1008.10 **Geodesic Spheres in Closest Packing**

1008.11 What we call *spheres* are always geodesics. While they may superficially appear to be spherical, they are always high-frequency geodesic *embracements.*

1008.12 In the closest packing of omnitriangulated geodesic spheres, the closest the spheres can come to each other is as triangular face-bonding, which is of course triple- bonded, or trivalent. In such cohering tangency, the closest-packed geodesic "spherical" polyhedra would constitute crystalline arrangements and would take up the least amount of space, because the midfaces are radially closer to the center of the sphere than are the midedges (midchords) of the omnifaceted "spheric" polyhedra, while the vertexes are at greatest radius.

1008.13 Taking up a little more room would be closest packing of geodesic spheres by edge-bonding, which is double-bonded, or bivalent. Bivalently tangential spherical polyhedra, being hinged edge-to-edge, may have characteristics similar to liquid or gelatinous aggregates.

1008.14 Single-bonded geodesic spherical polyhedra closest packed point-to-point are univalent. This point-to-point arrangement takes up the most space of all closest- packed spherical tangency agglomerates and may illustrate the behavior of gases.

1008.15 These nuances in closest-packing differentiations may explain many different unexpected and hitherto unexplained behaviors of Universe.

1009.00 **Critical Proximity**

1009.10 **Interference: You Really Can't Get There from Here:** Omnitopology recognizes the experimentally demonstrable fact that two energy-event traceries (lines) cannot pass through the same point at the same time. It follows that no event vectors of Universe ever pass through any of the same points at the same time. Wherefore, it is also operationally evidenced that the conceptual-system geometries of omnitopology are defined only by the system withinness and withoutness differentiating a plurality of loci occurring approximately midway between the most intimate proximity moments of the respectively convergent-divergent wavilinear vectors, orbits, and spin equators of the system. (See Sec. 517, "Interference.") The best you can do is to get almost there; this is evidenced by physical discontinuity. Zeno's paradox thus loses its paradoxical aspects.

1009.11 In omnitopology, a vertex (point) is the only-approximate, amorphous, omnidirectional region occurring mid-spatially between the most intimate proximity of two almost-but-never-quite, yet critically intertransformatively, interfering vectors. (See Sec. 518.)

1009.20 **Magnitude of Independent Orbiting:** Most impressively illustrative of what this means is evidenced by the mass-attractively occasioned falling in toward Earth of all relatively small objects traveling around Sun at the same rate as Earth, Earth itself being only an aggregate of all the atoms that are cotravelers around Sun at the same velocity, while each atom's nucleus is only one-ten-thousandth the diameter of its outer electron shell. There is as much space between the atom's nucleus and its electron-orbit- produced shell as proportionately exists between Sun and its planet Pluto.

1009.21 The tendency to fall in to Earth or any other celestial body will be reduced as a cotraveling object increases its distance away from Earth or any other relatively large body as a consequence of its being given acceleration into orbital speed greater than Earth's Sun-orbiting speed. In 99.9999999999 percent of Universe no body tends to fall in to any other; 99.999999×10^{30} of all known Universe bodies are independently orbiting.

1009.30 **Symmetrical Conformation of Flying-Star Teams:** We have terms such as "boundary layer" that have to be recognized in hard technology where we find that despite the accurate machining to fine tolerance of such things as steel bearings, there is always a dimensional aberration that is unaccounted for in man's eyes but, when measured instrumentally in nuclear-diameter magnitudes, is as relatively great as that between the stars of the Milky Way. Men think superficially only of lubricants and mechanically-fitting- bearings tolerances whereas—focused at the proper magnitude of conceptuality—what goes on in the affairs of lubricants and bearings discloses discrete geometrical relationships where no event ever makes absolute contact with another. There are simply orbital interferences, where the mass attractions will always be just a little more powerful than the fundamental disintegrative tendencies.

1009.31 The relative frequency timing of orbits is such that as one complex energy event (a body) approaches critical proximity between any two other equal mass bodies to that of the intruder, the group mass interattraction fourfolds. We get to a condition where the approaching body is suspended between two others like landing on an invisible trampoline. Similarly, in manmade machinery as the teeth of gears enter into the matching gears' valleys, the mass-attraction forces finally provide an invisible suspension field whereby none of the atoms ever touches another. (See Sec. 1052.21.)

1009.32 When metallic alloys are produced, we have such conditions, for instance, as four symmetrically orbiting stars producing a tetrahedral flying formation, each trying to orbit away from the other but inter-mass-attractively cohered. When this flying team of four stars in tetrahedral conformation joins together with a second team of four stars in tetrahedral conformation, they take position symmetrically with each member star of the two sets of four becoming congruent with the eight corners of a cube.

1009.33 Now each of the stars in the flying teams has nearer neighbors than it had before, and this mass interattractiveness is multiplied as the second power of relative proximity. Their initial acceleration of 186,000 miles per second keeps their orbits always intact. Each of the flying formations is made up of other flying teams of atoms with a central commander nucleus and a fleet of electrons buzzing around it at 186,000 miles per second; being interfrequenced, the four nucleated team members synchronously interact as the orbits of their electrons in closest proximity are intervally geared in second-power accelerations of intertenuousness, producing an omnicoordinate condition akin to the mid- gear-tooth trampoline (an invisible muscular field).

1009.34 Next, a six-member flying team (octahedron) heaves into critical proximity with the original two teams now flying a group formation in the form of the eight comer positions of the cube. The acceleration stability of each of the flying teams is such that they join with the new six-star team taking symmetrical positions in the middle of the six square faces of the eight-star-team cube. The mass interattraction of the 14 now becomes vastly greater, and the electron-orbit-gear-trampolines of each of the 14 nuclear-flow spherical ships are now in very much greater second-power increase of interattractiveness.

1009.35 This cubical flying team of 14 ships now sights another flying team of 12 ships, and the team of 14 and the team of 12 are flown into group formation with the 12 ships taking station at the midpoints of the 12 edges of the 14-star-team cube. Thus the mass attraction is ever more vastly increased, yet the integrity of their interpositioning and their non-falling-into-one-anotherness is guaranteed by the centrifugal forces of the orbiting superbly balanced by the second-power increase of the gravitational buildup already noted.

1009.36 Thus are planets cohered, and thus are metallic alloys on planets even more powerfully cohered—all within the rules of never-quite-touching; all within the rules of interval; all within the rules of no actual particulate "solids." They may fly wavilinear patterns, but the atoms are found to be as discontinuous as the wavilinear sky trails of the jet airplane. While physics is as yet formally puzzling over the paradox of the wave and the particle, the apparent contradiction is occasioned only by the superficial misconception of a particle where none exists. We deal only with events in pure principle. The sense of physical, textural reality, of awareness itself, which uniquely identifies life and time (in contradistinction to eternal, weightless metaphysics), is inherent to the plurality of frequencies and degrees of freedom that in pure principle theoretically provide different interpositionings within given amounts of time. The plurality of principles, which themselves are interaccommodative, inherently generates awareness differentiability. The exquisite perfection of the total interaccommodation and the limited local set of the tunabilities of the terrestrial living organisms, such as the human instrument vehicle, are all permitted in the general complexity and permit local-focus, limited awareness as individual-seeming perceptivity. (See Sec. 973.30.)

1009.37 What I am saying is that we have only eternity and integrity. Unity is plural in pure principle. The awareness we speak of as life is inherently immortal and equieternal.

1009.40 **Models and Divinity:** Because of indeterminism, the exclusive tenuous nature of integrity—discontinuity—means that no exact hard particulate models may ever be fashioned by man. The conscientious and competent modelmaker undertaking to make a beautiful tetrahedron suddenly becomes aware that it is impossible to make a perfect corner at a point. There is always both a terminal and a radius and an askew convergence- divergence at noncontacting critical proximity. When he magnifies the edges which look sharp to the naked eye, he sees they are never sharp. The more powerful the magnification he brings to bear on his work, the more he becomes aware of the lumpy radii of the micropatterning of the stuff with which he works. Finally, the electron microscope tells him that the point of a needle is a pile of oranges and that the blade of the razor is a randomly dumped breakwater of spherical rubble. When further meticulously studied and magnified, this superficial seeming randomness proves to be our flying squadrons, earlier described, enjoying a vast number of intricately orderly team maneuvers but with never a pilot in sight. The whole is flown by remote control with fantastic feedback and local automation, all governed by an eternally complex integrity of complementary, interaccommodative principles.

1009.41 Little man on little planet Earth evoking words to describe his experiences, intuiting ever and anon the greater integrity, struggles to form a word to manifest his awareness of the greater integrity. His lips can express, his throat and lungs can produce, in the limited atmosphere of planet Earth, he may make a sound like g o d . . . which is obviously inadequate to identify his inherent attunement to eternal complex integrity. The little humans on little Earth, overwhelmed these millions of years with the power of the bigger over the lesser (muscles), have spontaneously identified the cosmic integrity with the local terrestrial experience. The conditioned-reflex feedbacks have introduced enormous confusion of approximate identification, fusing the local physical muscular authority with the eternal complex integrity, whose absolute generalizability can never be locked into or described as a special case.

1009.50 **Acceleration:** Physics does not speak of motion; it speaks of acceleration. And physics has identified only two kinds of acceleration, linear and angular. We are informed experientially that this is a misinterpretation of the data.

1009.51 There are indeed two kinds of acceleration, but they are both angular. All accelerations are angular and cyclically complete. There are no open endings in Universe. Physics has discovered only waves, no straight lines.

1009.52 The angular accelerations, however, manifest a vast variety of radii. The differentiation of physics into linear and angular occurred when the humans involved failed to realize that the diameter of the little circle is always a small arc of a vastly greater circle passing through it. The greater the radius, the slower the total cyclic realization. There are no straight lines or "linear infinities." Realization of this is what Einstein spoke of as "curved space." (See Sec. 522.21.)

1009.53 Einstein was up against trying to communicate with the mathematicians in terms of their adopted mathematical models, all of which were— and still are—straight- line, XYZ models on a linear frame and with linear coordinates going outward from the model to infinity. So "field" was always a little set of local perpendicular crossings of straight lines each outward bound to an infinity of infinities.

1009.54 All the experimentally harvested information says that the "field" must now be recognized as a complex of never-straight lines that, at their simplest, always will be very short arcs of very great circular orbits. And the orbits are all elliptical due to the fact that unity is plural and at minimum two. There will always be at least one other critical proximity-imposing aberration restraint focus.

1009.55 A single ellipse is a wave system with two diametric peak phases—a gear with only two teeth—at 180 degrees from one another. All other gears are multitoothed, high-frequency waves. All is wavilinear.

1009.56 Critical proximity crimping-in is realized by local wave-coil-spring contractions of the little system's diameter by the big system, but local radius is always a wavilinear, short-section arc of a greater system passing through it in pure generalized eternal principle. (See Sec. 541.04.)

Fig. 1009.75A

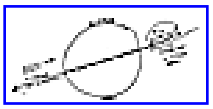

Fig. 1009.57B

1009.57 An apparent straight line is not only locally wavilinear but a short-section arc of a greater system passing through a lesser system. (See Figs. 1009.57A-B.) Universe lines return upon themselves.

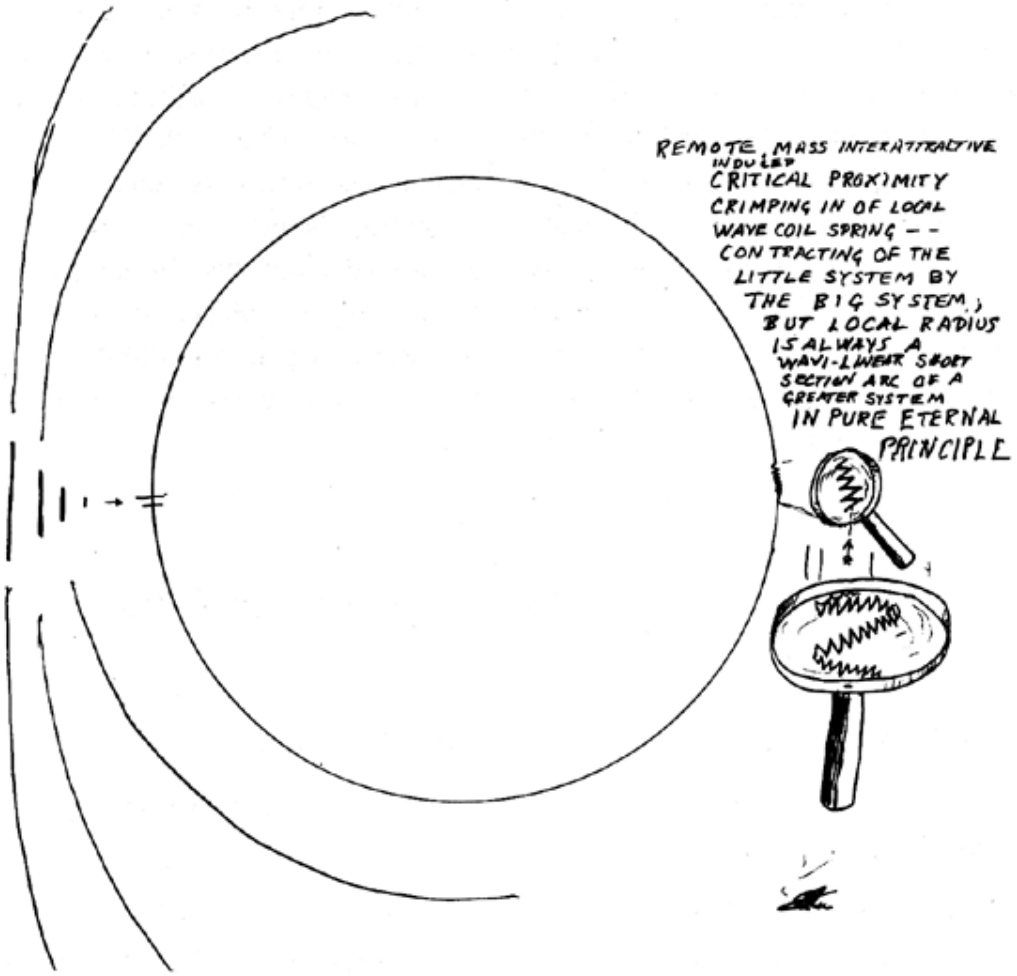

Fig 1009.57A Critical Proximity Crimping-in of Local Wave Coil-spring: Consideration of the little system by the big system. Local radius is always a wavilinear short section arc of a great system in pure principle.

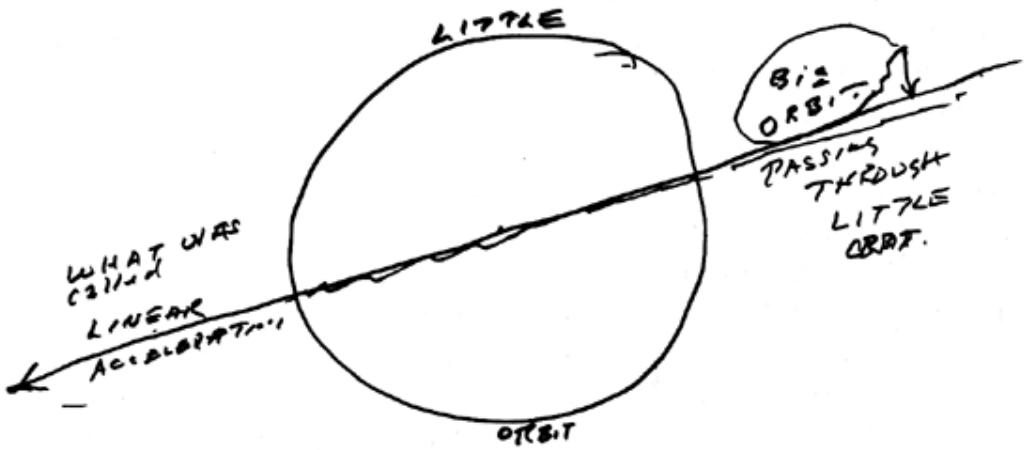

Fig. 1009.57B Big Orbit Passing through Little Orbit: What was called linear acceleration is an unrecognized arc of a bigger system.

1009.60 **Hammer-Thrower:** The effect of bodies in acceleration upon other bodies in acceleration is always precessional, and the resultant is always at an angle other than 180 degrees. Even today, the physicists consider precession to be only mathematically treatable by quantum mechanics because they have failed to realize that the complex intereffects are conceptually comprehendible.[1]

(Footnote 1: The author established this fact with the authority of the great specialists in applied precession (i.e., gyroscoping), the chief engineer and vice president for research of the Sperry Gyroscope Company. See the author's article on the gyroscope in *Fortune,* Vol. XXI, No. 5, May 1940.)

1009.61 The model of the man fastening a weight to a string and swinging it around his head is the familiar one of the hammer-thrower. With each accelerating cycle the object swung around his head accumulates in its velocity the progressive energy imports metabolically exported through the action of the human's muscles. (See Sec. 826.03 for description of the metabolic energy accumulation of the hammer-thrower.) Men have not accurately interpreted their instinctively articulated performance of slinging, hammer- throwing, baseball pitching, and other angularly accelerated hurlings. When a human picks up a stone and throws it, he thinks of it as a different kind of a sport from the hammer- thrower's activity. But the only difference is that with throwing the stone, his arm is the rod of the hammer and instead of accumulating velocity by many cycles of acceleration, he operates through only one-third of a circle in which he can accumulate a certain amount of metabolic muscle energy to transform into acceleration. Substituting the athlete's "hammer" for the stone or baseball, the hammer-thrower is able to build much more of his metabolically generated energy into muscular acceleration, which accumulates to produce very great force. The baseball-throw and the hammer-throw utilize the same principle, except that the rate of accumulation is one-third cycle for the former while it is a plurality of cycles for the latter, thus permitting the introduction of larger amounts of time-of-effort application.

1009.62 A man with a weight on a string swings it above his head and lets go of it, but the man is in such close proximity to Earth that the attraction of Earth takes over and pulls the weight in toward Earth. This tends to misinform the observer, who may lose sight of the fact that the man and Earth and the weight on the string are all going together around Sun at 60,000 mph.

1009.63 Despite the overwhelming power of the attraction of Earth, we must continue to keep in mind the critical-proximity concept. For instance, let us consider two steel magnets lying on a table and apparently not attracting one another simply because Earth-pull against the table and the friction of the table prevent them from indicating their pull for one another. But as they are given a series of pushes toward one another there comes a point when Earth's gravity-induced friction is overcome by the local magnetic interattraction which increases as the second power of the relative interdistance increase; and there comes a moment when friction is overcome and the two magnets start moving toward one another and accelerate to a fast, final-snap closure. It is when such other forces are overcome that the two magnets articulate their interattraction independent of all other forces: this is the point we call critical proximity. (See Sec. 518.)

1009.64 Earth and Moon were, still are, and always will be pulling on the two magnets to some extent—as are all the other galaxies of Universe. The critical-proximity moment is when all the other pulls are overcome by the pull between the two magnets and "falling-in" occurs; and the falling-in is always of the lesser toward the greater.

1009.65 The astronaut can go out space-walking because he and his space vehicle are in the same Universe orbit at the same rate, as would be any other object the space-walker had in his hand. Here is an opportunity for the mutual mass attractions to articulate themselves, except that in this situation, the prime force is the acceleration itself. What the physicists have failed to elucidate to society, and possibly to themselves, as well, is that *linear acceleration is also orbital* but constitutes release from co-orbiting (or critical- proximity orbiting) into the generalized orbiting of all Universe.

1009.66 All the creatures on board planet Earth are in such critical proximity that the falling-in effect of the apple hitting the grass, the rain dropping on the sidewalk, the hammer falling to the floor, or the child bottoming to the deck of the crib are all typical of the critical-proximity programmability of a design integrity, which programmability is employable by humans in design science. All of the creatures of planet Earth are in a "fall- in" programmed by a critical-proximity guarantee.

1009.67 The bee goes after his honey and, inadvertently, at 90 degrees to his honey- seeking plunge, his tail takes on pollen and knocks off pollen to produce a large, slowly orbiting interfertilization of the vegetation's prime-energy impoundment of photosynthesis from the stars—particularly the Sun star—of all the radio-transmitted energies to Earth. Photosynthesis impounds energy, and by orderly molecular formation and crystal building, the synergetic intertransformabilities and the associabilities and disassociabilities of the isotropic-vector-matrix field accommodation occur. What is spoken of as ecology is slowly orbiting local interaction of mutual intersupport within unpremeditatedly accomplished tuning of the prime drive programming of the spontaneous fall-in-ability of the creatures within the critical-proximity conditions: the sugar on the table, the naked girl on the bed.

1009.68 All special-case events are generated in critical proximity. Critical proximity is inherent to all intertransformability and interaccounting of eternally regenerative Universe—as, for instance, in the myriad varieties of frequencies ranging from eons to split-seconds. When Earth's orbit passes through a comet's stardust plume, we witness some of the comet's stardust falling in to Earth captivity, some of it igniting as it enters the atmospheric gases, some falling into Earth, and some with such acceleration as only to pass through the atmosphere leaving meager entropic dust to fall to Earth.

1009.69 Comet: A comet is a celestial itinerant, a cosmic skyways vacuum cleaner trying to accommodate an aggregation of stardust as it travels successively through the orbital neighborhoods of planets, stars, and other comets. The radiation pressures from the nearest stars, however, tend to blow the vacuum cleaner's stardust gleanings out into a bagless "dustbag," causing what we erroneously speak of as the comet's tail. These "tail" displays should be spoken of as Sun-radiation blowout trajectories. As comets come into critical proximity of syntropically importing planets, the stardust aggregates of their inverted "tails" are gravitationally depleted by the planets they pass, as much of that stardust is attracted into the planets or moons to become part of those import centers' syntropic buildup in a multibillions-of-years syntropic preparation of their stored-energy aggregates to be converted into the state of an entropically exporting star.

1009.70 **Orbital Escape from Earth's Critical-Proximity Programmability:** Human mind, while discovering generalized principles, eternally persisted in special-case experience sequences, but has gradually developed the capability to employ those principles to put vehicles and then self into such acceleration as to escape the fall-back-in proclivity and to escape the general ecological fall-in program of invisible interorbiting regeneration.

1009.71 As each human being discovers self and others and employs more principles more and more consciously to the advantage of others, the more effectively does the individual retain the integrity of his own unique orbiting in Universe, local though it may seem aboard our planet. His unique orbiting brings him into a vast variety of critical- proximity fall-ins. Man has progressively acquired enough knowledge to raise his vision from the horizontal to the vertical, to stay first atop the watery ocean and next atop the airocean heights, and most recently to orbit beyond the biosphere with ever greater independence, with ever greater competence, and with ever greater familiarity with the reliability of the generalized principles.

1009.72 Little individuals in orbit around little berry patches, fruit trees, nut piles, and fishing holes are instinctively programmed to pick up rocks and pile up walls around the patches, orchards, and gathering places. Some men floating on the waters and blown by the wind were challenged to respond to the accelerating frequence of stress and high- energy impacts, and they went into vastly longer orbital voyages. Others went into lesser and slower orbits on camels and horses, or even slower orbits on their own legs. The effect of human beings on other human beings is always precessional. All of us orbit around one another in ever greater acceleration, finally going into greater orbits. The local critical-proximity fall-in and its 99.9999 percent designed-in programming becomes no longer in critical-proximity evidence, while all the time the apprehending and comprehending of the generalized principles elucidates their eternal integrity in contrast to the complex inscrutability of the local critical-proximity aberrations permitted and effected in pure principle whenever the frictional effect on the two stones lying before us overcomes their tendency to fall in to one another—with naught else in Universe but two stones—which statement in itself discloses our proclivity for forgetting all the billions of atoms involved in the two stones, and their great electron orbits around their nuclei, guaranteeing the omniacceleration, yet synergetically and totally cohered by the mass- interattractiveness, which is always more effective (because of its finite closures) than any of the centrifugal disintegrative effects of the acceleration. All the interaberrations imposed on all

the orbits bring about all the wave-frequency phenomena of our Universe. The unique wave frequencies of the unique 92 chemical elements are unique to the local critical-proximity event frequency of the elemental event patternings locally and precessionally regenerated. Finally, we must recall that what man has been calling "linear" is simply *big orbit arc* seemingly attained by escaping at 90 degrees from local orbit. There are only two kinds of acceleration, greater and lesser, with the lesser being like the radius of the nucleus of an atom in respect to the diameter of its electron shell.

1009.73 Humanity at this present moment is breaking the critical-proximity barrier that has programmed him to operate almost entirely as a part of the ecological organisms growing within the planet Earth's biosphere. His visit to Moon is only symptomatic of his total, local, social breakout from a land-possessing, fearful barnacle into a world-around- swimming salmon. Some have reached deep-water fish state, some have become world- around-migrating birds, and some have gone out beyond the biosphere. Long ago, man's mind went into orbit to understand a little about the stars. And little man on little Earth has now accumulated in the light emanating from all the stars a cosmic inventory of the relative abundance of each of the 92 regenerative chemical elements present in our thus- far-discovered billion galaxies of approximately a hundred billion stars each, omnidirectionally observed around us at a radius of 11 billion light years. Man can always go into infinitely great, eternal orbit. Mind always has and always will.

1009.80 **Pea-Shooter, Sling-Thrower, and Gyroscope:** Gravity and Mass-Attraction: Highly specializing, formula-preoccupied, conventional academic science of the late twentieth century seems to have lost epistemological sight of the operationally derived mathematics identifying Galileo's accelerating-acceleration of free-falling bodies as being simply R^2, where R is the relative proximity of any two bodies whose mutual interattraction is isolatingly considered. R^2 says that every time the proximity is halved, the mass-interattraction of the two bodies will be increased as 2^2, i.e., fourfolded.

1009.81 Isaac Newton did comprehend this. Newton was inspired by the early Greeks and by Copernicus, Kepler, and Galileo. Newton compounded Kepler's discovery of the mathematical regularities manifest by the differently sized solar system's interattractions with Galileo's discoveries—which information Newton's own intuition then further integrated with ancient experience of the sling-throwers, which showed that the more the sling-thrower converted his muscle power into increasing the speed of the sling orbiting around his head before freeing one end of it to release his stone pellet, the faster and farther would the impelled stone travel horizontally before another more powerful force pulled it inwardly toward Earth's center.

1009.82 The gravitational constant is expressed as a second power. Second-powering means that the number is multiplied by itself. Thus the forces of the accelerating- acceleration of gravity can be calculated, provided the masses of the two interapproaching bodies are multiplied and their relative proximity is expressed in the terms of the relative radii magnitudes of the bodies.

1009.83 When we see the pea-shooter blowing peas out in a trajectory, we see that if it is blown harder, the impelled peas may attain a longer trajectory before they curve down and toward Earth as they yield to gravity. Assuming no wind, the gradual curvature from approximately horizontal to vertical of the peas' trajectory all occurs in the same single vertical plane. When you insert your finger into the blown pea's trajectory, you interfere with the pea and deflect it angularly. This means deflecting the plane with which the pea's horizontal course is translated toward the vertical from below, or sideways, or from any direction. This trajectory altering is a phenomenon described by the physicists as angular deflection.

1009.84 In the same way, you can also deflect the plane of travel of water coming out of a garden hose—to aim the stream of water in any direction you want before gravity overcomes the initial force impelling the water. We cannot see the individual molecules of water we are deflecting one by one when our finger angularly modifies the stream of water at the hose nozzle, but we can see the individual shooter-blown peas that we can deflect individually, thus aiming them to hit various targets. The vertical plane of the pea is deflected sideways by you, and its falling within the plane is directed by gravity. There is a vertical integrity of the trajectory plane. The finger only deflects the horizontal orientation plane. The pea does not have a memory and after initial deflection by your finger does not try to resume the vertical plane of its previous travel.

1009.85 Two forces have operated to determine the pea's trajectory:

1. gravity, which continues to operate, deflecting it progressively; and
2. the finger, which momentarily deflected it but is no longer doing so.

When we come back to the spinning Olympic hammer-thrower this time rotating vertically between head-and-foot-clamped ball-bearing turntables which in turn are mounted in gimbaled rings, to whose belt is hooked a complete, 360-degree, ball-to-ball, "grass-skirt- like" ring of horizontally revolving steel balls on the outer ends of steel rods, on the inner ends of which are pairs of triangular steel handles now hooked to the hammer-thrower's belt after his successive angular acceleration of each hammer into the horizontal spinning ring of his "grass skirt." His separately accelerated and horizontally traveling balls are each similar to each of the peas as first blown horizontally out of the pea-shooter tube. Both the peas and the steel balls are being affected by two forces: the peas by gravity pulling upon them and by the force with which they were originally propelled in horizontal trajectory; the spinning steel balls have their original horizontal acceleration, which was so great as to overcome gravity's Earthward-pulling effect, plus their second restraint, that of the steel rods successfully restraining and countering the centrifugal force that seeks to release the balls into *tangential*, not radial trajectory.

1009.86 Because centrifuges separate "heaviers" from "lighters" by expelling the heavy from the light—such as milk centrifuges out of cream— people have mistakenly thought of the expelling as radial rather than tangential. Make yourself a diagram of your own spinning of a weight around your head—you tend to think of it as being released in a horizontal plane at a point on the spun circle directly in the line running between your eyes and the target direction in which you wish the hammer to travel, that is leading perpendicularly outward from the circle in the direction in which the released pellet travels. The fact is that if it were released at that point, it would travel at a direction 90 degrees, or sidewise from your desired trajectory, from that actually realized. Studying the action of an Olympic hammer-thrower, you will find that the spherical hammer and its rod are released at a point facing away 90 degrees from the direction in which the released hammer travels: i.e., the hammer always goes off tangentially from the circle of acceleration. This contradicts the popular conception of a centrifugal force as being radial rather than tangential.

1009.87 Returning to our Olympic hammer-thrower's steel-ball, flying skirt, if you touch evenly their successively passing tops, thus downwardly deflecting each ball of the full circle of ball hammers spinning around, each is discretely deflected, say 30-degrees downwardly, which changes the plane of its individual orbital spinning. Each "peels off," like an airplane flying formation and obeying a command to break company and go into a descending path followed exactly by each successive ball coming into touch-contact with your deflecting finger held rigidly at the same point.

1009.88 If your rigidly held finger is lowered further to another discrete point in the line of travel of the successively revolving balls, and if it is held rigidly at this new point, each of the circle of revolving spherical hammers will again be discretely deflected into an additionally tilted plane (with the hammer-thrower himself as axis of rotation always maintaining perpendicularity to the plane of the hammers' revolution, his axial tilting being accommodated by the three-dimensionally oriented axles of the two gimbal rings within and to which his ball-bearing foot-and-head clamps are firmly attached).

1009.89 We had learned earlier about fixed or progressive-horizontal reangling of the plane of the peas' coincidentally yielding to gravity (Sec. 1009.83), as we tried discrete deflecting of the successive peas shot from the pea-shooter. By experimenting, moving our finger progressively deeper, in deliberately distanced stages, into the peas' profile- described "tubular" space-path of travel, we found that the nearer our finger came to the center line of travel within that "tubular" space-path, the wider the resulting angle of deflection of the peas' trajectory. When finally our finger crossed the tube's center line, the angular deflection ceased and direct 180-degree opposition to the line of pea travel occurred, whereat all the horizontal force originally imparted to the peas by the pea- shooter's pneumatic pressure-blowing is almost absorbed by impact with the finger. The pea bounces back horizontally for a usually imperceptibly meager distance before yielding entirely to gravity and traveling Earthward at 90 degrees to its original horizontal trajectory.

1009.90 What we also learned observationally before and after deflecting the peas experimentally was that gravity went to work on the peas as soon as they left the tube, and that as the peas were decelerated by air resistance below the rate of acceleration that rendered them approximately immune to the pull of gravity, that latter force became ever more effective as the air resistance took its toll of energy from the peas, and the peas were deflected progressively Earthward. We also observed that no wind was blowing, and when we did not deflect the peas with our finger, they all followed a progressively descending path in exactly the same plane until they hit the ground. Next we learned that if we intruded our finger horizontally a discrete distance into the tubular space-path of the peas, they were deflected at some discrete angle (less than 90 degrees, diametrically away from the point of entry of our finger into the peas' tubular space-path), and that if we did not move our finger further into the tubular space-path, each traveling pea thus interfered with deflected the same angular amount horizontally away from our intruding finger and held that newly angled direction, yielding further only to air resistance and gravity, with the result that each successive pea thus discretely deflected proceeded in a progressively curved trajectory, but always within the same vertical plane. In other words, successively separate and discretely distanced progressive intrusions of our finger into the tubular space-path of travel deflected the vertical plane of the trajectory of the peas into a new but again sustained vertical plane of travel, that new vertical plane occurring each time at a more abrupt angle from the original nonintruded vertical plane of the stream of traveling peas. Thus we learned that we could deliberately aim the peas to hit targets within the range of such traveling. (We have all succeeded in deflecting the trajectory of a pressured stream of water in just such a manner, but we cannot see the individual molecules of water thus deflected and think of it as a continuous stream.) The discretely modified behavior of our pea-shooter's individual peas and the individual steel-ball "hammers" of the Olympic hammer-thrower altogether permit our comprehension of the parts played by individual, but invisible-to-human-eyes energy quanta in bringing about only superficially witnessed motion phenomena that most often appear deceivingly as motionless solids or as swiftly rotating solid flywheels such as those of gyroscopes.

1009.91 Thus we now can understand that our touching the rim of a flywheel of an XYZ-axialed and gimbaled gyroscope causes each of the successively and discretely top- touched quanta to be deflected downward into a new plane of travel, accompanied always by the coincident tilting of the axle of the flywheel, which always maintains its perpendicularity to the plane of spin of the flywheel. The tilting of the plane of spin of the flywheel, caused by our finger touching the rim of the spinning wheel, tilts that wheel around an axis of tilt, which axis is the line diametrically crossing the circular plane of spin from the rim point that you touched. This diametric line is the tilting-hinge line. It runs directly away from you across the wheel. This means that as the wheel's extended axle perpendicular to the flywheel plane tilts with the wheel, as permitted by the three-axial degrees of freedom of the gimbaled gyroscope, then the axle tilts in a plane at right angles to the tilting-hinge line in the flywheel. Because the steel wheel and its axle are integral, it would be in exactly the same plane of force in which you applied your touch to the flywheel's rim, if, instead, you took hold of the top bearing housing the flywheel's top axle extremity and pulled that gimbal-freed bearing toward the rim point at which your finger had applied its initial touch, the bearing housing and the axle of the flywheel will rotate exactly sidewise from the direction in which you are pulling on it because that force makes the flywheel tilt hingingly around the line running diametrically across the wheel from your rim-touching point.

1009.92 Thus we learn that pulling the axle bearing atop the gyroscope toward the rim-touching point, which is also incidentally pulling the top axle bearing in the gimbaled system toward yourself, results in the wheel plane tilting around the described hinging line, and the axle and its bearing are thus forced to move coincidentally in a plane perpendicular to that hinge line and in the direction which is tangential to the wheel spinning at the initial touching point. This means that pulling on top of the gyroscope does not result in its yielding toward you, as you might have expected from its three-axial degrees of gimbaled freedom, as it would have done had the wheel not been spinning. Instead, it seemingly travels rotatingly in a plane at 90 degrees to your effort and continues to do so so long as you apply the force, and does so ever more speedily if you increase the force. This yielding at a plane angled at 90 degrees to your (or anyone's) applied effort is *precession*, which is the effect of a body in motion on any other body in motion; the resulting angles of precession are never in a plane congruent with the precessionally actuating force.

1009.93 Since all Universe is in motion, all the intereffects of its energy concentrations as "matter" are always intereffecting one another precessionally. The pull of Sun on Earth results in Earth orbiting around Sun at 90 degrees to the line of Sun's mass attraction of Earth. Bodies "fall" toward Earth only when their relatively small size and the critical proximity of their respectively mutual orbiting of Sun at 60,000 mph allows their progressive orbital convergence; the lesser body is only negligibly affected by the precessional forces of other astro bodies because of the second-power rate of diminution of intermass-attraction occurring as the intervening distances are increased.

1009.94 All the foregoing illustrates the integration of (1) Newton's mass-attraction law, (2) precession, and (3) synergy. They are all coming together here: Kepler, Galileo, and Newton. The earliest sling-thrower revolving the sling around his head (angular acceleration, as it is called by the physicists) demonstrates the added energy of the sling- thrower extending the trajectory. The pea-shooter does the same thing in linear acceleration. It can extend its trajectories with greater energy, but its pellets, too, yield to the gravity of Earth. Earth is very powerful, but the pea-shooter or the sling-thrower discover that the harder they swing or blow—i.e., the more energy they put into accelerating their pellets—the farther the pellets go horizontally before gravity deflects them at 90 degrees.

1009.95 But there is an integration of the horizontal and vertical planes of applied forces, between the horizontal plane of your varying effort and the vertical plane of the constant Earth's pull. Realization of this integration may be what inspired Newton. Galileo used the phrase "accelerating-acceleration," which means that the velocity is continually increasing. But the sling-thrower's force was discontinued, and the air resistance decelerated its missile until gravity's force at 90 degrees became greater. If the sling- thrower propelled his missile outside the atmosphere of Earth and beyond the critical- proximity limits within which falling in occurs, his missile would keep on traveling ad infinitum in an astro-wandering orbit.

1009.96 The logic of sensorially satisfactory experience acquired in the foregoing elucidation of precession—and the discovery of our self-deceivingly-conditioned reflex in respect to assuming 180 degrees to be the normal angular direction of spin-off instead of reality's 90-degreeness—not only renders precession comprehendible, but can make its 90-degree spin-off and other effects understandably normal and can explain much that has heretofore seemed inexplicable and abnormal. The two angular-acceleration planes become very important devices of comprehension. In our generalization of generalizations, we find that synergy, as "the behavior of whole systems unpredicted by any of the systems' parts taken separately," embraces both the generalized mass attraction and the precessional laws. Apparently, synergy embraces our definition of Universe and is therefore probably the most generalized definition of Universe.

1009.97 The generalizations are of the mind and are omniembracing and omnipermeative. Like the rays of Sun, radiations are radii and are focusable. Gravity cannot be focused; it is circumferentially embracing. Radiation has shadows; gravity has none. Radiation produces the phenomenon known to Einstein as the bending of space, the gravitational field.

1009.98 Gravitation is omniembracing. In the barrel hoops (see Sec. 705), gravity operates only in single and parallel, separate planes. Omnitriangulated geodesic spheres consisting exclusively of three-way interacting great circles are realizations of gravitational-field patterns. Events are forced to bounce in spherically contained circles because they seek the largest possible interior circumference patterns. All great circles cross each other twice. Three or more noncongruent great circles are automatically inter- self-triangulating in their repetitive searching for the "most comfortable" interactions, which always resolve their three-way-great-circle patterning into regular spherical icosahedra, octahedra, or tetrahedra. The gravitational field will ultimately be disclosed as ultra-high-frequency tensegrity geodesic spheres. Nothing else.

Next Section: 1010.00
