The dynamic steady state universe

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Abstract: It is a strange historical omission that no examination of the intrinsically cellular universe model has ever been reported. In an effort to correct this oversight, the current work constructs a surprisingly natural cosmology by combining Hubble's great discovery, Einstein's "nonponderable" aether, Penzias and Wilson's distant starlight, Heraclitus's harmony-of-opposites principle, and by incorporating more recent developments including the powerful particle theory of Williamson and a unifying concept of gravitation. With the addition of a two-faceted *sine qua non* Primary-Cause process and a *sui generis* mode of aether excitation, the entire construction becomes fully functional. It is clearly shown how the photon is responsible for the cause of gravitation. Avoiding the speculative assumptions and preposterous extrapolations inherent in expanding-universe cosmology, the new interpretation constructs a perfectly natural Dynamic Steady State Universe with integral cellular structure. © *2014 Physics Essays Publication.*
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Résumé: L'absence totale d'études publiées sur le modèle de l'univers intrinsèquement cellulaire constitue une omission historique étrange. Dans le but de remédier à ce manquement, la présente étude construit une cosmologie étonnamment naturelle en combinant la grande découverte de Hubble, l'éther impondérable d'Einstein, la lumière stellaire distante de Penzias et Wilson, le principe d'harmonie des contraires d'Héraclite, ainsi que des développements plus récents dont la puissante théorie particulaire de Williamson et un concept unificateur pour la gravitation. Avec l'ajout d'un processus de cause primaire *sine qua non* à deux facettes et d'un mode *sui generis* d'excitation de l'éther, la construction dans son ensemble devient entièrement fonctionnelle. La manière dont le photon est à l'origine de la gravitation est clairement montrée. Tout en évitant les suppositions spéculatives et les extrapolations aberrantes inhérentes à la cosmologie de l'univers en expansion, la nouvelle interprétation construit un univers dynamique en régime permanent avec une structure cellulaire intégrale.

Key words: Aether; Fundamental Fluctuators; Electron Structure; Self-Confined Radiation; Mass-Property Acquisition; Excitation-Annihilation Process; Gravitation Processes; Cosmic-Scale Gravity Cells; Cosmic Tension; Cosmic Cellular Structure.

"Nothing in science—nothing in life, for that matter—makes sense without theory. It is our nature to put all knowledge into context in order to tell a story, and to re-create the world by this means."—Edward O. Wilson, *Consilience, the Unity of Knowledge*

"…creating a theory is not simply a matter of deducing it mathematically from a set of preordained principles. Our principles are often invented as we go along, sometimes precisely because they lead to the kind of rigidity we hope for." –Steven Weinberg, *Dreams of a Final Theory*

I. INTRODUCTION

From a cosmology perspective, we are living in the age of the Mathematical universes. This period in the long history of cosmology began in 1917 with Einstein's Equilibrium universe; but the philosophical roots of the mathematical universes go back much further. The roots wend back to the Pythagorean belief "that mathematical objects and relations are the building blocks of physical reality." Aristotle, on the other hand, did not share this worldview; he considered mathematics to be an idealized representation of the superficial appearance of things and not of the underlying reality.[1] The age of the Mathematical universes began with the publication of Einstein's single-cell Equilibrium universe, a model based on his then recently completed geometric theory of gravity. The "equilibrium" in his construction in four-dimensional geometry turned out to be spurious; it was unstable and eventually abandoned. But in time other versions followed, authored by outstanding experts in their field: DeSitter, Friedmann, Lemaître, Eddington, Robertson,

a)Ranzan@CellularUniverse.org. In accordance with common practice, I have used "Universe" when referring to the world we live in, and "universe" when referring to a world model. The distinction also applies to "Cosmos" versus "cosmos."

Tolman, Walker, and others, proffered various abstract constructions. According to historian Helge Kragh, most of these pioneers realized they were constructing mathematical universes, and were not necessarily representations of the real Universe.[2] With their Steady State models of 1948, H. Bondi, T. Gold, and F. Hoyle continued the tradition. During the first half of the 20th century, cosmology was "a theory-spinning branch of mathematics."[3]

The second half of the 20th century witnessed the formulations (and reformulations) of such models as the Oscillating universe with the cosmos repeatedly passing through a mathematical singularity, the Accelerated Expanding universe with its "very strange equation of state," and the Inflationary universe with its multi-stage expansion and its "seven free parameters" as proposed in some versions.

Americans Howard P. Robertson and Richard Tolman (and independently, A. G. Walker in England) were major players in the development of the theory of the expanding universe. "Yet, in spite of their fundamental contributions to cosmological theories of the big bang type, neither Robertson nor Tolman… equated their theoretical model with physical reality."[4]

And it all started with a geometric interpretation of gravity via a four-dimensional space–time. This so-called *curved space interpretation* became the foundation of the abstract mathematical universes. But since no one could say what was actually "curving" (what was behind the curvature relationship of space coordinates) the resulting cosmology was merely an abstraction. Einstein called it the *relativization* of the universe.[b)] In his famous Leyden lecture, Einstein talks about the states of the aether as determined by his general theory of relativity, states which are merely mathematical expressions of change, but he does not explain the physical meaning of these states. To ask what is *actually* changing in Einstein's aether is pointless because his aether is abstract and mathematical—as is all cosmology based on Einstein's gravity.

There is no doubt about the rationality of the models, provided, of course, one accepts the assumptions. The problem is that they do not work as *natural* systems. The old Ptolemaic model was rational, but it was not natural. The problem is serious. A sampling of comments and sentiments from the experts underscores just how serious it is. The following comments are in reference to the Accelerating Expanding universe, which, as everyone knows, is supposed to be speeding up its outward expansion.

Physicist Lisa Randall, in her book *Warped Passages, Unraveling the Mysteries of the Universe's Hidden Dimensions*, devotes considerable print in discussing "the extent of our ignorance about gravity and the shape of the universe."[5] Baffled by multiple extra dimensions, size scales, and the nature of space-and-time, Randall, near the end of the book, makes the disheartening confession, "we are clearly still missing the big picture."[6] Popularizer of the Accelerating model, Neil deGrasse Tyson, calls it *The Inexplicable Universe*. Astronomer Robert P. Kirshner, author of **The Extravagant Universe** (a book about the Accelerating model), waxes on its unreality when he says, "The universe is wilder than we ordinarily dare to imagine." American astrophysicist S. M. Carroll forthrightly calls it "**the Preposterous Universe**,"[c)] and admits that "If any system should be natural, it's the universe. Nevertheless, according to the [big-bang perspective], the universe we observe seems dramatically unnatural." In fact, it "staggers under the burden of its unnaturalness."[7]

There is an obvious need to reexamine and reinterpret the evidence; to consider inclusion of some of the great insights and advances made during the last couple of decades; and to extirpate some of the obviously flawed elements of conventional cosmology; and thereby, to forge a realistic model of the Universe. The need is for a *natural* universe.

The following construction will incorporate some truly great discoveries and theories, both ancient and modern. They will serve as the building components and building systems; and will include Albert Einstein's space medium (his post-1920 aether), Edwin Hubble's foundational discovery, Heraclitus's ancient *harmony of opposites*, Penzias and Wilson's ultra-distant starlight, Reginald Cahill's mechanism of gravitation, Williamson's amazing theory of particles, DSSU's[d)] profound mass-acquisition process, DSSU's corollarous terminal process of annihilation, and cosmic-scale *unified gravitation cells*. Based on a renewed interpretation of existing evidence and the addition of key axioms, we will construct what will turn out to be a fully-functional replica of the Natural Universe.

To keep things organized, the presentation follows a building plan—a block diagram in which each block represents a component or subcomponents. Blocks are linked in a specific way, the logic of which will become obvious as the assembly progresses. Each component-block, one by one, will be featured along with its relationship to the overall scheme.

The construction begins with the all-important space medium that permeates the Natural universe (see Fig. 1).

II. THE SPACE MEDIUM

Quantum mechanics is the foremost theory of the atomic and subatomic realm. However, as physicist Robert K. Adair wrote in *The Great Design*, "Einstein and others felt that quantum mechanics, although an accurate description of nature, must be an approximation to some more fundamental concept."[8]

Einstein, in his now famous lecture presented at Leyden University in 1920, made it quite clear that aether exists.

> "According to the general theory of relativity space is endowed with physical qualities; in this sense, therefore, there exists an ether…"[9,10]

But Einstein told us precious little about the aether's qualities; he mainly told us what aether was *not*.

[b)]Einstein had said, in his Leyden lecture, that the mathematical "aether of the general theory of relativity is the outcome of the Lorentzian aether, through relativization."

[c)]S. M. Carroll even used the term for the name of his website http://PreposterousUniverse.blogspot.com.

[d)]DSSU is the acronym for *the Dynamic Steady State Universe*.

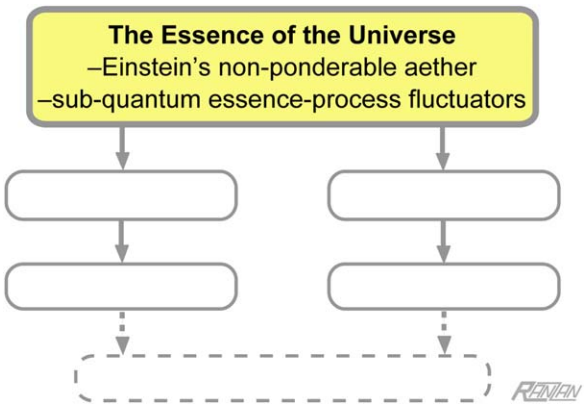

FIG. 1. (Color online) The "essence" component and its position in the construction blueprint of the Natural universe.

> "The ether of the general theory of relativity is a medium which is itself devoid of all mechanical and kinematical qualities, …"[10]

This simply means that it cannot resist the motion of objects and it cannot itself have momentum. At the end of the lecture Einstein underscores the key point of what aether is not.

> "But this ether may not be thought of as endowed with the quality characteristic of ponderable media, …"[10]

Einstein is, in effect, stating that the aether is a non-material *and* non-energy medium. Take note, the aether—and this includes its discrete units—*possesses no mass and no energy*.

There is a strange historical irony here. The young, somewhat rebellious, Einstein, in 1905, rejected the notion of aether; while the mature Einstein, in 1920, fully acknowledged the existence of aether. Strangely, the 1905 view is popularly embraced while the 1920 view is ignored; the 1905 Paper is adopted as sacred scripture while the message of the 1920 Leyden lecture is deemed heresy. This is most comical to observe but truly disturbing when it obstructs the advance of physics.

Science has been trying to reinvent the aether for over 100 years; witness the various kinds of property-endowing fields and vacuum energies that have been proposed. Yet the answer was right there, and still is there, in the Leyden lecture of 1920. The real controversy, most likely, is in actually daring to use the term "aether" in the context of a serious theory.

The conventional wisdom has long been committed to the sacred words of the young Einstein. We, however, choose to heed the words of the mature Einstein. The flowchart, in Fig. 2, summarizes the first of several deviations—divergences from the traditional blueprints of the master builders.

There is another irony. Einstein never succeeded in applying and exploiting his aether. The *space* component of his universe forever remained a geometric abstraction. But for our universe we need something more specific—

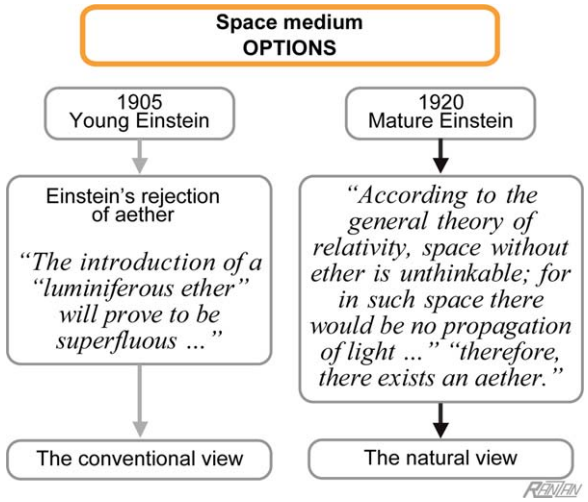

FIG. 2. (Color online) The *space medium* question. The choice, for the Natural universe, is unhesitatingly obvious. Making the wrong choice here requires advanced indoctrination.

something beyond *what aether is not*. We must therefore turn elsewhere.

The brilliant physicist Julian S. Schwinger (he wrote his Ph.D. thesis before he got his bachelor's degree), working on QED field theory in the 1940s, proposed a quantum field having harmonic oscillators at each and every point in space.[11] Now, if these oscillators occur at each point in space, wherever there are quantum fields (which happens to be most everywhere), then two amazing opportunities arise: (i) they can serve as a quantization of space; (ii) they can, collectively, serve as a space medium. The "oscillators" may serve as our aether. However, unlike Schwinger, we do not associate these "oscillators" with varying energy levels; instead, we will defer to the Einstein view and treat them as non-energy entities.

We avoid conflict with Schwinger's *quantum oscillators* by renaming our version of the oscillators, by calling them *essence fluctuators*, and, further, by placing them in the sub-quantum domain. We turn them into sub-Planck-scale entities (Fig. 3).

Our first component, then, for the *Dynamic Steady State Universe*, is an essence medium consisting of sub-quantum fluctuators. The fluctuating activity is called *axiomatic essence-process I*. (The reason why the fluctuators do not, and cannot, represent energy will become obvious later.)

III. HUBBLE'S SPACE MEDIUM EXPANSION

We next turn to the expansion of the space medium (Fig. 4). The pioneering work of the German astronomer Carl Wirtz, the American Cosmologist Howard Robertson, and the legendary Edwin Hubble (Fig. 5) led to the discovery that the farther a galaxy is from Earth, the larger is its redshift ("redshift" being the change, that is, the elongation, in the wavelength of the observed light from the stars of the particular galaxy). The discovery became known as the *Hubble law of cosmic redshift*. Now, because wavelength changes are routinely associated with the Doppler Effect, the effect caused be the motion of a radiating source, Hubble's

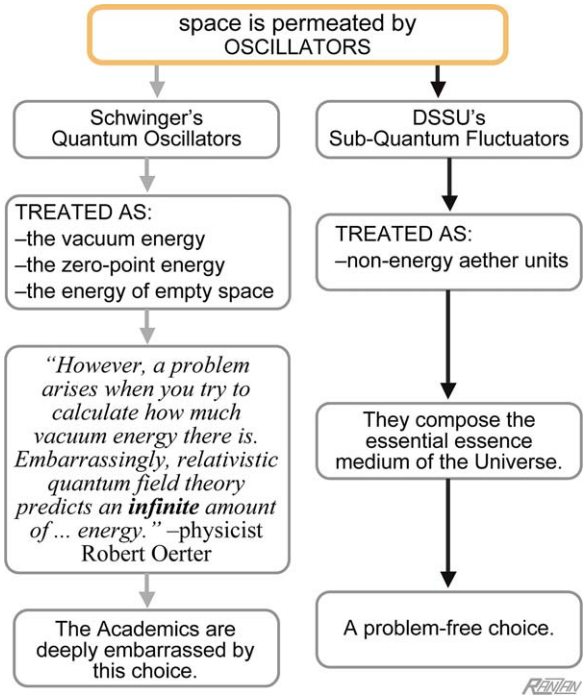

FIG. 3. (Color online) The space medium as energy oscillators *vs* non-energy fluctuators. The proper choice here is absolutely critical to the design of a problem-free cosmology.

cosmic redshift became linked with what appeared to be a receding motion. It simply meant that the greater the distance of a galaxy the greater its *apparent* recession speed.

It was soon understood that this "recession speed" was not a motion *through* space. Since distant galaxies are much like our own Milky Way galaxy, in the sense that they are more or less at rest within their own region of space (ignoring comparatively minor *peculiar* motions), the obvious conclusion is that the space between the Earth and the distant galaxies must be expanding. And this is the sound interpretation adopted by the pioneers in the 1920s, particularly since it was compatible with the dynamic nature of space according to general relativity theory. Hubble's great discovery of cosmic redshift was interpreted as the expansion of the space medium.

Astronomers of the 1920s, in their investigations of deep cosmic space, discovered that the space medium, the aether, expands. The discovery was a historically pivotal event. But

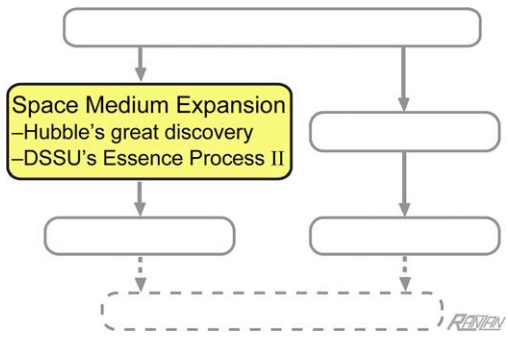

FIG. 4. (Color online) Construction component: Expansion of the Space Medium (showing its position in the overall plan).

FIG. 5. Edwin Hubble and the Hooker telescope (1952). Reproduced by permission of The Huntington Library, San Marino, CA.

then what followed formed the seed of a shockingly unnatural cosmology. Not long after the redshift evidence was properly interpreted as being the consequence of space medium expansion, the experts abandoned sound scientific practice. See Fig. 6. They took the additional step of interpreting the redshift of the distant galaxies as evidence of *actual* recessional motion of those galaxies (a motion attributed, of course, to the expansion of the intervening space medium). Essentially, the Academics took the concept of *expansion of aether* and extrapolated it into the fanciful *expansion of the entire universe*! This outrageously unscientific extrapolation has devastated Modern Cosmology; it is the root cause of what is being called the Preposterous Universe; it is considered as such by the experts themselves. Stop and think of

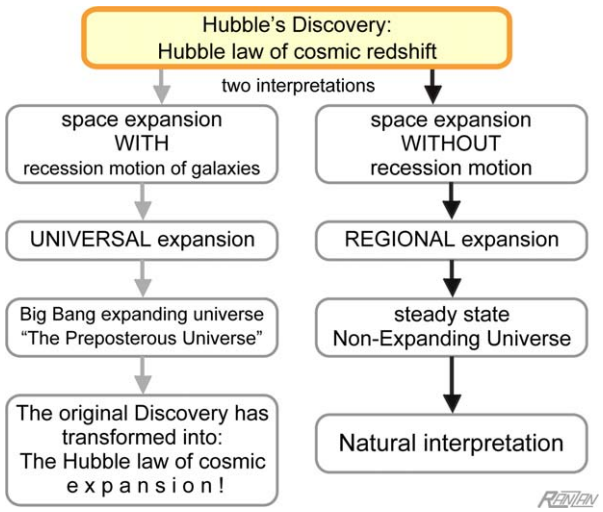

FIG. 6. (Color online) Space-medium expansion with recession motion *vs* expansion without recession motion. The left-hand sequence reveals the blatant unscientific extrapolation which is central to the Official Cosmology. The right-hand sequence avoids the philosophically unsound extrapolation and reveals the natural choice.

what it means to blow up the Universe—the infinite Universe!

Returning to our construction, we adopt the reasonable interpretation that *space-medium expansion is a regional phenomenon* (which we will see later is balanced by regional contraction). And the obvious choice as the location where such expansion occurs is the central region of the cosmic voids. The central region of each of the Universe's countless voids is dominated by an expansion process.

Consider the structural configuration: Surrounding the vast voids are networks of galaxy clusters (as confirmed by decades of astronomical observations); clusters that oppose each other across a void are gravitationally "pulling" on each other; this "pulling" imposes a tension effect on the in-between space (Fig. 7); and no physicist will deny that a space medium under tension-stress *expands*.[12]

The DSSU theory goes a step further—a step beyond the "tension" causality. The *expansion of the space medium* is treated as an axiomatic process. Called the *essence process II*, it is defined as a process whereby additional fundamental fluctuators come into existence. Recall from the earlier discussion, these are non-mass, non-energy, entities and, therefore, no violation of the conservation of energy is involved.

Incidentally, the cyclic activity of the fluctuators themselves is termed *essence process I*. Thus, essence process II brings the fluctuators into being; while essence process I is the manifestation of their being.

The "axiomatic" designation simply means that if one could (which, of course, one cannot) isolate an empty region of the universe, the aether in that region would expand. Even in the absence of tension, the medium would expand. It would grow ***quantitatively*** in the number of fluctuators.

Another extremely important property of the aether medium is that the count density of the aether units is constant. This property may be considered as a corollary to the axiom in that, if negative pressure (i.e., tension) is applied to the medium, the count density will not become diluted but rather new fluctuators will come into being to maintain a constant count density.

The Greek philosopher Heraclitus is famous for his *doctrine of opposites*, a doctrine that involved the pairing of opposing factors which constitute our universe. He

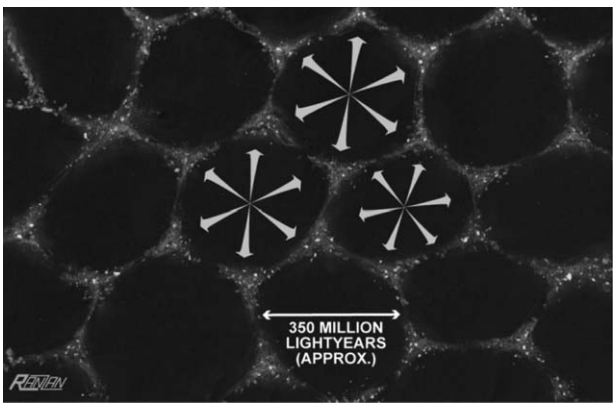

FIG. 7. Our Universe consists of a vast structural network (shown here in a schematic cross-section) of galaxy clusters and large voids in which a process of space-medium expansion takes place.

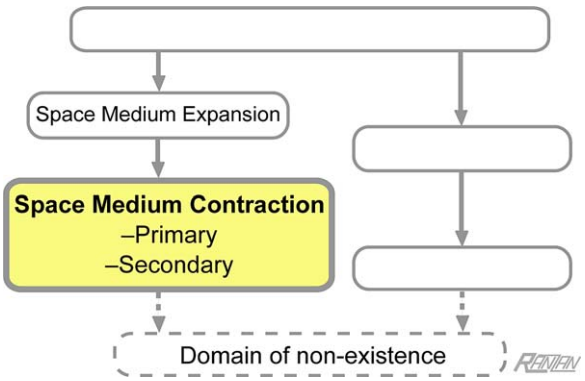

FIG. 8. (Color online) "Space medium contraction" is introduced into our universe blueprints to provide a *Heraclitean harmony-of-opposites* to the expansion process.

particularly stressed the *harmony of opposites*. We apply his principle to the space-expansion process and introduce its harmonious opposite (Fig. 8).

IV. SPACE MEDIUM CONTRACTION

A. Primary contraction

In order for our universe to be natural, its key processes must be balanced by harmonious opposites. The process of aether-medium expansion must be countered by some *contraction* process. It turns out, there are two processes that "consume" aether. For the more fundamental of the two, which we will simply call the primary contraction process, we turn to Australian physicist R. T. Cahill's theory of gravitation, a theory built around the notion that aether, behaving as an ethereal fluid, literally flows into matter. Although our immediate concern is with aether flowing and streaming into matter, it must be pointed out that the actual gravity effect is NOT attributed to the flow itself but rather to the rate of change of the flow. That is to say, the direction of gravitational acceleration corresponds to the direction of maximum inhomogeneous aether flow.[13,14] The direction of flow velocity and the direction of flow acceleration may be entirely different. Cahill's model, then, provides the basic feature whereby aether disappears when it comes into contact with mass and energy.

The cosmic voids supply the aether which then streams into matter. One is the source, the other is the sink. There is no escape from such flow. This terminal process, then, is our *primary mode of aether contraction*. See Fig. 9.

The *primary contraction process* and the deeper connection between aether and matter—a heretofore unrecognized connection—will be explore in a later section.

B. Secondary contraction

The *font of aether* is associated with cosmic voids; the *loss of aether* is associated with physical matter. Why then do we need another aether-contraction process? Recall, an axiomatic feature of DSSU aether requires that the density count of the aether quanta always remains constant. A simple (and otherwise reasonable) interpretation of this feature would suggest that the aether is not compressible. But the

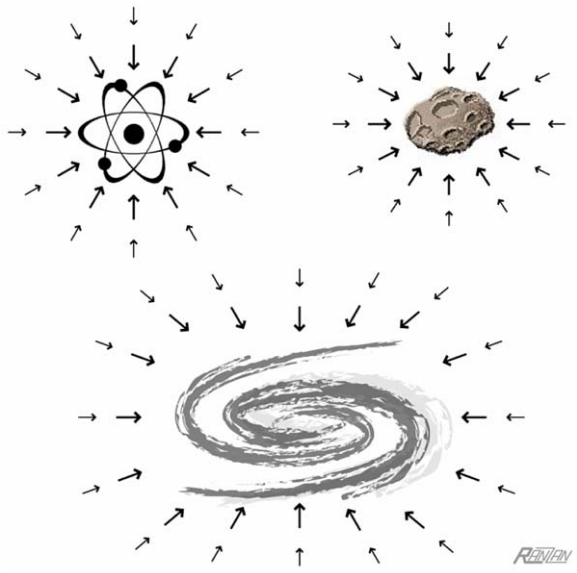

FIG. 9. (Color online) *Primary process of aether contraction*: Aether flows into particles and massive bodies. Whereas the cosmic voids act as the source of aether, mass (and energy) serves as the sink.

interpretation would be wrong. Consider the following explanation.

Let us wrongly assume that the aether is not compressible. It can be shown[15] by applying the fluid-flow continuity equation to a spherical inflow situation, that if the aether did not contract, then gravity (and gravitational acceleration) would be determined by an inverse fifth power law—meaning that it would be an incredibly weak effect! [Fig. 10(a)] But we know from observation that gravity is an inverse-square effect [Fig. 10(b)]. This much stronger form of gravitation is only possible if aether undergoes a process of contraction during its inflow into matter. Real-world gravity demands that aether contracts (or is, in some way, compressible).

Our assumption, then, must be wrong. The fact is that the aether *is* compressible—just not in the usual way. The DSSU essence medium is unique in that when it is compressed it tends to maintain a constant density (a constant-count density). How is this possible? Reginald Cahill, in his theory, calls it a process of self-dissipation—a

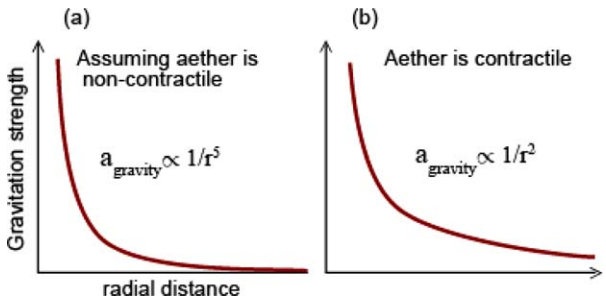

FIG. 10. (Color online) A comparison to show the necessity of secondary contraction of aether. In (a), with primary consumption *but without regional contraction*, gravitation manifests as an extremely weak inverse-fifth-power effect. In (b), with both primary absorption and regional contraction, gravitation manifests as a real-world Newtonian inverse-squared effect.

process of self-extinction of the *quantum foam* (to use his term for the aether medium).

In DSSU theory, aether *compressibility* means that there is a disappearance of fundamental fluctuators within any converging flow of aether. In this *secondary contraction* process, a proportion of the aether units simply stop oscillating—thereby terminating their very existence.

The bulk inflow surrounding a gravitating body may be thought of as predominantly a flow of aether into a domain of non-existence (as shown in the flowchart, Fig. 8). It disappears from the Universe. The surviving aether continues on its way to feed the mass and energy of the central body.

It should now be clear that aether contracts *without* a density change.

In summary, every gravitating body (and particle) in the universe is surrounded by a compression-contraction region. Although in conventional gravity theory it is called the *gravitational field*, we will refer to it as the *contractile gravity region* or region of *secondary gravitation*.

C. Aether-based gravity theory

The primary and secondary contraction processes are the key features of an aether theory of gravity. It differs considerably from conventional interpretations of gravity. According to Einstein's general relativity theory, gravity does not exist as a force at-a-distance but as a manifestation of geometry—geometry that, in some unknown way, is warped by the presence of matter. There is also the interpretation proffered by particle physicists; who claim that gravity is a force, a force that is mediated by a force-carrier particle, the graviton boson. There are other interpretations, such as *quantum gravity* involving gravity waves and *string-theory gravity* involving multiple extra spatial dimensions; however, they are far too speculative to be taken seriously. They are mathematical concoctions, and as Lee Smolin recounts, in his book Three Roads to Quantum Gravity, they have failed as representations of reality. His "Three Roads" have led ever deeper into an abstract mathematical realm.

When selecting a gravity theory for a natural universe, three considerations are important: (i) It must have a causal mechanism. (ii) It should not be dependent on hypothetical force carriers. (iii) It must somehow incorporate a mass-bestowing process.

The first feature means that we need something beyond Einstein's geometric kinematic (no force) theory with its lack of a causal mechanism—a mechanism for actually making the geometric coordinates dynamic. The second means that gravity is really, *really*, different from other forces, and a mass/energy intermediary particle will not work. The third means that, unless it can also explain gravitation, the Higgs mechanism becomes irrelevant.

As presented in Fig. 11, the choice is among: The mathematical abstraction based on curvature; the force model based on a problematic missing force-carrier; or, the processes model based on a kinematic-and-dynamic aether.

The essence medium is responsible for the cosmic redshift (a direct, and indirect, consequence of its expansion process) and it is responsible for the gravitation effect (a

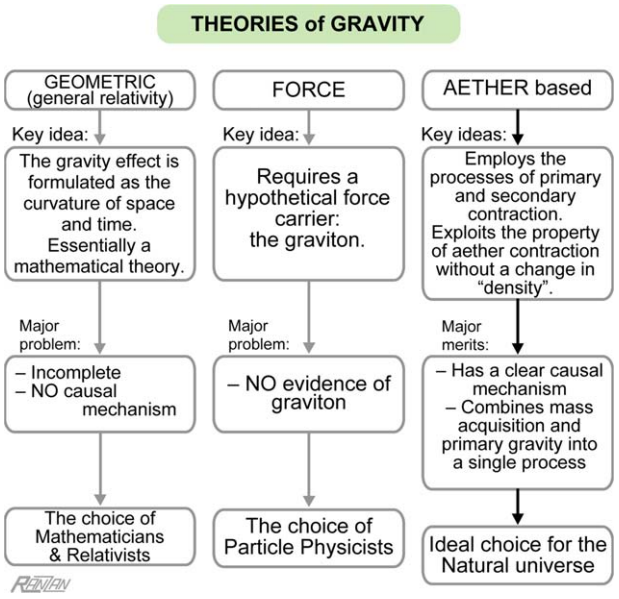

FIG. 11. (Color online) Three categories of gravity theory: gravity as a geometric abstraction (left column); as a force-particle model (middle column); or, as a processes model (right column). In the real Universe *all things are processes*; hence, it is ruled by an aether theory of gravity.

consequence of its two contraction processes). We next explore how the essence medium is responsible for the formation of matter.

V. MATTER FORMATION COMPONENT AND PROPERTY-OF-MASS ACQUISITION

"Matter formation" is probably the most diverse component within the plan (Fig. 12) in the sense that it encompasses not only the spontaneous formation of primitive matter but also a theory of fundamental particles and even the process by which the property of mass is acquired.

A. Matter formation

Every universe construction requires a method for bringing matter into being; there must be some spontaneous means for the creation or formation of energy and mass. Although there are several ways to accomplish this, they all fall into one of two categories: the catastrophic-event method and the uniformitarian process. One embodies the idea of a *concentrated creation* as, for instance, creation by a demiurge; the other encompasses the idea of *dispersed formation* such as may be found in Fred Hoyle's "matter creation-field."

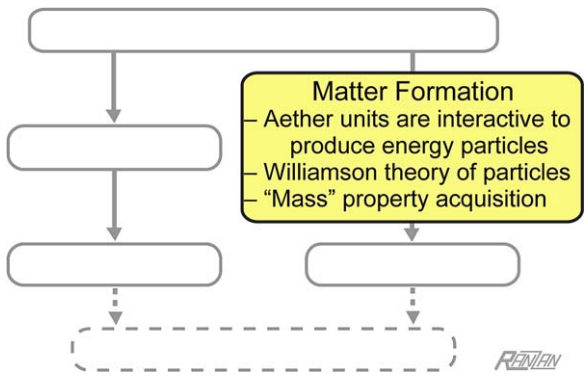

FIG. 12. (Color online) The DSSU blueprints: focusing on the processes for *matter* formation and *property-of-mass* acquisition.

Conventional cosmology obviously employs the catastrophic-event method. In the "Inflation" version of the Big Bang (BB) model, matter formation is connected to space expansion; the energy of the hyper-fast expansion of space is somehow converted into all the matter in the universe. Matter—including photons, electrons, protons, neutrons, and antiparticles—is said to be created during the first millisecond of the big-bang event. But where the energy—the energy that drives the inflation process—comes from is not known. Incidentally, this lack of cognizance of the source of the energy has consequences: It means that the sudden appearance of matter in the BB must be classified as a *creation* event rather than a *formation* process. A "formation" process is preferred as it is considered more scientific, thus, placing conventional cosmology at a grave disadvantage.

For the DSSU construction, we make a reasonable assumption; we recognize source-matter formation as a mysterious process involving a self-organizing (or self-assembling) activity of the fundamental fluctuators of the space medium. Aether-space units are postulated to be interactive (at their sub-quantum level) and to produce/evolve energy particles (at a quantum level). At the source stage, matter formation is a derivative process of the *essence-process I*.

Essentially, matter formation, both at the source stage and subsequent stages, is just another process—a continuous, steady state, process. The process involves several elements; and as detailed in a later section, it is harmoniously balanced by a counter process.

The flowchart in Fig. 13 contrasts the choice for the coming-into-being of matter and places the DSSU into the more reasonable category of continuous source-matter formation. Obvious advantages include: There is no launch event, no "genesis event" demanding an explanation; there

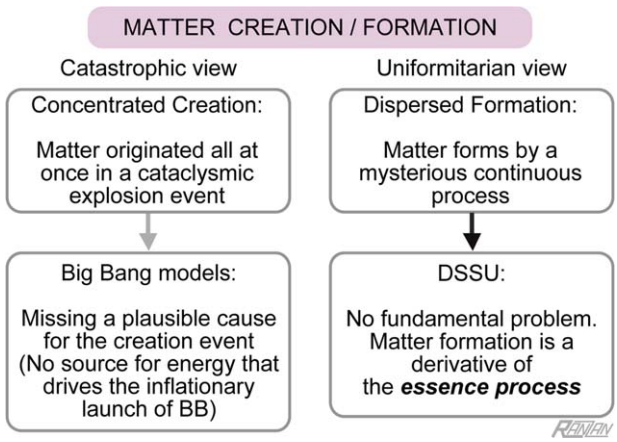

FIG. 13. (Color online) Matter-creation event *vs* matter formation process. For the construction of the Natural universe, the idea that *matter formation is a derivative process of the "essence process"* (as noted in the right-hand column) is clearly more reasonable. For the DSSU, matter formation is a progressive, on-going, steady-state, process.

are no initial conditions to explain simply because there was no initial time.

The pursuance of the axiomatic assumption (that matter formation is a derivative process of the *essence-process I*) is reflective of Steven Weinberg's sound advice, "[on scientific progress and following one's assumptions] the great thing is not to be free of theoretical prejudices, but to have the right theoretical prejudices. And always, the test of any theoretical preconception is where it leads."[16]

It should be pointed out that "matter formation" is rather a broad term whose meaning may encompass processes ranging from the manifestation-process of the most primitive particles all the way to the formation of particle systems such as atoms and molecules. In order to gain a better understanding of the sequence in which matter takes form, we make a simplifying assumption. We assume that the matter formation process in its primitive stage involves the generation of energy particles.

We assume that the only entities we actually need to derive from the self-organizing activity of the essence fluctuators are fundamental units of energy commonly recognized to be photons, and possibly neutrinos. (Regarding the nature of possible processes that might precede, and lead to, the formation of photonic energy: We must defer investigation, since these prior processes would occur in the unknown, perhaps unknowable, realm of sub-quantum entities. Or perhaps, it is here that mathematics may take center stage.)

Now let us see where this leads.

B. Williamson theory of particles

Our construction has progressed to the stage where it now contains energy particles; it has a process, or processes, that produce photons. The next construction step calls for the formation of mass particles and charged particles. Here we make use of a relatively recent discovery involving a new level of understanding of the underlying nature of subatomic particles.

The compelling realization is that all particles that have the property of mass are composed of confined photons. That is to say, all such particles are simply photons that have been confined to a species-specific configuration.

The idea was inspired by the well-known particle reaction that produces an electron-and-positron pair when two photons of sufficient energy collide under suitable conditions; also there is the opposite reaction in which the electron and positron collide, annihilate each other, and produce two high-energy photons (with opposite spin). Consequently, physicists have long suspected that the electron (and its anti-particle, the positron) is a manifestation of a localized photon; the problem was, however, that an electron has mass while a photon is characteristically massless. The question often asked was, *is the electron a wave or a particle?* Without some deeper understanding, the question was unanswerable; the electron clearly displayed the characteristics of a wave (as in interference experiments, and its orbital states) and the characteristics of a mass particle (as manifest in deflection experiments).

But the deeper nature is that the electron (and positron) is a wave; its structure is a wave; its structure is a confined photon. And its mass, as will be discussed shortly, is related to the radius of the confinement. How does this come about? How do we picture a massless particle transforming itself into a particle *with* mass and also with appropriate charge?

We start by considering an electromagnetic (EM)-wave with linear polarization, as shown in Fig. 14(a), as it is usually presented in textbooks. The *linear polarization* means that all the electric-field vectors (shown in blue) lie within a plane (shown here in the plane of the page). We associate the one wavelength of the EM-wave with a photon propagating at the speed of light. Next, in Fig. 14(b), we simply reorient this linearly polarized photon so that the magnetic field vectors (green) lie in the plane of the page and the electric field vectors (blue) lie perpendicular to the plane of the page. Continuing, in Figs. 14(c) and 14(d), we apply a *circular polarization* to the photon, which we model with a flat strip of paper, so that the magnetic field vectors are pointing in the same direction on the strip and the electric field vectors are pointing into the plane of the strip. The next step, as shown in Fig. 14(e), is to apply a full twist to the strip model. Essentially, we now have a twisted-strip model of one wavelength of a circularly polarized photon.

If a simple cut-out model is available [Fig. 15(b)], take a hold of each end and without releasing this hold, adjust the twisted strip into the spirals shown in Fig. 15(b). The final

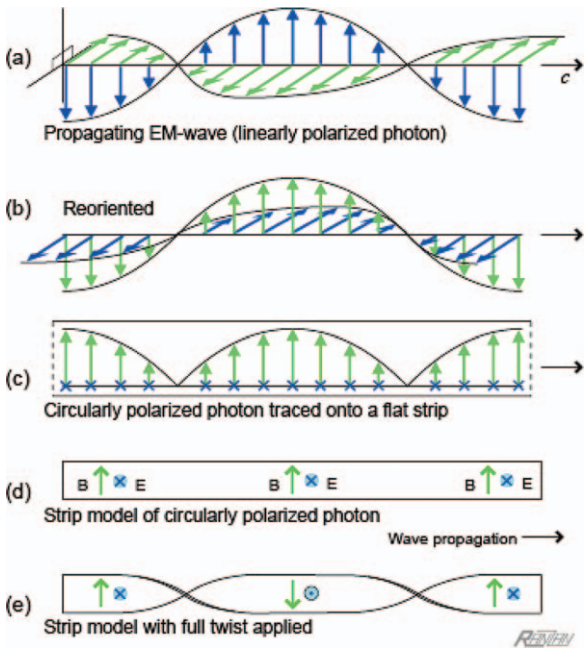

FIG. 14. Development of twisted-strip model of one wavelength of a circularly polarized photon. Start with the usual representation of an EM-wave with linear polarization as shown in (a); this single wavelength is associated with a propagating photon. Part (b) is simply a reorientation of the linearly-polarized photon, so that the magnetic field vectors (light grey, or green) lie in the plane of the page and the electric field vectors (dark grey, or blue) lie perpendicular to the plane of the page. Part (c) shows the photon having *circular polarization* and traced onto a flat paper strip. Part (d) represents a strip model of the *circularly-polarized* photon with peak magnetic field (light grey, or green) in the plane of the strip and peak electric field (dark grey, or blue) perpendicular to the strip. In (e), a full twist has been applied to the strip model.

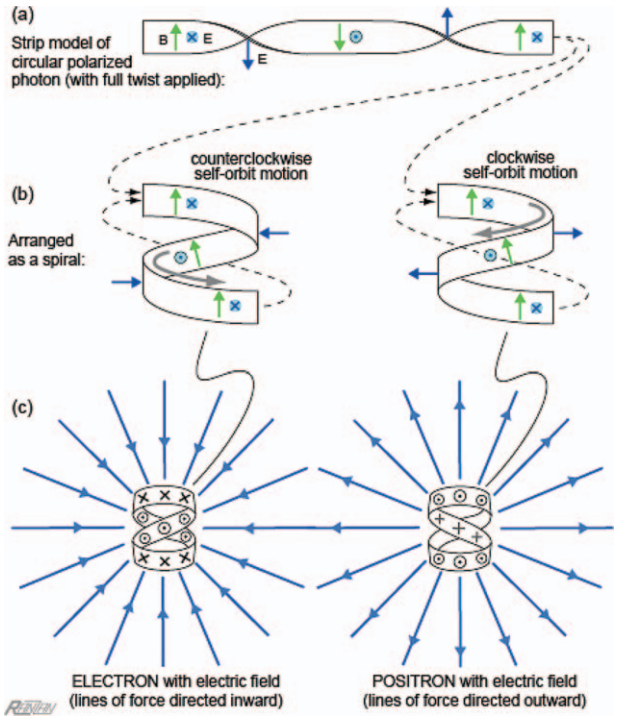

FIG. 15. Illustrative sequence for confining photons to produce charged mass particles. (a) The previously detailed strip model of a circularly polarized photon with a full twist applied. (b) The twisted strip arranged into a spiral. Note that the left-handed spiral (with the counterclockwise self-orbiting motion) has all its electric vectors pointing *inward*; while the right-handed spiral (with the clockwise propagation) has all the electric vectors pointing *outward*. When the spiral ends are joined together as shown we "create" the ½-spin particles of part (c), the electron and the positron. (The ⊙ is for the point-end of a vector and ⊗ is for the tail-end.)

step, then, is to join (and glue) the two ends together to form the double looping structure pictured in Fig. 15(c). The truly remarkable feature, with a pleasing conformance to reality, is that all the electric field vectors are directed inward, in the case of the electron, and outward in the case of the positron. The photon spins so that the peak electric-field vectors are always in a radial direction. Yet at the same time, the magnetic-field vectors tend towards a single direction and thereby account for the electron's magnetic dipole property. The double-looped structure also models the electron's property of spin; this spin is independent of that related to the photon's propagation. The electron's ½-spin property is modeled by the obvious 4π periodicity (i.e., each "spin" occupies ½ of the full orbital period).

Essentially, Fig. 15 shows the key steps for conceptualizing the confinement of a photon into a double-loop entity possessing all the essential properties of the electron such as spin, charge, magnetic moment, and spin momentum.

The model also accounts for the mass of the electron. From basic geometry, the radius of our structure is $r = (\lambda/4\pi)$ (where λ is the wavelength). The energy of the self-orbiting photon is $E = hf = (hc/\lambda)$ (where h is Planck's constant). By combining the two expressions, the radius may be expressed as $r = (hc/4\pi E)$. The relationship to the mass comes about by incorporating Einstein's equation in which mass is directly proportional to energy, that is, *mass* $= (E/c^2)$. By combining the last two equations and simplifying, the mass of the loop structure may be expressed as *mass* $= (h/4\pi rc)$.[17] In the realm of particle physics, *mass* is determined by size: the smaller the structure, that is, the smaller the particle, the greater must be its mass. This inverse relationship between mass and structure radius is reflected in the preceding equation of electron mass.

Now, there are two ways to increase the mass (in accordance with the equation): One is to use a shorter wavelength; this, of course, increases the frequency and energy of the photon. The other way is to increase the number of loops in the spiral configuration. Note that by inserting additional loops the direction of the field vectors does *not* change! And as long as only one wavelength is involved the charge remains quantified at e^- or e^+.

This feature provides a clue to the structure of "heavy" electrons. A tighter confinement, as described, is just what is needed to account for the greater mass while retaining the unit charge. These heavy electrons are named the muon and the tauon; they, along with the electron, are known to have identical properties except for mass and lifetime, and belong to the same geometrical/topological class.[17] The identity of a particle, as J. G. Williamson explains, rests with the confinement configuration. "The simplest of these, a simple electromagnetic vortex, corresponds to the electron or positron, with more strongly looped configurations corresponding to the muon and tauon."[18]

It is easy to see how the electron (and its classmates) is both a wave, since it consists solely of a photon, and a particle, since it possesses mass. Profoundly, this applies to all sub-atomic elementary components/particles. According to the new paradigm, all particles consist of electromagnetic loops (or loops of loops)—all particles are confined photons. When these loops are complete, resonant, and harmonic they represent independent particles, such as the electron, muon, and tauon (and their antiparticle versions). However, when the electromagnetic loops are *not* complete configurations, then an interesting possibility arises. If a confined photon state is not sufficient in itself to complete a closed loop in space, then it may be possible to combine a number of such incomplete loops into a complete-and-stable combination.[19]

An example of an incomplete loop occurs when a photon encounters a tiny region of energy density only strong enough to bend the photon, say, 90°. Or consider a loop that is complete but non-closing; One such object is the five-quarter turn, a complete loop, but an overshoot that also results in a 90° change of direction. Clearly, two such "loops" joined together cannot constitute a complete path in itself. However, Williamson suggests how such non-closing loops may combine to build closed three-dimensional loops. His idea involves a configuration in which three such change-of-direction "objects" may form a complete-path object: Join the x-to-y loop, the y-to-z loop, and the z-back-to-x loop. Three change-of-direction loops in the same sense (say that of the right hand rule) may be combined to form a complete path. It is this sort of oriented, non-closing, loop which is identified as a *quark*.[19] From Williamson's 2008 paper:

> "Any such loop (for example a double loop with an overshoot, corresponding perhaps to a strange

> quark) could be bolted together in sets of three (in a trefoil configuration) to form particles. As is well known, such a symmetry generates the observed spectrum of baryons. Another possibility to form a particle is to combine a loop in one sense (x to y) with a reverse loop in the opposite sense (y to x) (identified with an antiquark). This means that loop-antiloop (quark-antiquark) pairs would also form particles, in a figure of eight configuration in the bivector space. Again, it is well known that such a condition generates the observed hadronic mesons."—*J. G. Williamson (Reproduced with permission)*[19]

For a photon to be confined as a quark, it must find a way to close its path; it must join with another photon (or two others) similarly seeking path closure. When it succeeds, it finds itself within a powerfully interdependent grouping of two or three quark-photons.

What this means is that in the new paradigm the proton, the neutron, lambda, sigma, Xi, etc.,—the baryons—are manifestations of a *triple photon confinement*; and the pion, the kaon, eta, etc.,—the mesons—are manifestations of a *twin photon confinement*.

Profoundly, since the quark-photons are held together by the necessity of path closure, the concept of *gluons* becomes redundant. No hypothetical force particle, no *gluon*, is needed to bond the quark-photons into pairs or triplets!

Given that all the mass of the Universe, the real universe, is made of quarks and electrons and their antiparticles, then it follows that all the mass of the Universe is made of confined photons!

The DSSU construction employs a greatly reduced collection of particles. Earlier in the discussion, we discarded the hypothetical graviton particle; we did this because gravity in the Natural universe is not a force and so a force-carrier particle is not needed. We now discard the gluon force-carrier and do so because, once induced into a tight geodesic, photons are naturally self-confining. Later we will see that *dark matter* particles, as well, are not needed. The story is the same for the Higgs particle. And to complete the cataloguing of particles, we have free photons (of course); and neutrinos; and the W and Z weak-force carriers, which might actually be further instances of a confinement-configuration effect.

The dominant particulate constituents of the DSSU are confined photons and free photons. They overwhelmingly constitute the gravitational and visible matter of the universe. This feature is selected as an important subcomponent for the Natural universe construction. Once again, the DSSU construction follows a course that is radically different from the Official plan. In the Official cosmology, the ruling particulate class is *dark matter* while *visible matter* is relegated to minority status; the proportional mass of dark matter is said to be about six times the mass of the visible (i.e., baryonic) matter. Understand that *dark matter* is supposedly invisible and non-interactive, has never been detected, and serves as a critical repair patch for a failed cosmology. The problem, in a nutshell, is that in an expanding accelerating universe it is practically impossible to account for the cohesion of major galaxy cluster, the strong agglomeration observed by astronomers. The gravity of all the visible matter was inadequate for the task; hence, gravitationally-powerful "dark matter" was invented. Simply put, mysterious dark matter is unnatural. Given the choice between unnatural invisible matter on the one hand and natural visible matter having self-evident structure on the other hand, as outlined in Fig. 16, the more reasonable selection should be obvious.

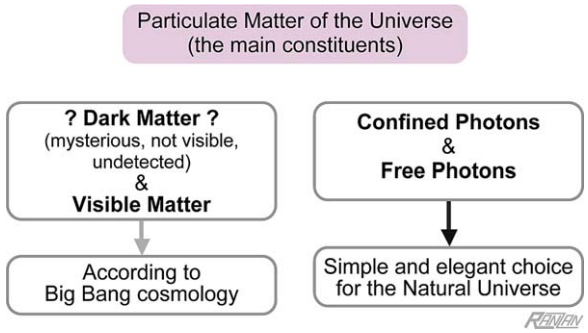

FIG. 16. (Color online) Main categories of *the particulate matter of the Universe*. Big Bang Cosmology holds that a hypothetical dark material dominates. In the Natural Universe, it is ordinary matter that dominates: all particles classed as *mass particles* are composed of confined photons; all massless particles (ignoring neutrinos) are "free" photons.

Reiterating the key point in this sub-section (and of the "matter formation" sub-component): All particles that are endowed with the property of mass are composed of self-confining photons. Self-orbiting photons come in a considerable variety of topological configurations with each configuration representing a different particle species.

C. Mass-property acquisition

> This will be very shocking for many people and teach us something profound.
> –Physicist Nima Arkani-Hamed[20]

Mass acquisition, the third ingredient within the "matter formation" category, is the key component of the DSSU construction. The process involved is unique. To the best of my knowledge, the process embodying this sub-component is unprecedented and appears in no other cosmology model or physics theory. To say that the process is *sui generis* does not do it full justice; there is simply nothing comparable, nothing that can be cited and advanced as an analogy.

Returning briefly to the concept of the space medium: Theorists, over the decades, have come to realize the existence of some kind of aether that permeates space. Note, however, that most professionals do not actually use the term "aether," preferring to distance themselves from an embarrassing association. The term immediately brings to mind the nasty issue of the Physics Community having adopted and nurtured a flawed interpretation of the Michelson aether-wind experiment of 1887. Instead, they call it the *quantum foam* and describe it as a sea of entities popping into and out-of existence.

Sometimes they call it a *substrate*; for instance, an "utterly fundamental substrate." Their hope is that entities as

diverse as quarks, electrons, and the photon may be shown to be mere vibrational variations on a single, utterly fundamental, substrate. Or, when attempting to explain the origin of mass, they may call it an *all-pervasive but-so-far-undetected field*. Among physicists, the general agreement is that the property of mass is conferred upon particles when they interact with an all-pervasive but so-far undetected field, the so-called Higgs field.

Most often the space-medium concept is linked to *the vacuum* with its *dark energy*, or *vacuum energy*, or some fundamental *source energy*. Based on centuries of accumulated evidence, physicists believe that at the smallest size-scale or infinitesimal energy level it is probable that all matter is essentially made of the same stuff, and that all forces are manifestations of a single fundamental energy; and that there is a deep underlying unity, a process, some fundamental process, that is common to all matter. Hold this thought for a moment: *at the smallest size-scale, there is some fundamental process common to all matter*.

Now, there is an important question that must be asked. When one examines the relevant research, two things stand out: Theorists know there is a space medium and they know that mass and energy involve an interaction with *that* medium. The question then is: *What do the experts mean by entities* ***interacting*** *with the field, or with the substrate, or with the vacuum*? Keep in mind, this interaction is deeper (more fundamental) than the exchange interactions of non-conserved field particles (such as the photon in the electromagnetic field, or the hypothetical gluon in the nuclear strong field); the exchange particles, called bosons, are themselves *interacting with the field, the substrate, or the vacuum*. So, what do they mean by the underlying "interaction"?

The interaction refers to some kind of *excitation*; it refers to a kind of vibrational excitation, a simple vibratory excitation of the substrate as in the case of the photon; it refers to a kind of looping vibratory excitation, as in the case of string theory representation of particles. It is always the *excitation* of the space medium. Calling the medium a field, a substrate, a vacuum, or a sea of fundamental fluctuators, makes no difference. We may be assured that the interaction *is* an excitation of the medium.

The patterns of the excitations have been explored endlessly; in fact, the confined-photon structure described above is an example of a successful excitation pattern. But the experts have overlooked a deeply fundamental aspect of the interactions. They have been so intensely absorbed in synthesizing, scrutinizing, anatomizing, and mathematically interpreting the patterns themselves that they have neglected a key process common to ALL patterns.

The excitation patterns, in themselves, do not solve the underlying problem—and do not resolve the impasse in physics—of finding the deep underlying unity of all matter. In desperation, patterns are being explored in ever higher spatial dimensions (such as the nine dimensions of the "simplest" string theory). The results are as incomprehensible as they are disappointing; incomprehensible, because our Universe only has three spatial dimensions; and disappointing, because so much talent, time and effort has been expended in the pursuit. As string-theory expert, Lisa Randall, reports, "we have not yet detected even the slightest trace of their existence."[21] She goes on to explain, "Addressing the unresolved problems of string theory appears to require a fundamentally new approach that goes well beyond the tools that mathematicians and physicists have so far developed."[22]

Mass has two fundamental features. Mass involves an excitation interaction with the space medium and it causes a distortion of the space medium. From Einstein's general relativity theory we know that mass, in some way, distorts the local space medium—causing the aether, Einstein's aether, to contract. (This contractile effect is described, in Einstein's theory, as a spherical curvature space-distortion, or as a positive curvature of space, surrounding a gravitating body; applied to the cosmos it means, if the general relativity BB universe has positive curvature, then it would contract and collapse.)

So, why not just combine the two features whereby mass excites the space medium and simultaneously distorts it? This approach seems entirely reasonable and intuitive. And so, the DSSU construction adopts an excitation process that is accompanied by a contractile process. The space medium, the aether, is subjected to the excitation and consequently becomes permanently distorted!

Here is how the excitation and subsequent contraction works. The photon is the embodiment of the excitation of the aether's fundamental fluctuators (discussed earlier); this is true whether the photon is freely propagating or trapped in a confined pattern. The excitation (the photon) is conducted by the aether medium in a most unusual manner. The aether units (those non-energy fundamental fluctuators), after having undergone the *excitation*, are absorbed and annihilated. We picture the "excitation" as an increase in the activity of the affected fluctuators; we think of the "absorption" as a transition state of the fluctuators; the "annihilation" is the extinction of those fluctuators. In short, the photon conduction process is an excitation-annihilation process. It means the literal destruction of aether units (fluctuators); the "holes" left behind in the space medium are immediately filled by the surrounding aether. It is this initial flow, tending to fill the holes, so to speak, that gives aether a dynamic quality. See Fig. 17. Another perspective on the photon is to think of it as being sustained by the absorption of aether (but

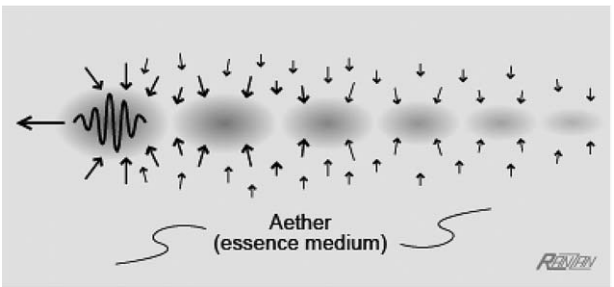

FIG. 17. *The process of photon propagation (a travelling excitation)*: It is the active conduction (by the aether) of an excitation (of the aether) via an absorption-annihilation (of the aether). This conduction-by-excitation-annihilation process destroys aether units (fluctuators) leaving "holes" in the space medium; these holes are immediately filled by the surrounding aether.

since aether units have neither mass nor energy, nothing accumulates).

Without question, having fluctuators that disappear is a most unusual mode of conduction. Yet, there is no violation of the energy conservation law—the fundamental fluctuators, recall, are NOT energy oscillators.

Coming back to the earlier notion that *at the smallest size-scale, there is some fundamental process common to all matter*. It is the excitation-annihilation process with its destruction of aether that defines the underlying meaning of energy (as described in *The Fundamental Process of Energy–A Qualitative Unification of Energy, Mass, and Gravity*[23]). It is the very process by which the photon acquires the property of energy.

Now, "mass" particles are nothing more than parceled energy—nothing more than localized photons. Thus, the very same process also bestows the property called *mass*. The continuous and localized process of aether excitation-annihilation sustains an inward flow as the surrounding aether strives to replace the fluctuators lost in the excitation interaction (Fig. 18). A mass particle is little more than this process. (Note that the concept of *inertial mass* requires the additional process of aether self-extinction as described in the section on *space medium contraction*.) The process that sustains energy, also sustains mass. The concept of "matter" consists of energy particles, mass particles, and electromagnetic-energy fields—and *the excitation-annihilation process is the fundamental process common to all matter*.

This commonality is the underlying reason why it may be said that the photon, although a massless particle, does have *mass equivalence*; and the reason why solid matter is said to be *frozen energy* and have *energy equivalence*.

Recall from the earlier discussion that aether "flows" into matter, but no causal explanation for the flow was given. The cause can now be specified as the *conduction by excitation-annihilation*. Furthermore, since the cause applies to mass *and* energy we have the underlying reason why both are known to be gravitational.

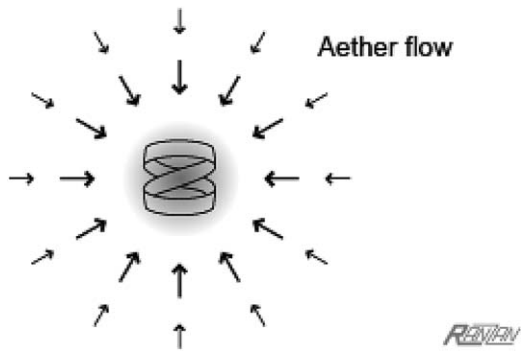

FIG. 18. For a confined photon (using the double-loop electron as an example) the *excitation-annihilation process* occurs in a confined region; the localization of this process bestows the property of mass to the 'object'. The process sustains an inward medium flow with the surrounding aether striving to replace the aether lost in the excitation interaction. Significantly, the very same process, by which a particle acquires mass, also makes the particle gravitational.

What all of Physics to date has assumed is that mass is some addition of material to empty space. However, in the excitation-annihilation theory mass is the opposite; mass is the removal of ethereal entities that fill all space. *Mass* is a subtractive activity. *Mass* is a process that subtracts from the universe; while elsewhere, the Lambda *essence-process II* adds to the universe. (And the harmony of the Natural Universe, again, reveals itself.)

The problematic Higgs. There are currently, at least, two interpretations for the Higgs method of mass acquisition. In the original interpretation, the Higgs is a scalar or gauge boson—that is, it is a particle—which somehow determines the rest masses of elementary particles. In a newer interpretation, the Higgs is some sort of "field"—a "Higgs aether" which acts as the source of particle mass in the sense of inertial resistance to acceleration. In this latter interpretation, all massive particles interact with a universal Higgs field in proportion to their bound energy content, and it is this interaction or ***Higgs aether drag*** which causes the inertial resistance to acceleration we characterize as mass.[24] Evidently, this sounded too much like something borrowed from the 19th century and so the interpretation was readjusted. Hence, we witness the popularity of a hybrid (and more complicated) Higgs-scalar-boson hypothesis with a gravitational-field-drag hypothesis. Whatever the Higgs might be, subatomic particles like quarks and leptons are said to acquire their masses by *interacting* with it.

Unfortunately for conventional cosmology, the recent claimed "discovery" of a Higgs particle does not help to make the conventional universe more understandable.

The BIG question now is this: If the Higgs particle is the giver of mass to all other particles, what then gives the Higgs itself its mass?! (Yes, the newly discovered particle has mass, lots of it!) A difficult and embarrassing question indeed. It is like asking: *if God created everything, then who or what created God? While physicists think they have solved the mass-acquisition problem, the reality is that they have unwittingly exposed an even bigger problem—the riddle of First Cause*.

What has been discovered is that there is a fatal flaw with the Higgs boson.

American/Canadian Physicist Nima Arkani-Hamed, one of many researchers involved in the "discovery," has commented:

> "There are people trying to figure out the indirect effects between the different Higgs like particles. These are very difficult experiments and will take another 20 years before any confirmation is reached. … We don't know what the answers are but we are moving towards them."[25]

Notice the complexity, there is more than one Higgs particle; notice the uncertainty, it may not actually be the Higgs particle that was found but an imposter Higgs-like particle; notice the delay, the projected 20-year delay before we see the conclusive results. The Higgs particle (and its associated field), if anything, is problematic.

The Higgs field concept is fundamentally flawed in the sense that its hypothesized exchange of field particles is not

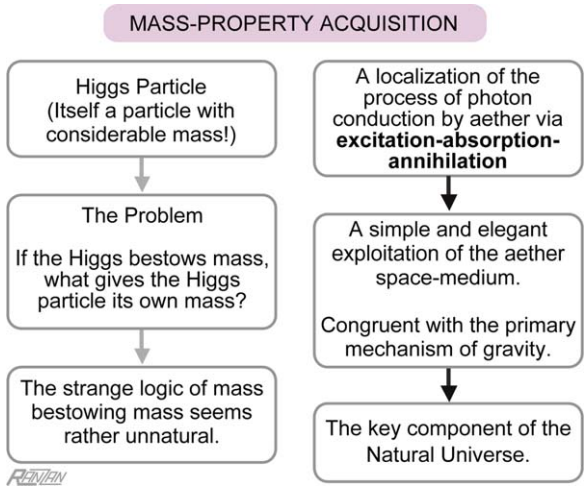

FIG. 19. (Color online) Choice for acquisition of the property of mass: Particle *vs* Process. The "particle" method is favored by the professionals (left column). The "process" method is the method adopted for the Natural Universe (right column).

reflective of what occurs in the real world; there is no exchange. No intermediary boson carrier is required once the nature of the interaction with the medium is understood. Everything hinges on the mode of interaction with the aether!

Back to our construction, the selection options for the method of mass acquisition are summarized in Fig. 19. In rejecting the conventional "particle" view of Higgs and choosing the unique "process" view of *excitation-annihilation*, we find, on closer examination, that the process is much more than the explanation of mass-property acquisition.

There is a multi-faceted, deep significance, in this excitation-annihilation process. It is the very process that is common to both energy and mass particles. It is the causal process of gravitation; it causes primary gravitation. It is the missing component of all previous gravity theories. It is through this process that the ordinary photon unifies energy, mass, and gravitation. This process is the reason why gravitation does not fit the academics' standard model of a force field mediated by the exchange of non-conserved field particles (the hypothetical gravitons).

The DSSU process of *mass-property acquisition* is profoundly powerful; its importance cannot be understated. With this single process, we simultaneously explain how and why aether "flows" into matter. It is the process that eluded Newton, Tesla, and Einstein and many others—the causal mechanism of gravitation. It is the very process that links the photon, the carrier of the electromagnetic effect, to gravitation.

And gravitation in its final stages, gravitation in its terminal manifestation, gravitation as it affects the fate of matter, will be examined in the next section. The true nature of black holes will be revealed.

VI. THE TERMINAL MATTER-ANNIHILATION PROCESS

Localized *matter formation* leads to matter accumulation; and with matter accumulation comes gravitational

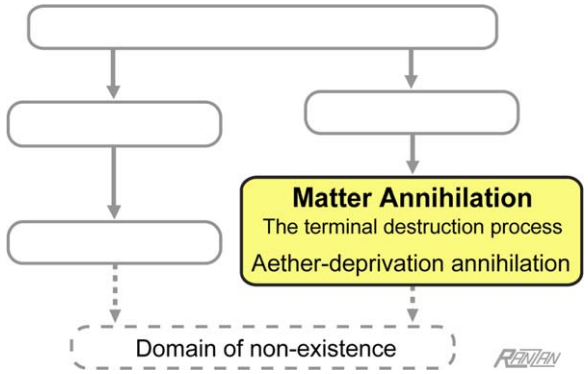

FIG. 20. (Color online) The DSSU master plan: focusing on the process for *matter annihilation*.

aggregation. The aggregation process is driven by the primary and secondary processes of gravitation and leads variously to the formation of gas and dust clouds, planets and stars, star clusters and dwarf galaxies and full-size galaxies. Under certain conditions, the aggregation of matter reaches a critical mode. The purpose, in this section, is to investigate the nature of aggregation criticality and its connection to the process of "matter annihilation." In the context of the DSSU blueprints (Fig. 20), the "matter annihilation" process is the Heraclitean harmonious opposite to the previous "matter formation" process.

Every gravitating body has an enveloping inflow of aether—aether that is required to sustain the very existence of the mass and energy contained therein. It is a reasonably simple exercise to derive an expression for the velocity of such flow.

Consider a spherical planet-size mass embedded (at rest) within a stationary aether medium; its mass is represented by M and its radius by R. Its inflow-velocity field follows from Newtonian physics. A small test-mass is resting at some arbitrary distance, r from the center of mass M; it is shown, in Fig. 21, resting just above the sphere's surface. This small mass, designated as m, is "experiencing" a force, in accordance with Newton's Law of Gravity:

$$F_{\text{gravity}} = -GMm/r^2, \quad \text{where } M \gg m, \text{ and } r > R. \tag{1}$$

But from Newton's second law of motion, a force is defined as $F = (\text{mass}) \times (\text{acceleration})$, so that

$$ma = -GMm/r^2. \tag{2}$$

Although at rest in the frame of the sphere, the test mass is undergoing acceleration; and whenever there is an acceleration there must be a velocity. Replace the acceleration with its definition, $a = d\upsilon/dt$,

$$\frac{d\upsilon}{dt} = \frac{d\upsilon}{dr}\frac{dr}{dt} = -\frac{GM}{r^2}, \tag{3}$$

which (after replacing dr/dt with its identity υ) may be integrated and solved for the velocity.

$$\int \upsilon d\upsilon = -\int \frac{GM}{r^2} dr, \tag{4}$$

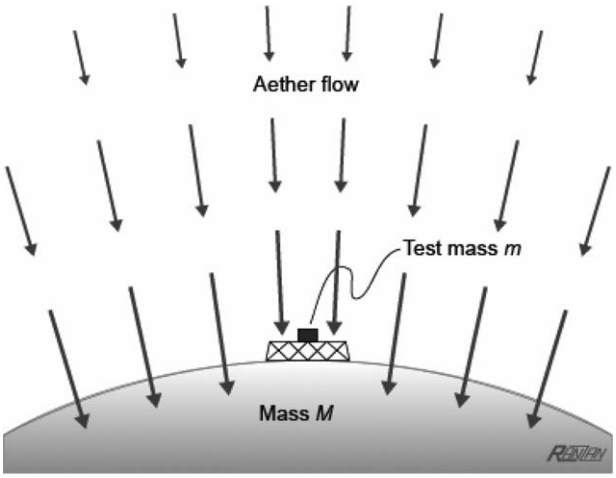

FIG. 21. Aether streams and accelerates towards and into the large mass. It is an inflow motion which the stationary test-mass "experiences" as gravitational acceleration. The speed of the small mass, with respect to the aether, is $\sqrt{2GM/r}$.

$$\frac{v^2}{2} = \frac{GM}{r} + C, \quad \text{where } C = 0 \text{ since } v = 0 \text{ when } r = \infty, \tag{5}$$

$$v^2 = \frac{2GM}{r}. \tag{6}$$

Understand that the test mass is stationary in the sphere reference-frame; it is not accelerating and has no speed with respect to the gravitating body. However, the test mass *does* have a speed with respect to the aether medium. The v in the equation represents the relative speed between the test mass and the aether.

$$v = \pm\sqrt{\frac{2GM}{r.}} \tag{7}$$

The equation has two solutions: one positive and one negative. The positive solution expresses the "upward" motion of the test mass *through* the aether (in the *positive* radial direction). The negative solution represents the *aether flow velocity* (in the *negative* radial direction) streaming past the test mass.

The negative solution represents the speed of *inflowing aether* at the particular radial location specified by r. If the direction is specified with the subscript "inflow" then the negative sign can be discarded; we then have the expression that is of key importance in the investigation of matter annihilation.

$$v_{\text{inflow}} = \sqrt{\frac{2GM}{r}}, \tag{8}$$

where G is the gravitational constant and r is the radial distance (from the center of the mass M) to any position of interest external to M.

Incidentally, for an Earth-like body, the aether-inflow speed at the surface is 11.2 km/s.

Now let me briefly explain how the inflow velocity field influences the motion of particles or objects in the field. In a steady state aether velocity field whose simplest expression is $(2GM/r)^{1/2}$, the velocity is constant at each radial point surrounding a gravitating body; and *if* an object were a point particle (in a true absolute sense) then it would not, and could not, experience gravitational acceleration.

But, of course, true point particles do not exist. Every real particle is surrounded by its own extended gravitational field—that is, its own aether inflow field. As a simple intuitive explanation: If the particle is located at some position r, then one half of the particle's field lies inside the r-radius and the other half lies beyond the r-radius. This means that one half of the particle's field is "experiencing" a range of velocities that are higher than what is "experienced" by the other half. This imbalance causes the particle's velocity field to move in the direction of the maximum gradient. And wherever the field goes, the particle tends to follow. Furthermore, since the incremental difference, the described imbalance, increases with decreasing r-radius, the speed of the motion of the particle increases—the particle accelerates towards the gravitating body.

More specifically and more accurately, the particle/object moves *in the direction of the flow* of maximum gradient—after removal of any constant component of the aether velocity. Even if the aether velocity is decreasing in its forward motion (as occurs in the interior of a gravitating body), the particle/object will tend to move in the direction of forward flow *and* in the direction of maximum decrease.

It is the gradient of the aether velocity field that dictates freefall motion. And it is the gradient of the aether velocity field that determines the acceleration "experienced" by bodies resting on the surface of a planet.

Let us move on and consider an extreme aether-inflow situation. Imagine an astronomical object having the same average density as our own Sun and having a radius R of 338,000,000 km (equal to 2.25 AU). This would be equivalent to a "Sun" that fills the inner Solar system all the way to the inner edge of the Asteroid Belt (somewhat beyond the orbit of Mars); it would be a gaseous giant with Solar density ($\rho_s = 1.41 \times 10^3\,\text{kg/m}^3$) and total mass M of 2.27×10^{38} kg (or 114×10^6 Solar masses). The important thing to note about this enormous star is that the aether inflow, at the surface, approaches the speed of light. Using the equation derived above (Eq. (8)), we can graph the aether-inflow as a function of radial distance as shown in Fig. 22.

The surface area of this structure multiplied by the speed of the aether flow at the surface gives the volume flow

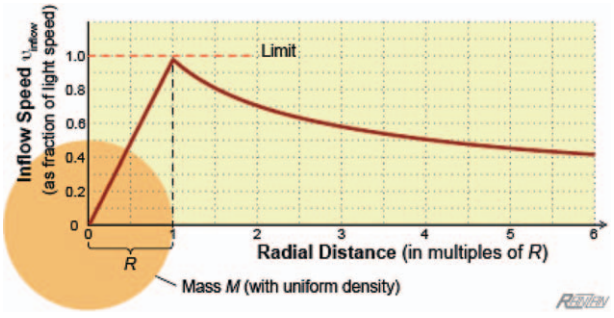

FIG. 22. Graph of *aether-inflow speed vs radial distance* for the gaseous giant described in the text. The interior inflow is linear because it has been assumed that the mega-star has a constant density.

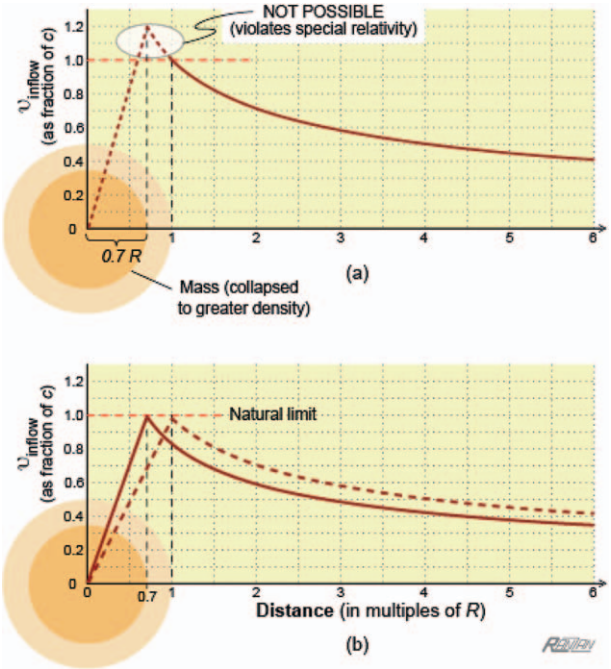

FIG. 23. What happens as the mega-mass "collapses" to greater density? (a) According to a naïve application of the v_{inflow} equation, aether inflow at the surface becomes 1.2 times lightspeed. (b) As the mass body collapses to greater density, the inflow curve ALWAYS stays below the natural speed limit.

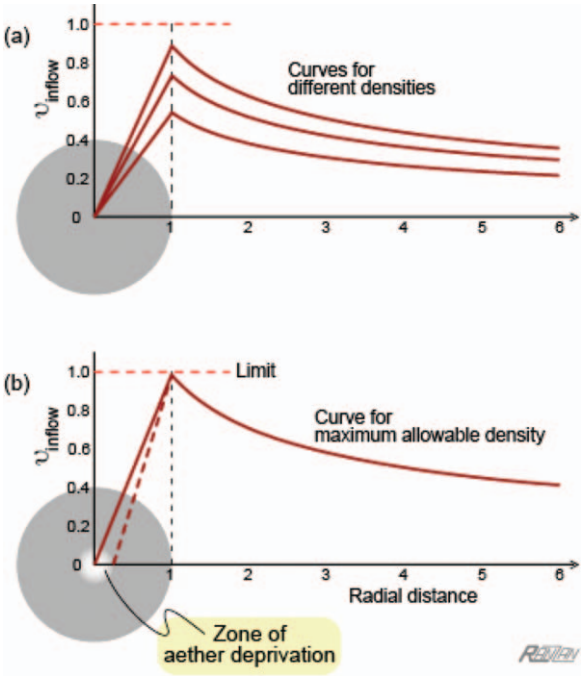

FIG. 24. Two thought experiments. What happens when mass is incrementally added to a body while the radius is held constant? (a) With the resulting increase in density the surface inflow increases and the slope of the internal v_{inflow} increases. In (b), the density is already at maximum; but, as before, the internal inflow slope must increase; thus resulting in a zone of *aether deprivation*.

required, each and every second, to sustain the existence of all the energy and mass within.

Such a structure, quite obviously, is not stable; it will tend to collapse. And as it collapses, it will attain a greater density. Let us say the radius shrinks by thirty percent to $0.7R$; then, according to Eq. (8), the v_{inflow} should increase from $0.999c$ to $1.20c$. However, this is simply not possible![e)] The inflow speed can never reach, let alone exceed, the speed of light [Fig. 23(a)]. The relative speed between any surface "material" and the aether must conform to the limit imposed by Einstein's *special relativity*. Thus, the surface inflow speed must remain below the speed of light, say at $0.999c$.

The only way to comply with special relativity is as shown in Fig. 23(b). In allowing our giant star to partially collapse, all we wanted to do was reduce the volume and thereby increase the density. But we now find something amazing has happened. Mass has been lost!

When we do the calculations (for the situation after the partial collapse), we find that the remaining mass is thirty percent less than the original amount. Take the basic aether-inflow equation, $v_{inflow} = (2GM/r)^{1/2}$, and rearrange it to obtain $M = ((v_{inflow})^2\ r)/2G$; with the appropriate substitutions $M = (0.999c)^2\ R\ /\ 2G$. (Notice that mass is directly proportional to the radius.) After reducing the radius to $0.7R$, the compressed mass is $M' = (0.999c)^2\ 0.7R\ /\ 2G$; but this is just 0.7 times the original mass M. Therefore, three tenths of the original mass (a factor of 0.3) has been lost. Even though the volume has been reduced—reduced by a significant 65.7%—the mass loss is only 30%. Clearly, density *has* increased. The big question is, *How do we explain the mass disappearance?*

First of all, let us consider the situation well below the lightspeed restriction and make note of the simple fact that when the density increases—this time without changing the radius—the radial inflow increases AND the slope of the internal v_{inflow} increases. Entirely self-evident, as shown in Fig. 24(a); but now, what if the surface inflow is already near the natural limit? What happens if we hypothetically increase the density even further—say by adding material while the radius again remains constant?

As before, the slope of the internal inflow must increase. What this means is that the inflow speed becomes ZERO *before the aether reaches the center of the gravitating body or region*! This core "region" becomes the zone of *aether deprivation*. Recall that matter does not and cannot exist without aether. So this is serious. [See Fig. 24(b)].

No, this does not mean there will be a hollow core—a sort of zone of nothingness. Let me explain the mass disappearance with another thought experiment. Assume the spherical body of Fig. 23 or Fig. 24(b) collapses to significantly greater density but without loss of mass. Then, because of the resulting reduction in surface area, there would be a fateful decrease in the quantity of aether reaching the mass-and-energy particles located at the innermost interior. The aether would be entirely consumed long before it

[e)]Note that the problem is not the enormity of the speed itself; for instance, in a singularity type of black hole the inflow speed of space, or the space medium, can increase to many times the speed of light—without any logical inconsistency. However, our "collapsing" structure is not, and does not become, a singularity. The reason for the speed restriction is that the flow of the space-medium simply cannot impact matter with a speed greater than lightspeed.

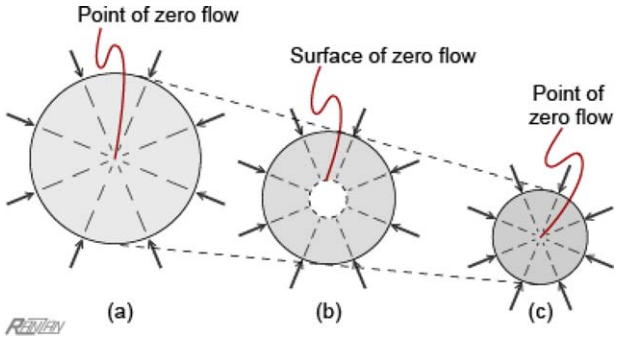

FIG. 25. (Color online) Gravitational contraction to greater density while surface inflow remains near light speed. (a) Stop-motion image of the collapse to greater density. (b) If it is wrongly assumed that mass-energy is absolutely conserved, then there simply will not be a sufficient quantity of aether to supply the core region; this deprived region is defined by a surface of zero inflow. (c) *But since matter cannot exist in the absence of aether, such a region must immediately collapse*.

reaches the center of this experimental star; somewhat like the water of the mighty Colorado River being consumed before reaching the Gulf of California. It is easy to imagine, located at the body's core, a spherical surface of *zero aether flow* (Fig. 25). This spherical region is the *zone of aether deprivation*. And since matter deprived of aether simply cannot exist, the matter literally disappears, the zone of deprivation shrinks to nothing, and the surface of zero aether flow becomes a mere point.

Thought experiment aside, in the real world, the core material *terminates* before any spherical zone of aether deprivation has a chance to develop. In DSSU theory, this is also called the *suppression-annihilation* process (SU-AN process). There are locations, within all galaxies, within some stars, where mass and energy undergoes total SU-AN mode of destruction.

We can state a rule that limits the quantity of material within any enclosed volume. The limiting quantity of matter inside any enveloping surface (such as the spherical surface used in the foregoing thought experiments) depends on the quantity of aether that enters through such surface; and this aether quantity depends wholly on the surface area and the natural speed limit with respect to that surface.

The amazing thing, in all this, is that the actual matter density has no bearing. The density may be the density of a neutron star or the density of a gaseous sphere; both can be subject to aether deprivation and the associated ultimate collapse.

What about *black holes*!? Aren't they supposed to manifest the ultimate collapse of matter? Understand that *singularity black holes* are not physical objects—they are mathematical objects. They are components of BB mathematical cosmology; they are components of the old 20th-century worldview. These conceptual objects of infinitely dense mass inside an infinitely small "volume" have no place in the Natural World. The object-as-a-singularity idea does not pass any reality test, being as it is an affront to common sense and an overextension of physical law. We do, however, retain what is useful. Since the objects discussing in this section do have surfaces where the inflow approaches the speed of light, we have what might be called a quasi-event horizon. And so, in the Natural Universe we may choose to categorize collapsing stars as quasi-black holes (recognizing that they come in a range of sizes and densities).

The present section has explored a new and unfamiliar perspective on the fate of matter within the DSSU. Table I provides a short summary and a side-by-side comparison with the more conventional, albeit unrealistic, view. The table also describes how the two cosmologies comply, in radically different ways, with the law of mass/energy conservation.

The terminal matter-annihilation process is *aether deprivation*. With this addition to the DSSU construction, matter formation is put in a state of balance with matter destruction.

TABLE I. The fate of matter within different cosmologies.

Big bang Mathematical universe	DSSU Natural universe
Final fate of mass and photonic energy…	
… is to self-collapse into a black hole (BH) OR to fall into an existing BH … however, there is more to the story (see below).	… is to self-collapse into a quasi-black hole (QBH) OR to fall into an existing QBH … then eventually undergo *aether-deprivation annihilation.*
Final structure	
Singularity black hole: ☐ Infinite density ☐ Infinite smallness ☐ More a mathematical construction than the representation of something real. ☐ Contravenes Einstein's view.[a]	Quasi black hole: ☐ Size and density vary. ☐ Size is defined by a quasi-event horizon. ☐ In agreement with Einstein: Matter cannot collapse through its Schwarzschild radius.[a]
Method for Complying with conservation-of-matter law	
Matter is not permanently lost; it never dies! The matter within the BHs is said to slowly (very slowly) evaporate (as Hawking radiation).	Matter *suppression-annihilation* process is in perpetual cosmic-scale balance with matter formation process(es)
Matter is RECYCLED	Matter is REPLACED

[a]In 1939, Einstein published a paper in which he showed that matter could not be so condensed that the Schwarzschild radius would fall outside the physical gravitating body.

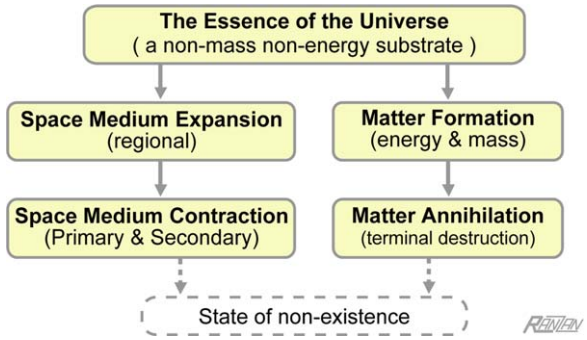

FIG. 26. (Color online) *The DSSU simplified master plan*. On the cosmic scale, the volume rate of space-medium expansion is balanced by a corresponding amount of contraction; and the rate of matter formation is similarly balanced by matter annihilation. The result is a set of steady state systems.

Earlier, we designed the space-medium to be a steady state system, now we have two opposite processes that make particulate mass-and-energy into a steady state system.

The next step is to bring these systems together—to build an intimate interaction of two steady state systems.

VII. BRINGING THE PIECES TOGETHER

A. Cosmic cellular structure

The master plan of the universe (Fig. 26), in simplified terms, contains a space medium specified as a non-mass, non-energy, aether with axiomatic properties; an aether expansion process; an aether contraction process which includes *excitation-annihilation* by matter and *self-dissipation* by secondary gravitation; a multi-faceted mass-and-energy formation process; and lastly, a terminal *matter-annihilation* process.

The expansion and contraction components form one balanced system; the matter formation and destruction components form another balanced system. The two systems are presented schematically in Fig. 27. Various stages of matter formation occur within the cosmic-scale expanding-space regions, while large-scale matter aggregations (and terminal destruction) occur within the cosmic contracting-space regions.

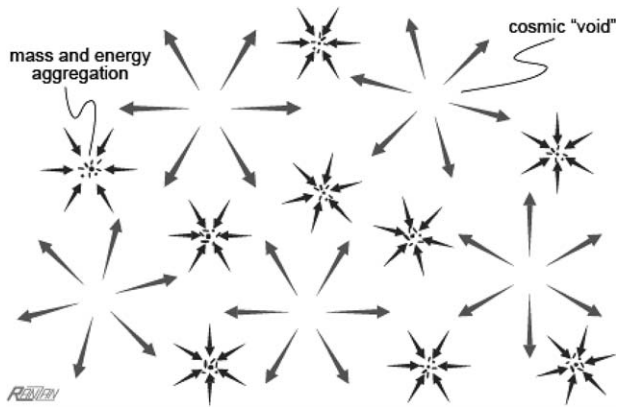

FIG. 27. Schematic of the Natural Universe showing the flow of the aether medium and comoving material—a flow from expanding-space regions to contracting-space regions.

FIG. 28. The three polyhedral cells capable of dividing space—capable of orderly cellularizing a volume.

Now, if one fails to recognize that the systems are inherently balanced, then one might easily gain the impression from looking at Fig. 27 that the space-expanding regions are getting bigger (and the space-contracting regions smaller). It is at this stage, from just such an impression, that BB model-makers may be misled into believing that their universe is expanding. They see the space-expanding regions—the voids—as becoming larger and then assert that therefore the universe must also grow larger! They theorize that space-expanding dark energy dominates over space-contracting gravity, and so, end up with an unbalanced world system.

Also understand that the BB interpretation, influenced as it is by an explosion type of genesis, portrays a chaotic mixture of expanding regions and aggregating regions. The BB proponents hold the view that the (seemingly random) distribution of these underdense and overdense regions are related to the acoustics of the big-bang explosion. Astrophysicist Mark Whittle, in his popular lectures, promotes the view that the two types of regions are related to the various wavelengths of the sound of the big-bang stage of the creation of the universe.

In contrast to the randomness, the imbalance, and the unrestrained expansion of the BB speculation, our construction is designed to sustain a more or less stable cellular structure.

The theoretical shape of the structural cells is surprisingly simple to determine. There are actually only three ways by which a volume can be divided into ordered polyhedral cells (identical units with no gaps between adjacent cells). The space can be divided-up into hexahedra (cubes), into truncated octahedra, or into rhombic dodecahedra (Fig. 28). These are the three candidates for cosmic structural units available for space-filling packing.[26] Of the three candidates for cosmic structural units available, we immediately eliminate the cube—it is unstable when subjected to the forces involved. That leaves the truncated octahedron and the rhombic dodecahedron.

The choice of shape depends entirely on the type of force involved: When the forces of surface-tension are involved then the cell tends to *minimize the surface area*. When the force involved is that of "negative pressure" then the tendency is to *maximize the surface area*. The truncated octahedron has a surface-to-volume ratio of 5.315; the rhombic dodecahedron has a surface-to-volume ratio of 5.345 (both expressed in terms of the geometrical invariant: ratio $= S/V^{2/3}$). The difference is subtle—so small that it only appears in the 3rd significant digit. Nevertheless, this difference means that for equal volumes the truncated

octahedron has less surface area than does the rhombic dodecahedron. Thus, *surface tension cells*, striving to minimize their volume and surface area, take the shape of truncated octahedra. While *negative pressure cells*, striving to maximize their volume and surface area, take the shape of rhombic dodecahedra. Soap bubbles are considered *surface tension cells*; thus, they tend to be shaped as truncated octahedra when packed together.[f)]

The cosmic cells of the DSSU are *negative pressure cells*. The negative pressure is the manifestation of the process of space-medium expansion. Thus the cosmic cells of the DSSU tend to be shaped as rhombic dodecahedra (and *not* as truncated octahedra).[g)] Each cell, enveloping a central void, interfaces with twelve others as each cell tries to maximize its volume and surface area. The result is a twelve-faced dodecahedral structure—a cosmic cell with fourteen nodes. Each node is a center of gravity as indicated by the observable presence of at least one supergiant elliptical galaxy (a "cD"-type galaxy). Each node is the center of gravity of a rich galaxy cluster. The fourteen galaxy clusters are linked by a network of 24 filamentous arms. These arms represent the extensions of the various galaxy clusters.

Thus, the shape of the Natural Universe's largest cosmic structural component (as shown in Fig. 29) is non-platonic dodecahedral; and the size of these structures, in agreement with astronomical observations, is approximately 350 Mly in diameter.[27]

The Natural Universe is a densely packed array of rhombic dodecahedra as well as trapezoidal-rhombic dodecahedra; both are known as closest-packing shapes, which means that they fit together so as to divide up a volume of space without leaving gaps between adjacent cells. This aspect of the DSSU construction is nothing more than basic Euclidean spatial geometry. It is the flow of the space medium within these structures that introduces a degree of complexity and a localized distorting effect resembling non-Euclidean geometry (spherical and hyperbolic); however, in what follows, our reference frame will always be one or more of the Euclidean "stationary" points of the cosmic structure. And another vastly simplifying factor—as I often point out—is that the cosmic cells are NOT expanding. *The grand web-like (cellular) network of galaxy clusters and superclusters is intrinsically stable*.

A close look at Fig. 29 will reveal that there are two types of vertices or nodes. There are minor nodes and major nodes where, respectively, three and four of the structure's filamental arms meet. Also notice, the minor nodes outnumber the major nodes—eight *versus* six. But the difference between the two sets of nodes goes deeper.

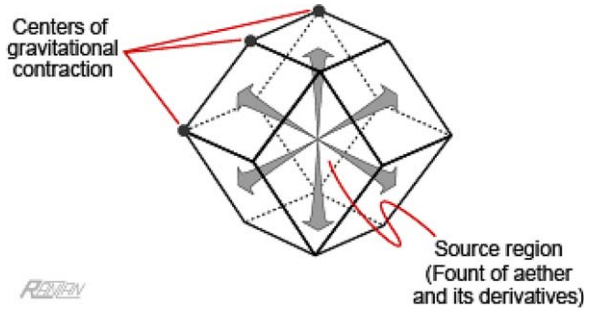

FIG. 29. (Color online) Schematic view of an isolated structural cosmic cell. The Natural Universe's largest structure has the shape of a *closest-packed dodecahedron*. Note, in spite of the pronounced flow arrows, the cell itself does NOT expand. It is prevented from expanding by a self-balancing mechanism.

Real cosmic cells are never isolated; nodes are *always* shared with neighboring cells. The geometry requires that shared nodes must have either FOUR branches or EIGHT branches. Matter, of course, moves away from the voids and towards the filaments and clusters. Minor nodes absorb this flow, aggregate the material, from four filaments; while major nodes absorb the vastly greater flow from eight filaments! We recognize this to be the overwhelming reason behind the variation in material aggregation and the variation in the observed richness of galaxy clusters.

We next focus on one of these centers of gravitational aggregation and its surrounding region.

B. Unified gravitational cell/region

Consider a plan-view layout of cosmic cells (instead of dodecahedra, we have hexagons). Surrounding each region of aggregation, there are six points of zero space-medium flow. These six points are shown in Fig. 30, which illustrates a group of three idealized cosmic cells in a two-dimensional representation, and when joined together form a triangle (dashed lines). Also notice, *no flow lines cross the boundaries of the triangle*. What this triangle represents, in two dimensions, is a complete, autonomous, gravitation region. It represents a *unified* gravitation cell.

The "unified" designation for the gravity cell is easy to justify. The *gravity effect*, by definition, always manifests as an acceleration. Place a small test mass within the diverging zone of one of the three lobes of the trefoil-shaped cell in Fig. 30. It will accelerate, in co-motion with the aether, along the flow lines. The divergence of the flow lines indicate that this is a region of expanding aether, also known as a region of anti-gravity, also known as a region dominated by the Lambda effect; but most importantly, as far as the gravity definition is concerned, the flow here is an acceleration towards the aggregation node at the cell center. Although the acceleration is extremely weak, the test mass (after many billions of years) is carried into the converging pattern of primary and secondary gravity (discussed earlier) and gradually increasing accelerated comoving motion.

In other words, the *unified* gravitation cell incorporates primary, secondary, and tertiary forms of gravitation.

[f)]It should be pointed out that soap bubbles are not regular in shape even when experiments strive for constant volume. They tend to be highly irregular tetrakaidecahedra. [P. Pearce, *Structure in Nature Is a Strategy for Design* (The MIT Press, Cambridge, Massachusetts, 1990) p6] The reason is that gravity induces film thickness distortion. However, it is predicted that under weightless conditions soap bubbles will be shaped as truncated octahedra (if equal volume bubbles are produced). The truncated octahedron is, of course, a tetrakaidecahedron.

[g)]Note that the rhombic dodecahedron has a twin called the rhombic-trapezoid dodecahedron. All the main geometric features are the same except half of the 12 faces are trapezoids—while the other half are rhombuses.

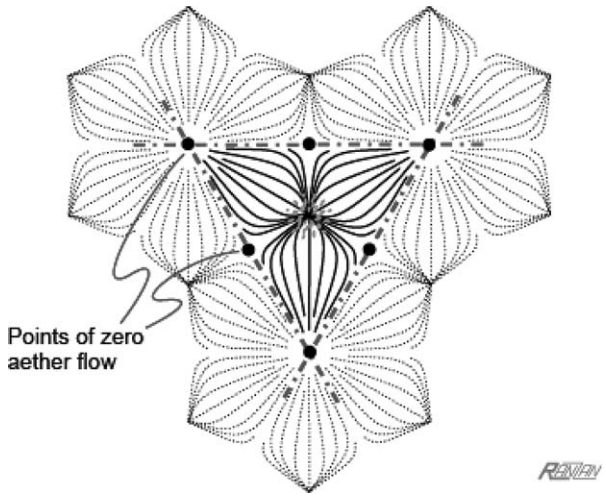

FIG. 30. Within a group of three idealized cosmic cells in a two-dimensional representation, an autonomous gravity cell is delineated by the dashed triangle and the six points of aether-flow stagnation. Note that no flow lines venture across the boundaries of the indicated gravity cell.

In the simplification given in the previous drawing, there are three hexagons that meet at one point, and so, the associated gravity cell has three extensions or lobes (and 6 neutral points). Now consider the three-dimensional gravity cells centered on the minor and major nodes of our Natural Universe. A simple building-block assembling exercise reveals that any minor node is the meeting point of FOUR dodecahedral cells; consequently, minor nodes are the centers of four-lobed gravity cells. A minor-node gravity region takes the shape of a tetrahedron and has 10 neutral-flow points. As for the major nodes, they are the meeting points of SIX dodecahedral cells and consequently are associated with SIX-lobed gravity cells. A major-node gravity region is shaped as an octahedron (the six vertices of the octahedron correspond to the extremities of the six lobes) and has 18 neutral-flow points. The two types of gravity cells are shown in Fig. 31.

What this analysis of the universe's geometry means is that the cosmos is an interweaving of three basic structures. The universe is spatially divided into dodecahedra corresponding to the visible bubble-like structures *and* into tetrahedral and octahedral gravity cells—with each gravity cell having a single multi-branched galaxy cluster at the center. Although there may be factors that lead to real and apparent distortions, the intrinsic tendency towards the noted geometric shapes is relentless—perpetual and steady state.

There is a fundamental reason why the tetrahedral and octahedral shapes are so important. A volume of space cannot be completely divided up (tessellated) exclusively with tetrahedra, or exclusively with octahedra. However, when combined together, the two types of cells *can* be close-packed to completely "fill" space. Tetrahedra and octahedra gravity cells are in this way intimately connected, yet there is no intercellular interaction between them. From this perspective, we say that the universe is a *dense packing of autonomous cosmic gravitation cells*.

Here then, with the "pieces" brought together, is the bare-bones picture of our universe: Dodecahedral structural cells (about 350×10^6 lightyears in diameter) for which all

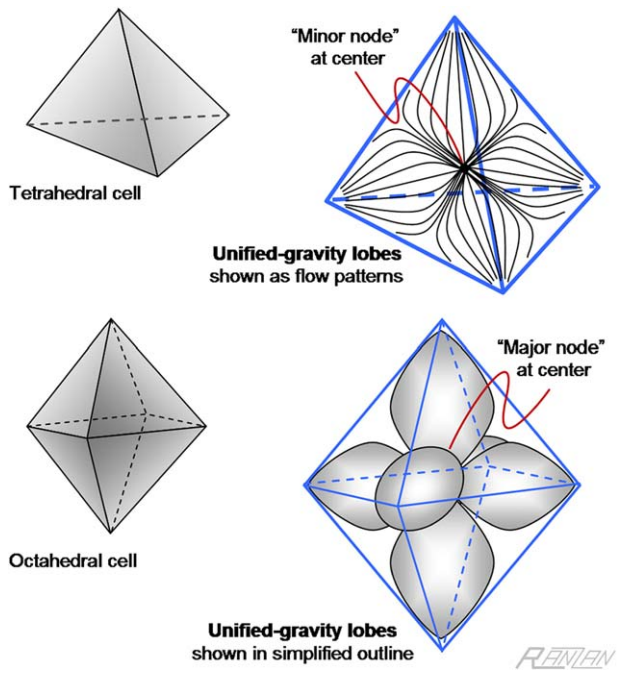

FIG. 31. (Color online) The tetrahedral cell represents the *unified gravity region* associated with the Minor-node galaxy clusters. The octahedral cell represents the *unified gravity region* associated with the Major-node galaxy clusters.

nodes are shared and all boundaries are interactive; and *autonomous gravitating regions with totally non-interactive boundaries*.

To complete the DSSU construction, we need to add one more item. A categorical feature must be designated in order to avoid a serious violation of a fundamental principle in cosmology.

VIII. THE QUESTION OF INFINITY

Is the Universe finite or infinite? This question is an enquiry into the Universe's spatial extent and its temporal duration. Let us, for now, focus on the spatial part. (The Universe's temporal aspect will be addressed in a later section.)

Is the Universe spatially infinite? The answer, based on the following simple argument, is that the Universe is indeed spatially infinite. The Natural Universe has three Euclidean spatial dimensions; this property vastly simplifies the choice between *finite* and *infinite*. The Euclidean geometry means that the universe is either finite and surrounded by nothingness OR it is infinite and has no boundary. There is no alternative. There is no in-between choice as there is in BB cosmology with its *finite volume* somehow enclosed by an *infinite boundary* (the relativists describe it as an *unbounded* general relativity universe).

Continuing with the Euclidean geometry argument, if the universe is finite, it would effectively require that there be a boundary separating the inner region from the surrounded region of nothingness. Obviously then, a finite universe has special locations, those at or near the boundary; moreover, it would have a center-point midway between opposite boundaries. This would represent a violation of what is considered to be the foundation principle of modern cosmology—the *cosmological principle*. This principle

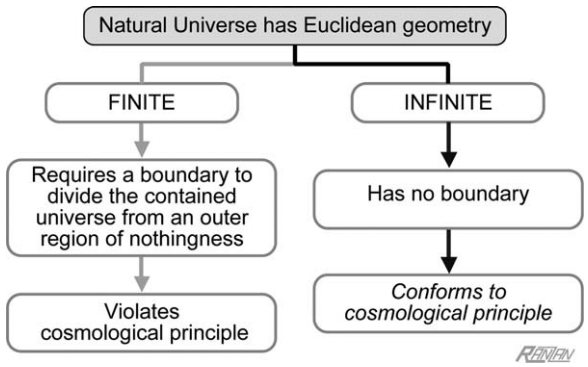

FIG. 32. "Geometry" argument necessitates an infinite universe. A Euclidean-geometry universe can only conform to the *cosmological principle* by being spatially infinite.

requires that the universe be the same everywhere in space, apart from the structure and irregularities of a local nature; it requires that if there are cosmic cells in one region then they must occur in all regions.

The Natural Universe, the DSSU, simply cannot be finite (Fig. 32).

Incidentally, the original BB model managed to conform to the *cosmological principle* by means of the distortion of space and time into a *space–time* geometry and structuring itself into a hypersphere (sort of a mathematical single-cell universe). Even then, it only manages to conform to a weak version of the principle.

There is also a philosophical argument involving two inconceivables. Philosophers generally agree that the notions of *infinity* and *nothingness* are inconceivable in the sense that our minds cannot fully comprehend them. Galileo held the view that *infinity*, by its very nature, is that which is incomprehensible. The French mathematician and philosopher Henri Poincaré found that infinity's incomprehensibility lead to contradictions and went so far as to claim that there was no actual infinity.

Infinity and *nothingness* are notions the profoundness of which tax the limits of our brains. They represent the unattainable limiting concepts of existence itself. The intrepid reader may wish to try a mental exercise: First, one should isolate oneself from all sensory input, entering sort of an induced state of sensory deprivation, then attempt to absorb the idea of infinitude of space, imagine grasping a concept that forever keeps slipping out of reach. "Nothingness" will likewise frustrate the brain's efforts.

Now comes the critical question of actuality. *Infinity* and *nothingness* may be inconceivable or incomprehensible but can they represent an actuality?

Our core premise is this: Nothingness is inconceivable AND cannot have actuality. That is to say, there cannot be a total absence of processes and/or things; there cannot be absolutely nothing. It is not possible to have a universe of nothingness. (It is but a trivial fact that our Universe is not *nothingness*.)

Based on this premise, it is not possible to have a region of total nothingness. (Our construction conforms to this premise by having an aether that permeates *all* space.)

It follows that if something exists, then it cannot be surrounded by nothingness and must, of necessity, exist in infinite extent. A universe, if it exists, and obviously it does, must exist as an infinite universe. Now to emphasize an important point: It is not the inconceivability of *nothingness* that precludes its actuality. There is no conditional relationship between the two. The two are simply combined as a reasonable compound premise.

Turning to the other inconceivable and the question of its actuality: Does the inconceivability of the concept of infinity preclude its actuality, as Poincaré had asserted, OR can it exist in actuality?

Some philosophers make the inconceivability the main premise and argue along the line of the syllogism: What is inconceivable is not actual.

Infinity is inconceivable.

Therefore, infinity cannot have actuality.

However, for the DSSU, it is recognized that "inconceivability" does not necessarily preclude actuality. We adopt the following "infinity premise": *Infinity is an inconceivable having actuality*.

Combining the three ideas, a class of geometry, an inconceivable having no actuality, and an inconceivable having actuality, we conclude: A spatially infinite universe is a reality which is inconceivable—but a reality nonetheless. Bringing the deduced cellular structure into the picture, we further conclude that the DSSU consists of an infinite packing of cosmic gravitation cells.

IX. TESTING THE DSSU CONSTRUCTION

The most basic test is that of homogeneity and isotropy. A realistic universe, when considered on the cosmic scale, must be homogeneous and isotropic. Our construction, with its cell structure extending to infinity in all directions, obviously conforms. Furthermore, these structures are *sustained for all time* by perpetual processes (the universal laws of physics).

A. Agreement with Hubble's great discovery

The DSSU conforms to the principle that the higher the redshift associated with a galaxy the greater is its distance from us.[h)] A very simple formula relates the measured redshift of a distant object, most often a galaxy, to its corresponding cosmic distance. Distance as a function of the redshift z is[28,29]

$$D(z) = \frac{\ln(1+z)}{\ln(1+z_{cc})} 350\text{Mly}. \tag{9}$$

What is amazing about this equation is that it has only one empirical term: the wavelength elongation factor $(1+z_{cc})$ for a representative structural cosmic cell. The parameter z_{cc} is the redshift index across such a cell. The "350 *Mly*" in the equation refers, of course, to the cosmic

[h)] A recognized deviation from the Hubble principle involves the spectral shift caused by galactic local motion (at the source). The significance of the deviation diminishes with increased distance.

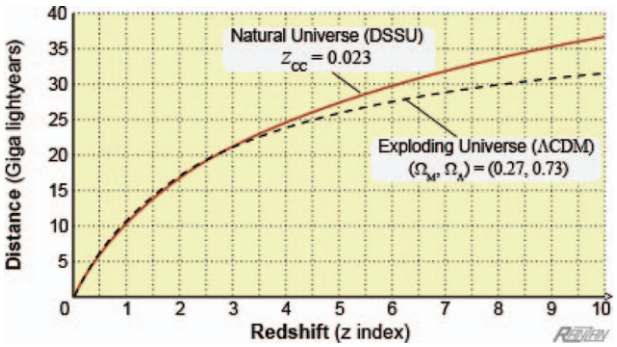

FIG. 33. The value of $z_{cc} = 0.0230$ for the redshift across each structural cell was chosen for a best-fit to the observational evidence. Likewise, the values $\Omega_M = 0.27$, $\Omega_{vac} = 0.73$, and $H_o = 71\ \text{km s}^{-1}\ \text{Mpc}^{-1}$ were chosen for a best-fit to the same evidence. Supporting evidence is only available for distances less than $z = 5$ and has an accuracy tolerance of 5–10%.

cell's nominal diameter of 350×10^6 lightyears. This diameter is based on the results of a massive 200,000-galaxy survey, which probed within a cosmic volume of about 3×10^9 light years cubed. The new data, reported in the *Monthly Notices of the Royal Astronomical Society* (**The WiggleZ Dark Energy Survey: the transition to large-scale cosmic homogeneity**), disproves the hierarchical model in which it is argued, by some theorists, that the entire universe never becomes homogenous and that matter is clustered on ever larger scales, much like one of Mandelbrot's famous "fractals." The finding is considered to be extremely significant for cosmologists.[30]

In remarkable agreement with the DSSU, the survey essentially revealed that the universe is not hierarchically structured but has a regularity of structure, and that *the largest structuring* occurs on the scale of 350×10^6 lightyears. Furthermore, since, as the report title claims, "large-scale cosmic homogeneity" begins at this scale, then it follows that the Cosmos is ***regularly*** cellular and also that the Universe has a *steady state* cellular structure. Without some defining *steady state* aspect, there could be no regularity, no "large-scale homogeneity."

A graph of our redshift-distance expression, in which the parameter z_{cc} is assigned a value of 0.0230, is shown in Fig. 33 as a solid curve. As a comparison, the "proper distance" curve for the Big Bang universe is shown (as a dashed curve). The comparison has a two-fold purpose: to show the remarkable agreement in the first half of the graph; and to reveal a significant divergence of predicted distance with increasing redshift in the second half.

All distant objects are identifiable with some redshift index. But knowledge of the redshift number does not in itself give the object's distance. Astronomers, using various methods including the famous standard-candle method of analyzing the luminosity profile of type 1a supernovae, have spent many decades measuring and refining cosmic distances. The methods were independent of z but then used to calibrate z; and in the process, redshift became a powerful tool for testing cosmology models. The result of their efforts is the portion of the curves up to about $z = 5$.

The distances, between redshift 0 and 5, are considered by astronomers to be reasonably accurate within 5–10%. Of course, most astronomers and astrophysicists are using the relationship represented by the figure's dashed curve—representing the BB Universe.[31] But the DSSU curve (up to $z = 5$) is definitely within the 10% permitted tolerance. This means that both the Natural Universe ($z_{cc} = 0.0230$) and the Exploding Universe ($\Omega_M = 0.27$, $\Omega_{vac} = 0.73$) conform to the astronomical evidence available for the verifiable zone. For distances beyond the verifiable zone, however, the distance curves are purely predictive and obviously divergently so. It all depends on the specifics of the cosmological model.

And two cosmologies as radically different from each other as the DSSU and the BB(ΛCDM)[i)] would be hard to imagine. One is in a steady state of non-expansion; the other is in an accelerating-state of expansion. They are opposites! One cosmology is natural, the other is unnatural.

One uses a single parameter z_{cc} in the formulation of the redshift-vs-distance curve; the other uses a generous assortment of parameters including the present Hubble expansion H_0, the time-dependent Hubble expansion parameter, the scaling factor, and several density parameters such as (Ω_{DM}) for dark matter, (Ω_Λ) for dark energy, (Ω_B) for atomic matter, (Ω_R) for radiation.

One cosmology, because it denies universal expansion, maintains a constant average density; the other, because it embraces a cosmic Hubble-flow expansion, undergoes a relentless density decrease. (With this deep fundamental difference between the two models, there can never be agreement on cosmic distances except for relatively low redshift distances.)

One cosmology uses the observed cosmic cell size, 350×10^6 lightyears, in its redshift-versus-distance formulation; the other treats the cells as a cosmic phenomenological effect having no relevance to cosmic distance formulation. Clearly, one distance curve is natural, the other is unnatural.

B. Cosmic background radiation as starlight

When astronomers measure the thermal emission of the distant universe they purposely aim their instruments so as to avoid focusing directly on any particular star or galaxy and proceed to measure the incoming stream of photons. Technically, the stream is a bolometric flux of energy consisting of a mixture of an enormous range of photonic wavelengths; it is a collection of photonic energy originating from stars, quasars, supernovae, collisions, hot-plasma clouds, and so on. Depending on the type of detector, it is possible to record everything from gamma rays, X-rays, and ultraviolet radiation through the visible spectrum and beyond to infrared and radio waves.

When all the radiation data are graphed—wavelength along the horizontal axis and intensity along the vertical axis—a distinct intensity peak is found at one specific wavelength. The peak occurs in the microwave region of the electromagnetic spectrum. This means that when one takes into account both the individual-photon energy and the photon-type abundance, then there is more energy in the microwave

i)"ΛCDM" is the acronym for Lambda cold dark matter. It signifies an unbalanced expanding universe in which *dark energy* Λ dominates over *dark matter*.

range of the curve than in any other category of the measured spectrum. What astronomers have found is a sea of photons, a large number of them in the microwave range. And they are truly abundant: It is said, there are 400 cosmic-background-radiation photons in every cubic centimeter of space; or equivalently, there are over 10^{13} photons passing through every square centimeter of surface area every second.[32] While the cosmic background radiation (CBR) spectrum forms a peak in the "microwave" range, the spectrum also includes photons of the radio-wave variety (which are even more abundant than the microwave kind) but their energy contribution to the curve is less and diminishes with increasing wavelength; and also includes higher energy photons but being comparatively far fewer in number their energy contribution to the curve is again less than the microwave photons.

The location of the peak energy density determines the wavelength λ_{max}. And this wavelength turns out to be 0.187 cm (corresponding to a frequency of 160 GHz). It is from this value that physicists calculate what is known as the black-body temperature of the Universe—2.73 K. Technically, the CBR, as encoded in the wavelength-intensity curve, has a thermal black body spectrum at a temperature of 2.73 K.

The BB model assumes that the CBR is the highly stretched light from an early period in cosmic history when, supposedly, the young hot universe had cooled to a red-hot temperature of 3000 K—when the universe was a single universe-size star! What astronomers now detect is, again supposedly, *that* star's 3000° light after having been stretched by the universe's 13.7×10^9 years of continuous expansion. The stretch factor, coded by the redshift index z, is about 1000. American physicist Joel Primack describes the universe-size star as having a radius of 13 *Mly*; more accurately, the "visibility" horizon of the universe at this stage in its expansion evolution was 13 *Mly*: "When the cosmic background radiation was emitted, the material that emitted it was actually only 13×10^6 light-years away from the material that would become our galaxy, but it is now about 44×10^9 light-years away."[33]

For the BB model, it is assumed that the gas that eventually congealed to become our Milky Way galaxy was located at the center of this red hot primordial star-like region; the "surface" of this region—and the surface of CBR emission—was 13×10^6 lightyears away; and so the CBR emission distance, as shown in Fig. 34 and in accordance with Professor Primack, must be 13 *Mly*.

For the DSSU, we make a much more reasonable assertion. Instead of having the CBR originating from a red-hot 3000° gaseous universe, we will assume it originates from a multitude of red-hot 3000° ordinary stars, and, for the reason to be explained in a moment, we also include stars up to a yellow-hot 6000 K.

In making this assertion, we note that the vast majority of stars in the Universe are, now and always, red-hot to yellow-hot stars. Here is the justification: The fact is that 96.3% of the stars on the "main sequence" of the Hertzsprung-Russell (H-R) stellar classification system are within this range of 3000–6000 K. In addition, there are a large number of high to extremely high luminosity stars

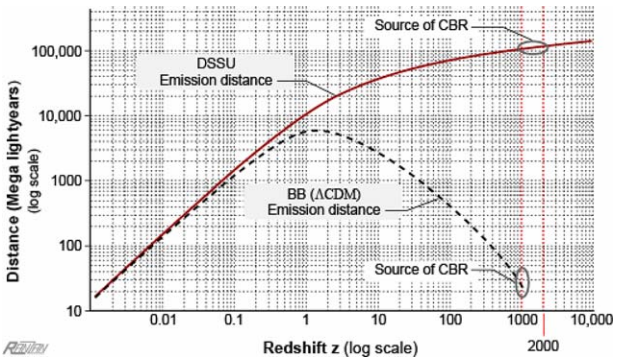

FIG. 34. (Color online) Source of the CBR in the DSSU (upper curve) is the starlight from all the stars (with temperatures 3000–6000 K) within a vast shell region between about 107 and 118 *Gly* distance; it is a region from which the now observed light has been redshifted between $z = 1000$ and 2000. The CBR in the Big Bang model (lower curve) is the 13.7×10^9-year-old light originally emitted when the BB was only 380,000 years old and by then had cooled to 3000 K —when the universe had a radius of somewhere between 13 and 44 *Mly* corresponding to a redshift of $z = 1000$. Note: Since the DSSU is non-expanding, its emission distance is (aside from limited local relocation) identical to its reception distance.

above the main sequence of the H-R chart. And again the great majority of these are in the same temperature range and, hence, are classified as "red giants." Although the statistics of the H-R classification is based on the stars of the home galaxy, there is no reason to doubt that the star-making process is the same throughout the Universe. Thus, the overwhelming source of radiation throughout the universe is from stars with surface temperatures of 3000–6000 K. The dominant photonic flow comes from red stars and yellow stars and everything in between.[34]

We further note that the light from distant sources can undergo some dramatic energy loss; when the light from red stars (3000 K) is redshifted by a z-factor of 1000, the temperature equivalence of the radiation decreases to about 3 K.[j] When the light from bright-red stars (~4600 K) is redshifted by a z-factor of 1500, the temperature of the radiation weakens to about 3 K. When the light from orange stars (~5000 K) is redshifted by a z-factor of 1700, the temperature of the radiation again weakens to about 3 K. And when the light from yellow stars (6000 K) undergoes a redshift of z2000, its temperature, too, would be detected as about 3 K. Starlight, when it is subjected to cosmic redshifting between $z = 1000$ and 2000, is transformed into a 3° cosmic background photon-gas or radiation.

Joel Primack, in making the case for the BB, says, "When we observe the cosmic background radiation, we see. what started out like sunlight now reaches Earth as short-wavelength radio waves."[35] Note that it started out *like sunlight*. In the Natural Universe, the 3° background started out "like sunlight" because it started out AS STARLIGHT. Distant starlight, ranging from red to yellow, after being redshifted by z-factors of 1000–2000, arrives at Earth as microwave "light."

The source of the CBR is the starlight from all the stars (with temperatures 3000–6000 K) within an immense cosmic

[j]The relationship between the detected temperature equivalence and the emitted temperature is $T_{observed} = (T_{emit})/(1+z)$ where z is the redshift index.

shell between about 107 and 118 *Gly* distance from us. These distances correspond to the relevant redshift interval shown for the DSSU graph in Fig. 34.

If we wanted to add the relatively few high luminosity stars to the source of the CBR, we would just increase the thickness of the source shell by extending it beyond z2000. White-hot stars (10,000 K) and blue-hot stars (30,000 K) could be included by extending the far surface of the shell out to $z = 10{,}000$—or out to 142×10^9 lightyears.

And what about the starlight coming from beyond the extended shell? Two factors contribute to make such radiation negligible. First, there is the relentless weakening effect of the cosmic redshift phenomenon. Second, there is an extinction factor that grows exponentially with distance; although the number of sources (hence the number of photons) increases as the square of the distance, the number of photons that actually penetrate that same distance decreases exponentially with distance; the exponential effect wins (a basic mathematical inevitability) and the number of photons, detectable at the concentric center, *tends to zero*.

Before moving on, let us be clear on the emission and reception distances for the Natural Universe. Since the DSSU is non-expanding, its *emission* distance is identical to its *reception* distance. These "then" and "now" distances—aside from local motion—are the same. (The DSSU distance curve in Fig. 33 is identical to the DSSU emission-distance curve in Fig. 34, except for range and log scale.)

C. CBR as the temperature of the universe

The source of the CBR has been explained and how the cosmic redshift affects its temperature. But the temperature is also determined by another factor—density. Understand that in the BB model, the CBR temperature is determined by evolution—the universe's evolutionary state: The BB starts out dense (with a high background temperature) and transitions to ever lower density states (and ever lower background temperatures); and it just happens that the current stage of the evolution has reached a density state at which the temperature measures about 3°; and is destined to transition still lower. The Natural Universe, in contrast, is 3° now and forever. Its temperature is determined by the particular combination of the cell-matter quantity and cosmic-cell size. Imagine, for a moment, if the cell matter content were held constant while the cell size were to decrease, then the background temperature would increase. On the other hand, if the cell size were increased, while still holding each cell's matter-content constant, then the background temperature would decrease (Fig. 35). A more diluted universe has a lower temperature. For the DSSU, cell size and matter content are both stable; hence the CBR temperature is stable.

D. Temperature patchiness

A noteworthy characteristic of the CBR is that it is not entirely uniform: Sky-map images of the radiation display patchiness, somewhat like the thermal patchiness on the surface of the Sun. Some regions are slightly warmer than others. Astronomers have analyzed the distribution of these patches; they determined the power spectrum and found

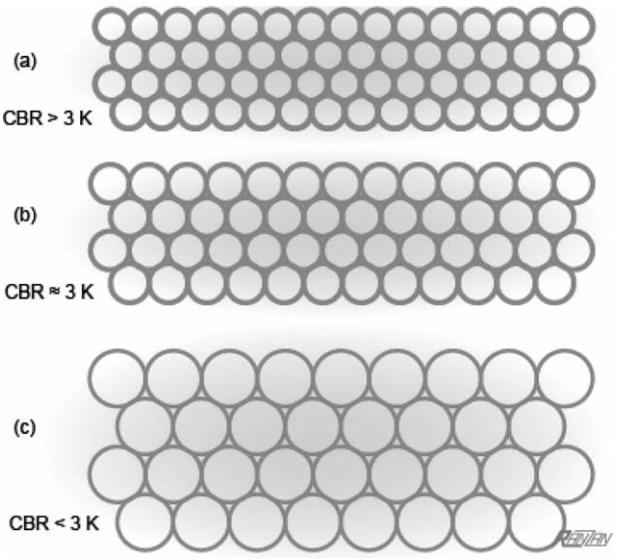

FIG. 35. Temperature of the CBR is directly related to density. Assuming that each cell contains the same quantity of radiating matter, a universe with smaller cells, as in (a) will have a greater intergalactic temperature than in (b). Similarly, a universe with larger cells, as in (c) will have a lower intergalactic temperature than in (b). Of course, if each cell simply contained more (less) luminous/radiating matter, then the CBR temperature would be higher (lower).

three intensity peaks with corresponding angular separation. One of these intensity peaks indicates that the typical angular distance between "warm" patches is about 0.2 arc degrees.

Recall, the distance to the CBR source shell is 107 *Gly*, as was derived earlier. Using this radial distance and the 0.2° angle and a simple geometry formula, we find that the lateral distance (the arc distance) between hot spots is 373 *Mly*. This is remarkably close to the distance between opposite major nodes in a typical cosmic cell (a closest-packed dodecahedron with an inscribed sphere 260 *Mly* in diameter has major nodes that are 368 *Mly* apart). In other words, the patchiness, what is often called the "small-scale anisotropy," corresponds to the distribution pattern of ultra-distant galaxy clusters!

The "small-scale anisotropy" is noteworthy for another reason: Most BB proponents actually consider it to be the best evidence for an explosive genesis of the universe, a scenario originally inspired by Lemaître. The layperson, however, must surely think it very strange for the miniscule variation in background temperature of one part in 100,000 to be a pillar for an entire cosmology! When one realizes that no true alternate interpretations are considered and awareness of alternate models is lacking, then the sentiment of BB proponents is quite understandable. Every observation made, every conjecture suggested, every hypothesis proposed, every theory formulated, every scrap of evidence ever encountered, has been in the context of the expanding universe. The vast majority of cosmologists, participants in a century long blunder-of-omission, have overlooked the steady state cellular universe and missed its simple solution.

The CBR is NOT some remnant radiation of a cataclysmic transition from a universe in one state of existence (dense and opaque) to a universe in another state (dilute and transparent). The CBR is simply a measure of the

intergalactic background temperature of our Natural Universe. And contrary to current academic teaching, the CBR is a non-evolving steady-state temperature—it will always be 2.7° above absolute zero.

E. The Universe as a thermodynamic system

In testing our construction, it is important to investigate the extent of compliance with the laws of thermodynamics.

The first law of thermodynamics, also known as the law of conservation of energy, simply states that in a closed isolated system, energy can neither be created nor destroyed, but can be converted into other forms. Mass and radiation are the most prevalent forms of energy.

The second law of thermodynamics, also known as the entropy law, requires that when processes occur in a closed system, the entropy, the measure of thermal disorder, can never decrease and for macro-scale processes it always increases. In general, if heat is added to a system, entropy is increased; if heat is removed from a system, entropy is decreased. Another rule is that the more uniform the temperature of a system the greater is the entropy.

Notice that both laws apply specifically to *closed and isolated* systems. Our Natural Universe is certainly isolated in the sense that it does not—and, by definition, cannot—interact with anything outside itself. However, our construction is, unequivocally (per axioms and postulates), NOT a closed system. I will elaborate in a moment. Now this nonconformity does not mean we can claim the laws do not apply and proceed to ignore them; it means we should test for conditional conformity.

The DSSU is an open system; as an open system, matter enters the system AND matter leaves the system. The two-way flow of matter is achieved through the harmonious balance of processes. Aether enters the system AND aether leaves the system; the two-way flow of aether is likewise achieved through the harmonious balance of processes. The argument to be made with respect to the first law is this: As a balanced open system in which the energy and matter (and aether) content remains stable, no net energy is created or destroyed and consequently the system must be compliant. The argument for the second law makes use of the unchanging CBR temperature: As a balanced open system in which no net heat is added and no net heat is removed, the entropy remains constant and consequently the system must be compliant.

When the universe is treated as a proper *closed and isolated* system, as is sometimes done with BB cosmology, then problems arise. As a closed system, no matter may enter or leave the system; this strict application of the first law severely complicates the BB "creation" event. Another problem: As a closed and isolated system, the entropy, by law, MUST INCREASE with time. With universe-wide expansion the entropy grows; with expansion to infinity, the entropy tends towards maximum. The increase in entropy dooms the expanding universe to what is commonly called the "heat death of the universe" as all energy becomes evenly dispersed and the temperature becomes uniform.[36]

In truth, the BB universe is only a half-closed system. The mere act of expanding means that "space" is being added; which in turn means that vacuum energy is entering the system. Attempts to overcome this problem by balancing a loss of gravitational energy with the gain in vacuum energy are not convincing; one only needs to point out that preexisting gravitational energy is finite while the incoming vacuum energy is potentially infinite. A gain in energy represents a first-law violation. And since it is well understood that space expansion is a source of low entropy, then, as the BB universe expands to infinity its entropy tends toward zero (as the temperature tends towards absolute zero); such a decrease in entropy represents a second-law violation.

The key to the success of our construction is that low entropy matter enters the system while high-entropy matter leaves the system. Matter enters via a primitive two-stage formation process—a low entropy process. High-entropy matter leaves the system via the *suppression-annihilation* process. The overall entropy remains constant reflecting the perpetual steady-state nature of the processes. Because of the way energy is defined, the aether does not, in and of itself, possess energy—it does not possess vacuum energy in the usual sense.

On the grand scale, the processes that drive the DSSU are not reversible—they run only in a forward direction. Moreover, they are NOT cyclical—in reality they are continuous and perpetual. Aether "flows" into and out-of the system continuously and perpetually. Matter forms and disappears, according to respective postulated processes, continuously and perpetually.

F. The ultimate test

A philosophically sound understanding of the real Universe requires that when we apply a verb to it we really have only one choice: we must say, "The Universe IS." And if we want to describe the properties of the real Universe, then it would be a simple matter of adding a suitable predicate: We are permitted to say, "The Universe is infinite or finite." We are free to say, "The Universe is hot or cold." We can say, "The Natural Universe is perpetual and timeless." We can say, as we have done, "The Natural Universe is cellular; it has a cellular structure."

However, one cannot apply an action verb, or a verbal, to the Universe. One cannot say the Universe *begins*; one cannot say the Universe *inflates*; one cannot say the Universe *expands*; one cannot say the Universe *evolves*; one cannot say the Universe *changes in cycles*. Such constructions are technically flawed and philosophically untenable—as has been amply demonstrated in earlier discussions. The ontological truth is: ***The Universe is.*** Period.

I have repeatedly underscored the point that the Natural Universe is *perpetual*. The "perpetual" predicate, or a "steady state" predicate, provides emphasis to such statement but is not essential; the perpetual nature is already implied in the simple and unambiguous verb "is."

Let the predicate stand; and consider the simple question, *What is it that categorizes the Universe as being perpetual?* Yes, the Universe is perpetual in the sense that it has no

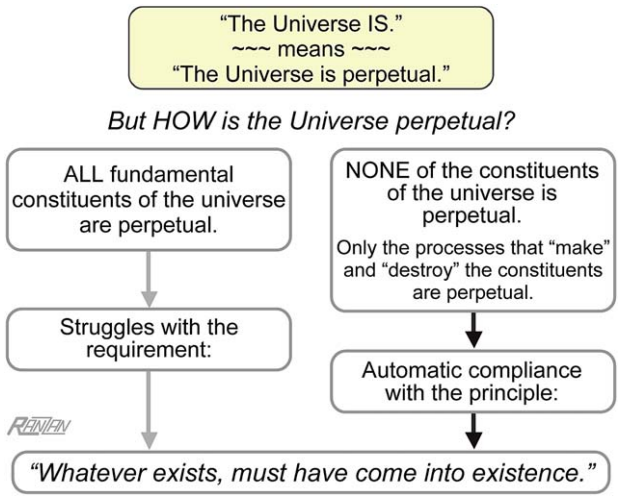

FIG. 36. (Color online) *The Universe IS*. If no restrictive conditions are imposed, then the statement must mean, "The Universe is perpetual." There are two ways in which the Universe can conceivably be in a perpetual state (where perpetual means having no beginning and no end). Only one of the two satisfies the principle, *whatever exists must have first come into existence*.

time-wise beginning and no end. But consider all the stuff in the universe: Are the constituents of the universe "perpetual"?…

It turns out there are two ways to conceptualize a perpetual universe (Fig. 36). In the first, ALL the fundamental constituents of the universe are perpetual; its raw stuff such as the energy that goes into particles and the space medium exists forever. In the second way, NONE of the constituents is perpetual; only the processes involved in "making" and "destroying" the constituents are perpetual. The result, with the second way, is a universe that is *perpetual* while no thing, no particle, no entity, material or nonmaterial, within the universe is itself perpetual (aside from processes, process which serve as natural laws).

The two arrangements are subjected to an acid test: any sound cosmological construction must conform to the principle that *whatever exists must have come into existence*. One of the two constructions readily complies; but for the other, compliance is a tortuous struggle.

More on that struggle in a moment. But first, we take the condition-of-existence principle, "*whatever exists must have come into existence,*" and apply the Heraclitean doctrine of opposites so that *coming into existence* is countered by its harmonious opposite of *passing out of existence*. Let us call the combination the principle of *the necessity of limited existence*.

We arrive at the ultimate cosmological test. The ultimate test of cosmology theory is a check of conformity to the *necessity of limited existence*, while at the same time retaining the universe's passive perpetual status. All known cosmologies attempt, in some way, to comply with this requirement; none has heretofore succeeded. The Brahmanda universe, one of the earliest known cosmologies, cycles through cosmic periodic birth, death, and rebirth, endlessly; existence is *limited* and confined to autonomous cycles. This ancient Vedic cosmology undeniably succeeds in limiting existence, but to do so it invokes forbidden actions attributed to the entire universe—it invokes the birth and death of the entire universe. Few believe the Brahmanda to be a realistic universe; but it does exemplify the necessity of limited existence. Most Cosmologies simply hide their failure to limit the temporal duration of existence by sweeping "the beginning" under the rug of past infinity and dismissively relegate "the ending" to the infinite future. Alexander Friedmann's favorite, now known as the Friedmann-Einstein Oscillating universe, was of this genus; there are also many modern versions. A higher-dimensional version, authored by Paul Steinhardt and Neil Turok, is based on *brane* and *string* theories. The various BB Models strive to time-limit existence; they attempt to define a beginning when everything came into existence. But with the "existence" clock running into its 14th or 15th billion years of ticking, Big Bang adherents are struggling to find a workable ending—and give their universe (or its contents) some sort of terminus of existence.

A cosmology model fails when it attempts to comply with the limited-existence principle by treating the universe itself as a "thing" and demanding of it a beginning and an ending. The BB model with its various speculated beginnings—such as the singularity genesis, inflationary launch, and cyclical rebirth—and its currently forecast heat-death demise, fails utterly. The entire expanding-universe paradigm is a failure.

Although the Universe is perpetual, all things within the Universe must have a time-wise beginning and an ending—in other words, what exists must have come into existence and will in the finite future not exist. This is of paramount important. Likewise, what existed in the distant past, now, no longer exists. Everything must come into existence by way of a formation process and eventually undergo a negation process into non-existence (such as suppression-annihilation into non-existence in DSSU theory). *In this sense, the Universe is continually coming into existence while simultaneously extinguishing existence*. It is in this way that the Universe IS—the Universe is perpetual.

It is in this way, and only in this way, that the Universe is infinite in its temporal duration. (And here lies the answer to the unanswered part of the earlier question; *Is the Universe finite or infinite?*)

The Natural Universe that we have constructed within these pages is the only cosmology in history, going back to the time when the Ancients decided the Universe was not ruled by gods but was ruled by natural law, with a logic structure able to withstand the ultimate test of validity. Let me underscore the following crucial feature of the DSSU construction: While the Universe is perpetual in its key processes, the things *of* the Natural Universe, the particular manifestations of those processes—whether those manifestations are objects, particles, or entities of the most fundamental nature—are not.

G. A selection of other tests

The DSSU construction solves the mystery of gravity—the mystery that Einstein's student, Peter G. Bergmann, publicized as *The Riddle of Gravitation* (1992). Not only does it incorporate the causal mechanism as the consequence of that most unusual mode of conduction of free and confined

photons, but also it unifies the conventional contractile gravity-effect with the expansion Lambda-effect—combining the two into a unified field that manifests as cosmic-scale gravity cells.

An important test relates to the simplification of fundamental forces. The standard contemporary approach in the effort to combine the basic forces of strong, weak, and EM is a unification that is limited to a hypothetical period 13.7×10^9 years ago during the early evolution of the BB universe; the approach involves a supersymmetry higher-dimensional, not to mention highly speculative, construction.

The approach used for the DSSU construction is to employ the EM interaction as the sole fundamental force. The basic EM particle is the photon. All particles of mass are self-confined photons—self-orbiting photons configured as patterns of integer-wavelength loops. The strong nuclear force is replaced by the Williamson condition of loop completion. The condition means that the more the loop (the self-orbiting photon or photons) is stretched the greater the resisting tension. With extreme stretching, with the application of sufficient energy to break the loops, new loops are created. The *condition of loop completion* makes the gluon, the hypothetical carrier of the strong force, redundant. The Natural Universe has only one fundamental operational force—the force of electromagnetism.

One of the most demanding tests is finding the solution to the cause-of-mass mystery, the mystery of mass acquisition. As described earlier, mass acquisition is achieved by the localization of the photon in conjunction with the photon's unique mode of conduction *by* and *through* the aether medium. The photon, as a wave-like excitation-disturbance of aether, is conducted ***by*** aether in a manner that is destructive ***of*** aether. At the most fundamental level, the conduction process is manifest in the *absorption-annihilation* of fundamental units of *space* ("space" being defined as a non-material aether). Without this active process, neither mass nor radiation can exist.

What all of Physics, to date, has assumed is that mass itself is some kind of addition of material to empty space. However, in the conduction-absorption-annihilation theory, mass is the opposite; *mass is the macro-effect resulting from the removal of ethereal entities of the space medium*. Mass is a process that subtracts from the universe. There is no mass-bestowing Higgs field; there is no Higgs particle; there is only a most unusual excitation-annihilation process.

The test for *a causal mechanism for large-scale rotation* is an excellent exposer of non-viable models. This test refers to the ability to explain the source of the enormous angular momentum displayed by spiral galaxies—some of which are truly the most majestic objects in the Universe. In order to induce rotation, what is needed is nothing more than two objects, galaxies in this case, to be travelling on a near collision course towards each other and undergo gravitational interaction—a close encounter resulting in mutual orbital motion. The key is, they must initially be moving in approximately opposite directions. Now where does one find such opposing trajectories? Certainly not in the BB model—all material *there* is initially "launched" in an outward direction with no chance for any major collisions! But in the DSSU, the radial motion occurs within each cosmic structural cell. And those radial motions are in direct conflict when extended to the interface "surfaces" between adjacent cosmic cells (Figs. 29 and 30). In the ensuing collisions galaxies often just pass through each other, even repeatedly; smaller scale angular momentum is acquired and manifests in the numerous binary stars and planetary systems. When it comes to the acquisition of stellar- and galactic- scale rotation, it is hard to imagine any mechanism being more self-evident.

The BB's failure of this test is underscored by the puzzlement of astrophysicists over the recent discovery of a mature-status spiral, which supposedly formed a mere 3×10^9 years after the big beginning.[37] The study's lead author, David Law of the University of Toronto, is reported to have stated, "The fact that this galaxy exists is astounding! … Current wisdom holds that such 'grand-design' spiral galaxies simply didn't exist at such an early time in the history of the universe."

And then, of course, there is the Ockham test of theoretical parsimony. This test invokes the "rule of greatest simplicity" which holds that the theory that explains more with fewer hypotheses is the superior. Does the DSSU discard the things that never were, and dispose of unproven ideas, and expel unscientific extrapolations? Indeed it does. The DSSU discards the unsubstantiated "dark matter", abandons the gluon and the graviton, makes the Higgs mass-acquisition concept redundant, and repudiates the wild notion of an exploding universe.

X. A NATURAL COSMOLOGY

In striving to make sense of the real Universe, it is reassuring that "In truth," as cosmologist Mark Whittle advises, "it [the Universe] is much simpler to understand than almost everything that we find all around us here on Earth." In actually making sense of the real Universe, we have the distinct advantage in that our DSSU construction is a *natural cosmology*; moreover, it is considerably simpler than the standard "preposterous" view.

A. The natural universe concept map

The world system we have constructed rests—like all systems—on certain axioms and postulates, certain underpinnings that cannot be disturbed without putting the entire edifice into danger of collapse. Such underpinnings are for that reason always sacrosanct. Incorporated into the DSSU are the following essential core assumptions, starting with its two axiomatic processes:

Essence-process I is the fluctuating activity (the pulsations) of the sub-quantum-scale fundamental units of the essence medium. It is not an energy process.

The important point is that this process is prior to the definition of energy and, contrary to what one might expect, is not itself a form of energy.

Essence-process II is, on the sub-quantum scale, the coming-into-being of new fundamental fluctuators. On the cosmic scale it is the quantitative growth of aether and the axiomatic *expansion of the space medium.*

The importance of this axiomatic process is that it ensures the expansion-growth of a hypothetical "isolated patch of aether."

The process of aether formation and persistence, as specified by essence-process I and essence-process II, together, represent the essential *primary-cause process—essential because the Universe cannot exist without a primary-cause process!* The process through which aether comes into being, and persists in a state of being, is the mainspring of our Natural Universe.

Postulate One: The expansion postulate: The space medium expands, in the manner of *essence-process II*, when subjected to tension.

There is a cosmic tension that exists between galaxy clusters separated by some significant empty region; this postulate accounts for the prodigious flow of new aether coming from those "tension" regions. Since there is an increase in the number of fluctuators, this represents a positive energy process (a generic Lambda).

Postulate Two: The space-medium contraction postulate: (1) All matter, in the course of its very existence, exists as a process that absorbs-annihilates aether. (2) Aether, when under pressure, as occurs within a contractile gravitation region, undergoes a process of self-extinction. The resulting acceleration of the aether flow is manifest as gravitational acceleration.

This postulate requires all matter to be either in the form of free radiation or confined (self-looping) radiation; and further that all such radiation is conducted by aether via a most unusual mode of conduction described as an excitation-assimilation-annihilation of aether. This active aether destruction applies to all EM radiation and all entities that comprise atomic particles. This photon-energy-conduction model may well be the most important conceptualization for understanding the fundamental nature of the Universe.

Postulate Three: The matter formation postulate requires there be a process of self-assembly of aether units into patterns of excitations that persist. Such patterns interact and evolve, through unknown interactions, into the basic forms of matter.

It seems, deriving matter from the space medium is an old idea: In 1930, Einstein, with sagacious insight, stated, "now it appears that space will have to be regarded as a primary thing and that matter is derived from it, so to speak, as a secondary result."[38]

Associated with Postulate Three is a third Axiom: Aether units (fundamental fluctuators) are interactive; they are capable of self-organizing (or self-assembling) and synchronizing their pulsing activity in the formation of primitive matter.

Postulate Four: Matter extinction: Since matter exists as excitations of the aether, the absence of aether must be equated with its extinguishment. The process, called aether-deprivation annihilation, is a total destruction of matter and occurs only at the core of extreme matter concentrations.

Notice that the "formation of aether," what we associate with *space expansion*, is both an axiom *and* a postulate (Fig. 37). Space-medium expansion is axiomatic in the sense that the formation process of new aether does not require a prior cause. The aether expansion axiom (*the Essence Process II*) defines the coming-into-being of new aether units, described as non-material, non-energy, fundamental fluctuators. And as a postulate: Space-medium expansion is a postulated process whereby new aether forms when a cosmic region is subjected to gravitational tension such as between galaxy clusters separated by a large void.

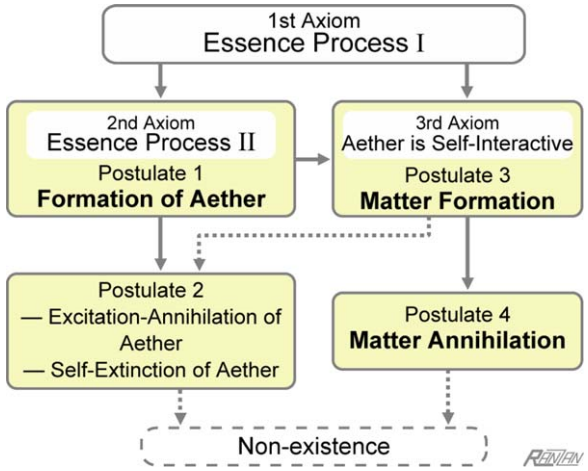

FIG. 37. (Color online) *Concept map of the DSSU*. With an understanding of the processes and their interconnectivity comes cognition of the secret of the Universe (the dashed link between postulates #2 and #3 reminds us that "matter," at the most fundamental level, exists as the excitation-annihilation of aether).

It has been pointed out that the *essence-process I* cannot be an energy process. Here is the reason: Energy at the most fundamental level has been defined as any localized quantitative change in the number of aether units (fundamental essence fluctuators). The pulsating activity of the essence fluctuators themselves is outside the energy definition; therefore, the essence fluctuators themselves cannot be a form of energy! Only when a fluctuator stops pulsing or when a new fluctuator starts up, is there an energy manifesting event. It is this fundamental distinction between the *Energy Manifesting process and the Primary-Cause process I* that precludes the "fluctuating sub-quantum-scale units of aether" from being labeled as *energy oscillators* or *energy fluctuations*. It also explains why the DSSU has a process that is not an energy process. "The one process that is not an energy process" would make an apt epigram for the DSSU's *essence-process I*.

One of many remarkable features of the construction is the lack of a fine-tuning problem—a problem that seriously plagues BB cosmology. It deals with the difficulty of explaining how the BB universe was launched from a dense speck of a "particle" to become several billion years later a universe exactly balanced between continued expansion and gravitational re-collapse!) The fine-tuning problem simply does not exist for us: If one forcibly adjusts any of the four postulated processes—increasing or decreasing their rates—the only change that would be noticeable is a change in the size of the cosmic cells, meaning a change in the distance between nodal galaxy clusters. Left undisturbed, the rates of aether expansion and contraction, and matter formation and

negation, constitute a self-adjusting, self-correcting, mechanism with a tendency towards size consistency.

Clearly, the concept map is intended as a blueprint for a distinctly orderly universe. However, confronting us is the uncompromising fact that the real Universe appears chaotic! There seems to be a fundamental conflict here. Before giving the solution to this conflict, let us consider the options available, and, in doing so, underscore the radical basic difference between our natural construction and the unnatural model with respect to chaos.

How does each theory explain the Universe's apparent randomness in its structure? The Standard Cosmology is undoubtedly a sophisticated mathematical construction but as a physical emulation it is hopelessly naïve. The option it embraces is: *the Universe appears chaotic because it is chaotic*. Its cosmic structure is random and the evolutionary processes that determined the structure were random—it all stemmed from the quantum randomness that was an intrinsic part of the inflationary launch of the big-bang event. It is a familiar story. The intrinsic chaos of the primordial "vacuum seed" became, in the course of fourteen billion years of cosmic evolution, magnified into the chaotic network of galaxy clusters evident today. It is a familiar story for another reason; notice the pattern, notice the naïveté: If distant galaxies appear to be receding, then they must actually be receding! If the Universe appears chaotic, then it must actually be chaotic and be indicative of a chaotic history!

The DSSU natural construction, in sharp contrast, is built on order—the order of steady-state cell structure, the order of steady-state processes. The option it adopts is: *the Universe really is orderly but only appears chaotic*. So, that being the case, why the apparent chaos? … Recall, the Universe is structured as dodecahedral cosmic cells which themselves are less-obviously configured as gravitation cells—the entire Universe is a dense packing of giant gravity cells. Now, everyone should be familiar with the concept of gravitational lensing—the distorting effect introduced when viewing something through a gravity field, especially when one's line-of-sight passes through or near an intensely gravitating region. When astronomers view the Universe they are viewing everything through unavoidable gravitational lenses—the DSSU gravity cells being the lenses. The cellular structure means that the universe is entirely filled with gravitational lenses! The greater the distance, the more such lenses any line of sight will encounter and the greater will be the distortion. It is like gazing through many layers of antique window glass with its waviness and thickness distortions; with the object of interest embedded in the last layer. The greater the viewing distance the greater the number of layers of such distorting panes. Is there any wonder the Universe appears chaotic?

The Universe is intrinsically orderly; but its order is hidden. Its ordered structure is a treasure yet to be discovered.

B. Conclusion

Let me conclude by drawing a thought provoking comparison between the study of life and the study of the Universe—between biology and cosmology.

The pillar of *modern* biology is the cellular organization of all living things. What about the pillar of *modern* cosmology? Based on a natural interpretation of the evidence presented, the pillar of *modern* cosmology should be *the cellular organization of all the Universe*.

Sadly, the cosmology currently practiced by Academia is distinctly not *modern* cosmology. Academia is teaching and practicing 20th-century cosmology—whose pillar, resting on a foundation of evolutionary chaos, is Einstein's incomplete theory of gravity. According to historians, it all began in 1916 with a geometric interpretation of four-dimensional space-and-time applied to a spherical universe. Several versions appeared over the next few years. Then, starting in the 1920 s that central pillar took on a new meaning—it now represented general-relativity theory in the context of an expanding universe. The expansion idea flourished in a profusion of abstract mathematical universes. In mathematical terms, these models were considered successful; so successful that no theorist, it seems, ever stopped to consider a cellular alternative model. Throughout the 20th century, no intrinsically cellular universe was ever constructed. No research paper, no great debate, no recorded debate, no historical entry, yet it was a long century—a very long century.

It is time for the science of the Universe to emerge from its *pre-modern* state.

In the mid-19th century, in 1839 to be exact, German physiologist Theodor Schwann developed the cell theory of life and revolutionized biology. Modern biology began with the realization that all life is innately cellularly ordered.

Modern cosmology begins with the realization that the Universe is intrinsically cellularly ordered. □

GLOSSARY

Aether: is a "fluid" composed of *non-energy* fundamental fluctuators—flickering quanta of existence, or flickering units of essence.

Aether-deprivation annihilation: a process of total destruction of matter that takes place deep inside extreme mass concentrations. It occurs when mass aggregation reaches a state at which an insufficient quantity of aether reaches the core; and since matter cannot exist in the absence of aether, the aether deficiency results in the suppression-annihilation of the affected matter. (When a neutron star, for instance, gains too much additional mass, then its core will become a region of *suppression-annihilation*.)

Conduction hypothesis of fundamental energy particles: the mode of propagation of excitation *by* and *through* the space medium involves a patterned excitation accompanied by the assimilation-annihilation of the aether's fundamental fluctuators which were participatory in the excitation pattern. (It applies to all EM radiation; all entities that comprise atomic particles.)

Cosmic gravity cell: It is the autonomous domain of a single unified gravitation region (field). A cosmic gravity cell is the dynamic region centered on a galaxy cluster and having a domain bounded by surfaces of tangential aether flow and points of zero aether flow. It is a region within which all objects stream toward the core of the galaxy

cluster, and all matter (except escaping radiation and those particles encountering a SU-AN process) ultimately falls into the central giant elliptical.

Energy, (fundamental energy process): The manifestation of any form of intrinsic energy involves a localized quantitative change in the aether—an increase in the sub-quantum units of aether, in the case of positive energy, and a decrease in units of aether, in the case of negative energy.

Energy, (mass, radiation, electromagnetic): Energy that manifests, at the most fundamental level, as an excitation-annihilation process—a process whereby flickering units of essence (aether) are excited and annihilated. In effect, it is the absorption of *space*, fluctuating sub-quantum units of *space* ("space" being defined as a non-material aether). Without this active process, neither mass nor radiation can exist.

Essence fluctuators: The discrete units of the essence medium, the medium that we equate with a non-ponderable aether; they are the discrete entities of a *nonmaterial, non-energy, aether*.

Essence-process I: The pulsing activity of the fundamental units of the essence medium. It is an axiomatic process; and being axiomatic, requires no external cause. Not an energy process.

Essence-process II: On the sub-quantum scale, it is the coming-into-being of new essence fluctuators. On the cosmic scale, it is the quantitative growth of aether. As the *cosmic essence process*, it is the *expansion of the space medium.* Since there is an increase in the number of fluctuators, this *does* represent an energy process (what is commonly called a positive generic Lambda).

Excitation-annihilation: refers to the mode, or process, by which the space medium (aether) manifests "stationary" particles, and conducts or conveys "moving" particles. The process is an excitation of non-energy fundamental fluctuators followed by a total annihilation of those fluctuators.

Fundamental fluctuators: see *essence fluctuators*.

Gravitation field: a region, surrounding mass (and mass equivalences), in which a process of aether-annihilation by self-extinction contributes to the acceleration of aether inflow. It acts as a gravitational amplifier; and represents *secondary gravitation*.

Gravitation processes: (1) The *direct absorption* or *assimilation* of aether by all mass and all radiation; this process is the *primary cause of gravitation*. (2) A process of the self-extinction of the space medium; the *indirect contraction* of aether within contractile regions (gravitation fields); this process is the *secondary cause of gravity*. (3) A process of the self-expansion of the space medium; it is related to the axiomatic dynamic nature of the essence medium and the cosmic tension inherent in the universe's cellular structure; this process is the *tertiary cause of gravitation*.

Hubble law: *Hubble's Law of Redshift* is the defining premise of scientific cosmology. The greater the change in wavelength (the redshift of the light) observed, the more remote is the object (the galaxy) that emitted the radiation. The Hubble law does NOT give the cause of the redshift; *the cause must be interpreted by theory*.

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

Mass (and energy) particles: are the manifestations of a continuous interaction-process at the sub-quantum level; the interaction involves the excitation-absorption-annihilation of the entities that constitute the aether medium.

Matter formation process: Aether-space units are interactive; they self-organize to produce energy particles which we recognize as photons, and possibly neutrinos.

Photon: is an elementary quantum of electromagnetic radiation that exists simultaneously as a wave and a particle. **A photon**, in DSSU theory, is a wave-like conduction-disturbance of aether. It is conducted *by* aether and is destructive *of* aether. (See *excitation-annihilation* process.)

Quasi black hole: is a region whose size is defined by a bounding quasi-event horizon where aether inflow approaches the speed of light. Size and density vary considerably. In complete agreement with Einstein's view on mass concentration, matter of the *quasi black hole* cannot become so dense that it would collapse through its Schwarzschild radius. (See *Unnatural black hole*.)

Suppression-annihilation (SU-AN) process: also known as **aether-deprivation annihilation**.

Unnatural black hole: For the mathematical universes, a black hole is defined as a collapsed gravitational mass, a mass having a gravitational field so intense that the escape velocity exceeds that of light. Consequently, in the case of a non-rotating black hole, practically no radiation is emitted. In terms of general relativity, the space around a black hole reaches infinite curvature, and the interior tends to infinite density, thus making it a singularity. (See *Quasi black hole*.)

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