

537.00 Twelve Universal Degrees of Freedom

537.01 Nothing stands in a vacuum of Universe. Nothing can change locally without changing everything else. We have to look for conditions where there is permitted transformability and where there is some really great unanimity of degrees of freedom. We see that certain kinds of patterns accrue from certain numbers of restraints. You could see how planar things could happen as a consequence of two restraints and how linear things could happen as a consequence of three restraints. (See Sec. [401](#), Twelve Vectors of Restraint Define Minimum System.) We see, then, that we are in a Universe where there is a certain limited number of permitted freedoms. Synergetics discovers that whatever is rigidly related to anything else discloses 12 restraints. There are a minimum of 12 restraints in developing anything we might call a rigidly related set of events.

537.02 We start with Universe as a closed system of complementary patterns—i.e., regenerative, i.e., adequate to itself—that has at any one moment for any one of its subpatterns 12 degrees of freedom. There is an enormous complexity of choice. We start playing the game, the most complicated game of chess that has ever been played. We start to play the game Universe, which requires absolute integrity. You start with 12 alternate directions and multibillions of frequency options for your first move and from that move you have again the same multioptions at each of your successive moves. The number of moves that can be made is unlimited, but the moves must always be made in absolute respect for all the other moves and developments of evolving Universe.

537.03 The game of Universe is like chess with 92 unique men, each of which has four different frequencies available, and it works on 12 degrees of freedom instead of a planar checkerboard. The vector equilibrium becomes the omnidirectional checker frame and you can change the frequencies to suit conditions. But you must observe and obey the complexity of mass attraction and the critical proximity between precessing and falling in. And there are also electromagnetic attractions and repulsions built into the game.

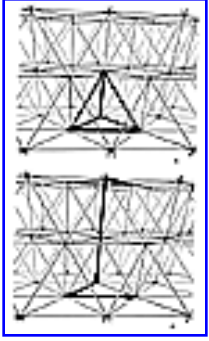
537.04 In order to be able to think both finitely and comprehensively, in terms of total systems, we have to start off with Universe itself. We must include all the universal degrees of freedom. Though containing the frequently irrational and uneconomic XYZ dimensional relationships, Universe does not employ the three-dimensional frame of reference in its ever-most-economical, omnirational, coordinate-system transactions. Nature does not use rectilinear coordination in its continual intertransforming. Nature coordinates in 12 alternatively equieconomical degrees of freedom—six positive and six negative. For this reason! 12 is the minimum number of spokes you must have in a wire wheel in order to make a comprehensive structural integrity of that tool. You must have six positive and six negative spokes to offset all polar or equatorial diaphragming and torque. (See illustration [640.40](#).)

537.05 Once a closed system is recognized as exclusively valid, the list of variables and the degrees of freedom are closed and limited to six positive and six negative alternatives of action for each local transformation event in Universe.

537.06 **Four Sets of Actions, Reactions, and Resultants:** Nature always employs only the most economical intertransformative and omnicosmic interrelatedness behavioral stratagems. With each and every event in Universe—no matter how frequently recurrent—there are always 12 unique, equieconomical, omnidirectionally operative, alternate-action options, which 12 occur as four sets of three always interdependent and concurrent actions, reactions, and resultants. This is to say that with each high frequency of recurring turns to play of each and all systems there are six moves that can be made in 12 optional directions. (See Secs. [251.46](#), [421.20](#), [521.06](#) and Fig. [537.10](#).)

537.08 Universe Divisible by Two: Everything in Universe is divisible by two. There will always be two poles to any system. Unity is two.

537.09 All the aspects of the constant relative abundances of points, areas, and lines are divisible by two: four faces, four points, and six edge lines. Thus there are six vectorial moves for every event; each of the vectorial moves is reversible, hence 12. Positional differentials in Universe derive only from the sixness of the 12 degrees of freedom.



537.10 **Six Vectors for Every Point**

[Fig. 537.10](#)

537.11 Each of the six positive and six negative energy lines impinging on every nonpolarized point ("focal event") in Universe has a unique and symmetrical continuation beyond that point. The six positive and six negative vectors are symmetrically arrayed around the point. Consequently, all points in Universe are inherently centers of a local and unique isotropic-vector-matrix domain containing 12 vertexes as the corresponding centers of 12 closest-packed spheres around a nuclear sphere. (See Synergetics Corollaries at Secs. [240.12](#), [240.15](#), and [240.19](#).)

537.12 Experiments show that there are six positive and six negative degrees of fundamental transformation freedoms, which provide 12 alternate ways in which nature can behave most economically upon each and every energy-event occurrence. Ergo, there is not just one "other"; there are always at least 12 "others." (See Secs. [502.25](#) and [511.03](#))

537.13 We find that in the 12 degrees of freedom, the freedoms are all equal and they are all realizable with equal "minimum effort."

537.131 **Six Vectors for Every Point:** The behavioral interpatterning frame of reference of the six degrees of freedom in respect to omnidirectionality is of course the vector equilibrium, which embraces the three-dimensionality of the cube and the six- dimensionality of the vector equilibrium. Experience is inherently omnidirectional; ergo, there is always a minimum of 12 "others" in respect to the nuclear observing self. The 24- positive- and 24-negative- vectored vector equilibrium demonstrates an initially frequenced, tetrahedrally quantized unity of 20; ergo, the Universe, as an aggregate of all humanity's apprehended and comprehended experiences, is at minimum a plurality of 24 vectors. (See Secs. [981.12](#) and [1224.21](#).)

537.14 **Basic Event**

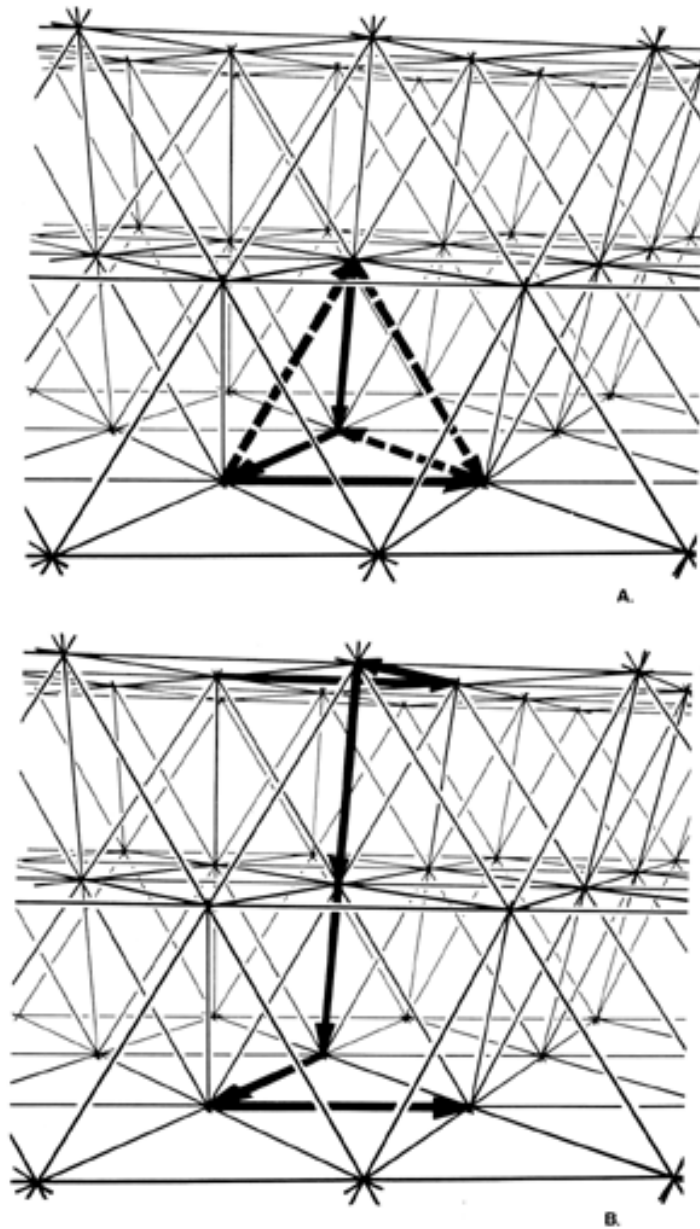


Fig. 537.10 Six Vectors for Every Point: With each high frequency of recurrent turns to play, there are six moves that can be made in 12 optimal directions.

537.15 A basic event consists of three vectorial lines: the action, the reaction, and the resultant. This is the fundamental tripartite component of Universe. One positive and one negative event together make one tetrahedron, or one quantum. The number of vectors (or force lines) cohering each and every subsystem of Universe is always a number subdivisible by six, i.e., consisting of one positive and one negative event on each of three vectors, which adds up to six. This holds true topologically in all abstract patterning in Universe as well as in fundamental physics. The six vectors represent the fundamental six, and only six, degrees of freedom in Universe. Each of these six, however, has a positive and a negative direction, and we can therefore speak of a total of 12 degrees of freedom. These 12 degrees of freedom can be conceptually visualized as the radial lines connecting the centers of gravity of the 12 spheres, closest packed around one sphere, to the center of gravity of that central sphere. The 12 degrees of freedom are also identified by the push- pull alternative directions of the tetrahedron's six edges.

537.20 **High-Tide Aspects**

537.21 Spheres in closest packing are high-tide aspects of vertexes. It is easy to be misled into thinking that there are no lines involved when you see two spheres in tangency, because the lines are hidden inside the spheres and between the points of tangency. And if you do realize that there is a force line between the two spheres' centers, you could assume that there is only one line between the two. This is where you see that unity is two, because the line breaks itself into radii of the two spheres.

537.22 In synergetics, a "line" is the axis of intertangency of unity as plural and minimum two. The line becomes the axis between two tangent balls which, without disturbing that single-axis aspect, can articulate both axial and circumferential degrees of freedom.

537.30 **General Systems Applications**

537.31 The 12 universal degrees of freedom govern the external and internal motions of all independent systems in Universe. In order to take synergetic strategy advantage and thereby to think comprehensively and anticipatorily, in terms of total systems, we have to start off with Universe itself as a closed finite system that misses none of the factors. We must also include all the universal degrees of freedom, and the approximately unlimited range of frequencies in the use thereof, which cover all variable interrelationships of Universe. They become the controlling factors governing general systems and, thereby govern such supercomplex systems design as that of a nation's navy or a fundamental program for comprehensively considerate and efficiently effective use of all world resources. The general systems approach starts with the differentiation of Universe, including both metaphysical and physical, and permits progressive subdivisions in cybernetical bits to bring any local pattern of any problem into its identification within the total scheme of generalized system events. Problem solving starts with Universe and thereafter subdivides by progressively discarding irrelevancies thereby to identify the "critical path" priorities and order of overlapping developments that will most economically and efficiently and expeditiously realize the problem's solution by special local problem identification and location within the totality of the problem-solving scenario.

537.32 Because of our overspecialization and our narrow electromagnetic spectrum range of our vision, we have very limited integrated comprehension of the significance of total information. For this reason, we see and comprehend very few motions among the vast inventory of unique motions and transformation developments of Universe. Universe is a nonsimultaneous complex of unique motions and transformations. Of course, we do not "see" and our eyes cannot "stop" the 186,000-miles-per-second kind of motion. We do not see the atomic motion. We do not even see the stars in motion, though they move at speeds of over a million miles per day. We do not see the tree's or child's moment-to-moment growth. We do not even see the hands of a clock in motion. We remember where the hands of a clock were when we last looked and thus we accredit that motion has occurred. In fact, experiment shows that we see and comprehend very little of the totality of motions.

537.33 Therefore, society tends to think statically and is always being surprised, often uncomfortably, sometimes fatally by the omni-inexorable motion of Universe. Lacking dynamic apprehension, it is difficult for humanity to get out of its static fixations and to see great trends evolving. Just now, man is coming into technical discovery of general systems theory. The experimental probing of the potentials of the computers awakened man to a realization of the vast complexes of variables that can be mastered by general systems theory. So far, man has dealt but meagerly and noncomprehensively with his powerful planning capability. So far, he has employed only limited systems theory in special open-edged systems—"tic-tac-toe" rectilinear grid systems and planar matrixes. The arbitrary open parameters of infinite systems can never be guaranteed to be adequate statements of all possible variables. Infinite systems engender an infinite number of variable factors. Unless one starts with Universe, one always inadvertently starts with open infinite systems. Only by starting with finite Universe and progressively dismissing finite irrelevancies can one initiate finite, locally limited, general systems theory to assured satisfaction in problem solving.

537.34 The Dymaxion airocean world map is only one of many devices that could provide man with a total information-integrating medium. We are going to have to find effective ways for all of humanity to see total Earth. Nothing could be more prominent in all the trending of all humanity today than the fact that we are soon to become world man; yet we are greatly frustrated by all our local, static organizations of an obsolete yesterday.

537.40 **Game of Universe: Individuality and Degrees of Freedom**

537.41 We may define the individual as one way the game of Universe could have eventuated to date. Universe is the omnidirectional, omnifrequency game of chess in which with each turn of the play there are 12 vectorial degrees of freedom: six positive and six negative moves to be made. This is a phenomenon of frequencies and periodicities. Each individual is a complete game of Universe from beginning to end. This is why each of us individuals is so much alike and yet completely different, a unique and individual way of playing the game with each of the omnidirectional degrees of freedom. With the six positive and the six negative omnidirectional degrees-of-freedom moves to be made at each turn of the play, the individual can move to any cosmic point that is not occupied and can move back over the same points or move on to new ones. (See Fig. [537.10](#).) Intellect as "god" can play all these incredibly different games in all these different ways and at all the differential rates at the same time. (See Sec. [1002.12](#).)

537.42 The individual differentiates position in Universe. The six degrees of freedom operate at *every* turn of the play. Just think of the frequencies per second of each of the chemical elements that make up the individual human body and then think of the periodicities of those frequencies.

537.43 That each individual is a complete integrity is one of the reasons I don't have to make any effort in loving my fellow human. (In the first-person plural of *we-even* the *I* even classes itself with the *other*. Each individual integrity has a steering effect, and like all steering effects it goes from one aberration to another. Certain individuals may be very wide aberrations from all the corruption that's going on in Universe, acting as just one of those infrequent and very wide aberrations so that Universe can hold its center. At that center sphere is the *two*, and you turn inside-out—and only the tetrahedron turns inside out. The other side of the Universe is not like the other side of the river; it is an inside- outing.)

537.44 We regard each individual as the special case, but consciousness as the generalization. Like the bumper sticker, "The Real World is Special Case." Reality is special case. You and I are sitting here, and no one else can be sitting right where we are. This is the kind of reality that the newspapers miss: they write about reality as if we were all the same realities, as if we were all the same things. If you and I are sitting here, we couldn't possibly be anywhere else.

537.45 There are many different realities. This is the difference between reality and generalization. There is only one generalization. The only reason the radio works is that it has no interference. The game of Universe can be played on any one of the fantastically large number of the quadrillions of quadrillions of frequencies: the game can be played any way just so long as there is no interference on the frequency you are using, so long as there are not two pieces in the same vector equilibrium at the same time.

537.46 What is important about the individual and important about the Universe is that neither is exempt from any of the rules. Universe is the sumtotal, and the individual is the special case. Universe is the aggregate of all the generalized principles. Each individual is one of the illions of ways the game of Universe could be played.

537.50 **Freedom and Will**

537.51 I think I tend to avoid using the word *will* because I spontaneously associate it with the term "free will" and all the controversies regarding the history of such human beliefs. I have felt that all such controversies lack adequate knowledge of science's generalized laws. To me it is obvious that no amount of individual will can nullify any cosmic law. It is also obvious to me that few know of and comprehend the significance of nature's having six positive and six negative equieconomical alternative moves to make with each turn to play in cosmic events.

537.52 It is clear to me that most humans tend to think in a linear, Go-or No-go, greenlight-redlight manner. To me, *will* is an optionally exercisable control by mind over brain—by wisdom over conditioned reflex—that becomes realizable when mind is adequately convinced regarding which of the 12 alternatives will produce the most comprehensively considerate vital advantage for all.

537.53 In a lesser way *will* becomes operative when the individual finds himself in terminal peril and has only seconds to "pull out" of a tailspin, when he becomes "cool," that is, when he discovers swiftly which of the alternative moves can save him, and exercises his will to execute the survival procedures.

537.54 Will determines what we should do in all the special case circumstances. Will is not a muscle thing—not the clenched fist—at all. People say I have a strong will, but what I have is a fairly clear view of the options of humanity and the commitments to their realization. It is thus that I determine what course to take in the special cases confronting us.

538.00 **Probability**

538.01 Nature's probability is not linear or planar, but the mathematical models with which it is treated today are almost exclusively linear. Real Universe probability accommodates the omnidirectional, interaccommodative transforming transactions of universal events, which humanity identifies superficially as environment. Probability articulates locally in Universe in response to the organically integral, generalized, omnidirectional *in, out, inside out, outside in*, and *around* events of the self-system as well as with the selfsystem's extraorganic travel and externally imposed processing around and amongst the inwardly and outwardly contiguous forces of the considered system as imposed by both its synchronously and contiguously critically near macrocosmic and microcosmic neighbors.

538.02 Real Universe's probability laws of spherically propagative whole systems' developments are intimately and finitely conditioned by the three-way great-circle spherical grids inherently embracing and defining the nonredundant structuring of all systems as formingly generated by critical proximity interferences of the system's components' behaviors and their dynamical self-triangulations into unique system- structuring symmetries whose configurations are characterized by the relative abundance patterning laws of topological crossing points, areas, and lines of any considered system as generally disclosed by the closed-system hierarchy of synergetics.

538.03 Synergetics, by relating energy and topology to the tetrahedron, and to systems, as defined by its synergetic hierarchy, replaces randomness with a rational hierarchy of omni-intertransformative phase identifications and quantized rates of relative intertransformations.

538.10 **Probability Model of Three Cars on a Highway**

538.11 I am tying up the social experience, often observed, in which three independently and consistently velocitied automobiles (and only three) come into close proximity on the highway—often with no other cars in sight. Mathematically speaking, three points—and only three—define both a plane and a triangle. The cars make a triangle; and because it is mathematically discovered that the total number of points, or areas, or lines of a system are always even numbers; and that this divisibility by two accommodates the polar-and-hemispherical positive-negativeness of all systems; and because the defining of one small triangle on the surface of a system always inadvertently defines a large triangle representing the remainder of the whole system's surface; and this large triangle's corners will always be more than 180 degrees each; ergo, the triangle is an "inside-out," i.e.,

negative, triangle; and to convert it to positive condition requires halving or otherwise fractionating each of its three corners by great circle lines running together somewhere within the great negative triangle; thus there develops a minimum of four positive triangles embracing the Earth induced by such three-car convergences.

538.12 The triangle made by the three cars is a complementarity of the three other spherical triangles on the Earth's surface. The triangle formed by the two cars going one way, and one the other way, gets smaller and smaller and then reverses itself, getting ever larger. There is always a closer proximity between two of the three. This is all governed by topological "pattern integrity. "

538.13 Probability is exclusively abstract mathematics: theoretically calculated points on curves. The statisticians think almost exclusively in lines or planes; they are what I call planilinear. Willard Gibbs in evolving his phase rule was engaged in probability relating to chemistry when he inadvertently and intuitively conceived of his phase rule for explaining the number of energetic freedoms necessary to introduce into a system, complexedly constituted of crystals, liquids, and gases, in order to unlock them into a common state of liquidity. His discovered phase rule and topology are the same: they are both synergetic. Despite the synergetic work of such pioneers as Euler and Gibbs, all the different chemistries and topologies still seem to be random. But synergetics, by relating energy and topology to the tetrahedron, and to systems as defined, and by its synergetic hierarchy, replaces randomness with a rational cosmic, shape-and-structural-system hierarchy. This hierarchy discloses a constant relative abundance of the constituents; i.e., for every nonpolar point there are always two faces and three edges. But systems occur only as defined by four points. Prime structural systems are inherently tetrahedral, as is also the quantum.

538.14 A social experience of three cars: they make a triangle changing from scalene to equilateral to scalene. The triangles are where the cars don't hit. (These are simply the windows.) But you can't draw less than four triangles. The complementarity of the three triangles makes the spherical tetrahedron—which makes the three-way grid. The little spherical triangle window is visible to human observers in greatest magnitude of human observability and awareness of such three-car triangles at 15 miles distance, which is 15 minutes of spherical arc of our Earth. Such dynamically defined Earth triangulation is not a static grid, because the lines do not go through the same point at the same time; lines—which are always action trajectories—never do. All we have is patterning integrity of critical proximities. There is always a nonviolated intervening boundary condition. This is all that nature ever has.

538.15 Nature modulates probability and the degrees of freedom, i.e., frequency and angle, leading to the tensegrity sphere; which leads to the pneumatic bag; all of which are the same kind of reality as the three automobiles. All the cosmic triangling of all the variety of angles always averages out to 60 degrees. That is the probability of all closed systems, of which the Universe is the amorphous largest case. Probability is not linear or planar, but it is always following the laws of sphericity or whole systems. Probability is always dependent upon critical proximity, omnidirectional, and only dynamically defined three-way gridding pattern integrity, and with the concomitant topologically constant relative abundance of points, areas, and lines, all governed in an orderly way by low-order, prime-number, behavioral uniqueness as disclosed by synergetics.

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