The Processes of Gravitation
–The Cause and Mechanism of Gravitation

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Abstract: A heretofore unrecognized but essential process is introduced. This *sine qua non* process serves to endow matter with the property of mass and mass equivalence (in the case of "massless" particles), and simultaneously serves as the primary causal process of gravitation, with the latter leading to the secondary process of gravitation. Then, with the inclusion of the Lambda "force" as the tertiary process, a complete and clear picture emerges —a picture in which the three processes manifest as observable, verifiable, cosmic gravitation cells, a picture in which gravitation has an intrinsic scale.

By combining Einstein's *non-ponderable* aether, Williamson's bound-radiation electron, Hubble's space-medium expansion, and DSSU's triple-process gravitation, an elegant and supremely powerful cosmology is constructed.

Note: DSSU is the acronym for *the Dynamic Steady State Universe* —the cosmology theory that holds that the space medium is dynamic and that the medium expands and contracts *regionally and equally* resulting in a cosmic-scale cellularly-structured universe. It is a model based on the premise that all things are processes.

Keywords: absorption-annihilation process; suppression-annihilation process; electron; radiation; mass; gravity; gravitation; gravity process; gravity cell; cosmic tension; cosmic structure; aether; space medium; fundamental fluctuators; essence; essence process; Lambda; cosmology; Dynamic Steady State Universe; DSSU.

"… a view that is currently shared by many physicists: If there is a final theory of nature, one of the most convincing arguments in support of its particular form would be that the theory couldn't be otherwise." –Brian Greene, *The Elegant Universe*

1. Historical Background

The Search for the Mechanism of Gravitation

It is fitting that we begin with Isaac Newton. Newton had devised an absolute space that was uniform, motionless, Euclidean, and universal. It was "immutable." For Newton, 'space' was a substance, a space-substance whose interaction with material objects resulted in inertia (an object's resistance to a change in its state of motion). Newton had asserted that all matter had some definite velocity in absolute space, even if it could not be determined.[1]

Newton recognized that with his postulated *immutable* space he could not forge a mechanical cause of gravity. He insisted that, unlike his opponents, he would not invent hypotheses merely to fill this explanatory gap, the missing cause. Nevertheless, his detailed definitions did serve to introduce hypothetical concepts —of absolute space, time, and motion— which he recognized he could not deduce from the phenomena.[2] Newton, who "believed with all his heart that he had been selected by God to decode His secrets"[3], turned to the supernatural for the cause of gravitation.

In the General Scholium of the *Principia*, Newton brought God into natural philosophy as the cause of the order in the world.[4]

But there was an obvious problem. Newton's space affected matter —as in the inertial effect mentioned above— but was not affected by matter in any way. This hold-of-space-on-matter was an inexplicable action *without a reaction*. Was there possibly some connection with gravitation?

It was in his personal correspondence, notably in letters to Oldenburg, Halley, and Boyle, that Newton entered into speculations on the non-mystical objective cause of gravitation. As one of several possible causes of gravity, Newton came up with the idea that gravity was

somehow caused by a flow of *aether* into celestial bodies. Furthermore, the cause involved the very consumption of aether. Physics historian, Mary B. Hesse, describes how "In a letter to Oldenburg of 1675 he allows himself to speculate upon an aether hypothesis ... Perhaps gravitation is due to a 'gummy tenacious and springy' part of the aether which continually condenses in the pores of the earth, its place being taken by air, exhalations, and vapours rising from the earth, for nature is 'a perpetual circulatory worker.' Gravitation between the sun and the planets might be explained similarly: **the sun 'feeds' on the aetherial spirit, which conserves [sustains] its shining, and whose sunward motion draws the planets with an attractive force.**"[5 Emphasis added]

Although it had its problems, the aether-flow gravity model did solve Newton's problem of mystical action at a distance. Oddly, the idea of aether as an intermediary for gravitation between distant bodies did not gain popularity; but the idea persisted. For example, J. Elliot, writing in 1780, compared the action of aether in causing gravitation with that of fire causing repulsion, that is, aether is thought of as an 'atmosphere' of the attracting body, carrying its attractive force to a distance.[6]

In the century that followed, James Maxwell, after successfully using the aether as the medium for the propagation of his electromagnetic waves, turned his attention to solving the mystery of gravity. Author David Darling describes Maxwell's attempt as follows:

> In *A Theory of the Electromagnetic Field* (1864), Maxwell wondered if his theory could be modified to describe gravity: "After tracing to the action of the surrounding medium both the magnetic and the electric attractions and repulsions, and finding them to depend on the inverse square of the distance, we are naturally led to inquire whether the attraction of gravitation, which follows the same law of the distance, is not also traceable to the action of a surrounding medium."
>
> But here he ran into a problem—**a paradox** caused by the fact that with gravity there's only attraction, never repulsion. In gravity's case all "charges" are [a]like and all try to pull each other together. This made Maxwell's equations go awry. The upshot of the attraction of like bodies is that the energy of the surrounding medium—the ether or whatever—is decreased by the presence of other bodies. "As I am unable to understand in what way a medium can possess such properties," Maxwell concluded, "I cannot go further in this direction in searching for the cause of gravitation."[7]

Attempts by Michael Faraday had also failed. In fact, all attempts failed. No evidence of a cause could be found and, in the words of historian Mary Hesse, "neither was there any satisfactory model of gravitational attraction in terms of aether action, although there were a great many attempts during the nineteenth century to construct *ad hoc* theories of gravitation in terms of mechanical aether motions, some of them based on the theory of Lesage of 1747."[8]

By the end of the 19th century gravitation was understood no better than in the 17th century.[9]

Then came a new century, a new thinker, a new perspective, and a new speculation. Misled, as were many others at the time, by the Michelson-and-Morley experiment of 1887, Albert Einstein speculated about the nature of space. The young and rash Einstein claimed it had no nature. His, then revolutionary, theory of special relativity, did *not* require an aether medium. Motion did not need to be referenced to any underlying substrate. Einstein, in 1905, effectively banished the aether in favor of the concept that empty space constitutes a true void, thereby overturning the dominant theory of space going back to the time of Newton. However, ten years later with the development of the general theory of relativity, with its concept of curved space and distorted geometry and space-and-mass reciprocal interaction, Einstein found that there was more to the nature of space than *nothingness*. Space was a richly-endowed plenum. He called it "spacetime."

Then in 1920, Einstein reversed his earlier position. He made it quite clear that the aether must exist and even specified its properties. In his Leyden lecture[10] he stated that the aether was a non-material and non-energy medium —his (translated) word for it was "nonponderable." Yet amazingly, Einstein never exploited the idea, never pursued it further! Like Newton centuries earlier, Einstein had opened the cause-of-gravitation door but declined to enter. Both had come within two steps of the causal mechanism of gravity; they had come so very close.

Newton had his conceptual *flowing aether* condensing on, or in, matter. Maxwell had his luminiferous aether, his successful electromagnetic medium. And Einstein had the conceptual refinement of the aether which made it *non-material and lacking in energy* (if it were otherwise, it would be a forbidden *ponderable* substance). And this, with respect to the cause of gravitation, is how things have stood since 1920. Just two ingredients were missing. Two breakthroughs were needed.

One breakthrough came in 1997 with the realization that matter is 'bound' radiation.[11] Mass, it turns out, is *bound* radiation. That is, all matter is spatially-restricted radiation. All 'material' particles are composed of one or another pattern of a confined fundamental energy quantization.

The other breakthrough came in 2009 with a revolutionary definition of the fundamental process of energy.[12,13] A key component of the definition involves radiation. All radiation —whether free, or partly free, or bound up as mass particles— propagates by a *process of aether absorption-annihilation*.

And there is one other, minor but essential, ingredient. It is an axiomatic feature of DSSU[a] theory and dates back to 2002. It specifies that the spacing density of the aether quanta is, by definition, constant.

[a] DSSU is the acronym for *the Dynamic Steady State Universe* —the cosmology theory that holds that the space medium is dynamic and that the medium expands and contracts *regionally and equally* resulting in a cosmic-scale cellularly-structured universe. It is a model based on the premise that all things are processes.

2. Missing Component One: All Matter is Bound Radiation

It is vital to find a theory which allows a continuous description of the transformation of light to particles and vice-versa, as the experimental evidence that this is essentially the case is overwhelming. –J.G. Williamson [14]

Particles are the interface between the ponderable and the nonponderable essence.

The fundamental particle of radiation is the photon. The photon travels through aether with a constant speed of about 300,000 *km/s*. It has electric and magnetic properties and has a spin number of 1. The anti-photon is identical except for the spin, which is in the opposite direction (i.e., it has opposite helicity).

When a photon is free, that is, when unconfined, it carries a clearly defined amount of energy represented by the equation, $E_{\text{photon}} = m_\gamma c^2 = h\frac{c}{\lambda}$. Although the unconfined photon has zero mass, it *does* have mass equivalence. Its mass equivalence may be expressed as $m_{\text{photon}} = \frac{h}{c\lambda}$.

When a photon is confined, part of its *mass equivalence* manifests as inertial mass. A confined photon represents a particle with a property known as mass.

When two high-energy (high frequency) photons collide, they produce an electron along with its anti-particle the positron. The reverse interaction also occurs; an electron and a positron may interact in an annihilation collision to produce a pair of photons. These are well known reactions in particle physics.

In the production of an electron-positron pair we witness the transformation of free-state photons to confined-state photons. The products represent what are probably the simplest of all confinement configurations. The electron (and positron) is a single-wavelength resonant electromagnetic wave. In the process of confinement, part of a photon's mass equivalence manifests as inertial mass; and another part as the energy of an electromagnetic field. The electron's mass and the electron's charge are the result of a specific pattern of photon confinement.

The electron is a purely electromagnetic vortex. With each wave cycle —with each resonance— the electron re-creates itself from itself. Interestingly, the authors of the confinement theory could not come up with a force involved in this self-creating process. (Witness the fact that the electron can exist in a free state, not bound to atomic structure, not interacting with atomic forces. All the while the confined photon remains confined!) Physicist, Dr. John G. Williamson, at a 2008 conference (www.cybsoc.org/cybcon2008prog.htm), commented, "It's a nice theory but it needs forces." Of course, relativists can always claim that an intense localized curvature of space maintains the confinement. But then, what is *curvature* in the real world? No answer. So the mystery remains; and the question is, *what force, or forces, is required to maintain the perpetual looping of the confined photon?* (Later we will see that the confinement involves a unique interaction with the aether medium.)

The Williamson electron, then, is a single-wavelength resonant harmonic, a purely electromagnetic self-recreating object.

So how do we picture a massless particle transforming itself into a particle *with* mass? Fig. 1 shows the 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 electron's ½-spin property is the consequence of the 4π periodicity of the photon's self-orbit (i.e., each 'spin' occupies ½ of the full orbital period). "Charge" is the consequence of the particular combination of helicity

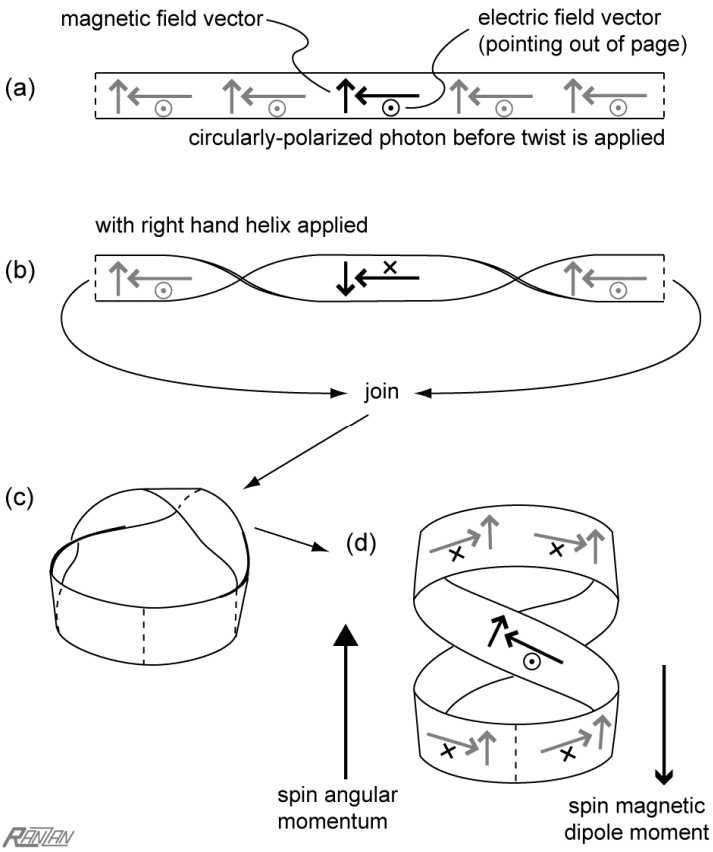

Fig. 1. Illustrative modeling sequence for confining photon to produce an electron. (a) Schematic of a circularly-polarized single-wavelength photon moving right to left with speed *c*. (b) A full twist is applied and the two ends are joined together above the plane of the page. (c) The resulting single loop is probably unstable. (d) But with the double loop configuration, all the key features of the electron are modeled. Notice that all the electric field vectors point inward thus modeling the electron's negative charge; all the magnetic field vectors point upward thus modeling the electron's magnetic dipole.

(of the photon spin) *and* rotation-sense of the confinement orbit (see Fig. 2).

The electron's mass is related to the fact that the confinement of energy constitutes 'mass' —a mass particle. While a free photon has a quantity of *equivalent* mass, a confined photon has a corresponding quantity of *ponderable* mass. Mass is the consequence of *aether absorption* by the confined photon. (The conventional view ignores the aether medium and resorts to attributing the property of 'mass' to (1) the mathematical concept of the curvature of localized space; or to (2) the mathematical force particle known as the Higgs boson.)

The anti-particle of the electron is the positron. The positron is also the result of a double loop configuration but the photon confinement is in the opposite sense to that of the electron. The result is that all the electric field vectors point outwards thus giving the positron a positive charge; and the spin is in the opposite direction. In all other respects the positron is identical to the electron. See Fig. 2. The photon's electric field vector, is represented by the symbol ⊙ for the point-end of the vector and by "×" or "⊗" for the tail-end of the vector.

The photon-confinement theory, whereby the electron and positron are single wavelength photon vortices, may be extended to other particles. What if the photon energy is higher and the number of loops is increased? What if the photon energy is higher and a tighter confinement wave-pattern of constructive-interference appears? Consider the muon particle. The muon and the electron are known to have identical properties except for mass and lifetime, and belong to the same geometrical/topological class.[15] This is also true for the tau particle. These particles, the muon and tauon, are so similar to the electron that they are often called *heavy* electrons.

The identity of a particle, as 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."[16]

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.[17]

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 degrees. 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 degree 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*.[18] 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)

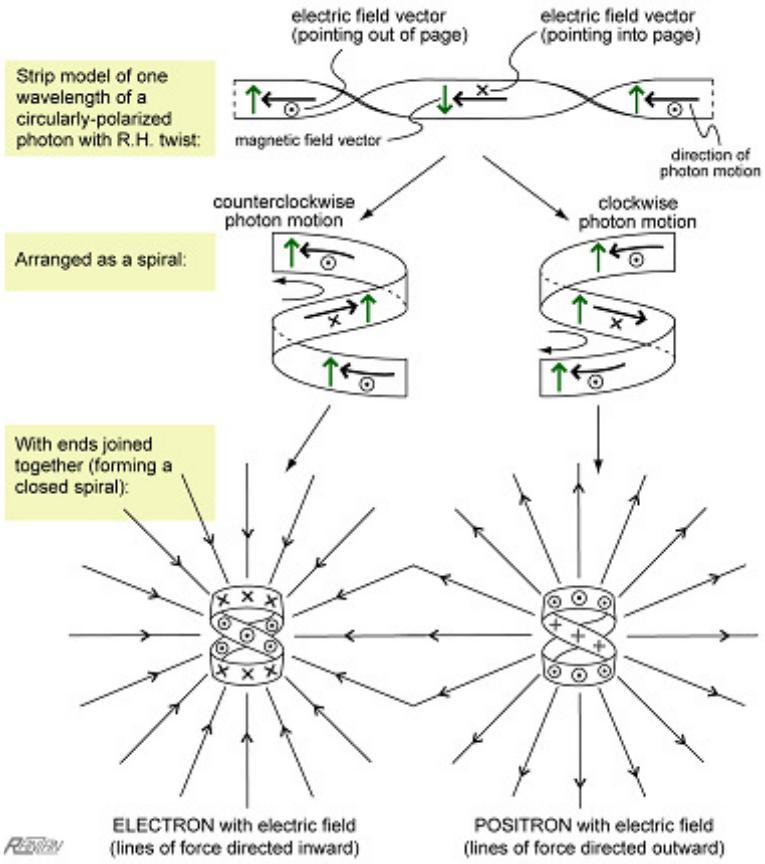

Fig. 2. Modeling sequence to produce, schematically, the simplest instances of the confined photon. The combination of twist and rotation-sense of the single-wavelength circularly-polarized photon determines the direction of the electric field vectors, which direction then determines the charge and the type of particle: The electron with its negative charge, the positron with its positive charge.

> *(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 [19] (Reproduced with permission)

In the context of photon confinement: 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, the eta, etc., —the mesons— are manifestations of a *twin photon confinement*.

Given that all the mass of the Universe, the real universe, is made of quarks and electrons and, of course, their antiparticles; then it follows that all the mass of the Universe is made of confined photons! (What about the mysterious and undetected *dark matter*? In the published work, *The Story of Gravity and Lambda —How the Theory of Heraclitus Solved the Dark Matter Mystery*, it has been shown that it is simply not needed.[20]) And all the electromagnetic radiation in the universe is made of free photons. Both manifestations of the photon —the bound state and the free state— are gravitational. Keep this in mind as we explore (in the next section) how the photon causes the gravitational effect.

But first, let me deal with the non-mass particles —the ones that travel at the speed of light.

The main point of this section is that all mass-type matter is bound radiation —bound electromagnetic excitation. The unbound state is, of course, the free photon. A reasonable question to ask is, *is there any other* ***unbound*** *radiation, other than the free photon?* … Let us look at the neutrino, the graviton, and the gluon (all supposedly travel at the speed of light).

Consider the neutrinos. Neutrinos were originally 'accounting' particles used to balance the energy in the interactions of real particle. But no one seemed to be quite sure what they were and whether or not they had mass. The neutrino supposedly travels at the speed of light and is said to pass freely through a lightyear's thickness of solid lead. This suggests that it is a form of energy with practically no detectable range of propagation —it manifests then disappears. If this is the case, one may be tempted to assume that the neutrino is not a real radiation entity. It may be that the energy attributed to the neutrino is some momentary interaction (an energy exchange) with the aether medium occurring in the immediate vicinity of certain particle collisions or decay events. On the other hand, it is more probable that the neutrino is actually a pair of equal wavelength photons locked together in such a manner that their electromagnetic fields are internalized; consequently, as the pair propagates through matter or space it manifests no external effects.

Consider the graviton. It is the hypothetical force-carrying particle, whose interchange between bodies conveys, at the speed of light, an attractive force. It represents the intermediary component, between gravitating masses (or mass equivalence), unequivocally necessary for *any* force-theory of gravity. But the reality is: gravitation is not a force. And, no, it (the graviton) has never been detected; all attempts have failed. It is safe to assume that gravitons do not exist. In the reality-based Dynamic Steady State Universe, gravitation is not a force and needs no force carrier.[21]

Now for the sake of argument consider the affirmative; consider the possibility that there is another type of force-carrying particle (for example, the W and Z bosons). If it turns out that there actually exists another form of energy carrying radiation —another fundamental energy particle— then the DSSU theory of gravitation would remain unaffected. This also applies to the neutrino if it is taken to be an autonomous energy particle. Nothing would change because of the unique way in which energy particles are conducted *by* the aether, *through* the aether.

Another massless particle that needs to be considered is the gluon. Gluons are the particles that supposedly bind quarks together. They are known to be very similar to photons and always travel at the speed of light. In the standard particle-physics model the gluon is the force-carrying particle for the nuclear *strong force*.

It turns out, however, that there is no need for a force to bind the quarks! The force-carrier gluons are simply replaced by the condition of continuity — the condition that the resultant photon(s) path is closed. Only three-dimensional *closed* loops are needed.[22] The new model, the Williamson model, affords a unification of the strong and electromagnetic interactions, in the sense that the removal of the necessity for an exchange particle, in the form of a gluon, constitutes a unification.[23]

Free photons and bound photons

make up the particles of the universe —they *are* the particles of our Universe. If we think of photons (including the possibility of photon-like entities) as the excitations of a nonponderable medium, then the particles, *all particles*, are the interface between the *ponderable* realm and the *nonponderable* essence. *Particles* are patterns of excitation of the essence medium.

Although the patterns of excitation are varied and as diverse as the particles themselves, the aftermath of the excitation is radical and unique. In all of Physics, there is nothing comparable to this mode of excitation. Any analogy with experience in the material world would fail. … No single word adequately captures the meaning, or describes the active process. I must, therefore, resort to using hyphenated terms.

3. Missing Component Two: All Radiation Propagates by a Process of Aether Absorption-Annihilation

First, let me be more specific about the nature of the aether. The aether is a medium of subquantum fundamental fluctuators. However, since the aether conforms to Einstein's requirements, it is nonponderable. Obviously, this means the fluctuators do not have mass. But amazingly, neither do they have mass equivalence. This is revolutionary. These *most fundamental fluctuators* do not represent any form of energy! They are not energy oscillators. (The reason these *fluctuators* are not, and cannot be, manifestations of energy —the energy we learn about in textbook physics— is embedded in the definition of the *fundamental process of energy*.)

Now, if the fluctuators in the vacuum are not energy vibrations, then what in the world is fluctuating? Or let me ask the question another way: If the aether medium is non-material and nominally lacking in energy, then wouldn't it be considered *non-physical*? … It would, if it were not for two considerations: One, the aether consists of *essence* fluctuators (non-energy subquantum entities). Two, the aether fluctuators serve as the means of conducting fundamental energy particles (electromagnetic radiation).

Another way of viewing the aether: Its essence fluctuators are real but are *not* physical! However, the excitations of the essence fluctuators are real and *are* physical! The essence fluctuators are physical only during momentary excitation. (In the absence of such excitation, the vacuum cannot be physical; this is why I refrain from using the term 'physical space'.)

Now here is the second missing component of gravity theory: All radiation —free or bound— is conducted through / by the essence medium via the non-energy essence fluctuators. It is a two-part conduction process — an excitation of fluctuators followed by their absorption-annihilation.

The missing component of gravity theory is the process of matter conduction by aether absorption.

Whether in a free state or a confined state, photon propagation through the aether is a process of *conduction by aether absorption* (see Fig. 3). The aether through which the excitation propagates is itself absorbed; those fluctuators participating in the excitation are absorbed *and do not reappear*!

The DSSU postulate of light conduction through aether-space involves *a most unusual mode of conduction*. Light waves are *not* vibrations of the particles of a mechanical medium; rather, light "waves" simply travel through the medium by a process of conduction —a process that consumes the "particles" of the medium. A photon, in DSSU theory, is a wave-like conduction-disturbance of aether. This "conduction" is unlike any other. The photon is conducted ***by*** aether in a manner that is destructive ***of*** aether.

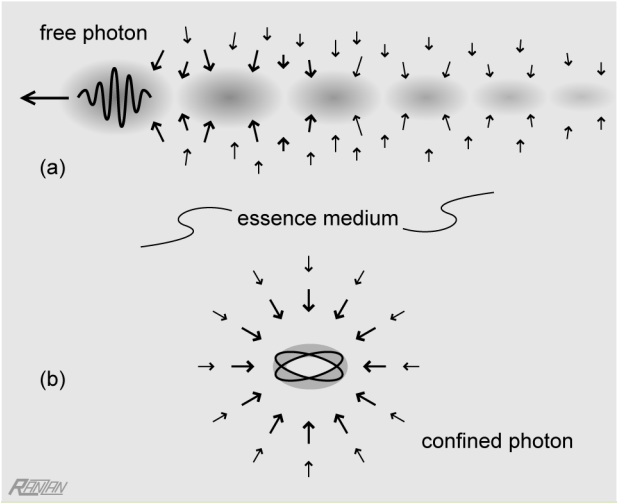

Fig. 3. The fundamental particle of energy (the photon) propagates through the essence medium by consuming units of aether —*a process of conduction by absorption*. The result is **a disappearance** of aether and **a flow** to replace the deficiency. (a) In the case of a free photon the flow is transient and spread along the trailing trajectory. (b) In the case of a confined photon it is a sustained flow directed radially inward.

Since all material entities are composed of photons or photon-like particles, it follows that all matter involves a process of *conduction by consumption* —a continuous process of aether absorption. In other words all objects are manifestations of the absorption-of-aether process. Atoms, pencils, rocks, and organisms exist because they are sustained by a continuous stream of essence-process entities.

Anything that has mass, anything that has mass-equivalence, and anything that is considered as radiation, has a profoundly destructive effect on the ultimate conducting medium. (Incidentally, the electric field surrounding a point charge is an example of something with mass-equivalence.) Now for the underlying connection to gravitation: It is not coincidental that mass, mass-equivalence, and radiation are gravitational. It is the very *process of absorption-annihilation* that makes them gravitational! It is *because* they absorb-annihilate aether that they are gravitational.

The use of the conduction by absorption-annihilation process is revolutionary. It has none of the problems associated with all other models employing such things as *aether wells* and *aether condensations*. These are models in which the aether-fluid flows into (or onto) mass/matter which acts as a sink. There are models, primarily based on Georges-Louis Le Sage's *kinetic aether*, in which the aether streaming —streaming toward and into the mass— pushes matter inward. Such models fail because of the simple fact that aether does not, in any way, resist the constant motion of an object moving through it. An aether wind simply cannot 'push' bodies towards each other. No resistance, no push.

There are other models in which the aether inflow

feeds a continuous condensation of aether in (or on) the particles that the matter is made of. Ivan Yarkovsky Osipovich used this method in 1888 in his attempt to explain gravity. The approach was again adopted, this time by Christopher Hilgenberg, in 1933. The idea persists. In 2004, Konstantin Meyl, tried using the flow of neutrinos, predicting that the absorption of neutrinos by the Earth would cause an expansion of the globe.[24] And there lies the problem —the problem of continuous condensation. *What happens to the vast accumulation of aether?* What indeed!

There are three processes associated with gravitation. All three involve a quantitative change in the aether —a change in the number of fundamental fluctuators which constitute the aether medium. One of these processes has priority status.

4. The Process and Cause of Primary Gravity

The process of Primary Gravity is the *absorption-annihilation of aether* —the process that accompanies any defined excitation of the aether. Yes, this is the very same process by which particles acquire (and sustain) their property of mass, and, by which radiant energy and electromagnetic fields acquire (and sustain) their property of mass-equivalence.

The *primary gravitation effect* is the quantitative reduction in the number of fundamental fluctuators as a consequence of direct excitation. The cause is the excitation of aether; the process is the reduction in the number of aether subquantum units.

Direct Cause of Gravitation

Aether excitations involve the absorption and annihilation of aether —tiny amounts on the particle scale, astronomical amounts on the astronomical scale. This annihilation is *not* the conversion of one form of energy into another —not like particle-antiparticle annihilation. Rather, this is a disappearance of the aether involved in the excitation. And it is this process that provides the direct cause of gravitation.

The *direct* cause of gravitation, as it relates to planets, moons, and stars, is simply the accumulated absorption effect of all the mass and mass equivalences that such bodies represent. The cause of gravitation is the activity of the multitude of confined photons as they absorb-annihilate aether. Surrounding any large mass accumulation, a bulk flow of aether becomes necessary in order to feed a truly insatiable demand. This bulk-flow aspect of gravitation is simply the side-effect of the relentless demand by mass (and its equivalences) for the essence medium.

It is a remarkable unification of theory that the process by which matter manifests itself is the same process that causes *direct* gravitation.

Primary Gravitation

Let us consider a gravitating body (with radius R), one that is at rest in a stationary aether medium. Its matter content (the mass, mass equivalence, and radiant energy) absorbs-and-annihilates the aether, as previously described, and the surrounding aether rushes in to replace the lost aether. We will pretend, for the moment, that the aether behaves as an ideal fluid —a fluid that does not alter itself in any way during its radially symmetric flow toward our experimental gravitating body.

Under these conditions we may justifiably apply the standard fluid-flow continuity equation to any concentric shells about the mass —including the spherical surface of the mass body itself.

$$\left(\text{Area}_{\text{outer sphere}}\right)\times\left(\text{FlowVel}_{@\text{outer sphere}}\right)\times\left(\text{Density}_{@\text{outer sphere}}\right) = \left(\text{Area}_{\text{inner sphere}}\right)\times\left(\text{FlowVel}_{@\text{inner sphere}}\right)\times\left(\text{Density}_{@\text{inner sphere}}\right) \tag{4-1}$$

Since aether density is constant (by definition), the two density terms cancel. For the inner concentric sphere we use the surface of the gravitating body; here the area is constant and is equal to $4\pi R^2$; and here the magnitude of the aether velocity is also constant, $\upsilon_{surface}$. Using these substitutions the equation allows us to determine the aether flow speed at any radial distance r (where $r > R$).

$$4\pi r^2 \times \upsilon = 4\pi R^2 \times \upsilon_{\text{surface}} . \tag{4-2}$$

After simplifying further, the speed of inflow at the outer sphere (having any radius $r > R$) can then be expressed as:

$$\upsilon = (R^2\, \upsilon_{\text{surface}}) / r^2 , \tag{4-3}$$

where R^2 and $\upsilon_{\text{surface}}$ are constant.

The speed of the inflow increases with proximity to the gravitating body. A test mass placed in this flow will also increase in speed. Obviously, we have an acceleration: The aether and the test object are accelerating toward the surface. And it is just such acceleration which defines the intensity of the gravity effect.

Mathematically, we find the acceleration by taking the *time* derivative of the above expression. The acceleration, and hence the primary-gravity intensity, is found to be

$$a_{\text{p}} = -\,(constant) / r^5 . \tag{4-4}$$

This is stunning. The acceleration varies inversely with the ***fifth power***! The primary-gravity effect is extraordinarily weak. Let me put this into perspective. The intensity of gravitation, according to Newton and experience, varies according to the inverse-square law — and not as $1/r^5$. The Newtonian gravitational attraction between two bodies diminishes with increasing distance between them as the inverse of the square of that distance; if the distance is doubled the force declines by a factor of four. However, with only the *primary gravity* effect, a doubling of distance between two masses *decreases* their mutual gravitational attraction by an astonishing factor of

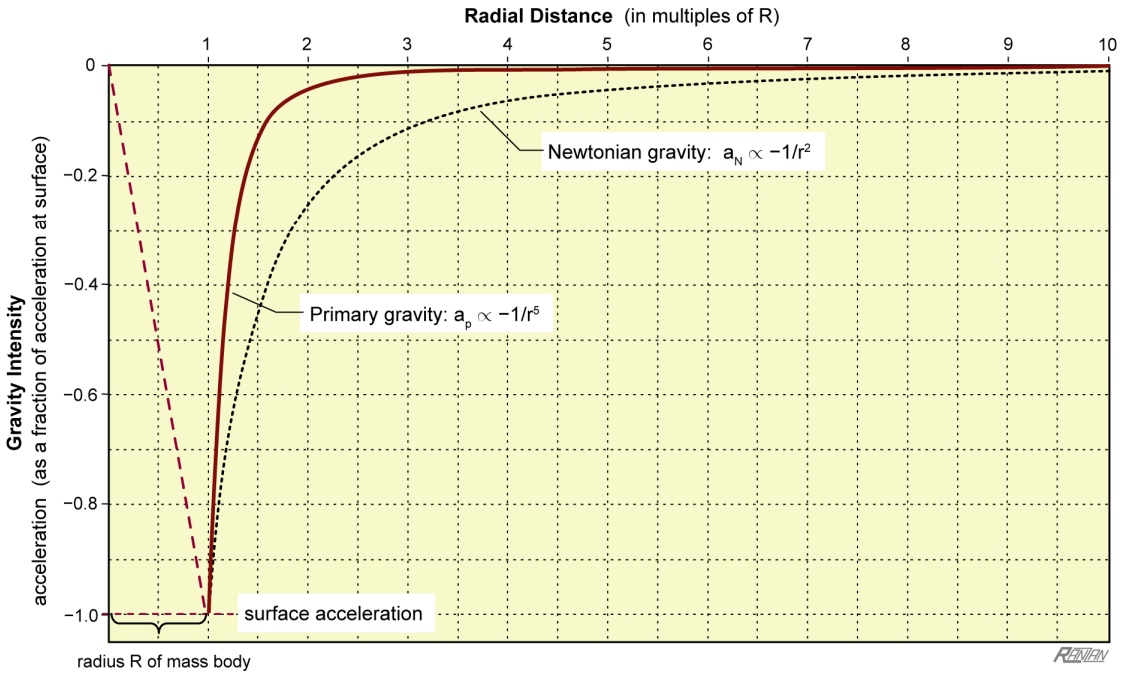

Fig. 4. *Graph of the intensity of the primary gravitation effect* (as a proportional function of distance). The graph represents the acceleration field of Primary gravitation in total isolation —that is, as it would appear if it were possible (which it is not) to remove the *secondary gravity* effect from the actual gravity field. The noteworthy feature is the effect's extraordinary weakness (inherent in the inverse-5th-power law) and limited reach. The Newtonian gravity (dotted curve) serves as a comparison.

Note: The graph is more accurately a comparison of two objects with different density. For the surface accelerations to be identical as portrayed in the drawing, the Newtonian-gravity object must have a mass density four times that of the primary-gravity object.

thirty-two.

The gravity intensity profile associated with Primary gravitation is shown in Fig. 4.

The Primary gravitation effect serves as the indirect cause of *Secondary gravitation*.

5. The Process and Cause of Secondary Gravity

The process: Recall, an axiomatic feature of DSSU aether requires that the count density (or spacing density) 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 interpretation would 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 always maintains a constant density (a constant-count density). How is this possible? The trick is in the process of self-dissipation. A proportion of the aether units simply disappear —literally. Fundamental fluctuators stop oscillating, thereby terminating their very existence.

Every gravitating particle (and body) in the universe subjects the aether (the aether surrounding itself) to this kind of compression. The compression region is conventionally called the gravitational field. This region is the site of the self-dissipation of aether.

In the aether-gravity theory the regional process of self-dissipation is the process of *Secondary gravitation.*

The cause: The indirect cause of Secondary gravitation is the previously discussed *primary gravitation* effect. The direct cause, however, is *the contractile nature of the aether medium.* It contracts without a change in density! When under pressure, aether undergoes a process of self-extinction.

Quantifying Secondary Gravitation

The easiest way to quantify the Secondary gravitation effect is by determining the radial inflow speed and analyzing the rate of change with respect to the location in the gravitating region.

The first step is to find an expression for the flow field of the aether.

Aether Velocity Field

Let us again consider a gravitating body with radius R (and having mass M); as before, we assume that it is at rest in a stationary aether medium. But instead of an ideal fluid, this time the aether is a dynamic fluid —that is, it has the ability to contract. We wish to find the inflow-velocity field.

A small test-mass is resting at some arbitrary distance r from the center of mass M; it is shown, in Fig. 5, resting just above the sphere's surface. This small mass, which we designate as m, is "experiencing" a force, in accordance with Newton's Law of Gravity:

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

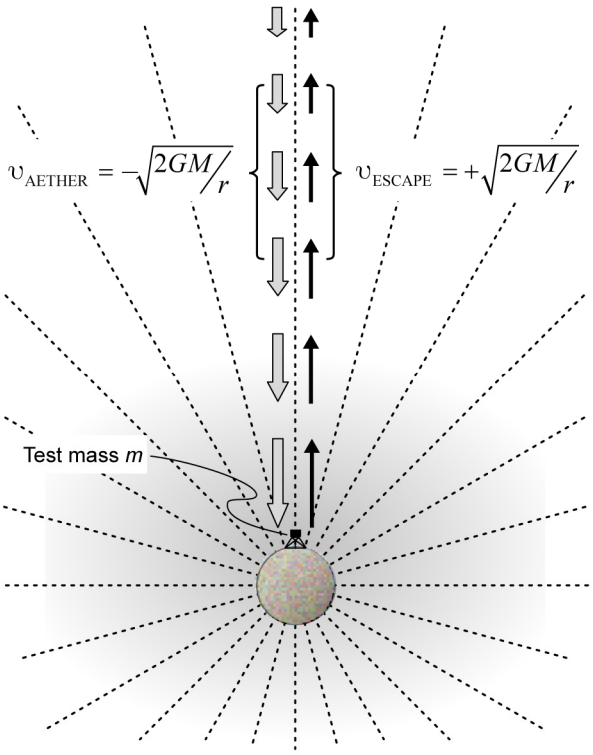

Fig. 5. *Aether-flow velocity* is derived from the gravitational-aether acceleration (eqn 5-1). For comparison, the *escape velocity* is also shown. The *escape-speed* equation is derived by an entirely different method, namely by relating the test object's kinetic energy and its gravitational potential energy. Nevertheless, the two velocities are *equal* in magnitude (and, of course, *opposite* in direction). (All motion is with respect to the central body. The 'field' is idealized; it is assumed, for the sake of simplicity, that the gravitating body is not rotating and there are no other aether-flow components.)

But from Newton's 2nd Law of Motion, a force is defined as $F = (mass) \times (acceleration)$, so that

$$F = ma = -GMm/r^2.$$

The test mass —although it is completely at rest in the frame of the main body— is undergoing acceleration, an acceleration that must have an associated velocity. We can derive an expression for the velocity by replacing the acceleration with its definition, $a = d\upsilon/dt$:

$$\frac{d\upsilon}{dt} = \frac{d\upsilon}{dr}\frac{dr}{dt} = -\frac{GM}{r^2}, \qquad (5\text{-}1)$$

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

$$\int \upsilon d\upsilon = -\int \frac{GM}{r^2} dr, \qquad (5\text{-}2)$$

$$\upsilon^2 = \frac{2GM}{r} + C, \qquad (5\text{-}3)$$

where $C = 0$ since $\upsilon = 0$ when $r = \infty$. But note, in the vector-component form of the equation, the constant C becomes important as it represents the background aether flow which for the sake of simplicity we have here assumed to be zero. (Our gravitating body is considered *at rest* in the aether.)

$$\upsilon^2 = \frac{2GM}{r} \quad \text{or} \quad \upsilon = \pm\sqrt{2GM/r}. \qquad (5\text{-}4)$$

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 υ in the equation represents the relative speed between the test mass and the aether.

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.

In general, the negative solution represents the speed of inflowing aether at the particular radial location specified by *r*. (However, if the direction is specified with the subscript "inflow", then the negative sign may be dropped.):

$$\upsilon_{aetherflow} = -\sqrt{2GM/r}, \qquad (5\text{-}5)$$

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. For a comparison between DSSU *aether velocity* and textbook *escape velocity* see Fig. 5. Incidentally, for an Earth-like body, the aether-inflow speed is 11.2 *km/s*.

Now, the expression (eqn 5-5) is quite useful. It can be used to determine the overall gravitation effect *and* the secondary gravitation effect: First, it is the **time rate of change** of this velocity ($\upsilon_{aetherflow}$) that describes the physical mechanism underlying the conventional gravitational acceleration parameter; and so defines the strength of the Newtonian gravitation effect. Secondly, the **rate of change with respect to radial distance** can be used to quantify the *secondary* gravitation effect. That is, $\upsilon_{aetherflow}$ can be used to quantify the field-gravity effect as distinct from the *primary* gravitation effect.

Quantifying the Secondary Gravitation Effect

For our investigation of Primary gravity we had assumed a non-contractile aether fluid. Then, when we constructed an imaginary shell around a gravitating body and applied the fluid flow equation (4-1), we found that

$$(\text{area}_1 \times \text{velocity}_1) = (\text{area}_2 \times \text{velocity}_2).$$

Essentially, $((A_1\,\upsilon_1) - (A_2\,\upsilon_2)) = 0$, which meant that there was no fluid loss.

However, since aether is a contractile fluid, there definitely *is* a volume loss; and so the actual fluid flow situation is described by:

$$(A_1\,\upsilon_1)_{\text{INNER}} < (A_2\,\upsilon_2)_{\text{OUTER}}\,.$$

This time we will use an *elemental* shell. We 'construct' a *thin-shell* sphere to enclose a central gravitating mass body M as shown in Fig. 6. Aether flows into the shell with speed υ_2, undergoes a certain amount of contraction-dissipation, and then passes through the inner shell wall with speed υ_1.

(Change in flow rate) = (flow rate out) − (flow rate in),

$$\Delta Vol_{\text{FLOW}} = (\upsilon_1 \times \text{Area}_{\text{INNER}}) - (\upsilon_2 \times \text{Area}_{\text{OUTER}}) \qquad (5\text{-}6)$$

where the expected negative value will represent a loss of aether (while a positive would indicate a gain).

From equation (5-5) we know that $\upsilon_1 = C/r^{1/2}$ and $\upsilon_2 = C/(r + dr)^{1/2}$, where $C = (2GM)^{1/2}$.

$$dV_{\text{FLOW}} = \left((C/r^{1/2})\,4\pi r^2\right) - \left((C/(r+dr)^{1/2})\,4\pi(r+dr)^2\right) \qquad (5\text{-}7)$$

$$= \left(4\pi C\, r^{3/2}\right) - \left(4\pi C\,(r+dr)^{3/2}\right)$$

$$= 4\,\pi C\left(r^{3/2} - (r+dr)^{3/2}\right)$$

$$= 4\,\pi C\left(r^{3/2} - r^{3/2}\,(1+dr/r)^{3/2}\right)$$

$$= 4\,\pi C\, r^{3/2}\left(1 - (1+dr/r)^{3/2}\right), \text{ (since } dr/r << 1, \text{ the binomial theorem approximation applies)}$$

$$\approx 4\,\pi C\, r^{3/2}\left(1 - (1 + 3dr/2r)\right),$$

$$dV_{\text{FLOW}} = -\,4\,\pi C(3/2)\, r^{1/2}\, dr\,, \qquad (5\text{-}8)$$

$$= -\,4\,\pi(2GM)^{1/2}\,(3/2)\, r^{1/2}\, dr\,, \qquad (5\text{-}9)$$

where the negative sign confirms a loss of aether volume.

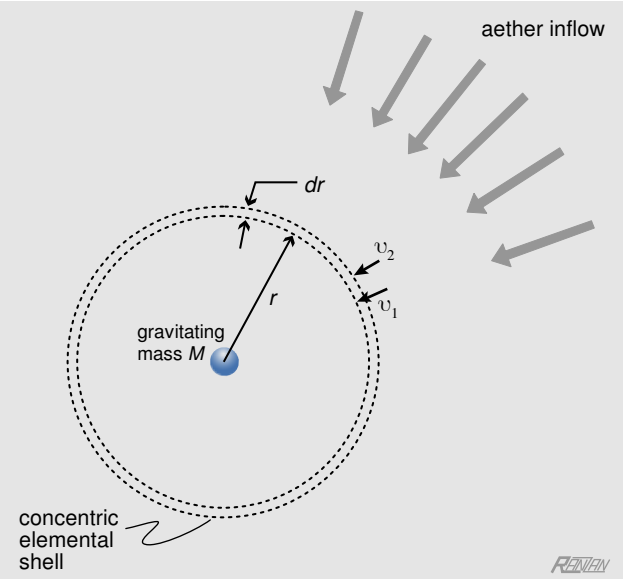

Fig. 6. An imaginary thin-shell (shown in cross-section) is 'constructed' concentric with a mass body M. The difference between the speed υ_2 of aether entering the shell and the speed υ_1 of aether leaving the shell is used to derive an expression for the volume contraction (self-dissipation) of the space medium.

Thus, the volume contraction rate within the thin shell of radius r is

$$dV_{\text{LOSS RATE}} = 6\pi\,(2GMr)^{1/2}\, dr\,. \qquad (5\text{-}10)$$

And the unit contraction rate at distance r, obtained by dividing (5-10) by ***the shell's Euclidean volume*** $(4\pi r^2\, dr)$, is

$$\text{v}_{\text{unit loss rate}} = 6\pi\,(2GMr)^{1/2}\, dr\,/\,(4\pi\, r^2\, dr)$$

$$= (3/2)\,(2GM)^{1/2}\, r^{-3/2}\,, \qquad (5\text{-}11)$$

where M is the total mass within the limits of radius r. The units are m^3/s per m^3 and are interpreted as cubic meters of aether per second per cubic meter of Euclidean space; or simply as the fractional volume loss per second.

What if M is moving with respect to aether? The foregoing discussion assumed that the mass body was isolated and that there was no external aether 'wind' (other than the 'wind' arising from the immediate gravitation field). Actually, if the analysis is based on the *net* flow through a spherical Gaussian surface, then the restriction becomes unnecessary. If the mass-induced velocity field were embedded in some other aether-flow field (of constant flow), then the above equations remain valid. It does not matter in the least if mass M is traveling *through* the aether sea.

Aether Extinction Example

Let us consider the dissipation rate for an isolated Earth-like object. From eqn (5-11), the unit volume loss as a function of radial distance is,

$$\text{v}_{\text{unit loss rate}}(r) = (3/2)\,(2GM_{\text{E}})^{1/2}\, r^{-3/2}$$

$$= (3/2)\,(2\times 6.67\times 10^{-11}\text{N}\cdot\text{m}^2\text{kg}^{-2}\times 5.98\times 10^{24}\text{kg})^{1/2}\,(r^{-3/2}). \qquad (5\text{-}12)$$

The contraction rate at the surface, where the radius r equals $(6.37\times 10^6 m)$, is about $2.64\times 10^{-3}\ m^3/s$ per Euclidean cubic meter, or 0.264% per second.

This means that 2,640 cubic centimeters of aether is dissipated every second within each cubic meter of Euclidean volume at the surface of the Earth-like mass. And this dissipation occurs while aether-space races through the Euclidean volume —which can be pictured as a stationary cubic-meter wooden crate— at 11.2 *km* per second.

The graph of the self-dissipation rate as a function of the radius is shown in Fig. 7.

The surface contraction rate is unambiguous. But what happens at some extreme radial distance? Notice how the graph is asymptotic to the r-axis. At some considerable distance (extrapolating far beyond the illustrated graph) the pressure is so diminished that it is insufficient to cause self-dissipation; there the extinction rate drops to zero. Incidentally, this is one of the reasons that Newtonian gravity fails at large distances from the gravitation source.

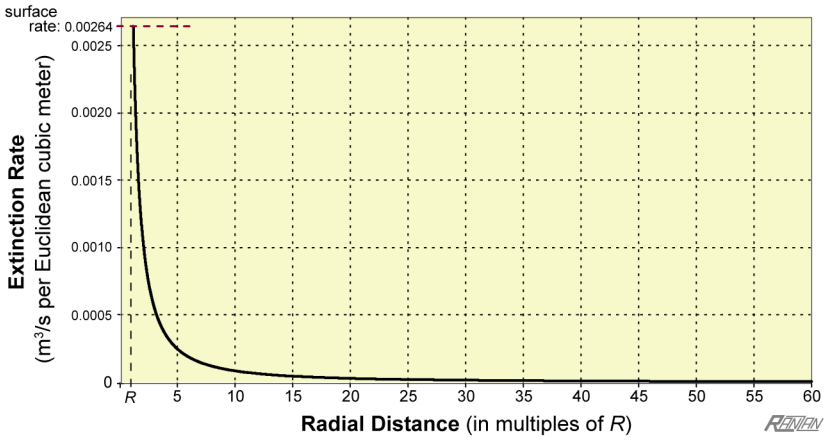

Fig. 7. *Graph of the process that produces the secondary gravitation effect* for an isolated Earth-like object. The curve shows the volumetric rate of *aether extinction* as it relates to radial distance. At the surface of the body, where the radius is R (= 6.37×10^{6}m), the rate of aether loss is 2.64×10^{-3} m³/s per Euclidean cubic meter. Expressed as a percentage, the peak extinction rate in this example is 0.264 % per second.

The Gravitation Amplifier

The secondary-gravitation region acts as a gravitation amplifier. Given that space is a constant-density, non-compressible, yet contractile, fluid we can make the following argument for the *amplification effect*: The cause of gravitation is the direct assimilation of aether by the central mass. This produces an acceleration of the surrounding aether inflow (this is true whether or not any secondary contraction takes place, as was shown above with the standard fluid flow equation). It is *that* acceleration —the primary-gravity acceleration— which then induces aether, in the 'field' region, to contract. And the contraction, in turn, increases the inflow speed and intensifies the acceleration in the region beyond the immediate vicinity of the body (beyond about 2 or 3 radii). The action is something like pouring water into a very leaky bucket; in order to keep the bucket full, water has to flow in faster. Thus, initial aether-contraction (absorption-assimilation) by mass, leads to acceleration; leads to secondary contraction; leads to further acceleration. In this way the secondary-gravitation region acts as a gravitation amplifier.

One way to gain an idea of the amplification effect is to compare the unamplified inflow with the predicted inflow (as in Fig. 8). For an isolated body at rest in the aether medium, the inflow associated with Primary gravitation is $v_{\text{P.inflow}} = (R^2 v_{\text{surface}})/r^2$, derived earlier as eqn (4-3). The inflow associated with the combined Primary and Secondary effect is $v_{\text{C.inflow}} = \sqrt{2GM/r}$ from eqn (5-5). The graphical comparison (below) plots the speed of the aether inflow (as a fraction of the body's surface inflow) versus the radial distance (in multiples of the body's radius R).

If we apply this comparison to our Earth-like example, and focus on a radial distance of, say, 100 times R, then the aether inflow is a considerable 1.12 *km/s* (or 1/10th of the surface inflow) of which the primary-inflow portion accounts for a miniscule 1.12 meters per second (or 1/10,000th of the surface inflow).

The range of gravitation. If we naïvely believe that gravity fields extend to infinity, and proceed to integrate eqn (5-10) summing the elemental contraction rates based on this belief, we would come up with a *total aether-contraction rate* of

$$V_{\text{LOSS RATE}} = 4\pi(2GM)^{1/2}\, r^{3/2}\,. \qquad (5\text{-}13)$$

We would be led to believe that the field contracts an infinite volume of aether every second! Clearly this is not possible. The contraction field must be finite. *Secondary gravitation must have a limited range*. Note, however, that this argument places no restriction on Primary gravity and therefore cannot be used to limit the range of the gravity effect entirely. Nevertheless, the range of the gravity effect *is* strictly limited —but for a different reason, as we will see next.

6. The Process and Cause of Tertiary Gravity

The processes of both Primary and Secondary gravitation involve the quantitative reduction of aether. The process associated with Tertiary gravitation, however, involves the quantitative ***increase*** of aether. To understand the deeper nature of the *tertiary* process —the

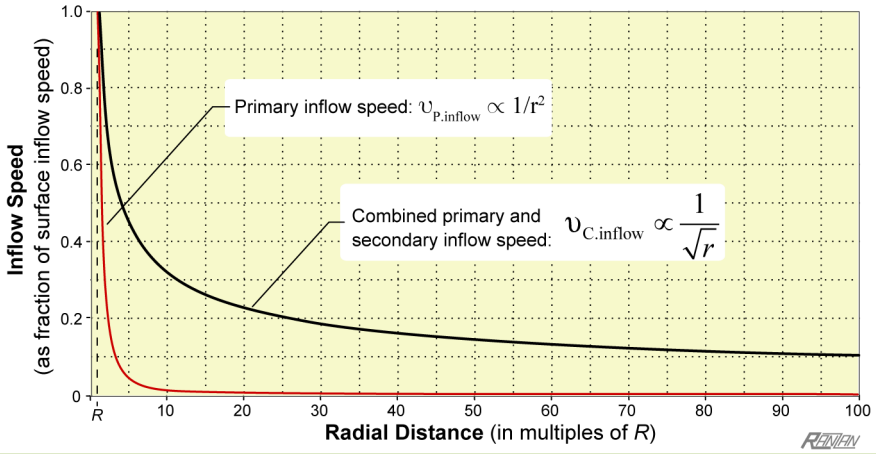

Fig. 8. *Primary inflow versus amplified inflow.* The speed of the aether inflow (as a fraction of the gravitating body's surface inflow) is plotted against the radial distance (in multiples of the body's radius R). For the lower curve, the assumption is simply that there is no *external* self-dissipation of aether.

causal factors affecting the volume increase in the aether— we need to understand (1) the dynamic nature of the essence medium and (2) the structure of the cosmos.

In the DSSU there is a unique *essence process* —a purely axiomatic process. It has two manifestations.

The *basic essence process*: It only occurs on the sub-quantum scale. It is the pulsation 'activity' of the fundamental fluctuators.

The *cosmic essence process*: On the sub-quantum scale it is the coming-into-being of new fluctuators. On the cosmic scale it is the quantitative growth of aether. *It is the expansion of the space medium.*

Although the *cosmic essence process* —the expansion of the space medium— is axiomatic, it cannot take place just anywhere in the universe. And here is where the structure of the universe plays a key role. The structure determines where the expansion of the medium occurs (even while the structure itself is determined in large part by the cosmic essence process).

The simple fact is that the universe is cellularly structured. Regions of Primary and Secondary gravitation are configured into cosmic Voronoi cells. The centers of these regions coincide with the Voronoi cell nodes and are prevented from 'coming together' gravitationally — prevented from merging and prevented from orbiting. As a result a cosmic tension exists between major gravitating regions.

It is this tension that is a factor in the cause of Tertiary gravitation.

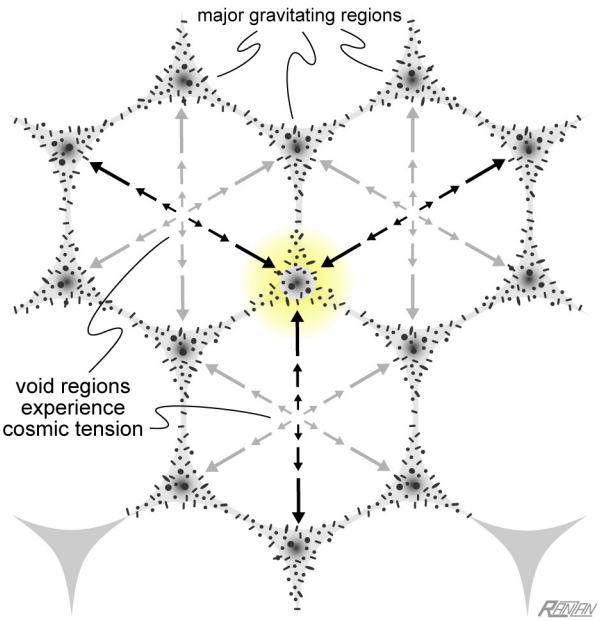

Fig. 9. *Cellular network consisting of rich galaxy clusters and aether-filled voids.* (The pattern is an idealized cross-section view.) As major centers of gravitation the clusters "pull" on each other in, more or less, symmetrical pairs, as indicated by the gravity-intensity vectors. Consequently, the central regions of the cosmic cells are **regions of negative pressure** (which is equivalent to cosmic tension).

Cosmic Tension

Our cellular universe, as any astronomer will confirm, consists of vast empty regions surrounded by significant clusters of galaxies along with dust clouds, gas clouds, and other debris —material inevitably attracted to the galaxies. These galaxy clusters are major centers of gravitation (Fig. 9).

Now consider how the clusters, positioned as they are on opposite sides of a void region, respond to each other. Each is gravitationally "pulling" on the other across this vast no-man's region. Each pair of clusters produces a *negative cosmic stress* between them. Moreover, all the galaxy clusters comprising a typical cosmic structural cell can be paired in this way. And there are seven such pairs active in every 3-dimensional cosmic cell. The result is a vast region in which aether-space is under t e n s i o n. (Realize that the opposite clusters cannot come together to relieve the tension. Every cluster is simultaneously being "pulled" from the opposing direction. In fact, it is being "pulled" from several cells, in each of which it is an intimate member.)

A schematic profile of the gravity intensity across a typical cosmic cell —a profile that includes the gravity wells of two opposing rich galaxy clusters— is shown in Fig. 10.

Interestingly, a cosmic region that is under tension behaves much like Einstein's Lambda force or *cosmological constant* —they share the ability to produce expansion. But Conventional Astrophysics makes the mistake of extrapolating the effect. The effect is correctly interpreted as the expansion of space, which expansion

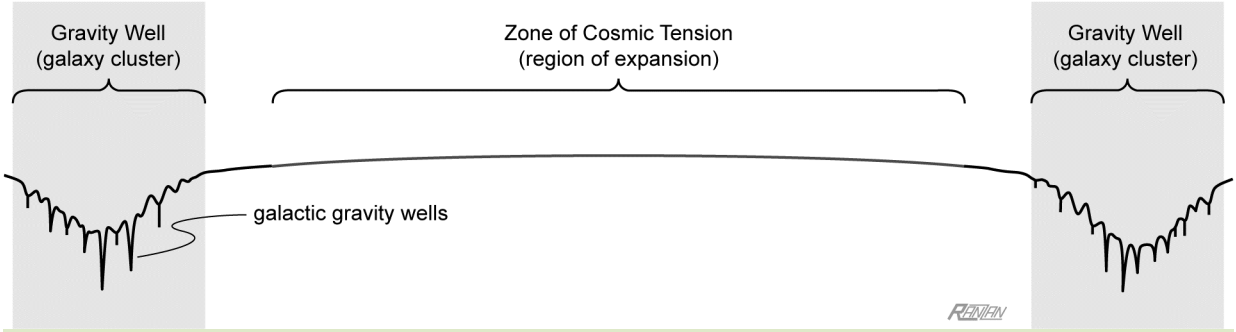

Fig. 10. Gravity intensity profile across a cosmic cell includes two opposing matter concentrations and the underdense region between them —where cosmic tension provides the conditions for the expansion of the aether medium. The schematic profile spans approximately 350 million lightyears, which is the typical diameter of a cosmic cell.

then, according to the conventional wisdom, leads to the pushing-apart of galaxy clusters (and isolated galaxies). There is a struggle for dominance between the opposites of gravity and Lambda.

In the DSSU Worldview there is no such extrapolation. Nature reacts to the cosmic tension by facilitating the expansion of the space medium (aether). *Major clusters do not move apart*; they remain stationary. They remain stationary because *primary* and *secondary* gravitation processes continuously consume all the new aether. There exists a perfectly natural harmony of opposites.

Quantifying Tertiary Gravitation

We begin by defining a space-medium expansion parameter.

$$\textit{Expansion Parameter} = \frac{\text{speed of expansion}}{\text{distance across expanding region}}. \tag{6-1}$$

The expansion parameter will have the symbol H and be expressed in units of *km/s* per million lightyears of distance (MLY).

$$H = \frac{\Delta\text{dist}}{\Delta\text{time}} \times \frac{1}{\text{distance}}. \tag{6-2}$$

Next, we derive the aether motion equations associated with the expansion, starting with an expression for the *relative rate of change* of a co-ordinate length r with respect to time:

$$dr/dt \div r = v/r = \text{k}, \tag{6-3}$$

where k is constant when the medium is expanding uniformly. The expansion is described by the ratio of the rate of change of a length divided by that length. In terms of the aether motion the left side is interpreted as the ratio of *comoving radial speed* to *radial distance* from the void center (the center of the expansion). Note that the value of k depends *not* on the length units, but only on the time units chosen. Constant k is simply our space-medium *expansion parameter* with its length units cancelled out. Let us, then, replace k with the *expansion parameter*, H, and write the *relative rate of change* equation as,

$$dr/dt \div r = v/r = H. \tag{6-4}$$

Since the tension across the void is approximately uniform (there is no reason to believe otherwise), the expansion of the space medium is likewise uniform. We accept as fact that aether expands uniformly within each cosmic cell's expanding region. Incidentally, this H-constant is analogous to the *Hubble term* used in Big Bang cosmology, in which it is unscientifically extrapolated and made the basis of a claim that the whole universe is expanding.

If we now integrate eqn (6-4), letting r_0 be the initial radius, and solve for r we obtain the exponential function for the radial position from the center of a cosmic void:

$$r(t) = \text{r}_0 e^{Ht}. \tag{6-5}$$

And by taking derivatives, this leads directly to the speed of radial expansion with respect to time,

$$v(t) = \text{r}_0 H e^{Ht}, \tag{6-6}$$

and finally, the acceleration of expansion,

$$a(t) = \text{r}_0 H^2 e^{Ht} = H^2\, r(t), \tag{6-7}$$

where r_0 is the radial position when $t = 0$. In working with these equations it is important to remember that the time units of H and t must be the same. (Important because the units of H and t must cancel so that the exponential growth function will have its necessary unitless exponent.)

Equations (6-5) and (6-6) may be combined as $v(t) = H\, r(t)$, which can be written to give the aether speed as a function of radial distance,

$$v(r) = H\, r. \tag{6-8}$$

Similarly, (6-5) and (6-7) may be combined so that $a(t) = H^2 r(t)$, which can be written to give the aether acceleration as a function of radial distance,

$$a(r) = H^2 r. \tag{6-9}$$

The above *expansion equations* apply specifically to the central portion of the cosmic cell. But they are useless unless we can determine the value of the expansion parameter H. Once we have H and a slightly modified equation (6-9) then quantifying Tertiary gravitation is simple.

Turning our attention to the structural cosmic cell. We need two pieces of information: the total diameter and the typical mass content of the surrounding nodal galaxy clusters.

By the method known as "standard distance candles" it is possible to obtain a reasonably good estimate of the size of the cosmic cell. We will use a nominal diameter of 300 million lightyears; and a node-to-node diameter of 320 million lightyears. For example, the distance between the center of the Virgo cluster (the Virgo node) and the center of the Coma cluster (the Coma node) is approximately 320MLY. Again, be reminded that these nodes are stationary. Understand that while most galaxies are streaming towards the nearest dominant galaxy — streaming towards one of the obvious nodal galaxies shown in Fig. 9— the giant nodal galaxy itself *does not move*.

The second ingredient, galaxy cluster mass, is notoriously difficult to determine. Part of the problem is that clusters do not have spherical symmetry; the extent of a cluster is not at all clear. There is also the problem of what used to be called the "missing mass." We will use an estimated mass of 2.2×10^{15} solar masses (so that $M_{\text{cluster}} = 4.38\times10^{45} kg$). This is close to the conventional estimate of Virgo's mass, but considerably less than the estimate for Coma's mass. We make a reasonable and simplifying assumption that the mass of the cluster is

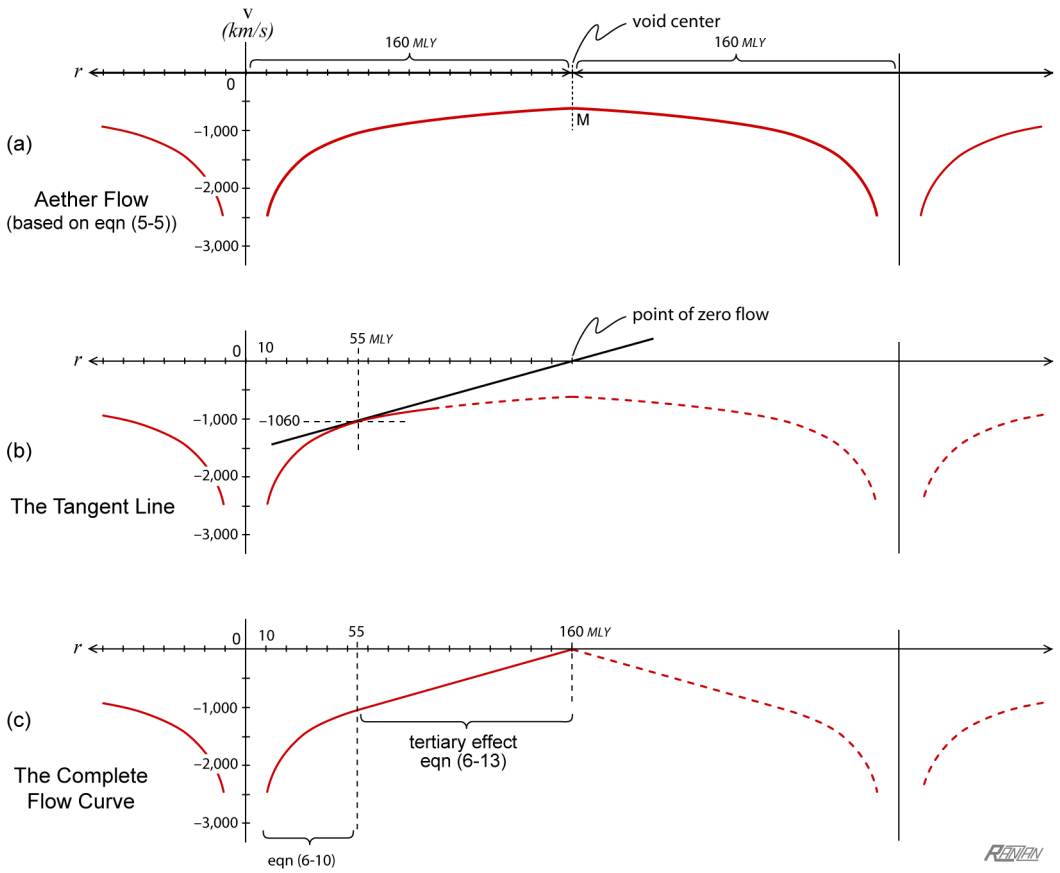

Fig. 11. Method for finding the expansion parameter H and the aether-flow curve associated with Tertiary gravitation (for the nodal cluster frame of reference). (a) The basic Newtonian-flow curves for two representative galaxy clusters located on opposite sides of a cosmic cell have been extended to meet at "M". (b) A tangent is drawn so that it passes through the point where aether flow, in order to avoid a logical contradiction, *must be zero*. (c) The complete aether-flow curve consists of the contractile portion and the expansion portion. The expansion portion is associated with Tertiary gravitation.

overwhelmingly concentrated within a 20*MLY*-diameter region.

The next step is to draw a graphical representation of a cosmic cell —a simple cross-section through two opposite nodes and the interior expanding region (Fig. 11). A horizontal axis passes through the two clusters; a vertical axis provides a scale for plotting the aether flow speed. With the help of eqn (5-5),

$$v_{\text{aetherflow}} = -\sqrt{2GM_{cluster}/r} = -\sqrt{\frac{2\left(6.67\times10^{-11}\,Nm^2kg^{-2}\right)\left(4.38\times10^{45}\,kg\right)}{r}}\,, \tag{6-10}$$

and with some units conversions, so that r can be expressed in convenient units of *MLY* and the speed in convenient units of *km/s*, we plot the *aether velocity field* for our typical nodal cluster as shown in Fig. 11a. We do the same for the opposite node.

It should be obvious that the Newtonian gravity field does not extend to infinity. But less obvious is the fact that *it does not even extend to the similar gravity field of the opposite galaxy cluster*! Although part (a) of the figure does show the Newtonian fields extrapolated so that they will meet, such an extrapolation, in reality, is not possible. How do we know this? Just look at the meeting point "M" (Fig. 11a). The graph (and its underlying equation) predicts that the velocity magnitude at this point would be about 621*km/s*. But this contradicts a foundation fact of the DSSU —*the aether flow at the center of a void is zero*. Therefore, the curve we seek must touch the horizontal axis.

Now for the key step in which we make use of the fact of a zero point and the approximation that the speed-of-expansion function is a linear function. (Although the motion equations, with respect to time, are exponential, the motion equations with respect to radial distance are ***linear***. That is, eqns (6-6) and (6-7) are exponential and eqns (6-8) and (6-9) are linear.) We draw a straight line, as shown in Fig. 11b, through the cosmic cell center-point and tangent to the basic aether-flow curve (given by eqn (5-5)). The point where they touch indicates where the Newtonian *inflow* EQUALS the expansion *outflow* —the outflow from the void.

The key information: The point of tangency gives the radial distance (55*MLY* on the horizontal axis) and the aether flow speed (1060*km/s* on the vertical axis). In the

galaxy cluster's frame of reference a 1060*km/s* inflow occurs at a distance of 55*MLY*; and in the void's frame of reference a 1060*km/s* outflow occurs at a distance of 105*MLY*.

The slope of the tangent turns out to be the Expansion Parameter from (6-1).

$$H = \frac{1060 km/s}{(160-55)\,MLY} = 10.1 km/s \text{ per } MLY\,. \quad (6\text{-}11)$$

Incidentally, this represents a space-medium expansion rate, within voids, of 3.37*cm/km* every one million years.

One more step. Equation (6-8) must be expressed *in terms of the galaxy cluster's frame of reference*. In the general form of the expression we use T as the distance to tangency and D as the distance to the zero-flow point. The equation for ***tertiary aether flow*** then is,

$$\upsilon(r) = H\,(r - D), \text{ where } T \le r \le D_{MLY}. \quad (6\text{-}12)$$

The specific expression for our example is,

$$\upsilon(r) = H\,(r - 160), \text{ where } 55 \le r \le 160_{MLY}. \quad (6\text{-}13)$$

which is graphed (in Fig. 11c) as the linear portion.

The complete graph —the composite aether velocity curve, consisting of the Newtonian flow *and* the tertiary flow— is shown in Fig. 11c.

Acceleration Graph

For the acceleration curve we could follow the same procedure used in Fig. 11. But since the mass is not being changed, there is no need. We have already worked out the radial distance to the transition point where the expanding region meets the contractile region. With our typical cluster example (with mass $2.2\times10^{15}{}_{\odot}$), *that* distance is about $r = 55$ *MLY*. Therefore, we plot the contractile acceleration, using eqn (5-1) for the r-axis domain only out to 55. But first let us re-express the equation and make it more useful.

$$a_{\text{aetherflow}} = -\frac{GM}{r^2} = -\left(1.483\times10^{-24}\right)\frac{M_{\odot}}{r^2}\,, \quad (6\text{-}14)$$

where $M_{\odot}$ is the mass expressed in solar masses and r is in million lightyear units (*MLY*); and the resulting acceleration is in the conventional m/s^2.

And for use with our sample cluster, as plotted in Fig. 12a:

$$a_1(r) = -\frac{\left(3.264\times10^{-9}\right)}{r^2}\,m/s^2\,, \quad r \le 55. \quad (6\text{-}15)$$

We graph the expansion acceleration using eqn (6-9) which must first be converted for the reference frame of the cluster, accomplished by replacing r with $(r-160)$. Then,

$$a_2(r) = H^2\,(r - 160), \qquad 55 \le r \le 160_{MLY}. \quad (6\text{-}16)$$

The complete graph of the aether acceleration produced by the three gravity effects is shown in Fig. 12. Keep in mind that the mass of the cluster is actually dispersed over a large region; it is, therefore, wise not to bring the curve too close to the axis marking the core of the cluster. Hence, the domain used in the graph has been given a lower limit of 10*MLY*.

At the expansion-contraction transition point the acceleration is approximately 1.1 picometers per second squared.

To cap off this section let me state the process and cause as concisely as possible. The process of Tertiary gravity is the acceleration of aether —radially inward from the perspective of the nodal cluster, radially outward from the perspective of the void center-point— accompanied by the quantitative increase in aether. The cause of Tertiary gravity is the axiomatic dynamic nature of the essence medium and cosmic tension inherent in the universe's cellular structure.

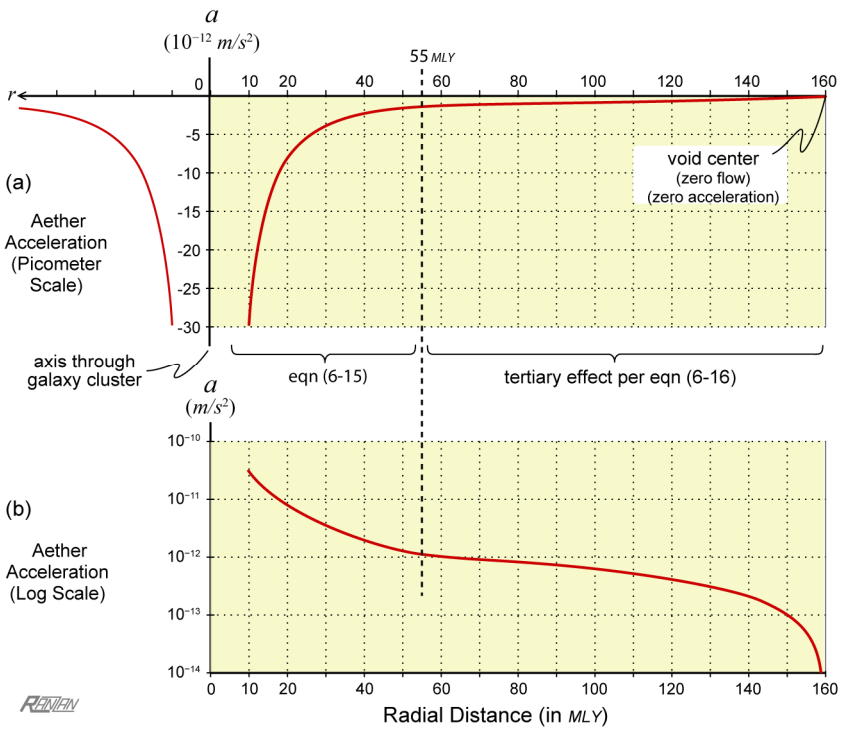

Fig. 12. Graphs of the gravitational acceleration produced by the three gravity effects. The plots are for a typical galaxy cluster as described in the text. (a) Separate equations were used for the aether flow in the contractile region and the expansion region. In (b) the same equations are plotted with a log-scale vertical axis. The dashed line indicates the transition between expansion and contraction.

7. The Triple Effect Gravitation Cells

While the previous sections focused on categorical processes and regions, the following will focus on the cosmic gravity cell as a whole.

Let me first explain what is meant by a gravitation cell. A cosmic gravity cell is the dynamic region of a galaxy cluster, a region in which all trajectories ultimately terminate at a single dominant nodal galaxy, a region in which all comoving and freefalling objects/particles ultimately fall into that single galaxy, with the qualification that in the case of astronomical cannibalism it is the survivor that ultimately takes the final fall completing the journey. Surrounding the gravity cell are a number of Lagrangian points but there is no interaction between any neighboring cells, no significantly-sized object from one cell ever crosses into another. (Also see *cosmic gravity cell* in the Glossary.)

The gravity cell's size and shape have a correspondence to those of the contained galaxy cluster. The non-sphericity is obvious but for a better understanding of the shape of the gravity cells we first need an understanding of the shape of the structural cells. Given the dynamics of space-medium expansion and contraction it is easy to predict a closest-packed dodecahedral shape, namely a rhombic dodecahedron.[25] A Platonic dodecahedron cannot subdivide (or fill) space, but a rhombic dodecahedron can, as can its twin the rhombic-trapezoid dodecahedron.

The structural cell, as shown in Fig. 13, has 14 nodes surrounding a defined interior region with an expanding medium, fourteen galaxy clusters surrounding an aether-expanding void.

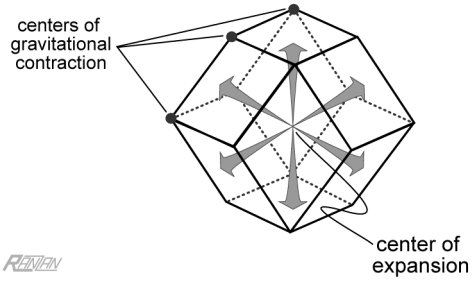

Fig. 13. Schematic view of an isolated structural cosmic cell. Do not be misled here; the cell itself does NOT expand. It is prevented from expanding by a self-balancing mechanism.

A striking feature of the structural cell is that there are two distinctive types of nodes —distinguished by the number of arms. There are *major nodes* and *minor nodes*; six of one and eight of the other. Now here is the amazing part: Some nodes have four-arm patterns and some have eight-arm patterns giving us a correspondence, respectively, to four-branch galaxy clusters at minor nodes and eight-branch galaxy clusters at major nodes! We have here the underlying reason for variation in size and density of galaxy clusters.

Real cosmic cells are never isolated; nodes are *always* shared with neighboring cells. Four cells meet at a minor node and six cells meet at a major node, resulting in the 4- and 8- branch patterns shown in Fig. 14.

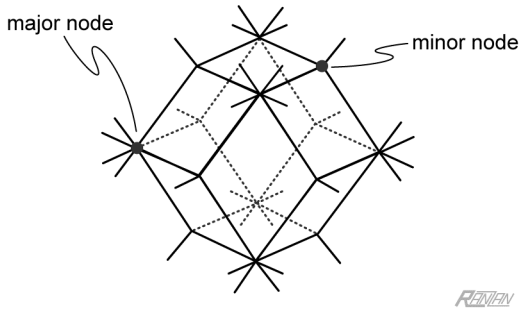

Fig. 14. Major nodes and minor nodes of the externally-linked structural cosmic cell. Nodes are schematically linked outward to the surrounding dodecahedra (not shown) to reveal that minor nodes actually have four arms and major nodes eight arms.

Clearly, this calls for two types of gravitational cells. The geometry demands there be a distinct shape for each of the two types of nodes. The four-armed node requires a tetrahedron; while the eight-armed node demands an octahedron. These two shapes, when "packed" together, will totally fill 3-dimensional space (as they must). But unlike the cosmic structural cells with their mass-sprinkled envelope, *the gravitation cells have no visible boundaries!*

Tetrahedral Gravitational Cell

The center of gravity of a *minor-node galaxy cluster* coincides with the geometric center of the tetrahedral cell. The four arms of the cluster is where the flow lines tend to concentrate (the cluster arms are more or less perpendicular to the tetrahedral faces). The vertices of the tetrahedron extend deep into the four surrounding voids. Fig. 15 attempts to show this arrangement; the fourth void (and fourth vertex) is hidden from view.

Perspective views of the tetrahedral gravity cell are shown in Fig. 16 and include the basic geometry, the aether streaming flow lines, and the cell as an isolated gravitational 'field'. The flow lines also represent the trajectories of comoving matter. The flow lines clearly reveal the cell's four internal lobes. The four lobes act to funnel the aether-and-matter flow towards the regional center of gravity.

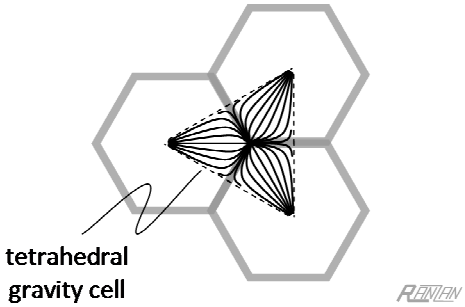

Fig. 15. The vertices of the tetrahedron (cosmic gravity cell) extend to the centers of four surrounding voids, three of which are shown.

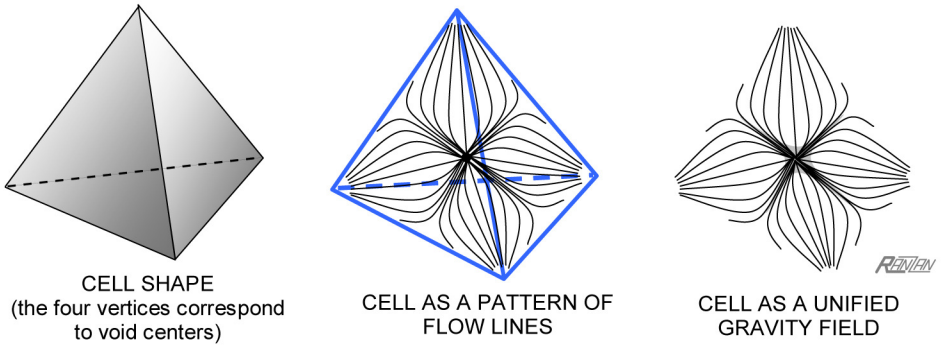

Fig. 16. Perspective views of an isolated tetrahedral gravity cell. The gravity cell is a dynamic structure in which aether (and any comoving material) flows as indicated by the trajectory lines, a structure in which aether inflow sustains a four-lobed pattern.

Octahedral Gravitational Cell

The dynamic cell associated with a *major node* (of the dodecahedral structure) is the *octahedral gravity cell* (Fig. 17). It consists of six lobes; each lobe a participant of a separate dodecahedral cell; each lobe having an axis directed to a separate void center; each lobe a pattern of ***inflow*** of diverging lines where the space medium expands and converging lines where the medium contracts. The lobes are all linked by one supergiant galaxy —a supermassive "elliptical" acting as the insatiable core of the confluence.

How the Gravitation Cells Fit Together

The simplest way to visualize how the gravitation cells fit together in a three-dimensional "tiling" is to select the center of a void as a reference point. Because of the geometry of the structural cell, this point is surrounded by 8 minor nodes and 6 major nodes, which means that a void is surrounded by 8 tetrahedral and 6 octahedral cells. Thus a total of 14 gravity cells meet at the void-center reference point.

The two types of cells fit together in a natural way. The tetrahedron and octahedron comprise what is called a dual space filling system.[26]

In conceptualizing an idealized assembly of gravity cells it helps to realize, first, that they all have faces consisting of identical equilateral triangles; secondly, that octahedra meet octahedra edge-to-edge; thirdly, that octahedra meet tetrahedra face-to-face, and finally, that tetrahedra meet tetrahedra edge-to-edge. These rules, along with a bit of cerebral effort, permit one to visualize an assembly of all 14 cells. The outer "surface" of such a cosmic 14-cell structure has the shape of an octahedron (Fig. 18). The assembly is a super-octahedron with a single void at its very center. Be reminded: Like the boundary of any gravity cell, the outer "surface" is characterized by tangential aether flow and specific points of zero flow (Lagrangian points) some of which are indicated in the diagram.

Hidden from view inside the super-octahedron is a single dodecahedral structural cell. We normally think of

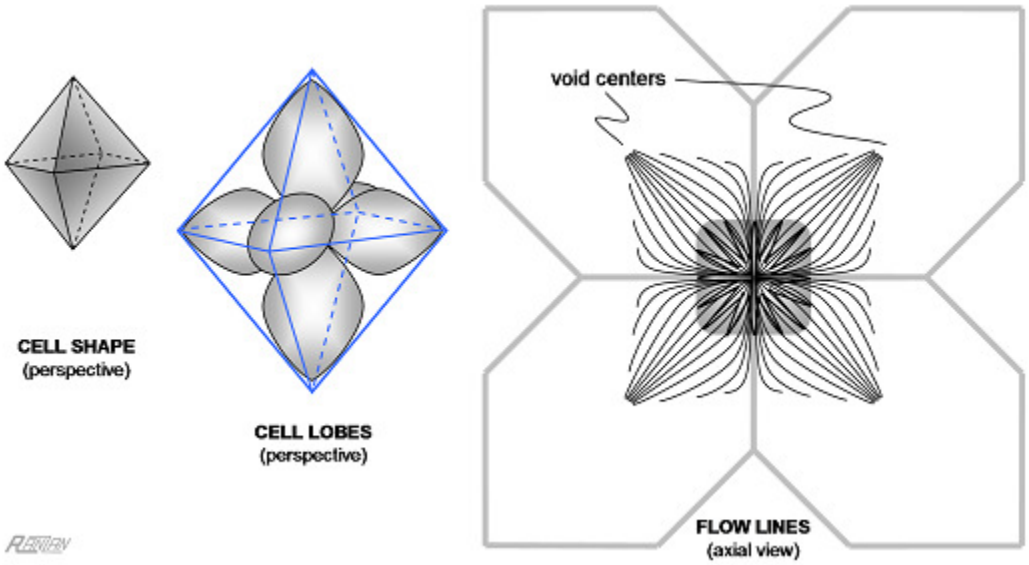

Fig. 17. *Octahedral gravity cell* is a dynamic structure in which the space medium flows in a pattern that sustains a six-lobed configuration —one that is associated with the dodecahedral major nodes. (The shaded region, in the axial view, indicates where lobes project into, and out of, the plane of the diagram.)

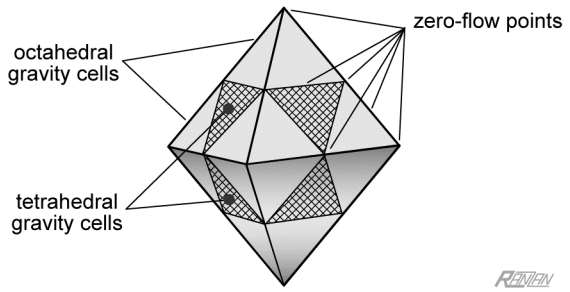

Fig. 18. *Assembly of the 14 gravitational cells,* 5 of which are out of view on the back side, associated with a dodecahedral structural cell. All 14 cells have a common vertex in the very center (not explicitly indicated in the diagram). The outer "surface" of the assembly (like the boundary of all gravity cells) is characterized by tangential aether flow and specific points of zero flow (Lagrangian points).

the dodecahedral cell as being surrounded by twelve others, each of the twelve faces shared with a different neighbor. However, the actual linking involves a total of ***eighteen*** others. A count of the number of boundary vertices, of the super-octahedron in Fig. 18, including those located at the long-edge midpoints (and including the 5 hidden ones) gives a total of 18 void centers —one for each of the 18 neighbors.

The foregoing is simply an application of the unwavering rule that every vertex of every gravitation cell must terminate at a void center.

As a broader view of how things fit together, the gravity cells are the active links of the Cosmos. They are the interclusteral dynamic bonds that lock the Universe into its cellular configuration —*preventing the Cosmos from expanding*.

This might be a good place to point out that space-medium expansion does not imply cell expansion. In view of the unfortunate situation in which most people actually believe that the Universe is expanding (a belief rooted in the unscientific extrapolation I often mention, a belief popularly known as the Big Bang), I do need to emphasize that *the cosmic gravitation cells do not expand —not individually and not collectively*. When I refer to the cells as being dynamic, do not misunderstand. A cell's size and shape are more or less stable; rather, it is the processes within the cell that are dynamic.

Why Don't Gravitation Cells Collapse?

Unless familiar with DSSU theory, the reader must surely be wondering, *Why doesn't the gravity cell simply collapse, with all the material accumulating at the center?* Why doesn't all the matter, over time, fall into some supermassive black hole at the center of the cell, the cell becoming a gravitating region without visible matter? … The answer is that gravitation cells are not so much evolving structures as they are self-sustaining structures. New matter is continually forming from aether-space, precipitating via some unknown process, one whereby the essence process achieves a degree of materialization, almost certainly by some self-interaction of the essence fundamental fluctuators. The continuously forming matter along with the axiomatically continuously forming aether (i.e., the axiomatic expansion of the space medium) feed the inflow and feed the gravity cell. These two processes sustain the endless formation of new gravitating structures (the visible galaxies) ***and*** the characteristic gravitational streaming. The more matter that is supplied to the galaxy cluster, the more aether must also be supplied to sustain the existence of *that* same matter.

The matter formation and aether formation represent the supply side of a truly remarkable self-regulating mechanism. The consumption side of the "mechanism" is performed (i) on the aether by the first and second gravitation processes and (ii) on the energy-and-mass by a *suppression-annihilation* (i.e., terminal annihilation) process. As a key component of this self-adjustment, the termination process represents the negation of a loosely balancing quantity of gravitating matter, a quantity loosely balanced with the ongoing primitive-matter formation taking place throughout the gravity cell. It is the ultimate-fate process by which matter disappears from the universe. The suppression-annihilation of matter takes place within the active cores of non-singularity black holes, without violation of thermodynamics law. The matter, flowing into these termination cores, leaves the universe. The so-fated matter then, literally, no long exists.

The gravity cell's integrity is a consequence of the combination —the interdependence— of the two pairs of processes. When the matter formation-and-negation pair is conceptually combined with the aether expansion-and-contraction pair, then we can see the gravity cells as self-balancing, self-sustaining, structures.

Thus, cosmic gravity cells do not collapse. *They exist in a state of timeless self-sustaining flows —driven by perpetual processes.*

Gravitation cells are not so much evolving structures as they are self-sustaining structures —in fact they are perpetually self-sustaining.

8. Related Points of Interest

Wrong Pieces and Missing Pieces

Let me briefly contrast the approach used in this paper with the one used in Standard Cosmology.

Comparing structural cellularity. The cellularity observed/detected in our universe, in the standard academic view, is merely phenomenological —a remnant feature of an earlier chaotic expansion phase of the Big Bang universe. Cellularity is not recognized as an intrinsic feature, not understood as the manifestation of ongoing fundamental processes, not considered a steady

state feature of our universe.

Comparing the gravity-cell concept. Standard Cosmology does not divide the universe into gravity cells, rather it treats the whole universe as a single mega-sized gravitation cell and then subjects it to the field concept, the mathematical theory of general relativity, and an ever growing number of adjustable parameters.

Academic cosmologists do realize, of course, that their expanding-universe model does not require space to be expanding everywhere; it simply requires a *net* expansion. Based on the prevailing Big Bang interpretation (or rather misinterpretation) the universal cosmic-redshift phenomenon represents a measure of net expansion of the whole universe. They are quite aware that in addition to regions of space expansion there are also regions of flat space and regions of contracting space. But they have no deep understanding of how these regions interact. Although, general relativity can model such regions by assigning curvature to each volume of space (whether hyperbolic, flat, or spherical), it cannot predict their configuration. A deeper understanding is missing. As reported in *Scientific American*:

> *Neither relativity nor standard cosmological observations say anything about how those volumes fit together to give the universe its overall shape —its topology. ... Determining the topology requires some physical understanding beyond relativity.*[27]

In other words, before general relativity can model or predict the configuration of the interactions of dynamic regions, it needs, as input, the very configuration of those regions. It needs the shape of the DSSU unified gravitation cells. What is needed, and happens to be outside the scope of relativity, is the inclusion of the aether medium. Cellularity and aether provide the vital pieces of the puzzle and the long sought "physical understanding." They tell us precisely how the three types of space "volumes fit together."

The deep understanding that is missing from Standard Cosmology is how gravitation consists of three processes, how these processes sustain cosmic gravitation cells, and how those cells "fit together to give the universe its overall shape —its topology."

Static Volume and Dynamic Volume

Why is the expansion region of a gravitation cell considerably larger than the contracting region? This is simply because the expansion-of-aether process is, per unit volume, constant; while the aether-extinction process intensifies with proximity to the central mass.

How do the dynamic volumes compare? The comparison is one of a balanced harmony of opposites: the volume of new aether formation in one region is, in the long run, equal to the aether consumption in the other.

Extra Dimensions, Unseen Dimensions

Attempts to unify the forces of electromagnetism and gravity go back to the second half of the 19th century following Maxwell's success in having unified the electric and magnetic effects as two aspects of a single force. But there seemed to be no way to bring about such unification and so the contemporary thinking gradually turned to the concept of extra dimensions. Einstein had famously used "time" as an extra dimension in his successful new theory of gravity. Einstein then sought to engage the new theory, and the new dimension, towards unifying the forces of electromagnetism and gravity. If gravity is a geometric property of spacetime, as his theory required, and if the electromagnetic effect could likewise be shown to be a geometric property of spacetime, then the sought after unification would be almost assured. But it was not to be. Einstein spent much of the rest of his life in what turned out to be a fruitless search.

The first attempt at unification by exploiting an extra *spatial dimension* came in 1919 when the Polish mathematician Theodor Kaluza, motivated by a possible extension of Einstein's general relativity, boldly proposed adding a new fourth dimension. Kaluza's goal with this extra dimension was to unify the forces of electromagnetism and gravity. Unfortunately, Kaluza could not say how this extra dimension is to be detected, nor could anyone else.[28]

Modern unification efforts employ string theory (best described as an esoteric mathematical exploration of infinite possibilities). String theory's role in the quest for unification is a story of ongoing failure. Where Kaluza modestly failed with *one* extra dimension, string theorists fail spectacularly with no less than *six* extra dimension!

The problem with string theory of modern physics, like the problem of big-bang theory of 20th-century cosmology, is the problem of ***too many outcomes***. As physicist Lisa Randall, in her book **Warped Passages**, pointed out, "string theory can lead to a plethora of possible predictions."[29] (Now isn't this state of *having too many outcomes* the classic sign of a weak theory?)

But let us be realistic. What hope is there for unification when gravity itself is so poorly understood? What hope is there for unification when gravity has not yielded its secrets after decades of intensive probing using the "tools" of quantum mechanics as well as string theories (and their offshoots)? The too-many-outcomes failure of string theory, the failure to come up with an understandable model of gravity, is matched by the three-roads failure of quantum mechanics to do likewise. So it is written. Written in the book **Three Roads to Quantum Gravity** is physics professor Lee Smolin's exceptionally clear story of the failure of the three roads being explored in quest of the elusive theory of quantum gravity. The problem, Smolin admits, is that "somewhere in our thinking there is at least one, and possibly several, wrong assumptions."[30] Forgive me for stating the obvious; perhaps the whole notion of extra *spatial* dimensions is flawed.

It turns out there is another kind of extra dimension; like those of string theory it is not a visible dimension; but unlike those of string theory this dimension produces detectable effects. It is successfully exploited in DSSU theory. The extra dimension of DSSU theory is simply the realm of non-existence; the realm into which aether

contracts as part of the secondary gravitation process; the realm from which aether expands as part of the tertiary gravitation process.

As for the feasibility of unifying electromagnetism and gravity, it turns out this is no more possible than unifying cause and effect; there can be a linkage but not a unification.

Cellularity Confirmed

DSSU theory predicts a certain degree of regularity in the cell structure of the universe. This regularity and cell structure is based neither on any fractal hierarchical nature nor on any random chaotic nature. As previously described, the cell structure is determined by the processes of gravitation and the processes of matter formation and suppression-annihilation. The cellular configuration is intrinsic.

In practical terms galaxy clusters are positioned at the nodes of "closest-packed" dodecahedral cells, whose cosmic size is determined by the self-regulating feature of the above processes. And because the laws of physics in the real world are invariant, the self-balancing mechanism achieves a reasonable degree of regularity of cell size. Variation in galaxy cluster size may (and does) exist but *not* variation in cosmic cells. The variation in cluster size arises intrinsically from the geometry of the *closest-packed* dodecahedron, from its minor nodes and its major nodes.

Now consider a cosmic void, a region of mostly empty space; such a region, based on observation, is realistically about 260*MLY* across. Next, think of this as the 260-diameter inscribed sphere that "touches" all the faces of the dodecahedron (Fig. 14), then, from basic geometry, the *inner circumscribed* sphere (the one passing through the minor nodes) will have a diameter of 320*MLY* and the *outer circumscribed* sphere (the one passing through the major nodes) will have a diameter of 368*MLY*. In other words the diameter associated with the distribution of one set of galaxy clusters is about 320*MLY* while the diameter associated with the other distribution is about 368*MLY*.

The two-part prediction is: no hierarchy of cosmic structure and a nominal cell size of 344*MLY* (using the average of the two distribution diameters).

As this section was being written, the results of a massive 200,000-galaxy survey, a deep probe within a cosmic volume of about 3 billion light years cubed, were announced. 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**[31]), 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.

In a remarkable confirmation of prediction, 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 million 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.

Invariably, when all the pieces —all the laws, observations, processes, including the *dynamic* gravitation processes— are brought together the picture is always the same, the conclusion always consistent: Our Universe is the *Dynamic Steady State Universe*.

9. Summary and Implications

The Universe is made of processes, not things.
–Lee Smolin

Gravitation is the effect produced by the acceleration of aether and has three causes: (i) the absorption-annihilation of aether as part of the mode by which all matter, and all radiation, is conducted by the aether medium; a direct consumption process by mass and photons, whose very existence depends on the process; (ii) the striving for constant spatial density of aether units via the self-extinction of aether units; and (iii) the axiomatic expansion of the space medium.

Gravitation involves three effects: Primary, Secondary, and Tertiary.

The *primary-gravitation effect* is the quantitative reduction in the number of fundamental fluctuators as a consequence of direct excitation.

The *secondary-gravitation effect* is the quantitative reduction in the number of fundamental fluctuators as a consequence of self-dissipation of aether (which in turn is a consequence of the aether's noncompressibility, its constant count-density property).

The *tertiary-gravitation effect* is the quantitative *increase* in the number of fundamental fluctuators as a consequence of an axiomatic process in conjunction with cosmic tension.

The three processes of gravitation, along with the pair of *matter postulates*, are responsible for sustaining the intrinsic cell structure of the universe.

The Cause-and-Effect Connection via the Ubiquitous Intermediary

Now to summarize the connection between the electromagnetic effect(s) and gravitation: EM effects involve the excitations of aether, while gravitation effects involve bulk motion of aether. The aether, the intermediary, 'responds' to the electromagnetic excitation with its own localized self-annihilation, which induces an inflow motion to the surrounding aether.

Electromagnetic phenomena are *conduction* properties of the aether; gravitational phenomena are *dynamic flow* properties of aether. The connection between the two is this: The electromagnetic excitation of aether is a destructive process, a process in which units of aether literally disappear. The response of the surrounding aether medium is manifest as gravitation.

From Photon to Gravity to Cosmos

Gravitation, as we have seen, *is not a force*; it, therefore, needs no force carriers, no hypothesized *gravitons*, no quantized gravitational waves. Gravity is wholly unlike the electromagnetic force, which *does* need a force carrier. There is, however, a very clear connection between the electromagnetic force (with its carrier particle, the photon) and the gravitation effects. The flowchart in Fig. 19 traces the connection —a cause and effect connection through a key intermediary process.

As a concept map, the flowchart outlines the flow of ideas from the most primitive of component conceptualizations including the essence medium of the Cosmos, through the three gravitation effects, leading to the paradigm concept of cosmic gravity cells, and finally leading to the non-expanding steady-state Cellular Cosmology.[32]

As far as I am aware this conceptualization is the first reality-based linking between the photon (as the carrier of the electromagnetic effect) and the three processes of gravitation. It is also the first fully-functional cosmology based on the Heraclitian principle of the *Harmony of Opposites*.

Through this new level of understanding of the processes of gravitation we inherit an *intrinsically*, not merely phenomenologically, cellularly-structured Universe; a universe that is Euclidian and non-expanding; a universe that uses continuous dynamic processes to sustain a steady state; a universe that retains the foundation premise of all modern cosmology, the premise that the cosmic medium is expanding; a universe that needs no boundary conditions, no unscientific extrapolations and, above all, no radical elevation of simple space expansion into a whole-universe explosion!

Profound Implication for Cosmology

Newton's cosmology was at its core supernatural. "Newton recognized that he was not in possession of the cause of gravitation," —he was, however, convinced of its existence.[33] When his attempts to forge a mechanical explanation in terms of the aether failed, when an explanation as compelling as his formulation of gravitation itself could not be found, he turned to the supernatural. And so, gravity, and consequently the cosmos, required the mediation of the hand of Newton's God.

What we think of as *Modern* cosmology began, in 1916, with a geometric interpretation of gravity via the mathematical interpretation of 4-dimensional space-and-time. This so-called *curved space interpretation* inaugurated a long period, nearly a century, of abstract mathematical universes —versions of which were proffered by pioneering cosmologists such as DeSitter, Friedmann, Lemaître, Eddington, Robertson, Tolman, Walker, and others. 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

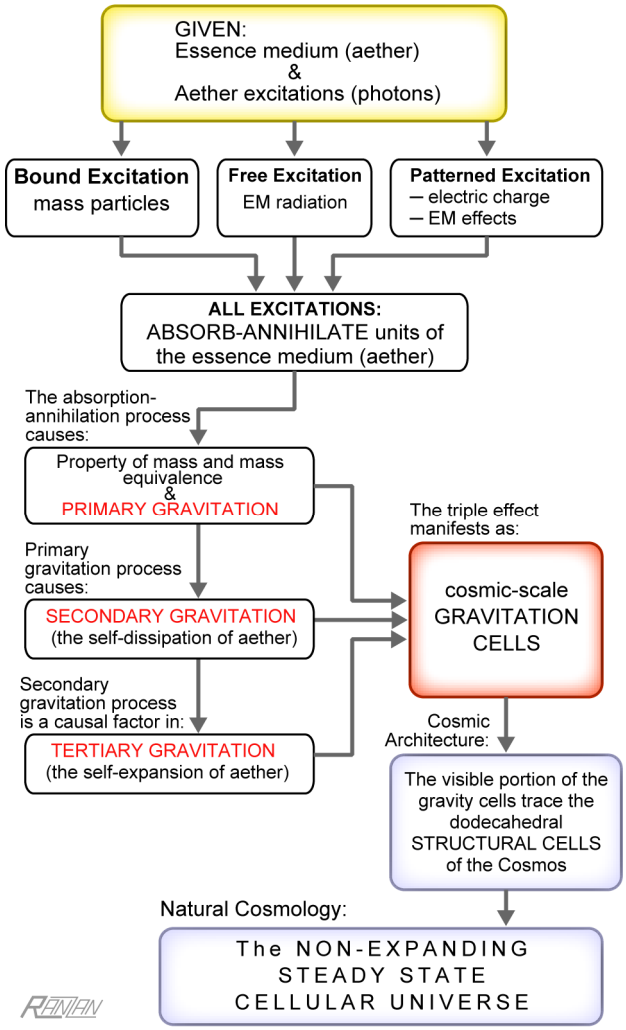

Fig. 19. A quick summary and interconnectivity map of the important ideas presented in this paper. From the introduction of an essential essence medium, and with the début of the innovative absorption-annihilation process, then through the unprecedented inclusion of a first-cause process, we are led via the three processes of gravitation to the unified gravity cells and the conclusion of a non-expanding steady-state cellular cosmology.

relativization of the universe.[b] In his 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 strict general relativity.

Einstein originally modeled the World as a single-cell Equilibrium universe; but it turned out that the equilibrium was spurious. The construct was unstable and eventually abandoned. But Einstein's equations had shown the way and there followed a strange procession of ever stranger interpretations of our Universe, a procession

[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."

that continued for the rest of the 20th century.

Georges Lemaître, basing his construction upon the biggest unscientific extrapolation in history and with the abandonment of philosophical considerations, came up with the Exploding universe! It would seem that Lemaître, being an ordained member of his religious order, had a strong bias and his chaotic-genesis-by-fire model was an interpretation of his supernatural cosmology.

Now, Einstein's aether, according to general relativity, could expand as well as contract. Edwin Hubble, and others before him, had amassed the evidence that the space-medium does indeed expand. Lemaître, had wasted little time in extrapolating the expansion aspect; and others did likewise. But what about the contraction aspect of the theory? In the 1930s A. Einstein and, independently, A. Friedmann combined phases of expansion and contraction and developed an oscillating model often called the Einstein-Friedmann Oscillating universe. This mathematical model amounts to extrapolations in both directions of expansion and contraction —Big Bang follows Big Collapse in cyclical succession. In the spirit of Lemaître, it was an Exploding-Imploding universe —a speculative cosmology that is doubly unnatural.

Another strange cosmology that was proposed and became quite popular centered on the idea of *steady-state* universal expansion. In 1948, H. Bondi, T. Gold, and F. Hoyle published their designs, which are now known as the historic Steady State models. The main feature they had in common was that they were infinite in size yet, supposedly, steadily expanded to become even more infinite! Although they avoided the strange singularity that comes with reverse extrapolation, they retained the extrapolation of expansion, elevating it to a new level of unnaturalness.

In the 1970s and 1980s, motivated by the need for an explanation of the origin of the density variation in the observable universe and also the apparent flatness of the universe (the lack of Einstein's "curvature"), theorists[c] concocted an early inflationary stage of expansion for the Exploding universe. This oddity represented an extrapolation of the expansion speed —to a speed far beyond the speed of light! Keep in mind, during this burst of inflation the universe supposedly grew from a speck of almost nothing to become whatever size the designer dictates. Strange indeed.

But stranger still are the speculations of Andreï Linde, a prolific master builder of mathematical universes. With a fondness for things out of control, notably *cosmic inflation*, and with a disregard for any connection with reality, he generated the Chaotic Inflation model and the cancerous Self-Reproducing universe.

Then, around the turn of the century, came the Accelerating Expanding universe —yet another wholly unnatural version of a general relativity cosmos. Popularizer of the Accelerating model, Neil deGrasse Tyson, calls it *The Inexplicable Universe* (which is also the short title of his published set of lectures). 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**,"[d] and with all sincerity admits that "the universe we observe seems dramatically unnatural" and, in fact, it "staggers under the burden of its unnaturalness."

Throughout the 20th century there were no universe models that could conceivably be considered natural; no model could justifiably call itself a *natural cosmos*. Of all the universe designs that have been proposed during the modern era, since Newton's time, the ***Natural*** universe was missing —conspicuously and ironically absent. And the overriding reason is that the essential mechanism of gravitation was missing.

The *Natural* universe is *that* cosmos construction that, first and foremost, solves the riddle of gravitation. It is a functioning construction in which Peter Bergmann's unanswered **Riddle of Gravitation**[e] has been resolved, in which the causal mechanism of gravity missing in Newton's and Einstein's theories has been found, in which the mystery of mass is unlocked by the very same key that resolves the gravitation process, and even more so, it is a universe in which boundary conditions are trivial issues, and in which there are only three physical spatial dimensions.

The *Natural universe* was 'discovered' in the first year of the new millennium. It is classified as a multi-cellular Euclidean cosmos. Its operational name is the Dynamic Steady State Universe.

The inclusion of the mechanism of gravitation into physics not only makes possible the Natural universe but also an entirely new cosmology —the cosmology of the non-expanding universe, the *Fifth Cosmology*. □

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[c] For this repair patch to the BB model, credit goes to Soviet cosmologist Alexei Starobinsky (which seems ironic since the cosmologists of the Soviet empire, for the most part, did not buy into the big bang idea), Alan Guth, Andreas Albrecht, and Paul Steinhardt. The patch was also meant to address the so-called *horizon problem*.

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

[e] *The Riddle of Gravitation* is the name of a book written by Peter G. Bergmann who at one time studied under Einstein. *The Riddle of Gravitation* (Dover Publications, Inc., New York, 1992).

Glossary

Aether (the historic aether): The *material* medium that fills the apparent emptiness of the universe. Invented by René Descartes, Isaac Newton, and reinvented by many others, including James Clerk Maxwell who used it for his electromagnetic theory; but was discredited and discarded by the young Einstein.

Aether (the new aether): In the Natural Universe (in the DSSU), aether is a *non-material* medium. Aether is *not* a physical substance, i.e., when in its static state it has no mass and no energy. In this respect it is totally unlike the conventional view of the aether which is typically bestowed with physical qualities such as mass and energy. The aether medium consists of essence units — fundamental essence-fluctuators, or essence oscillators. As a basic space medium it serves as the propagator of electromagnetic waves. As a dynamic medium it manifests gravitation in its secondary and tertiary forms.

Cosmic gravity cell: The cosmic gravity cell represents the domain of a single unified gravitation region ('field'). A cosmic gravity cell is the dynamic region centered on a nodal galaxy cluster, 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 that which has encountered a defined region of suppression-annihilation) ultimately falls into the central giant elliptical.

Electromagnetic field (EM-field): A region, surrounding a charge, in which a process of aether annihilation by absorption-conduction sustains a radial pattern of excitation.

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

Essence fluctuators: are the discrete units of the essence medium, the medium that we equate with a non-ponderable aether. They are, more specifically, the units of a *nonmaterial, non-energy, aether*.

Essence process: An axiomatic process unique to DSSU theory. There are two manifestations. (1) The *basic essence process*: It only occurs on the sub-quantum scale. It is the pulsation 'activity' of the fundamental fluctuators of the space medium. These fluctuations, in themselves, *do not* represent energy. (2) The *cosmic essence process*: On the sub-quantum scale, it is the coming-into-being of new fluctuators. On the cosmic scale, it is the quantitative growth of aether. *It is the expansion of the space medium.* The cosmic essence process —because it involves a quantitative change in aether units— *does* represent a form of energy.

Expansion (of the space medium): The DSSU axiomatic perpetual process of formation of aether. On the sub-quantum scale, it is the formation of additional essence-process units —non-energy fundamental fluctuators.

Fundamental fluctuators: see *essence fluctuators*.

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

Gravitation (its root cause): is a side effect of the conduction of electromagnetic excitation *by* aether and *through* aether. It is a side effect of the conduction process of photons, whether free or confined, in the aether medium. In fact, any process that causes excitation of the essence medium contributes to the gravitational effect.

Gravitation intensity: Intensity, at some radial point, is determined by the acceleration of the aether medium with respect to the gravitating body.

Gravitation direction: is determined, at some point in space, by the direction of maximum inhomogeneous aether flow. Note, however, that the actual bulk-flow of aether may be in an entirely different direction. (The difference can best be illustrated with vector field diagrams.)

***G*:** The gravitational constant G is essentially a measure of the rate at which matter effectively 'dissipates' the aether medium.[34]

Gravitation of ordinary experience: What we experience as the acceleration due to gravity is, in the DSSU gravity theory, the acceleration of the space medium itself. The intensity of the gravitational effect at a particular location is a measure of the local space-flow acceleration. The acceleration is simply the time-rate-of-change of the aether flow velocity.

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**. (These first two processes also produce the property of mass and inertial mass.) (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**.

Gravity cell: see cosmic gravity cell.

Photon: Elementary quantum unit 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.

Suppression-annihilation process: A *terminal annihilation* process that takes place deep inside extreme mass concentrations. It occurs when mass aggregation approaches 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. (An example: When a neutron star, for instance, gains too much additional mass, then its core will become a region of *suppression-annihilation*.)

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