vectors defined by the isotropic vector matrix are counted in addition to the vectors visible on the faces of the tetrahedra.

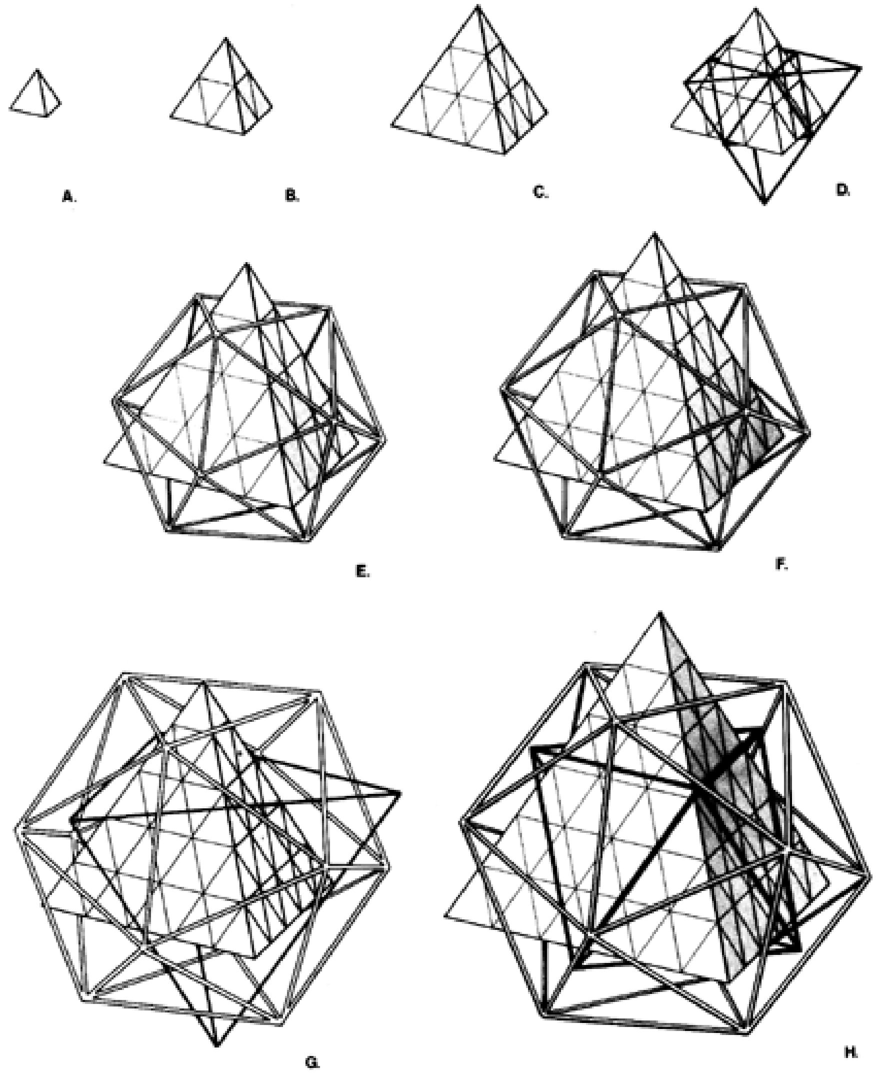

Fig. 995.03A Vector Models of Atomic Nuclei: Magic Numbers: In the structure of atomic nuclei there are certain numbers of neutrons and protons which correspond to states of increased stability. These numbers are known as the magic numbers and have the following values: 2, 8, 20, 28, 50, 82, and 126. A vector model is proposed to account for these numbers based on combinations of the three fundamental omnitriangulated structures: the tetrahedron, octahedron, and icosahedron. In this system all vectors have a have of one-third. The magic numbers are accounted for by summing the total number of vectors in each set and multiplying the total by 1/3. Note that although the tetrahedra are shown as opaque, nevertheless all the internal vectors defined by the isotropic vector matrix are counted in addition to the vectors visible on all faces of the tetrahedra.

60 vectors + 24 vectors times 1/3 = 28

Four-frequency tetrahedron + one-frequency icosahedron:

120 vectors + 30 vectors times 1/3 = 50

Five-frequency tetrahedron + one-frequency tetrahedron + one-frequency icosahedron:

210 + 6 + 30 vectors times 1/3 = 82

Six-frequency tetrahedron + one-frequency octahedron + one-frequency icosahedron:

336 + 12 + 30 vectors times 1/3 = 126

995.11 The sequence is as follows:

One-frequency tetrahedron: (Magic Number:)

6 vectors times 1/3 = 2

Two-frequency tetrahedron:

24 vectors times 1/3 = 8

Three-frequency tetrahedron:

60 vectors times 1/3 = 20

Four-frequency tetrahedron + One-frequency icosahedron:

120 vectors + 30 vectors times 1/3 = 50

Five-frequency tetrahedron + One-frequency icosahedron:

216 + 30 vectors times 1/3 = 82

Six-frequency tetrahedron + One-frequency octahedron + One-frequency icosahedron:

336 + 12 + 30 vectors times 1/3 = 126

995.12 **Magic Number 28:** The Magic Number 28, which introduces the cube and the octahedron to the series, was inadvertently omitted from *Synergetics 1*. The three- frequency tetrahedron is surrounded by an enlarged two-frequency tetrahedron that shows as an outside frame. This is a negative tetrahedron shown in its *halo aspect* because it is the last case to have no nucleus. The positive and negative tetrahedra combine to provide the eight corner points for the triangulated cube. The outside frame also provides for an octahedron in the middle. (See revised Figs. 995.03A and 995.31A.)

995.20 **Counting**

995.21 In the illustration, the tetrahedra are shown as opaque. Nevertheless, all the internal vectors defined by the isotropic vector matrix are counted in addition to the vectors visible on the external faces of the tetrahedra.

995.30 **Reverse Peaks in Descending Isotope Curve**

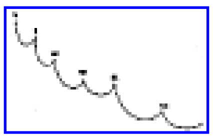
Fig. 995.31

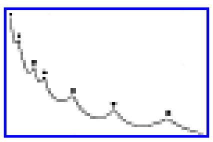
Fig. 995.31A

995.31 There emerges an impressive pattern of regularly positioned behaviors of the relative abundances of isotopes of all the known atoms of the known Universe. Looking like a picture of a mountainside ski run in which there are a series of ski-jump upturns of the run, there is a series of sharp upward-pointing peaks in the overall descent of this relative abundance of isotopes curve, which originates at its highest abundance in the lowest-atomic-numbered elemental isotopes.

995.32 The Magic Number peaks are approximately congruent with the atoms of highest structural stability. Since the lowest order of number of isotopes are the most abundant, the inventory reveals a reverse peak in the otherwise descending curve of relative abundance.

995.33 The vectorial modeling of synergetics demonstrates nuclear physics with lucid comprehension and insight into what had been heretofore only instrumentally apprehended phenomena. In the post-fission decades of the atomic-nucleus explorations, with the giant atom smashers and the ever more powerful instrumental differentiation and quantation of stellar physics by astrophysicists, the confirming evidence accumulates.

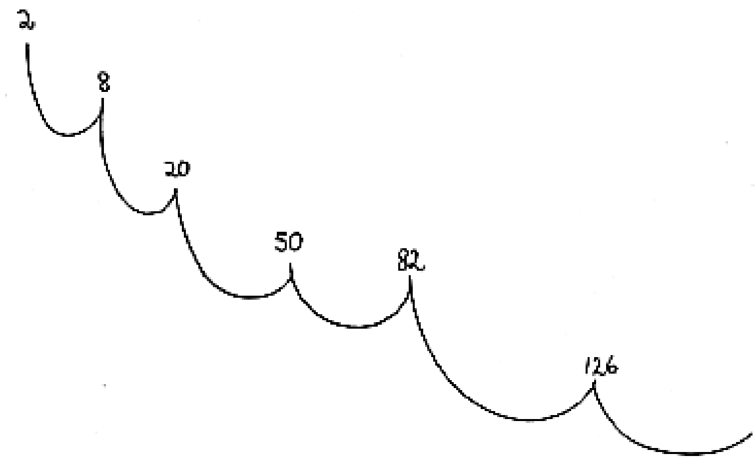

Fig. 995.31

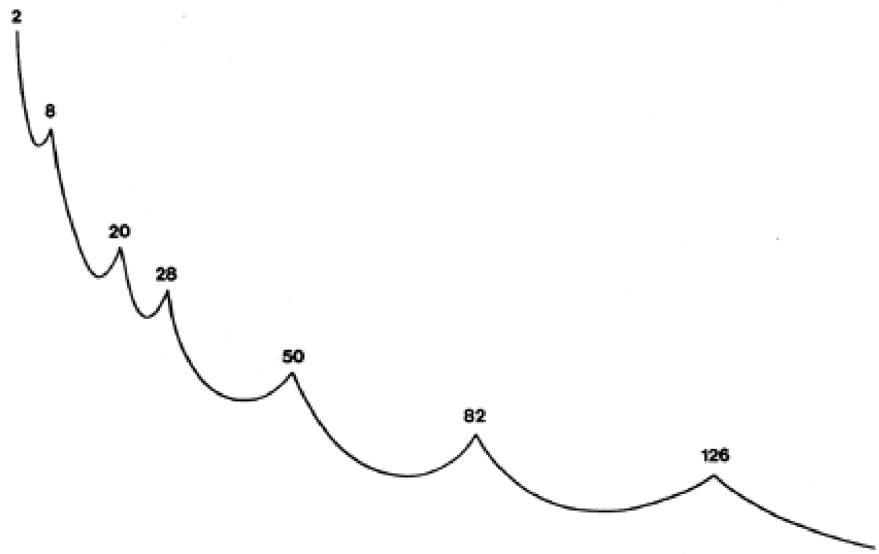

Fig. 995.31A Reverse Peaks in Descending Isotope Curve: Magic Numbers

995.34 Dr. Linus Pauling has found and published his spheroid clusters designed to accommodate the Magic Number series in a logical system. We find him—although without powerful synergetic tools—in the vicinity of the answer. But we can now identify these numbers in an absolute synergetic hierarchy, which must transcend any derogatory suggestion of pure coincidence alone, for the coincidence occurs with mathematical regularity, symmetry, and a structural logic that identifies it elegantly as the model for the Magic Numbers.

Next Chapter: 1000.00
