

Glossary of Terms

DSSU (Cellular Cosmology)

Definitions are the guardians of rationality, the first line of defense against the chaos of mental disintegration.

—Ayn Rand, objectivist philosopher

5th cosmology: The Cellular theory of the Cosmos; also known as the *Dynamic Steady State Universe*. In the chronology of Mankind's understanding of the Universe, it is the fifth interpretation. The 5th cosmology represents a revolutionary overthrow of the expanding-universe paradigm by the NON-expanding cellular concept. See **Cosmology revolutions**.

Absolute motion: Motion of a body *through* the universal space medium and referenced as such; it is the same as *intrinsic motion*. This is the motion that is strictly limited to about 300,000 kilometers per second.

Absorption line: A more or less narrow range, of wavelengths in a spectrum, that is darker than neighbouring wavelengths. Absorption lines are seen in the analysis of light from stars.

Accretion disk (gaseous): A disk of gas rotating about a central object. As the gas slowly spirals inward, it releases gravitational energy. If the central object is compact (e.g., a neutron or *Superneutron star*), the accretion disk becomes very hot and luminous.

Active galaxy: A galaxy with a rotating supermassive black region that is actively accreting gas, hence releasing energy as radiation, and generating outflowing jets (astrophysical jets).

Aether: (1) The original *ether*: In Aristotelian physics, the fifth element, the *quintessence*, of which the 'heavens' are made. In classical physics, the invisible medium that diffuses all space. (2) The historic: The *material* medium that fills the apparent emptiness of the universe. Invented by René Descartes and by Isaac Newton; reinvented by many others, including James Clerk Maxwell who used it for his electromagnetic theory; but was discredited and discarded by Einstein.

(3) The DSSU aether: The subquantum medium that permeates all space. It is the *nonmaterial essence* of the Universe; it consists of discrete units —fundamental essence fluctuators, or essence oscillators. As a basic space medium, it serves as the propagator of electromagnetic waves. As a space-permeating dynamic medium, it manifests gravitation; its nature is responsible for the several guises of gravity.

Aether was detected and verified in at least six separate experiments during the 20th century.

Aether deprivation: The termination process by which matter is extinguished. The process takes place deep inside extreme mass concentrations (matter concentrations that are large or dense or both). Matter does not, and cannot, exist in the absence of aether. When matter finds itself in a region of insufficient aether flow, it ceases to exist. Such a situation arises (1) at the bottom of the gravity well (sink) of a *Terminal star* (aka end-state neutron star); (2) during the final stage of stellar gravitational collapse and ending with the critical terminal state; (3) during the collision or merger of sufficiently massive compact bodies.

Anisotropic: The property of being different in certain directions. See *isotropy*.

Anisotropy: The observable difference between different directions.

Annihilation: A misleading term used to describe a particle and antiparticle collision. In fact, they are not "annihilated"; they are simply converted into energy, usually photons.

Antigravity: The cosmic 'repulsive' effect produced by the emergence/expansion of the *aether* medium.

Antiparticles: are the by-products of collisions of particles in high energy interactions (occurring, for example, in terrestrial particle accelerators, and near compact neutron and Superneutron stars) and often detected in cosmic rays.

Assimilation of aether: By this process, mass and energy are able to 'contract' the *space*

medium, thereby pulling-in the surrounding *space medium*. In the context of DSSU gravity theory, this is called *primary gravity* (and leads to secondary effects).

Background space: It is the Universe's 3-dimensional emptiness-space; it has no properties whatsoever and serves merely as a "container" —a repository permeated by a universal essence (a non-material medium) commonly called aether.

Baryon: Any massive atomic particle made up of three quarks. Neutrons and protons are baryons.

Big Bang (BB): The popular name for any expansionary model in which an explosion-like event initiated the entire universe.

Big Crunch: Speculative collapse of the universe, similar but opposite to the Big Bang. It is based on the belief that the universe's expansion might stop and reverse.

BBI: Expansionary and inflationary model of the universe; a universe that has at least one episode of abnormally high rate of vacuum expansion.

Blackbody: An object with a constant temperature that absorbs all radiation that hits it.

Black hole: According to the conventional (non-DSSU) view, it is any gravitating object, or region, possessing an *event horizon* (a "surface" from which the *escape velocity* exceeds the speed of light). In terms of general relativity, the space around a black hole reaches infinite curvature, and the interior tends to infinite density.

Black hole (mathematical): A black hole is a mathematical construction associated with a point mass of some specified magnitude, a point mass called a singularity. Differs from the usual treatment of mass in the following way: In conventional gravitation calculations, the mass body is assumed to merely act as if it were concentrated at a point (its *center of mass*); but for a black hole, the mass supposedly exists, in its entirety, at the center point!

Black hole (singularity): A black hole for which all of its mass is concentrated at a single central point. It does not exist except as a mathematical object.

Black star: Another term for *Terminal star*, or *Superneutron star*.

Boson: A particle with integer spin. Hypothetical carriers/intermediaries of the 4 forces of nature within the standard model of particle physics. (Fermions, in contrast, are fundamental particles with half-integer spin.)

cD galaxy: A supergiant elliptical/spherical galaxy found at the center of a galaxy cluster.

Celestial sphere: Apparent sphere of the sky; a sphere centered on the Earth observer and having celestial poles aligned with Earth's polar axis. Directions of objects are denoted by *right ascension* (the angle measured eastward along the 24-hour celestial equator from the vernal equinox) and by angular *declination* (above or below the equatorial plane).

CMB, CMBR: See *Cosmic Microwave Background Radiation*.

Conservation principle (or conserved quantity): Take any of the basic measurable physical quantities (like mass, charge, spin, position, and velocity) and combine them mathematically according to some fixed formula. If the resulting combination does not change when the measured particles interact, then the lack of change represents a conservation law/principle. Examples are the total energy and total momentum of a system.

Containment principle: (1) In standard cosmology: the physical universe contains everything that is physical, and nothing else.

(2) In *DSSU cosmology*: The universe contains everything that is physical, as well as a non-material, non-energy, essence medium, and nothing else.

Contractile gravity: *Contractile gravity* is the acceleration of aether flow towards mass bodies (where the local flow converges). It manifests as an *apparent* force of attraction. On the larger scale, contractile gravity acts in that portion of each cosmic-scale *gravitation cell* where comoving trajectories (of objects) are *converging*. It is the ordinary gravity of our everyday experience. See also *cosmic gravity*, and *unified gravitational cell*.

Contraction ‘field’: The region, surrounding a mass body, in which aether is contracted, in a process of self-dissipation. It is a key component in contractile gravity.

Cosmic cell (cosmic structural cell): The dodecahedral-shaped structural unit of the *DSSU*. It represents the universe's largest structure.

Cosmic evolution: Systematic change of the universe over time (*not* a Darwinian process). The term applies to the various hypothetical Big Bangs. It does NOT apply to *DSSU* cosmology.

Cosmic gravity: is the acceleration of the aether flow in the cosmic Voids where the dynamic flow has a radially diverging pattern. *Cosmic gravity* acts in that portion of the *unified gravitational ‘field’* where comoving trajectories (of objects) are *diverging*. It is the Lambda force/effect. See also *normal gravity*.

Cosmic Microwave Background Radiation (CMBR or CBR, aka “3 K blackbody radiation.”): A nearly uniform flux of microwave emission coming from all directions of the cosmos; with an intensity corresponding approximately to a black-body curve. (1) In 20th-century cosmology: Radiation left over from the hot Big Bang which has cooled due to whole-universe expansion to a temperature slightly less than 3 degrees above absolute zero. (2) In *DSSU cosmology*: The 2.7 K CBR is the radiation received from distant galaxies (emitting light at a peak intensity temperature of about 5800 K) after being redshifted by a *z*-factor of 2000 during a journey of about 123,000 Mly.

Cosmic redshift: The most important measure for determining cosmic distance of far off galaxies. Twentieth-century cosmology (unlike *DSSU* cosmology) interpreted the *cosmic redshift* as the evidence of actual receding velocities (of the source galaxies) and then extrapolated this evidence to support the speculation of the expansion of the whole universe.

The cause of the *cosmic redshift*: In expanding-universe models, the cause is primarily the *expansion of space* (i.e., expansion of the vacuum or *quantum foam*). In the *DSSU*, the cause is primarily the *velocity-differential spectral shift* that radiation acquires as it transits across gravity wells and particularly as it traverses the great *cosmic gravitation cells*.

Cosmic theory: The attempt to explain our existence and experiences as caused by observed and unobserved entities and processes.

Cosmism: A philosophy of the cosmos.

Cosmic Void: The mostly-empty region of the interior of the dodecahedral-shaped cosmic structural cells. It is here that aether emergence/formation occurs.

Cosmogony: The study of cosmic evolution; any theory of the origin of the universe or one of its component systems, such as star clusters, galaxies, and superclusters.

Cosmological constant (denoted by the Greek letter Lambda Λ): (1) Traditionally, it is the multiplicative constant for a term proportional to the metric in Einstein's *general relativity* equation relating the curvature of space to energy-momentum. When positive it represents space expansion and potentially leads to an acceleration of the expansion of the universe. (2) In modern usage it is identified with vacuum energy. (2) In *DSSU cosmology* it represents the emergence/expansion of aether, but has nothing to do with Universe expansion. In other words, the *space medium* expands, but the Universe *does not*.

Cosmological Principle: states that the universe, on the large scale, is homogeneous and isotropic; that is, uniform in all places and in all directions. Spatial homogeneity. See also *perfect cosmological principle*.

Cosmologist: One who studies *cosmology*, the science of the universe.

Cosmology: (1) The general science of the cosmos or material universe, its structures, its composition, and its laws. Combines astronomy, astrophysics, particle physics, and mathematics to assemble the knowledge into a world picture. (2) A particular cosmological theory. The *DSSU* is a steady-state cellular cosmology; in the chronology of worldviews, it is the 5th *cosmology*.

Cosmology revolutions: The 1st revolution in cosmology occurred when chaos was transformed into the conceptual Universes ruled by Gods. The 2nd revolution occurred when the universe ruled by gods was replaced by the Universe ruled by Natural Laws. The 3rd revolution, known as the Copernican revolution, saw the overthrow of the Geocentric by the Heliocentric Universe. The 4th revolution involved the overthrow of the STATIC unchanging universe by the EXPANDING universe. Finally, the 5th-cosmology revolution is the overthrow of the Expanding-Universe paradigm by the Non-Expanding Cellular Universe.

Cosmos (from the Greek word *kosmos* for order and beauty): The Universe as an embodiment of a system of order and harmony.

Critical density: A concept pertaining to the Big Bang model. It is the matter/energy density of the universe at which the universe *balances* between continued expansion and re-collapse. Its value depends on the universe's expansion rate.

Critical-state neutron star: See *Terminal star* and *Superneutron star*.

Critical-state star: Any star which, during the course of gravitational contraction, has acquired a pure energy surface (aka a lightspeed boundary).

Curvature of space: In conventional astrophysics, it refers to the mathematical representation of the distortion of abstract space (spacetime); the 3 types of curvature are spherical (space contracts), flat (Euclidean), and hyperbolic (space expands). In Natural astrophysics, because space is considered to be merely a 3-dimensional volume of nothingness, the term is meaningless.

Dark energy: See *Vacuum energy*.

Dark Matter: is the exotic ingredient required by the Big Bang model to explain the rotation curves of galaxies and the structural cohesion of galaxy clusters. Supposedly, a form of matter that does not emit, absorb, or scatter any light. Its only interactions are said to be gravitational. Has never been detected and remains elusive. It is the Achilles heel of the expanding-universe hypothesis. (Also see *Rotation curve/graph*.)

Declination (Dec.): Angular distance north or south of the celestial equator.

Deduction: A process of reasoning in which a conclusion is derived logically from a given premise or premises, without the need for additional information. The conclusion of a deductive argument must be true if the premises are true.

Reasoning from the general, a law of nature for example, to the particular.

Distance ladder: Because no single method can measure distances to both near and far objects in the Universe, the set of overlapping methods, in which nearby ones calibrate more distant ones, is called the *distance ladder*.

Dodecahedron: A twelve-sided 'solid' polyhedron. A *regular* dodecahedron has identical pentagonal faces. The *rhombic dodecahedron* is irregular, but symmetrical, and has identical rhombus faces.

Doppler effect (Doppler shift): The change in the observed frequency (and wavelength) of an acoustic or electromagnetic wave due to relative motion of source and observer. With sound the change is in the pitch; with light the change is in color. Named after the 19th-century physicist credited with its discovery.

DSSU: *Dynamic Steady State Universe*.

DSSU Theory: The natural cosmology theory that holds that the space medium (a nonmaterial aether) is dynamic and that it expands and contracts *regionally and equally* resulting in a cosmic-scale cellularly-structured universe. It is defined by four fundamental processes which provide a rationally coherent account of the major phenomena of our Universe.

Electromagnetic field: A region, surrounding a positive or negative charge, in which a radial pattern of aether excitation is accompanied by a process of aether absorption and vanishment.

Electromagnetic force: One of the four forces of nature. It is intermediated by the photon.

Electromagnetic interactions hold electrons in atoms, hold atoms in molecules, and are important in all electronic devices.

Electron: A negatively charged subatomic particle with rest mass 9.1×10^{-31} kg (rest energy 0.511 Mev). Structurally, it is a double loop of a single-wavelength self-orbiting photon — a self-looping quantum of electromagnetic radiation.

Electroweak force: A unified force that mathematically combines the electromagnetic and weak nuclear interactions. Predicted by Weinberg and Salam, experimentally verified by Rubbia and van der Meer.

Elliptical galaxy: One of the primary kinds of galaxies. It is a smooth distribution of stars, spheroidal in shape (usually prolate along the axis of motion), and has practically no rotation.

Emission line: A more or less narrow range of wavelengths in a spectrum that is brighter than neighbouring wavelengths. Emission lines are made by atoms or ions in a hot gas; often seen in the light from certain astronomical objects such as quasars.

Energy: (1) The capacity to do work. (2) Manifestation of a particular kind of force.

Energy process: Any localized quantitative change in aether units. Energy, both mass-energy and radiation-energy, at the most fundamental level is manifest in the absorption-annihilation of units of the *space medium* (defined as *a nonmaterial aether*). Without this active process, neither mass nor radiation can exist.

Entropy: is an increase in disorder, a trend towards thermal equilibrium. It represents a decrease in the useable forms of energy. For a closed or an isolated system, entropy is *not* conserved; it is *increasing* all the time.

- (1) In standard cosmology the source of low entropy is the expansion of the entire universe. The entropy is said to be forever increasing for the universe as a whole, however, this increase is incompatible with the Big Bang accelerating universe and actually leads to a paradox.
- (2) In DSSU cosmology the Universe is NOT a closed system: the source of low entropy is the perpetual emergence/expansion of the space medium. Entropy *increases* in the usual manner, while entropy simultaneously *decreases* via the process of aether deprivation mass extinction and the process of blueshifting, both occurring within *Terminal stars*. Each cosmic cell of the DSSU behaves as an autonomous thermodynamic system.

Escape velocity: The minimum velocity, with respect to the gravitating body, that will allow an object to escape from a gravitational ‘pull’ (or field). For a primary body of mass M and radius R , and ignoring any frictional resisting force, the *escape velocity* is $\sqrt{2GM/R}$.

Essence fluctuators: The discrete units of the essence medium, the medium that we equate with a non-ponderable aether. They are, more specifically, the units of a *non-corporeal, non-energy, aether*. (A vitally important concept in DSSU theory.)

Essence medium: A synonymous term for aether. It is the non-corporeal, non-energy, medium that permeates all space; consists of subquantum *essence fluctuators*.

Essence medium (historical): the substrate of the universe. Historically rooted in the “nonponderable,” nonmaterial, non-energy aether which Einstein expounded in his 1920 Leyden lecture.

Euclidean space: Space which is not curved (not distorted). Analogous to *aether* that is neither expanding nor contracting.

Event horizon: The boundary at which the speed of aether flow, with respect to the center of the gravitating region, is equal to the speed of light. Outside the boundary (that is, on the external side of the “horizon” surrounding the region of gravitating masses) the inflow of aether is less than lightspeed; while immediately inside the horizon, the inflow is *greater* than lightspeed. Event horizons are associated with *Supermassive black regions*, often misleadingly called *supermassive black holes*.

Fermion: A particle with half-integer spin. The fundamental fermions are the matter particles such as electrons and quarks.

Flat space: Abstract/mathematical space which is not curved. Analogous to *aether* that is neither expanding nor contracting.

Fundamental energy: See *energy process*.

Fundamental fluctuators: See *essence fluctuators*.

Fundamental force: of the universe is taken to be the *electromagnetic force*. As a corollary, there is the real possibility that the fundamental force particle, the photon, emerges from the non-ponderable aether as a spontaneous synchronization of the *Essence process I* (i.e., it emerges from a synchronized collection of fundamental fluctuators), a localized synchronization that has attained criticality.

Fusion: The combination of atomic nuclei to make heavier nuclei. If the collisions result from high-temperature interactions/collisions, it is called thermonuclear fusion.

Galactic cannibalism: The process whereby a smaller galaxy falls into a larger galaxy, undergoes tidal ‘shredding’, and ultimately sinks into its core.

Galactic cluster: An open cluster of stars. Not the same thing as a cluster of galaxies.

Galaxy: A basic cosmic unit containing roughly between 10^7 and 10^{11} stars, with gas and dust, all bound by gravity. There are five types: dwarf, elliptical, spiral, irregular, and supergiant (found at the center of every *cosmic gravity cell*).

Gly: Giga-lightyears. Or billion light years. But the term ‘billion’ is often avoided because of a potential confusion: In Canada and the United States it means a thousand million (1,000,000,000); while in Britain and Germany it refers to a million million (1,000,000,000,000).

Grand Unification Theory (GUT): A theory that unifies the electromagnetic force with the nuclear forces (weak, strong) into a single interaction. Several have been proposed, but none experimentally verified.

Gravitational energy: The energy in the gravitational fields acting between masses. For two masses M and m a distance r apart, the gravitational energy is $-GMm/r$. Gravitational energy is considered to be negative; the reason is that one must put energy into these objects to separate them to infinity where their energy would be zero.

Gravitational lensing: The creation of a distorted image of a distant galaxy or object when its light is focused by the gravity effect of a galaxy located between *it* (the distant source-galaxy) and the observer. In the DSSU, gravitational lensing is caused by the *aether contracting ‘field’* surrounding the particular intervening galaxy.

Gravitational redshift: Photons lose energy (increase in wavelength) when they move ‘uphill’, away from a mass concentration. The effect is an example of the *velocity differential spectral-shift*, in which the front and back ends of the wave are propagating at slightly different speeds.

Gravitation processes: (1) The *direct absorption* or *assimilation* of aether by all mass and all radiation; this process is the **primary cause of contractile gravitation**. (2) A process of the self-extinction of the space medium; the stress-induced vanishment of aether within contractile gravitation “fields”; this process is the secondary cause of gravity. (These processes also produce the property of mass and inertial mass.)

Gravitation, DSSU theory of: (1) *Gravitation is the effect produced by the acceleration of aether itself* towards the center of mass. (2) Gravity is caused primarily by the direct assimilation of the space medium by matter. By this process of assimilation, matter acts upon the medium —pulling-in the surrounding aether. (3) A secondary gravity effect involves the *contraction of aether* within a surrounding *contraction field*—a region where the medium self-dissipates and literally disappears. The intensity of *contraction* has an inverse relationship to radial distance. (4) A tertiary gravity effect involves the *emergence/expansion of aether* in each cosmic Void and produces a radial acceleration of the medium (directed away from the Void

center). It is a *cosmic-gravity* effect often likened to antigravity; generically, it is called the positive Lambda force/effect (comparable to the DeSitter effect). (5) Now, combine the normal *contractile-gravity* (described by (1), (2) & (3)) with the *cosmic-gravity* (described by (4)) and remarkably the *DSSU theory of gravity* becomes a ***unified theory of gravity***.

Gravity: The effect that causes the acceleration of all entities towards the center of mass, and is nominally proportional to $1/r^2$ (i.e., the inverse square of the distance to the mass center).

(1) In general relativity it is the effect of the curvature distortion of spacetime produced by the presence of mass and energy.

(2) In a quantum description, gravitons —hypothetical massless bosons— act as the force carriers.

(3) In DSSU cosmology it is the effect of the dynamics of the space medium —specifically the *accelerated flow*, or *inhomogeneous inflow*, of aether towards, and into, matter. In the context of processes, gravity is the side effect of, primarily, the mass-manifesting process.

Hadron: Particles that are made of quarks, such as protons, neutrons, and mesons, and their antiparticles.

Hertz (Hz): Unit of frequency; measured in number (of cycles) per second.

Higgs Boson, Higgs Field: In conventional physics, a hypothetical subatomic force-particle is believed to bestow the property of mass to all other particles exhibiting this property; in aggregate, these Higgs ‘particles’ constitute a related Higgs force field. As a mass acquisition concept, it is fatally flawed. It fails to explain how the Higgs particle acquires its own self-mass which is supposedly quite substantial.

Homogeneity: Components of the universe are evenly distributed within the universe on the large scale.

Hot Big Bang: A mythical creation model of the universe which begins at ‘infinitely’ high density and temperature, expands explosively, and cools to become like the Universe we observe now.

Hubble constant: (1) In expanding-universe cosmology it is symbolized by H_0 and represents the rate at which the recession velocity of galaxies increases with distance. The present value is roughly 22 km/s per million lightyears of distance; but since the expansion rate varies with the age of the Big Bang universe the Hubble expression is often written as ‘ H ’ (without the naught) and is then called the Hubble parameter.

(2) In the DSSU, H is the parameter that measures the rate of emergence/expansion of aether (as defined) within cosmic Voids and is expressed as the speed with which two comoving points, 1 million lightyears apart, undergo separation by the manifestation of new aether. The value is about 10 km/s per Mly, but varies with the location within the Void environment.

Hubble's law: (Applies only in expanding-universe models.) Big Bang’s mathematical rule of cosmic expansion: (Recession velocity) = (Hubble constant) \times (Distance).

By this law, widely separated galaxies are said to be moving apart from each other at an average rate of about 22 kilometers per second per million lightyears of distance between them (or 71 km/s per megaparsec).

Hubble length, L : (only for expanding-universe models) is defined as the distance at which the recession velocity equals light speed. The distance is expressed as c/H , in which $c = 3.00 \times 10^5$ km/s and $H \approx 22.0$ km/s per Mly, and equals 13,600 million lightyears.

DSSU cosmology does not recognize the recession-velocity interpretation and, therefore, does not have a Hubble length, or a Hubble sphere. *Implicitly and explicitly nothing whatsoever is receding* on the large scale.

Hubble sphere: In expanding-universe models, it is an imaginary sphere centered on the observer and having a radius equal to the Hubble length, L .

Hydrogen 21-cm emission: Radio emission of 21-centimeter wavelength produced by atomic hydrogen. Emission occurs when the electron’s spin direction reverses (180° flip of the spin axis).

Hyperbolic space: is the geometric term, related to the negative curvature of space, used to describe a region of dynamically expanding *space*.

Induction: Reasoning from the particular to the general; reasoning from a number of common facts to a general conclusion.

Inflationary scenario: One of the save-the-appearance modifications of the Big Bang (BB) model in which a large cosmological constant (a super-dense vacuum) is said to have operated, temporarily, early in the history of the big bang, and caused a rapid accelerating expansion of the universe; the inflation phase was then followed by a gradually decelerating expansion as described by the 'normal' BB model. In 1998 the inflationary scenario was again invoked in a further 'modification' made necessary by the unexpected reappearance of universe-wide acceleration. To minimize the confusion, the patch that was applied following the *Crisis of 1998* is called *re-inflation*.

Inflationary universe model: A version of the Big Bang hypothesis in which it is further speculated that the early universe experienced a brief period of extremely fast (exponential) expansion, supposedly involving a super-dense vacuum.

Interface: The common region between the cosmic structural cells; the region of aether-streaming confluence; the region where comoving material collides. Interfaces surround each cosmic Void.

Interstellar medium (ISM): The gas and 'dust' particles that exist in the vacuum of space between stars within galaxies. Its average density is about 10^6 atom/m³, with about 1 dust particle/km³

Invariance principle: When interactions between particles are unaffected by a change in some aspect of the interaction, then the interaction is said to be invariant under such change; this in turn leads to a conservation law. Invariance principles and their conservation laws lie at the heart of the laws of *conventional* physics. See *Conservation principle*.

Ionized: A condition in which one or more electrons have been removed from atoms, usually by energetic photons or collisions with other particles.

Isotropy: The property of being the same in all directions. Averaged over sufficiently large regions and distances, the Universe is considered to be isotropic.

Lambda force, +A: It is considered in conventional astrophysics as the 5th force of nature. It is often described as being a kind of *antigravity*, but its cause is unknown. This 5th force is the property of the *vacuum* or *aether* which, in an amazing coincidence, the Greek philosopher Aristotle called the 5th element.

In DSSU cosmology: (1) It is the force/effect that manifests within the cosmic Voids; and is caused (in part) by the fact that the *space-medium* across each Void is under tension. The positive *A* force is responsible for all large scale motion and subsequent angular momentum.

(2) It is the *negative pressure* present in the interior of each Void. Note, the *positive Lambda force/effect* and *negative pressure* and *tension* are all equivalent expressions.

Length contraction factor: The intrinsic contraction factor is $\sqrt{1 - v_a^2/c^2}$, where v_a is the speed with respect to the aether.

Lepton: A lightweight subatomic particle that does not feel the strong force of the Standard model of particle physics. The known leptons are the electron, muon, tau, and their associated neutrinos; and their antiparticles.

Light (quantized as photon): Light is a fundamental energy particle with cyclic (or oscillating) behavior.

Lightyear: A measure of astronomical distance. 1 lightyear = 9.47×10^{12} kilometers. (When converting to parsecs: 1 parsec = 3.26 lightyears.)

Linear galaxy cluster: The filamentous aggregation of galaxies that exists at any *triple*

boundary region where three cosmic cells meet each other. Along such ‘meeting line,’ galaxy structures from three neighbouring cells aggregate to form a concentration that extends from one node to another. Most often a *linear cluster* is observed as a branching arm of a *nodal galaxy cluster*.

Look-back time: The length of time light was traveling from a source object to us. This is also the period back in time that we witness the object. It is equal to the object’s distance (its *light-travel distance*) in lightyears.

Luminosity: The intrinsic brightness of a star. The intrinsic power radiated by an object, usually measured in watts. Since the light spreads out as it moves away from the object, its measured brightness would be $b = L/4\pi d^2$, measured in watts per square meter (where L is the luminosity and d is the distance). Solar luminosity (Sun’s total photonic power output) is $L_{\text{Sun}} = 3.86 \times 10^{26}$ watts.

Mach’s Principle: states that inertial mass and all inertial forces are due to the existence and distribution of all the matter in the universe. However, *cosmic gravitation cells*, because they limit the range of gravitation, make this an obsolete concept.

Magnitude: A scale used by astronomers to measure flux; the apparent brightness of a celestial body, expressed on a scale in which lower numbers mean greater brightness.

Mass-energy: The energy $E = mc^2$ associated with a particle or object’s mass. It is also called “rest energy,” because it is the energy of an object when it is stationary, with no kinetic energy.

Materialism: The belief that material objects and their interactions constitute the complete reality of all phenomena. *Materialism* does not permit a First-Cause process, which, of necessity, cannot itself be material; therefore, *materialism* cannot serve as the foundation of a theory of the Universe.

Matter extinction law: When matter (mass and energy) is subjected to *aether deprivation*, it ceases to exist.

Milky Way accretion disk: is the great rotating aggregation of matter formed and sustained by the rotation of a supermassive core consisting of many millions of *Superneutron stars*.

Milky Way density: The average density is one hydrogen atom per cubic centimeter. The Milky Way’s total mass is $10^{12} \odot$ (i.e., 10^{12} times the mass of our Sun) according to most textbooks.

Mly: Mega lightyears or million lightyears; a measure of cosmic distance.

Neutrino: A superposition of two phase-shifted photons (resulting in the effective cancellation of their normal electromagnetic effects).

NGP: North Galactic Pole. The Milky Way’s North Galactic Polar axis points toward the Coma nodal galaxy cluster.

Nodal galaxy cluster: the multi-branched galaxy aggregation that occupies each vertex of the cosmic-scale structural cells (shaped as rhombic dodecahedra). Each nodal galaxy cluster is the dense central region of a *cosmic gravitation cell*.

Nodal structure: the immense matter concentrations at the cosmic cell vertices. There are basically two types: the *tripodal* and the *quadrupodal* structures. There are also hypothetical *supernode* structures. The types are characterized by the number of ‘arms’ (*filament-like clusters*) that meet at a vertex.

Normal gravity: *Normal gravity* is the acceleration of aether flow towards mass bodies (where the local flow converges). It manifests as an *apparent* force of attraction. On the larger scale, normal gravity acts in that portion of each cosmic-scale *gravitation cell* where comoving trajectories (of objects) are *converging*. It is the gravity of our everyday experience. See also *cosmic gravity*, and *unified gravitational cell*.

Nucleosynthesis: The process by which new atomic nuclei are created, usually by the combination of smaller nuclei via *thermonuclear fusion*.

Old Physics: A term used to characterize the physics (the branch of science concerned with the nature and properties of matter and energy) that is specifically burdened by three major omissions. (i) It fails to recognize the existence of the mechanical space medium—a non-energy, non-mass, particulate aether. (ii) It fails to employ the velocity-differential redshift for cosmological distances. (iii) It fails to recognize the unity underlying the three manifestations of gravity.

Parallax: The apparent shift of a star's position (with respect to background objects) when viewed from different parts of the Earth's orbit. The angle, together with the size of the Earth's orbit, permits one to calculate the distance to the star, using the method of triangulation.

Parsec: Astronomical unit of distance, corresponding to a parallax of one arc-second, equal to 3.26 lightyears or 3.085678×10^{13} kilometers.

Perfect Cosmological Principle: It states that the universe, on the large scale, is uniform both in time and in space; an extension of the *cosmological principle*. The DSSU conforms to the *perfect cosmological principle*; it is forever uniformly cellular throughout infinite 3-dimensional space.

Photon: The photon is a wavelike particle of radiation energy; it is the carrier of the electromagnetic force. (It is an energy particle that may be thought of as a laterally oscillating excitation of the aether while traveling in the longitudinal direction.)

Photon conduction process: A wavelike conduction-excitation-disturbance of aether. This "conduction" is unlike any other. The photon is conducted *by* aether in a manner that is destructive *of* aether.

Platonic solids: The five regular polyhedra—the tetrahedron, hexahedron, octahedron, dodecahedron, and icosahedron—esteemed by Plato and the Pythagoreans as embodying aesthetic and rational ideals.

Positron: Another name for an antielectron.

Primary gravitation: is associated with the process—conduction by aether-absorption—that sustains mass particles and radiation particles and electromagnetic fields; and causes a weakly accelerating inflow of aether.

Proton: A subatomic particle (mass 1.67×10^{-27} kg) with positive charge, consisting of three quarks. The number present in an atomic nucleus defines the chemical element.

Quantum space: Refers to the quantization of the space medium. In the DSSU, space is permeated by discrete *fundamental fluctuators* of the *essence medium*. In conventional physics, the term refers to the 'vacuum' or the 'quantum foam' and this space medium's ability, or potential, to produce virtual and real particles. The difference: the discrete *fundamental fluctuators*, being sub-physical, carry no energy; while the units of the *quantum foam* do carry energy.

Quasar: An extremely luminous active galaxy—that is, one with a rotating accreting *Supermassive black region* at its center.

Radiation: Usually refers to any form of electromagnetic energy (photons) of any wavelength; as well as neutrinos.

Radiation pressure: The force exerted mainly by photons when they strike a surface. In the terrestrial context, it is negligible. In the extra-terrestrial context, however, it clears the gas and dust from the stellar environment allowing stars to be observable in the optical spectrum.

Reality: All reality is the interplay between two particles, photons and subquantum units (i.e., discrete aether oscillators).

Redshift (z): is defined as the displacement towards the longer wavelengths of all the spectral lines in light coming from the stars of distant galaxies; expressed as a fraction of the original wavelength itself. The ratio $\Delta\lambda / (\lambda \text{ source})$, where λ is the wavelength.

The redshift is used as a prized measure for determining cosmic distance. Expanding-universe cosmology (unlike DSSU cosmology) interprets the cosmic redshift as the evidence of the

source galaxies actually receding and then extends this interpretation to claim that the whole universe is undergoing expansion! In DSSU cosmology, distant galaxies are NOT receding, NOT part of any universal expansion. See *Cosmic redshift*.

Redshift-distance relation: The correlation between redshift in the spectra of galaxies and their distances. *The equation used depends on the particular cosmological model.* The Big Bang, a single-cell construct, and the DSSU, a multi-cellular model, use distinctly different formulae.

Relativistic: Refers to particles or objects moving close to the speed of light, resulting in their total energy being much greater than their rest mass. In a relativistic gas, the particles have kinetic energy greater than their mass-energy.

Relativity: Theories concerning the transformation of fundamental properties (space, time, length, mass) between different observers.

Relativity, general theory of: Einstein's mathematical theory, incorporating the gravitational effect, in which space and time are geometrized. Applicable to accelerating frames of reference.

Relativity, special theory of: Einstein's theory of the electrodynamics of uniformly moving frames of reference.

Rhombus: A parallelogram with all sides of equal length.

Right Ascension (R.A.): The astronomer's equivalent of longitude —longitudinal position lines projected onto the celestial sphere— which divides the celestial sphere in 24 slices, each 15 degrees wide.

Rotation curve/graph: The graph of rotation speed (y -axis) versus distance from the center of the system (x -axis). When interpreted strictly within Newtonian physics, rotation curves yield information on the mass distribution within the system. The failure of the rotation speeds to drop at large radial distances in spiral galaxies leads to two radically different interpretations: (1) In Old Physics, it is evidence of the presence of additional mass, believed to be in the form of a *dark matter* halo. (2) In DSSU/cellular cosmology, it is evidence of the gravity-amplifying effect caused by *aether vanishment* associated with the shear stress of rotation; based on the validated aether theory of gravity.

Sachs-Wolfe effect: An Old Physics concept described as a two-part effect, involving an alternating sequence of gravitational redshifts and gravitational blueshifts, believed to arise from light passing through a lumpy gravitational landscape (i.e., a series of gravity wells). The concept was decisively disproved in 2018 (C. Ranzan, *Sachs-Wolfe Effect Disproof –The fundamental flaw in the spectral analysis of gravity wells*, International Journal of Astrophysics and Space Science, Vol.6, No.1, 2018, pp.1-17).

Schwarzschild radius: (1) In conventional cosmology, it is a measure of the theoretical size of a nonrotating mass body/particle which, if compressed to this radius, would possess an *escape speed* (from the surface) equal to the speed of light. It can be calculated for any amount of mass, without reference to relativity, using the expression $R_S=2GM/c^2$. The Schwarzschild radius depends only on the quantity of mass (assuming no rotation). If different bodies could be compressed to within their Schwarzschild radius, they would not necessarily have the same density.

(2) It is a mathematical construct devoid of any connection to reality. When the concept is applied to a pre-collapsed mass/body, it fails as a prediction of the actual radius of the lightspeed boundary (event horizon); it fails because it neglects relativistic length contraction, ignores Nature's density limit, and overlooks *mass loss via aether deprivation*.

Singularity: A concept in 20th-century cosmology used to describe a point entity of infinite density—a point location where standard theories break down. Singularities do not exist in the real World.

SnS: Acronym for Superneutron Star. See *Superneutron star*.

Space: A general term for the *vacuum*, *the quantum foam*, etc. It is an ambiguous term for the background medium of the universe.

Space (DSSU): In DSSU theory, space is the 3-dimensional background and is completely permeated by the universe's essence medium—a ubiquitous, non-mass, non-energy, discretized aether. Space is a nothingness volume; it has no properties; none whatsoever. Its only function is to serve as an empty container of three spatial dimensions.

Space (3-dimensional): Three-dimensional space (in the sense of an empty container) is a nothingness volume permeated by (filled with) a space medium.

Space-medium contraction (DSSU): All matter contracts the universal medium (aether), (1) directly through a process of *excitation-assimilation-annihilation* and, (2) indirectly through a process of self-dissipation within a *contraction field* that surrounds each and every object or particle, individually and collectively.

Space-medium dynamics: This term refers to the *emergence/expansion* and *vanishment/contraction* aspects of the aether medium, as well as its flow. These aspects constitute a complete conceptual description of what sustains the cellular structure of the infinite Universe.

Space-medium expansion parameter: An empirically derived value, symbolized by H , which measures the rate of aether emergence/expansion within the cosmic voids. (Somewhat similar to the Hubble constant). Early research into the DSSU has used a value of 18.6 km/second per million lightyears of distance. (But more recent research suggests a value of 10.1 km/second per million lightyears.)

Special relativity (Einstein): (1) Principle of relativity: the impossibility of detecting uniform (inertial) motion by laboratory experiments. No preferred frame-of-reference. (2) Constancy of the speed of light: light is always propagated in *empty space* with a velocity independent of the motion of the source.

Special relativity (DSSU): (1) *Aether* serves as the preferred frame-of-reference. It is possible to measure motion relative to the aether medium. (2) Constancy of the speed of light: the speed of light is constant and absolute with respect to aether. However, with respect to the observer (any inertial observer), the speed of light is constant only as an illusion facilitated by physical length contraction of the measuring devices.

Special relativity speed rule: The rule that nothing can travel faster than about 300,000 kilometers per second *through* the vacuum, or *through* DSSU aether.

Spectrometer: An instrument that spreads the light from stars, or from any other source, into its different wavelengths.

Spectrum: A graph of the intensity of light (or other electromagnetic radiation) against wavelength (or frequency).

Speed of light: $c \approx 3.00 \times 10^8$ meters/second through vacuum or DSSU aether.

Speed of light constancy: The speed of light is *absolutely* constant with respect to the space medium (aether) AND is *relatively* constant with respect to inertial (stationary or uniformly moving) observers. The inertial observer's measurement of the speed of light is always the same because his clocks slow down and distances appear compensatingly smaller. The measure of speed is simply distance over clocktime; and this ratio always remains the same under uniform motion.

Spherical space: A geometric term associated, in the mathematical world, with the positive curvature of space; and may be associated, in the real world, with the vanishment/contraction of the space medium by a gravitating body.

Star clusters: are gravitationally bound aggregations of stars, smaller and less massive than galaxies. The largest star clusters are known as 'globular' clusters and harbour hundreds of thousands to millions of stars; while the smaller ones are called 'open' clusters.

Static surface: The static surface of infinite redshift is an oblate-shaped boundary, surrounding a spinning SnS (end-state neutron star), where vacuum/aether flow actually reaches the speed of

light (with respect to the background universe). Note the difference between the two kinds of lightspeed surfaces. At the *oblate static surface* the aether-flow speed is with respect to the background; while at the *critical-state surface*, the lightspeed flow refers only to the component perpendicular to the SnS's actual surface (ambiguously called an event horizon).

Steady State Expanding Universe: A speculative universe (originally advocated by Hoyle, Bondi, and Gold in the 1940s) that undergoes perpetual uniform expansion while maintaining constant density and physical properties. Matter must be continually created to offset the expansion-caused dilution and maintain the constant density.

Steady State Nonexpanding Universe: An infinite universe with constant density on the largest scale and constant physical processes and properties. Matter is continually being formed *and* annihilated. The space medium itself is continually being formed *and* annihilated.

String theory: A mathematical model; it holds that subatomic particles, instead of being mere points, actually have extension along one axis, and that their properties are determined by the arrangement and vibration of so called strings.

Strong nuclear force: One of the conventional four forces of nature. The strong nuclear force holds the particles in the nucleus of atoms together.

Supermassive black region (replaces the misleading term *supermassive black hole*): A structure delineated by an *event horizon* that surrounds an interior region of *noncontiguous* mass. It can exist and persist only if there is significant rotation.

Superneutron star: A neutron star with a superdense energy layer where the density is greater than neutron/nuclear density. Essentially, it has a surface layer of pure energy consisting of "stationary" photons (electromagnetic radiation) and neutrinos. The *Superneutron star* is a perfectly natural object; it has a no-escape boundary (horizon) but no empty region within. It replaces the paradox-plagued concept of stellar black holes. See *Terminal star*.

Superneutron star (in active state): This is a *Superneutron star* in which an insufficient quantity of aether reaches the core —making it an active *aether deprivation* core. Essentially, the SnS is absorbing more matter than it can sustain with a strictly-limited supply of aether inflow. With an insufficient quantity of aether reaching the core, the matter within is subjected to a terminal process of matter extinction/annihilation.

Supernova: A cataclysmic stellar explosion. The two most common types are the thermonuclear detonation of a white dwarf star (used to determine distances to remote galaxies) and the core collapse of a high-mass star.

Supernova type 1A: is the explosion of a white dwarf star in a binary system. Accretion from a companion raises the mass above the maximum mass permissible for gravitationally stable white dwarfs. The quantity of matter reaches the Chandrasekhar limit and the white dwarf starts to collapse. However, the ensuing compression ignites explosive carbon-burning leading to a total disruption of the star. The light output comes primarily from the energy produced by the decay of radioactive nickel and cobalt produced in the explosion. The peak luminosity is correlated with the rate of decay in the measured light-curve: less luminous supernovae decay more quickly than do more luminous supernovae. When the necessary correction is applied, the relative luminosity of a Type 1A SN can be determined to within 20% accuracy. [Edward Wright, *The ABC's of Distance* www.astro.ucla.edu/~wright/distance.htm] Type 1A supernovae are bright enough to be seen to such great distances that they can be, and are, used to calibrate the *cosmic redshift-distance law*.

Suppression-annihilation process: See *aether deprivation* process.

Symmetry principle: See *invariance principle*.

Terminal star: A star that is in the "Terminal" state —an ontological state that cannot be altered in any way other than changes of rotation. Such an object is truly in an end state of existence. It is both a destroyer of energy (specifically, mass energy) and a generator of energy (specifically, it amplifies the energy of photons and neutrinos). **The defining feature:** It is enveloped by an energy surface/layer onto which the space medium (aether) flows at the speed of light. Moreover, this energy layer encloses a fixed quantity of mass existing as nature's ultimate density state. **Rotation feature:** When rotating, it is unique. It manifests no centrifugal

effect. The only restraint on the rate of rotation is the resistance from the magnetic lines of force. In the absence of a magnetic field, there would be no theoretical spin limit and, of course, no way of measuring it.

Synonymous terms: *Terminal-state star*, *Superneutron star*, *end-state neutron star*.

Theory: A rational self-consistent account of a wider range of phenomena than is ordinarily accounted for by a hypothesis.

Thermonuclear fusion: The type of reaction in which atomic nuclei collide and combine, their collision energy (kinetic energy) arising from high temperature (thermal motion).

Trapezoid: A quadrilateral with one pair of parallel sides.

Unified gravitation region (unified gravitation cell): A typical cosmic region having a nodal galaxy cluster as its central mass, surrounded by a *normal gravity* region (a space-medium contraction field), which is in turn surrounded by a *cosmic gravity* region (a space-medium expansion field). It is called ‘unified’ because each cell consists of both *normal gravity* (aka contractile gravity) with its inward converging trajectories, as well as *cosmic gravity* with its inbound diverging trajectories. *Unified gravitation cells* exist in mainly two shapes: tetrahedral and octahedral; their orientations are dictated by the geometry of the dodecahedral cosmic cell structure.

Unified theory: In general, a theory that gathers a wide range of fundamentally different phenomena under a single precept. The DSSU *fundamental process of energy* is such a theory.

Universality: The property that the same physical laws apply throughout the infinite universe.

Vacuum: In modern physics, it is a generic term for the medium that permeates all space. (1) In conventional physics, it is sort of a quantum foam with quantum fields that continuously spawn virtual particle-antiparticle pairs. (2) In the DSSU, it is a sub-physical *aether*, a subquantum essence.

Vacuum energy (vacuum energy density): Quantum theory requires empty space to be filled with particles and antiparticles being continually created and annihilated. This leads to a net mass density of the *vacuum*, hence an energy density. This hypothetical energy is believed to behave like a *cosmological constant* in the way it affects vacuum expansion. As attractive as this concept sounds, it does not seem to be necessary for the DSSU. In the DSSU framework, the vacuum (i.e., the aether medium) when subjected to negative pressure—as happens in the cosmic Voids—tends to expand resulting in the formation of new aether. This negative pressure, in the act of expanding the vacuum, behaves like a positive cosmological constant.

Velocity, intrinsic: In DSSU cosmology the intrinsic velocity of an object or a galaxy is the velocity relative to the local space medium (aether).

Virtual particles: See *virtual quantum foam*.

Virtual quantum foam (also virtual foam): This is, according to conventional physics, the sub-microscopic description of space, which consists of virtual-real quantum particles and energy oscillators. Since space is said to be saturated with these mass and energy entities, the concept leads to the embarrassing prediction of unimaginably enormous energy density for the vacuum. The prediction is demonstrably wrong. In contrast, with the sub-microscopic description of the space medium of the DSSU, the discrete units of aether possess neither mass nor energy.

Weak nuclear force: One of the conventional four forces of nature. The weak nuclear force is responsible for radioactive decay as well as the fusion reactions in the Sun that provide heat and light for the Earth.

Weight: is the measurable force (mass × acceleration) that manifests when matter is prevented from accelerating with the aether medium.

White dwarf: The burned-out core (about Earth-sized) of a star; its mass is equivalent to that of the Sun but consists of extremely compressed carbon and oxygen. If a white dwarf is in a binary system and the other star dumps matter onto it, the white dwarf can be triggered to undergo thermonuclear detonation as a supernova explosion (Type Ia).

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