The Nature of Gravity –How One Factor Unifies Gravity's Convergent, Divergent, Vortex, and Wave Effects

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Abstract: It is explained how one factor underlies the various manifestations of gravity. They include: (1) The primary cause of convergent gravity. (2) The secondary convergent effect. (3) The divergent gravity effect —known informally as antigravity and formally as Lambda, or the *cosmological constant*. (4) The vorticular stress effect —responsible for inward spiral orbits. (5) Gravity waves —an acoustic-like effect. Also explained is the vorticular drag effect (often called the frame-dragging effect) and how it acts as a gravitational amplifier with the remarkable ability to reduce the potency of the centrifugal tendency. This amplification effect has profound relevancy for understanding the cohesion of spiral galaxies and the non-Newtonian nature of their rotation curves. The article essentially describes a comprehensive aether theory of gravity, one that is specifically based on the essence medium employed in DSSU cosmology (which is itself a model that was validated in 2015 per *Physics Essays* Vol.**28**, No.4, p455).

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1. Background

Historically, gravity theories based on aether have been a failure. There are two main reasons: First, the insistence of attributing mass and/or energy to the constituent aether entities —or whatever it is that defines the aether. Second, in an effort to make the aether dynamic, it was deemed to vary in density and manifest density gradients. Essentially, theorists failed to recognize the importance of having a subquantum level of existence; and failed to adopt the aether as *that* subquantum level —a substrate below the mass-and-energy domain. Moreover, they failed to appreciate the pitfall associated with the variable-density hypothesis.

However, by avoiding the mass-energy allure and the variable-density trap, a powerful unified gravity theory has been constructed. It has made possible a conceptually simple way to bring all manifestations of gravity together under the aether umbrella —under the distinct aether that serves as the foundation of DSSU theory and DSSU cosmology. (DSSU is the acronym for *the Dynamic Steady State Universe* —the cosmology theory that holds that a nonmaterial aether is the ultimate bedrock of Nature, and further, that aether 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.) For the first time in the scientific quest to understand gravity and to go beyond merely describing gravity, a process has been identified that underlies, severally, the primary cause of gravity; normal convergent gravity; divergent gravity (known variously as Lambda expansion, dark energy, and antigravity); spiral-flow amplification of gravity (manifesting in rotating structures); and gravity waves. In each and every case, the energy can be linked to aether; but not in the way that others have been attempting for centuries.

There are two kinds of theories: descriptive and explanatory. Descriptive theories detail the apparent aspects, specify the measurable features, formulate their relatedness and interactions. Explanatory theories go deeper; they spell out the underlying causes of the interactions. Explanatory theories are powerfully predictive (capable of profound illuminations). I raise this point in order to contrast the difference between the aether theory of gravity and other theories of gravity (namely, Newton's force theory and Einstein's geometric theory).

The difference of great importance centers on the meaning of space. In the case of Newtonian gravity, space has no properties; however, it is said to be absolute. What does that mean? It means that you should be able to use space to reference locations; you should be able to label absolute positions within absolute space. But if Newtonian space has no identifiable properties *there is no way to make use of its absoluteness*. Absolute space served no functional purpose. For Einstein, space was a mathematical canvas. Nothing was absolute, except for rotation. Everything else was relative —relative to whatever frame of reference one chooses or one happens to occupy.

Space plays an extensive role in Einstein's gravity theory with its space dynamics, spacetime, and space curvature. In contrast to Newton's do-nothing static space, Einstein made his into "something" dynamic. *Space dynamics* means that space has the ability to expand or contract. But what is space? No answer. Next, there is *spacetime*; it is a mathematical concept-of-convenience and has no connection to reality [1]. As for the last term, *space curvature* is the mathematical (geometric) identifier of space expansion and space contraction. Expansion, and contraction, makes sense. But, again, what is space? No one seems to know. But whatever it is, it has the ability to do amazing things —supposedly even expand the entire universe, even cause the acceleration of *that* expansion! And in order to perform such fantastic feats, the space of general relativity must possess energy. And the problem of understanding "space" grows deeper, for now one also needs a fundamental definition of energy.

The popular approach is to say, as Brian Greene does in his book *The Fabric of the Cosmos*, that space (or spacetime) is a fabric. A fabric? … So then, it is the "fabric" that curves, stretches, and shrinks; and, like "space," it is said to be saturated with energy. Obviously, space is not literally a fabric. The popular approach is to focus attention on metaphors, which then help to camouflage the inability, in the context of general relativity, to meaningfully deal with the question of *what is space*?

While no one has a clear explanation of the space of Einstein's gravity theory, granted, almost everyone agrees on the presence-of-energy aspect. In physical cosmology and astronomy, it is called *dark energy*, an unknown form of energy hypothesized to permeate all space and to accelerate the expansion of the universe. But what does it mean for space to have energy? Notice the depth of the problem of understanding gravity: as something conveyed by the fabric-like space. The figurative fabric is a math canvas and space is an abstraction filled with phantom vacuum energy. The failure of the explanatory side of the theory is exemplified by the mismatch between the predicted enormous vacuum-energy density and the negligible amount of it actually in evidence. Experts in the field have long considered this to be an embarrassing failure.

The extremely important question of *what is space?* is addressed in a comparative way in **Table 1**. A deep understanding of gravity depends on selecting the optimum worldview.

Table 1.   *What is space?   It depends, as revealed by the comparison of three dramatically different views. Newton's space is said to be absolute (sort of an empty container for the stuff of the universe), does nothing, and has no causal connection to gravity. Einstein's space is a mathematical abstraction; its geometrical dynamics define gravity. For the DSSU, space is a nothingness, a metaphorical empty vessel, filled with DSSU-defined aether. Three-dimensional space has no properties; all the action, everything that happens, is rooted in aether, the universal medium.*

Worldview	What is Space?	Defining feature	What is Gravity?
NEWTON:	Absolute	Space is STATIC	Force
EINSTEIN:	Abstraction (coded in 4-dimensional geometry)	Space is DYNAMIC and saturated with energy	Spacetime curvature
DSSU:	Nothingness vessel permeated by defined aether	Space has NO PROPERTIES	Aether (acceleration of flow)

For the DSSU aether theory, space is an empty nothingness; other than having three dimensions, it has no properties; it merely serves as a container. However, because nothingness is inconceivable, or let me say, Nature does not permit a state of nothingness, space must be "filled" with a substrate that supports (sustains) the existence of mass, matter, and energy; the existence of what Einstein would call "ponderable." *That* substrate is what is being called aether.

A wonderful simplifying factor.   This approach greatly simplifies our endeavor to understand the Universe, since aether acts as the cause *and* mechanism of gravity. Space curvature is totally unnecessary. All the action is with the aether (aether as a mechanical substrate) and not with space (space as an esoteric abstraction). This, in turn, means that space (space as a container) is Euclidean. In other words we can use this background space as a working canvas —an uncomplicated 3-dimensional volume in which aether flow patterns can be modelled and analyzed.

The three key features of our subquantum mechanical aether are as follows: The entities that comprise the aether do not possess mass; moreover, these entities, in their vibratory activity, do not represent energy. (The energy aspect, at the fundamental level, will be explained in due course.) The second key property is that the spacing density of aether, the spacing density of the discrete aether units, is constant within a narrow tolerance range. The third property is that aether is dynamic —in fact, it is *uniquely* dynamic. With this new understanding of space and aether we are led directly to a powerful aether-based gravity. And gravity based on aether is a broader theory —a theory able to accomplish considerably more than Newtonian gravity and more than Einstein's gravity. Newtonian gravity does not work for cosmic Voids and spiral galaxies; general relativity fails for spiral galaxies and black holes. And they both fail when it comes to explaining cosmic-scale cellularity. Aether gravity works for all cases.

Aether, as the central player of the theory, is subject to various types of stress. The stresses, of which there are five,

and their association to gravity are as follows:

- Excitation stress. It is active in the Primary cause of gravity.
- Convergent-compression stress. It plays the key role in normal (everyday) gravity.
- Tension stress. It is important for antigravity manifesting in the cosmic Voids.
- Shear stress. It plays the crucial role in modifying the gravity associated with rotating structures.
- Radial-compression stress. A minor player responsible for the acoustic aspect of gravity (gravity waves).

The following sections will explain how these stresses are connected to the four gravity effects mentioned in the main title.

We begin with a discussion of the underlying driver of gravity. We do need to understand its root cause.

2. Convergent Gravity

Let me begin by expanding on the definition given in **Table 1**. *Gravity* under the new paradigm is defined as the acceleration effect —influencing the motion of matter— that is produced by the aether's acceleration of flow. This definition applies not only to Convergent gravity but also to the other effects.

2.1. Root Cause of Convergent Gravity

In addition to its uncomplicated space-as-a-container aspect, the Universe has another marvelous simplifying feature. All matter consists of electromagnetic waves. This has been understood for a very long time. British physicist and astronomer Sir James Hopwood Jeans (1877-1946), back in 1931, stated:

> *"[T]he tendency of modern physics is to resolve the whole material universe into waves, and nothing but waves. These waves are of two kinds: bottled-up waves, which we call matter [i.e., mass], and unbottled waves, which we call radiation or light. The process of annihilation of matter is merely that of unbottling imprisoned wave-energy and setting it free to travel through space. These concepts reduce the whole universe to a world of radiation, potential or existent, ..."* [2]

Jeans reiterates the point: "[W]e may think of [material] matter and radiation as two kinds of waves —a kind which goes round and round in circles, and a kind which travels in straight lines."[3]

And he concludes: "[A]ll physical phenomena are ultimately electrical [i.e., electromagnetic]." [4]

By which he meant that all matter, all transformations, everything perceptible, is the result of photons in motion —moving in a confined state or a free state. Even the phenomenon called *mass* is ultimately "electrical." In other words if we focus just on the mass aspect, anything that is baryonic, anything that possesses the quality of mass, is simply an organized package of confined photons. Clearly,

Jeans' photon theory of particles and phenomena provides a powerfully unifying framework. In its 21st-century incarnation, the theory finds support among physicists such as J. G. Williamson [5] [6] and his colleagues.

Now for the link with aether. Understand what is about to happen here. By linking the universe's sole fundamental particle, the electromagnetic photon, to the Universe's essence substrate, the aether, we are connecting everything —literally *everything* — to this aether.

Photons, as quantum particles, exist as excitations of the subquantum entities of aether. Photons exist purely as a process of aether —an excitation of aether. This represents a profound connection because it means that the photon is not something, in and of itself, beyond manifesting as an aether activity. In other words, no excitation (of aether), no photon.

And finally, there is the link between aether excitation and gravity —the very cause of convergent gravity.

When aether undergoes electromagnetic excitation, it is invariably accompanied by its own annihilation. When photons excite the subquantum aether particles, the affected particles vanish. They literally vanish from the Universe. No! This is not a violation of thermodynamic law. The aether particles, being *subquantum*, cannot and do not possess energy. They are mechanical (in the sense of being discrete), but they are not physical (in the sense of having mass or energy). So, when photons propagate through aether (i.e., are conducted by aether), whether in self-looping patterns or free ranging, they will continuously annihilate a certain small quantity of aether. The significance of this process cannot be overstated. Extensive research has shown that *the aether destroying propagation mode of photons is the secret of the Universe* [7].

It follows that mass particles and objects will absorb and annihilate aether —tiny amounts on the particle scale, astronomical amounts on the astronomical scale. In order to sustain the existence of the mass, a converging flow of aether is thus required.

Convergent flow, by virtue of being compelled to merge, means that the aether flow must accelerate. And there lies the direct link to gravity. Gravity is defined as the effect produced by the dynamics of the space medium —*the accelerated motion of aether* (and sometimes stated as the inhomogeneous flow of aether towards, and into, matter).

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 excite-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.

Recapping, all matter and all phenomena are linked to the fundamental energy particle, the photon; and the photon, via a unique process, is linked to aether; and aether, via its motion, is linked to gravity.

2.2. Primary Convergent Effect

The simplest way to examine Primary gravity is to assume, for the moment, that the aether is an unalterable (non-contractile) fluid. The strategy is to analyze the aether flow without taking into consideration the stress effect —without letting the stress of convergence alter the aether in any way.

Imagine a gravitating mass surrounded by a concentric sphere —an imaginary outer surface with a fixed radius r_0, as shown in **Fig. 1**. In order for the aether to reach the mass body, it must pass through this "surface." Let the radially inward flow-speed, at the instant of entry, be v_0. In order to see how the speed of our idealized fluid changes, an inner concentric sphere (with arbitrary radius r) is added (**Fig. 1**). The focus is on the shell defined by the two spheres. The idea is to compare the flow entering the shell (through the outer "surface") and the flow exiting the shell (through the inner "surface"). For this, all that is needed is the standard fluid-flow continuity equation:

$$\begin{bmatrix} \text{area of concentric} \\ \text{outer sphere} \end{bmatrix} \times \begin{bmatrix} \text{flow velocity at} \\ \text{outer sphere} \end{bmatrix} \times \begin{bmatrix} \text{fluid density at} \\ \text{outer sphere} \end{bmatrix}$$
$$= \begin{bmatrix} \text{area of concentric} \\ \text{inner sphere} \end{bmatrix} \times \begin{bmatrix} \text{flow velocity at} \\ \text{inner sphere} \end{bmatrix} \times \begin{bmatrix} \text{fluid density at} \\ \text{inner sphere} \end{bmatrix}. \quad (1)$$
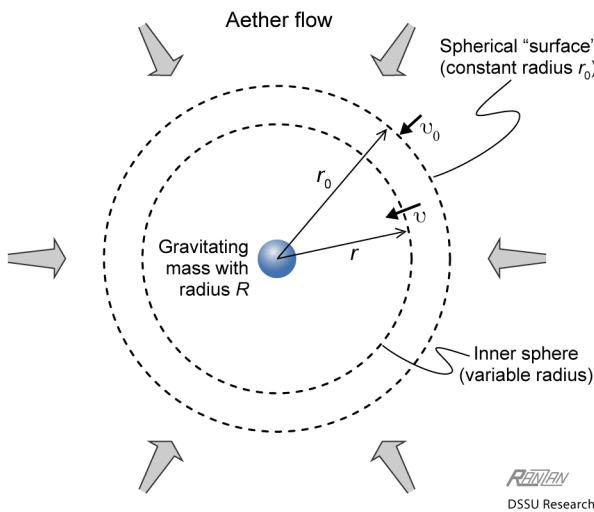

Fig. 1.   Diagram for formulating the Primary convergent flow of aether. The radius r_0 of the outer spherical surface is deemed constant, and so is the aether speed v_0. The radius r of the inner spherical surface, and the speed there, are treated as variables.

Since aether density is constant (by definition), the two density terms cancel. Substituting the parameters from **Fig. 1** gives

$$\left(4\pi r_0^2\right)v_0 = \left(4\pi r^2\right)v \, ; \quad (2)$$

$$v = v_0 r_0^2 \frac{1}{r^2} \, . \quad (3)$$

Expressing the primary flow as a function of the radial position,

$$v_\mathrm{p}(r) = -\left|\text{constant}_1\right|\frac{1}{r^2}, \quad \text{where } r \ge R. \quad (4)$$

This says that the aether flow is proportional to the inverse square of the radial position. As was expected, the magnitude of the inflow *increases* with proximity to the gravitating body. (The "R" refers to the radius of the central gravitating mass.)

Now, in order to make the connection to gravity, all we need is the acceleration of this flow. By taking the *time* derivative of the above expression, the acceleration, and hence the *Primary-gravity* intensity, is found to be

$$a_\mathrm{p}(r) = -\left|\text{constant}\right|\frac{1}{r^5}, \quad \text{where } r \ge R, \text{ and } a_\mathrm{p} \text{ is the}$$
$$\text{primary acceleration.} \quad (5)$$

This is the gravitational acceleration an object would "experience" under the described situation.

Remarkably, the primary acceleration varies inversely with the **fifth power**! It means the Primary-gravity effect is extraordinarily weak. Putting this into proper perspective, the intensity of gravitation, according to Newton and from experience, varies in agreement with 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, if only the *Primary gravity* effect were the active mechanism, then a doubling of distance between two masses would *decrease* their mutual gravitational attraction by an astonishing factor of thirty-two.

The importance of the Primary gravitation effect is that it serves as the indirect cause of *Secondary gravitation*.

2.3. Secondary Convergent Effect

This subsection reveals how aether responds to the stress of convergence and how it undergoes compression without changing its number density.

The primary aether flow speed, as determined above, is proportional to $1/r^2$. But the actual flow rate, at some radial distance, is proportional to $\sqrt{1/r}$. (See Appendix for the derivation.) The actual flow rate is much greater than what was determined for non-contractile aether. This can be seen graphically in **Fig. 2**.   Notice, in comparing the two velocity-magnitude curves, not only is the actual inflow speed greater (at whatever radius it is examined) but also its rate of increase is greater (except where the radius is less than 2.52R).
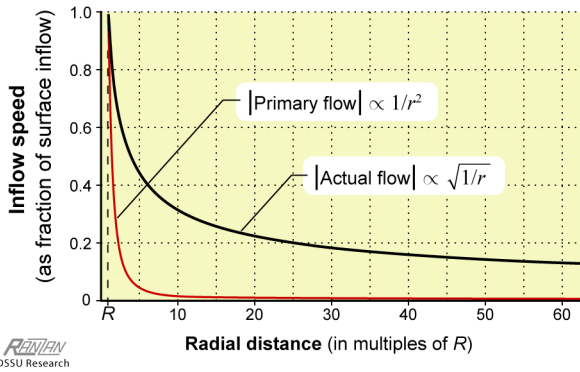
Fig. 2. Primary inflow versus actual (amplified) inflow. The Primary flow is that of aether if it were not altered in any way —no shrinkage, no loss, no density change. It is simply treated as a stable fluid. The Actual flow is a combination of the primary and secondary flows; the acceleration of this flow accurately models Newtonian gravity. (Slopes are equal at the point where the radius is 2.52 times the radius of the central mass. The gravitating mass is assumed to be at rest within the aether medium.)
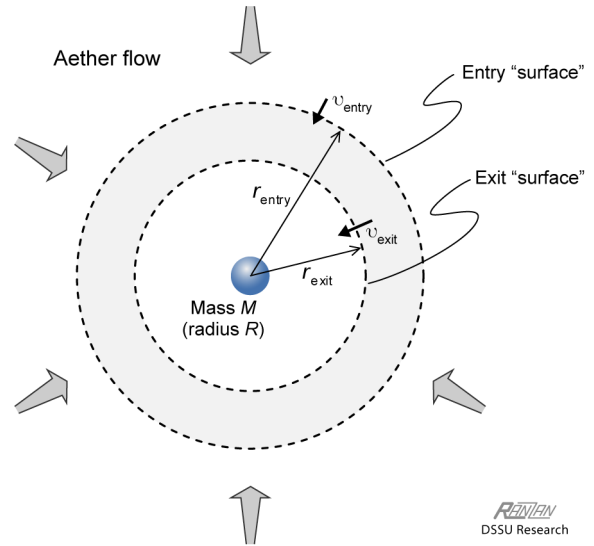

Fig. 3. Converging flow leads to aether volume reduction. The volume of aether flowing out from the shell is LESS than the volume flowing in. The proof is given in the text. Under DSSU theory this is interpreted as an absolute loss of aether. Symmetrical flow is assumed.

Ponder the situation for a moment. Is the intensification of the flow the consequence of additional aether entering the system (say by some sort of expansion)? Or is it a consequence of a loss of aether (by some sort of contraction)? There is an intuitive answer —in keeping with the aether's defining properties— but it is not immediately obvious. Before providing the intuitive rejoinder, a proper proof is in order.

For the investigation of Primary gravity, a stable non-contractile aether fluid was assumed. Then, by constructing an imaginary shell around a gravitating body and applying the fluid flow equation (1), it was found that

$$(\text{Area}_{\text{entry}} \times \text{velocity}_{\text{entry}}) = (\text{Area}_{\text{exit}} \times \text{velocity}_{\text{exit}}); \quad (6)$$

$$\left(\left(A_e v_e \right) - \left(A_x v_x \right) \right) = 0. \quad (7)$$

Essentially, the volume entering the shell was equal to the volume exiting the shell (per unit of time) —*which meant that there was no fluid loss*.

So, let us see (with the help of **Fig. 3**) what actually happens if the aether behaves in a manner that accords with Newtonian gravity. (For the sake of simplicity, it is assumed that the gravitating body is at rest with respect to the aether medium.)

The argument goes as follows:

$$r_{\text{entry}} > r_{\text{exit}} ; \quad (\text{per } \textbf{Fig. 3}) \quad (8)$$

$$\left(r_e \right)^{3/2} > \left(r_x \right)^{3/2} ; \quad (9)$$

$$\left(4\pi r_e^2 \right)\left(C\, r_e^{-1/2} \right) > \left(4\pi r_x^2 \right)\left(C\, r_x^{-1/2} \right). \quad (10)$$

The first terms on each side represent areas (of the respective entry and exit "surfaces"). The second terms are the respective flow speeds. As detailed in the Appendix (see **equation A-6**), the flow speed at r necessarily equals $C\sqrt{1/r}$. It is the velocity necessary to produce a Newtonian *acceleration* proportionality of $1/r^2$. The constant C depends on mass M and includes the Newtonian gravity constant.

Thus, **equation (10)** simply states,

$$(\text{Area}_{\text{entry}} \times \text{Flowspeed}_{\text{entry}}) > (\text{Area}_{\text{exit}} \times \text{Flowspeed}_{\text{exit}}); \quad (11)$$

$$(\text{Vol. flow rate @ entry}) > (\text{Vol. flow rate @ exit}). \quad (12)$$

The volume flowing into the shell region is greater than that flowing out (per unit of time). There is the answer. This proves that volume-of-aether reduction does occur.

There are basically two ways to bring this about.

One way is to adopt the constant density property as a foundational principle. The interpretation then is: The argument just presented proves that aether has somehow been lost during the converging flow. It has to be an out and out loss; it cannot merely be a shrinkage by compaction; it has to be the one and cannot be the other because of the constant-count-density condition.

The cause of the loss is, of course, the compression stress attendant with the convergent flow.

The other way (to account for the volume reduction) is to allow the aether density to vary. Under this interpretation, the compressive stress of convergent flow is allowed to alter the density of whatever it is that comprises (or defines) aether. It is a pitfall that has repeatedly trapped theorists. Volume reduction by increasing density, not surprisingly, can be made to work mathematically; but has not led to the vital connection with reality. The method is straightforward. Recall, when the fluid continuity equation was used, the

density terms were equal and dropped out. But with the traditional approach, the density terms are adjusted to effect the appropriate change in volume and directly achieve the flow acceleration that matches Newtonian gravity. The distinction between Primary and Secondary gravity is then not needed and not recognized. However, serious problems arise when attempts are made to expand the concept into a broader theory.

The two methods for effecting volume reduction are outlined in **Table 2**.

Table 2.   Comparing the two ways of reducing the volume of the aether "fluid." In an effort to achieve acceleration proportionality to the inverse square of the distance r, some theorists advance the notion of a variable-density aether (right-hand column). Whether the density change refers to inherent particulate nature or the energy content, the method is a pitfall. With DSSU aether (middle column), the volume reduction is achieved through the unique process of self-dissipation —a reaction to the stress of convergent-flow and the axiomatic constant density. It is this vanishment that makes DSSU aether dynamic —and gravitational.

How to effect volume reduction		
	DSSU aether	Popular approach (pitfall)
Key property:	Spacing density remains CONSTANT	Density VARIES
Method:	Volume is reduced by aether loss (SELF-DISSIPATION)	Volume is reduced by compression (DENSITY INCREASE)
Test:	Conforms to reality	Works math-wise but fails reality

Primary gravity is explained by non-dynamic (stable) aether. Secondary gravity, on the other hand, can only be explained by dynamic (contractile) aether. Aether must have the ability to contract. But the foundational requirement is that DSSU aether is not compressible. It is just not compressible in the sense that the discrete aether entities cannot be packed closer together. (It always maintains a constant number density within some narrow range.) It turns out, there is only one way for aether to be contractile (to reduce or shrink in volume) and meet those conditions.

For it to be both dynamic and count-density stable, *aether must be self-dissipative*.

Aether, when subjected to the compressive stress of converging flow (converging accelerating flow), suffers a quantitative proportional vanishment. Aether units are literally pressed out of existence. As pointed out earlier with the vanishment associated with excitation, this does not violate the first law of thermodynamics. *Self-dissipation* is one of the main processes that gives DSSU aether its dynamic quality. (Another one is discussed in the next section.)

The key point is this: The actual flow rate includes the Primary flow portion as well as a small LOSS portion (with significant consequences). Convergent gravity is the result of two flow components, or two effects.

It is interesting to note that under the general-relativity view of gravity there is, somewhat analogously, a two

component effect and also a spacetime self-interaction; although it is by no means an accurate analogy.   The way it is often described is to say that gravitating mass produces a gravity field (the primary effect), which then produces a secondary gravity effect, and even an additional effect. According to astrophysicist, Edward Harrison, "This self-interaction of spacetime is what is so important about general relativity. This self-interaction exists because the curvature of spacetime is itself a form of energy, which produces its own gravitational field, and is hence the source of further curvature. … Thus curvature generates curvature." [8]

What about quantifying the aether dissipation (in terms of its volume loss)?   Stated as a fractional loss of aether within a test volume located at radius *r*, the volume-loss function may be stated as

$$v_{\text{unit loss rate}}(M,r) = \tfrac{3}{2}(2GM)^{1/2}\, r^{-3/2}; \qquad (13)$$

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 (background container space); or simply as the fractional volume loss per second. The function's derivation appears in the 2014 article *The Processes of Gravitation –The Cause and Mechanism of Gravitation*, posted at www.cellularuniverse.org. [9] The smaller the radial distance (i.e., the closer to the gravitating mass) of the examination point, the greater will be the loss. The peak loss occurs at the surface. For the Earth (radius 6.37×10^6m and mass 5.98×10^{24}kg), it is about 2.64×10^{-3}m^3/s per background cubic meter, or 0.264% each second. For an extreme example, when the above equation is applied to a Supeneutron Star [10] (mass 2.62⊙) near the surface (radius 7770 meters), the loss to self-dissipation is a significant 58,000 cubic meters per second within each cubic meter of background space.

Here, incidentally, is an intuitive explanation of why aether loss results in self-acceleration. Think of a leaky bucket in which the number of holes increases with proximity to the bottom. There is a gradation of few holes at the top and many holes at the bottom. The water in this porous bucket is continuously resupplied. A comoving particle carried by the water will accelerate; whereas, with only one hole (or several holes) at the bottom there would be no acceleration.

In closing this section, let me tie Secondary gravity to the main title's "one factor" that unifies the gravity effects —namely, the response of aether to stress.   The secondary aspect of convergent gravity is related, in a causative way, to **the sensitivity of aether to compressive stress** —the stress that accompanies convergent flow toward the central mass. Simply stated, aether is not compressible; but neither does it resist compression. It cannot resist compression, for to do so would require an ability to sustain stress, which ability it does not possess. Secondary gravity is the direct consequence of a quantitative loss of aether.

3. Divergent Gravity (the Antigravity Effect)

3.1. Cosmic Tension

Convergent gravity, as we saw, involves the quantitative reduction of aether. Divergent gravity is an opposite effect. It involves the quantitative *increase* of aether. On the subquantum scale, it means the coming-into-being of additional aether units —new discrete fluctuators. On the cosmic scale, it means the bulk exponential *expansion of the space medium.* The nominal cause of this emergence of new aether is the cosmic tension associated with the large-scale structure of the Universe.

Here is where we enter the realm of cosmology and draw attention to the distribution of galaxy clusters. It is the distribution of clusters that determines where the tension —and, hence, the expansion of the medium— occurs. According to astronomical observations, clusters are arranged at the boundaries of cosmic-scale voids. Our Universe is a cellular construction, with vast empty regions surrounded by significant clusters of galaxies along with dust-and-gas clouds and other debris —material inevitably attracted to the galaxies. These galaxy clusters are major centers of gravitation.
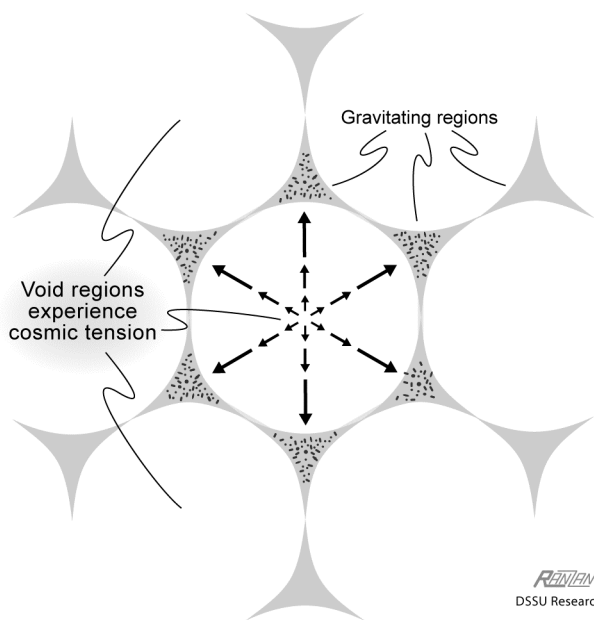

Fig. 4. *Interrelationship of major mass distribution, cosmic tension, aether emergence, and divergent gravity. The cellular network consists of rich galaxy clusters and aether-filled voids. (The pattern shown is an idealized cross-section view.) As major centers of gravitation the clusters "pull" on 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 —equivalent to cosmic tension. The tension promotes the emergence of aether. This "expansion" of aether, in turn, produces void-centric divergent gravity —a radially outward comoving acceleration of aether. (Cells are typically 350 million lightyears in diameter.)*

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 barren region. Each pair of clusters produces a *negative cosmic stress* in the region that separates them (approximately 350 million lightyears). 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 (shown in cross-section in **Fig. 4**). The result is a vast region in which aether 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.)

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. Under our reality-based view, aether expands; under the general-relativity view, the fabric of space expands. But then, Conventional Astrophysics makes the mistake of extrapolating the effect —extrapolating it beyond the voids. The effect is correctly interpreted as the expansion of the space fluid, but this expansion is then wrongly interpreted, according to the conventional wisdom, as something leading to the pushing-apart of galaxy clusters (and isolated galaxies) and the growth of the voids. There is a struggle for dominance between the opposites of gravity and Lambda. The expansion "force" is treated as something independent with no causal connection to the galaxy clusters. Picturing Lambda as a wholly-independent force/energy, astrophysicists have no reason to constrain its extrapolation and have naively hypothesized its ability to expand the whole universe.

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 the new aether. There exists a perfectly natural harmony of opposites.

It is this tension that is an important factor in the cause of divergent gravitation. But it is not the only factor.

Cosmic tension caveat. The emergence of aether is nominally caused by the tension across the cosmic Voids —by the tension produced by galaxy clusters "pulling" from opposite sides of a Void. But at a deeper level there is more to it. More accurately, the emergence of aether is a causeless process. It occurs without any prior cause. It is axiomatic. Nevertheless, the emergence/expansion cannot take place just anywhere in the universe. The cosmic cellular structure determines where the expansion of the medium occurs (even while the structure itself is determined, in large part, by the axiomatic emergence process). Here is what the stress of cosmic tension does: It allows newly emerged aether units to remain extant. It reduces the probability of fundamental fluctuators from vanishing.

The significance of the causeless process, the process of perpetual emergence of the essence medium, may be understood in a philosophical or a metaphysical context. Essentially, it means that if it were possible (which it is not) to isolate a volume of our defined aether, it would gradually expand and grow into a universe. It would become a cellular-steady-state universe.

3.2. Quantifying the Divergent Effect

It is assumed that the aether emerges uniformly within Voids (there is no reason to believe otherwise). The expansion is considered to be homologous and is defined by expansion parameter X as,

$$X = \frac{\text{(speed of expansion)}}{\text{(distance between comoving points)}} ; \qquad (14)$$

which can be expressed as

$$X = \frac{\Delta \text{dist.}}{\Delta \text{time}} \times \frac{1}{\text{(dist. between comoving points)}} ; \qquad (15)$$

and in the differential limit as

$$X = \frac{dr}{dt}\frac{1}{r} . \qquad (16)$$

This is simply the fractional change of length that takes place, between any two points embedded (i.e., comoving) in the aether, during each and every second (or other selected time unit). Mathematically, it serves as the *relative rate of change* of a coordinate length r with respect to time. And for convenience and conformity to convention, the expansion parameter is expressed in units of *km/s* per million lightyears of distance (MLY). That is, the velocity *dr/dt* calculated in *km/s* applies to some expanding distance in MLY. It will be used to derive the aether motion equations associated with the expansion.

With this in mind, the equation's right side can be interpreted as the ratio of *comoving radial speed* to *radial distance r* from the Void center (or the center of the expansion). That is, X can be expressed as $\frac{\upsilon(r)}{r}$ (where υ is understood to be the velocity of the aether, or its comoving expansion).

If we now integrate **equation (16)**, 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*:

$$r(t) = r_0 e^{Xt}. \qquad (17)$$

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

$$\upsilon(t) = r_0 X e^{Xt} ; \qquad (18)$$

and the second derivative gives the acceleration of expansion,

$$a(t) = r_0 X^2 e^{Xt} ; \qquad (19)$$

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 X and t must be the same. (Important because the units of X and t must cancel so that the exponential growth function will have its necessary unitless exponent.)

Equations (17) and **(18)** may be combined as $\upsilon(t) = X\, r(t)$, which, in agreement with the definition of X, can be written to give the aether speed as a function of radial distance,

$$\upsilon(r) = X\, r. \qquad (20)$$

Similarly, **(17)** and **(19)** may be combined so that $a(t) = X^2 r(t)$, which can be written to give the aether acceleration as a function of radial distance,

$$a(r) = X^2 r. \qquad (21)$$

The above expansion equations apply to any empty region within the expansion portion of the cosmic cell. But to encompass the largest possible region, it makes sense to adopt the coordinate system having its origin at the Void's center. However, since sometimes it is desirable to reference the void center to the tension causing clusters, we do have to give attention to the cluster-centered coordinate system.

The immediate task is to find a value for the expansion parameter X. And for this we need to work with a cluster-centered reference frame.

A reasonably good estimate of X can be obtained by examining the cross-section of a cosmic cell. This involves analyzing the gravity wells of a pair of typical galaxy clusters separated by a Void; that is, graphically analyzing the situation along the axis indicated in **Fig. 5**. First, a cluster mass is selected; a reasonable value is 3×10^{15} Solar masses. Also a cluster-to-cluster distance is estimated —this can be the same as the diameter of a cosmic cell, a distance commonly taken to be 350 MLY [7].
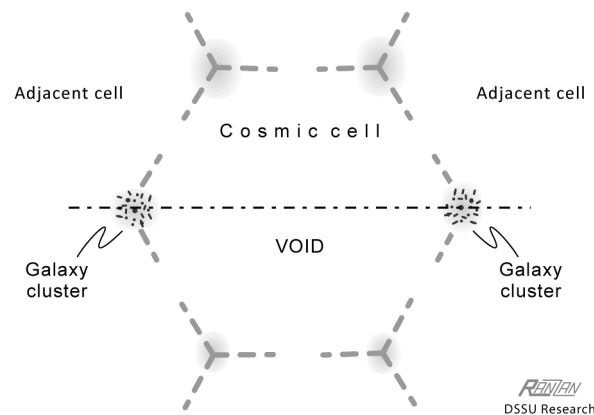

Fig. 5. *Schematic cross-section of a cosmic cell with a coordinate axis passing through opposite galaxy clusters.*

Next, each cluster's gravity well is graphed and extrapolated. This means plotting the cluster's aether flow curve (with the help of Appendix **equation (A-6)**), extending

it beyond its normal bounds (its zone of convergence), extending it as far as the center of the Void (as shown in **Fig. 6a**).

Next, we make use of the fact that *the aether flow at the center of a void is zero*. In other words, the curve we seek must touch the horizontal axis. We draw a straight line, as shown in **Fig. 6b**, through the cosmic cell center-point and tangent to the basic aether-flow curve. The point where they touch indicates where the Newtonian *inflow* EQUALS the expansion *outflow* —the outflow from the Void.

The point of tangency gives (i) the radial distance (55 MLY on the horizontal axis) and (ii) the aether flow speed (magnitude 1240 km/s on the vertical axis). In the galaxy cluster's frame of reference a 1240 km/s inflow occurs at a distance of 55 MLY; and in the Void's frame of reference a 1240 km/s outflow occurs at a distance of 120 MLY (from the Void center).

By comparing **equation (14)** and the graph (**Fig. 6b and 6c**), we see that *X* gives the slope of the constructed tangent. The slope, based on the attained velocity −1240 km/s over the radial length change of −120 MLY, is 10.3 kilometers per second per million lightyears of distance [7]. The velocity and acceleration equations —*referenced to the center of*

expansion— may now be expressed as:

$$v(r)_{\text{outflow}} = 10.3\, r. \tag{22}$$

$$a(r)_{\text{outward}} = (10.3)^2\, r. \tag{23}$$

However, our main viewpoint should be from the cluster.

From looking at part (c) of **Fig. 6**, it should be obvious that the expanding region (between 55 MLY and the Void center) is really a part of the cluster's total gravity well. A simple test. Place a test galaxy anywhere along the axis between 10 and 175 MLY and it will accelerate toward the cluster's center of mass. So, what we want is a pair of equations (for divergent gravity) for which the radial distance *r* is interpreted with respect to the center of the galaxy cluster.

This is accomplished by defining the range of *r* —restricting it, in general terms, between *T* (as the distance to tangency) and D_0 (as the distance to the zero-flow point)—and modifying the earlier **equations (20)** and **(21)** accordingly.

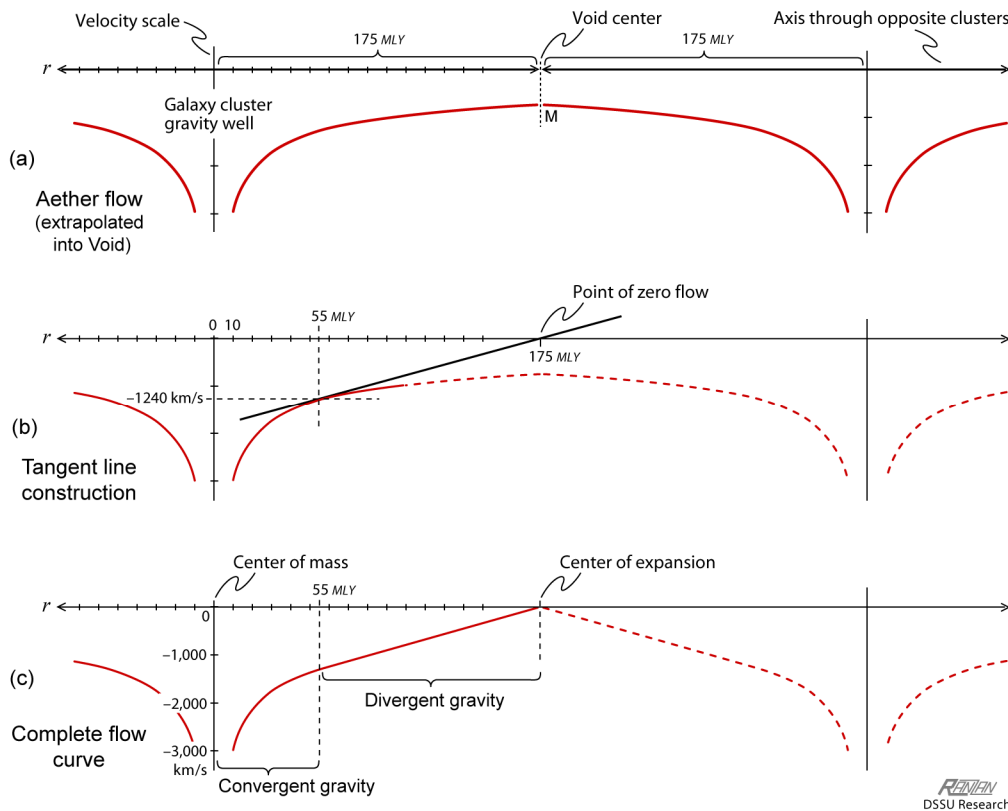In the cluster's frame of reference, the generalized expressions for divergent gravity, then, are,

Fig. 6. *Method for finding the expansion parameter X and the aether-flow curve associated with divergent gravitation. (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". The graph is based on convergent gravity equation (Appendix equation A-6) applied to a cluster mass of 3×10^{15} Suns. (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. The magnitude of the slope of this tangent gives the rate of expansion. (c) The complete aether-flow curve consists of the contractile portion and the expansion portion. The expansion portion is associated with divergent gravitation. Velocities are algebraically referenced to the center of mass. (For a Void-centered coordinate system, the curves would simply be mirror reflected above the horizontal axis. The comoving velocities would all be positive.)*

Comotion: $v(r) = X(r - D_0)$,   and   (24)

Acceleration: $a(r) = X^2(r - D_0)$, where $T \leq r \leq D_0$ MLY.
(25)

And for our specific example in which X equals 10.3 km/s/MLY, as shown in **Fig. 6c**, the expressions are,

Comotion: $v(r) = (10.3 km/s/_{MLY})(r - 175_{MLY})$,   and
(26)

Acceleration[A]: $a(r) = (10.3 km/s/_{MLY})^2 (r - 175_{MLY})$,
where $55 \leq r \leq 175$ MLY.   (27)

A few things worth noting:

■ The space-medium expansion rate (within Voids) that agrees with the example and admirably fits the astronomical observations is surprisingly small. All that is required is for each kilometer of aether to "grow" by 3.44 centimeters every one million years.

■ What has greatly simplified the above analysis is the use of a speed-of-expansion function that is a linear expression. Yet the time-dependent motions are not linear. The motion equations, with respect to time, are themselves exponential; but the motion equations with respect to radial distance are *linear*. (For instance, **equations (18)** and **(19)** are exponential while **equations (20)** and **(21)** are linear.) This feature allowed for an intuitive graphical analysis of the relationship between convergent and divergent gravity —an otherwise challenging association (made more so by the fact that the actual gravity domains are not spherical).

■ The time-dependent function, **equation (17)**, can be used to calculate the time involved in comoving with the expansion (within the void region). For example, by solving the equation and applying appropriate units conversions, one finds that it takes 139 Giga years to "drift" from a starting position 1.0 MLY from the Void center out to the 120 MLY position, the point 55 MLY from the cluster center, (the point of tangency in **Fig. 6c**).

■ The quantitative balance between emergence (expansion) of aether in the divergence regions and the primary- and self-extinction in the convergence regions, is the reason why the Universe does not expand. There is no net expansion.

4.   The Vorticular Effects

There are two separate effects to be discussed here. Both relate to structure rotation. In the context of the aether theory of gravity, both are gravity boosters, that is, they act as gravitational amplification effects.

4.1.   *Aether-Vorticular Dragging Effect*

When a gravitating body rotates, it causes the inflowing

aether to be dragged along with the rotation. This, in turn, causes a reduction in the centrifugal effect.

An expedient way to discern the relationship between the centrifugal "force" and the aether drag is with a thought experiment. The idea is to compare the various velocity vectors of a test object and of the aether —and identify the key vector that determines the intensity of the centrifugal phenomenon.

Here are the assumptions:

■ Other than possessing rotation, the gravitating body is assumed to be at-rest within the universal medium.

■ The speed of aether flow is not subject to special relativity; however, the inflow component perpendicular to the gravitating body's surface *is*. It follows that the perpendicular inflow speed cannot exceed lightspeed.

These are the relevant facts:

■ In conventional physics, the centrifugal effect is directly proportional to the speed of motion (about the axis of rotation) at some given radial distance from the axis.

■ However, in real-world physics where gravity is an aether phenomenon, the centrifugal effect depends strictly on the velocity *through* aether.

■ Background container-space will again serve as a useful conceptual frame of reference.

Thought experiment procedure:

■ The procedure involves sequentially and significantly increasing the gravitating body's mass content —BUT without changing its physical size and without changing its rate of rotation. In other words, only the density increases while the radius and the equatorial speed of rotation are to remain constant. (Within a non-aether theory, this would imply a constant centrifugal "force.")

■ What about the angular momentum? As the material is deposited, there will, of course, be an increase in rotational energy; however, the mass is added in such a way so that there is to be no change in the rotation rate.

The expected changes (as shown in **Fig. 7**):

■ In order to sustain the existence of the additional mass, the quantity of aether flow must increase. Since the surface area remains unchanged, there has to be an increase in the magnitude of the aether velocity. There is no alternative.

■ The surface, including the test block, experiences an increase in perpendicular aether flow; and most significantly, a decrease in lateral flow.

■ Although the block's motion through background space remains constant throughout the experiment, there is a substantial change in its lateral speed through aether.

■ The test block maintains its constant background circular motion by partly cutting through aether and partly dragging along with aether. As the drag component increases, the other component decreases (i.e., the lateral through-aether component decreases).

[A] A graph of the acceleration is available at
www.cellularuniverse.org/G6GravityProcesses-abst&.htm

The key observation is that the aether drag causes a reduction in the magnitude of the rotational velocity THROUGH aether. From the snap-shots as the experiment progresses, we see that the block's tangential vector diminishes (its lateral speed through aether decreases). And, by definition, this means a decrease in the centrifugal effect.
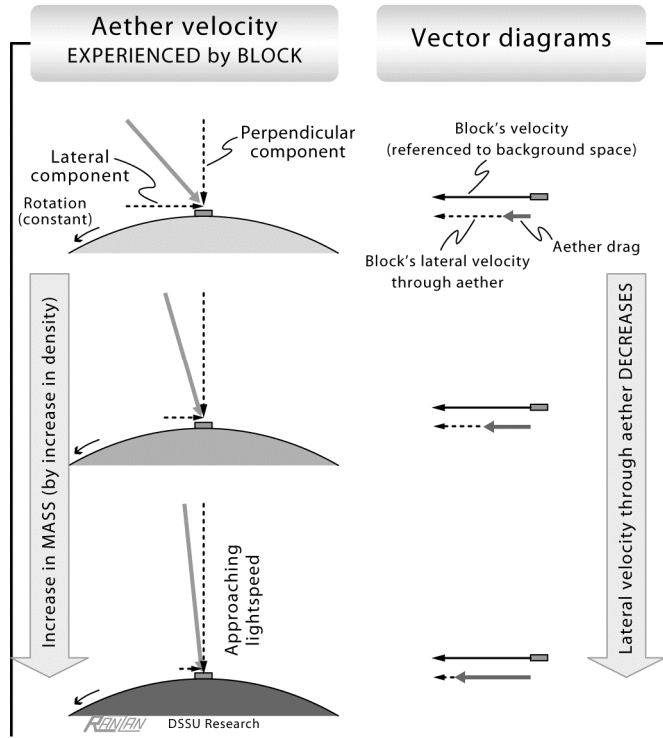

Fig. 7.   *Thought experiment examination of the relationship between rotational motion through aether and aether drag —and the implications for the centrifugal effect. The procedural sequence involves significantly increasing the gravitating body's mass content —without changing its physical size nor changing its rate of rotation. Consequently: (i) the quantity of aether flowing in must increase. (ii) The test block experiences an increase in perpendicular aether flow and a decrease in lateral flow. (iii) It is noted that the test block's velocity with respect to background space is equal to the sum of its lateral velocity through aether and the aether drag —the lateral velocity of the aether at the same location. (iv) Since the centrifugal effect depends on the lateral motion/velocity through aether (and not on the motion through background space, which motion remains constant throughout the experiment), the block experiences a diminishment of the centrifugal effect.*

Why is all this considered an amplification effect? Aether drag reduces the rotational motion *through* aether. Motion through aether is what is restricted by special relativity; and rotational motion through aether is what determines the intensity of the centrifugal effect. An increase in aether drag, then, causes a reduction in the centrifugal effect. Finally, because a reduction in the centrifugal effect simply means that the mass body can tolerate a higher spin rate before overcoming gravity and flying apart, it follows that aether drag increases the intensity of gravity. Simply put, aether drag causes mass to become more tightly bound together —it acts as an amplifier of gravity.

The rotational "drag" effect is summarized in **Table 3**, which includes a comparison with the general view for non-aether theories.

Table 3.   *Comparison of the rotational "drag" effect between aether and non-aether theories. In non-aether gravity theories, it is called the frame-dragging effect, but is not associated with an increase in the intensity of gravity.*

Aspects of structure rotation	Aether drag (Aether vortex)	Frame drag (non-aether theories)
Centrifuge mechanism:	■ Reduction in centrifugal effect ■ In the extreme case, a total cancellation	No reduction
Rotation limit: Drag limit:	No limits for Superneutron Stars	Equatorial speed limited to c
Implication for gravity:	Tends to increase the intensity of gravity	No increase in intensity

The next experiment examines the situation of a planet in circular orbit about a white-dwarf star. Two configurations are considered and subjected to analysis: In one, the star is NOT rotating and the planet's orbital period is one whole day. In the other, the star is rapidly rotating and the planet's orbital period is only one-half day. Essentially, the central mass and the orbital radius remain constant for both situations —only the star's spin and the observable orbital period are different. See **Fig. 8**.
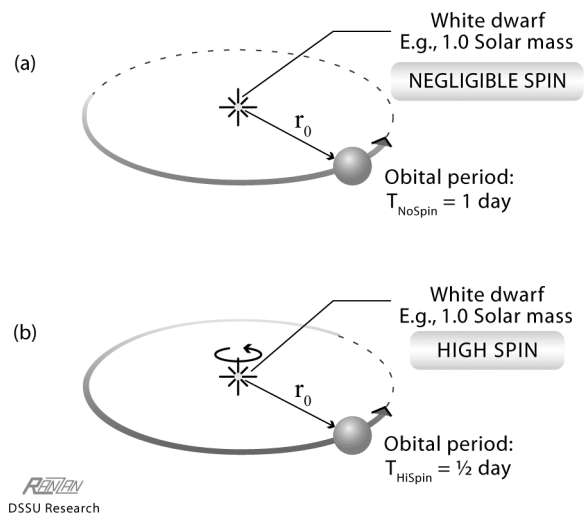

Fig. 8.   *For the negligible-spin configuration (a), Newtonian and Keplerian equations work admirably. From the details of the orbit, the mass of the star can be calculated. Not so for configuration (b). When the star spins, thereby generating an aether vortex, conventional methods allow only the calculation of the apparent mass. High spin rates can significantly change the orbital period and radically increase the apparent mass (compared to the actual mass value). As described in the text, the calculated apparent mass in part (b) turns out to be four times greater than the intrinsic mass.*

In order to make a meaningful comparison of the two configurations, we derive a simple equation for mass M in terms of orbital radius r and orbital period T. Thereafter, the concept of "apparent mass" is introduced so that the observable gravity-effect can be tied to the unobservable vortex-effect.

For uniform circular motion, as is the case for the orbiting planets (**Fig. 8**): $a = v^2/r$

Force is defined as mass multiplied by acceleration. So, the centripetal force experienced by each planet is $F_c = ma = mv^2/r$.

The "force" of gravity acting on each planet is $F_g = GMm/r^2$.

With no other forces acting, the gravitational and centripetal terms are equal and we have F_g equal to F_c , or,

$$\frac{GMm}{r^2} = \frac{mv^2}{r} . \qquad (28)$$

The orbital velocity v can be expressed in terms of the orbital period:

$$v = \frac{\text{(orbit circumference)}}{\text{(orbit period)}} = \frac{2\pi r}{T} . \qquad (29)$$

Equation (28) then becomes

$$\frac{GMm}{r^2} = \frac{m}{r}\frac{4\pi^2 r^2}{T^2} ; \qquad (30)$$

which simplifies to

$$M = \frac{4\pi^2 r^3}{GT^2} . \qquad (31)$$

For the situation shown in **Fig. 8a**, this can be expressed as

$$M_{\text{NoSpin}} = \frac{4\pi^2 r_0^3}{GT_{\text{NoSpin}}^2} . \qquad (32)$$

This allows one to accurately determine the star's mass.

However, this will not work for the "HiSpin" star. The HiSpin mass cannot be determined by this method. Of course, we already know that M_{NoSpin} equals M_{HiSpin}. It was, after all, specified that the same star is used in both configurations. But if we did not know this, there would be no way to calculate the mass with the basic equations of gravity (nor any other method to any reasonable degree of accuracy). Only the star's APPARENT mass value can be explicated in this way.

So, for situation (b) in **Fig. 8**, the expression is

$$M_{\text{apparent}} = \frac{4\pi^2 r_0^3}{GT_{\text{HiSpin}}^2} . \qquad (33)$$

Combining the last two equations gives

$$\frac{M_{\text{apparent}}}{M_{\text{NoSpin}}} = \left(\frac{T_{\text{NoSpin}}^2}{T_{\text{HiSpin}}^2}\right) ;$$

$$M_{\text{apparent}} = \left(\frac{T_{\text{NoSpin}}}{T_{\text{HiSpin}}}\right)^2 M_{\text{NoSpin}} . \qquad (34)$$

Now apply this to the specific example of **Fig. 8b**, in which there is significant rotation, hence vorticular drag. The orbital period for the "NoSpin" state is 1.0 day; and for the "HiSpin" state it is 0.5 day. And, for the sake of specificity, it is assumed that the mass of the white dwarf is 1.0 Solar mass. Then, the Newtonian law of gravity will predict an apparent mass-value of

$$M_{\text{apparent}} = \left(\frac{1 \text{ day}}{\frac{1}{2} \text{ day}}\right)^2 1.0_{\odot} = 4.0 \text{ Suns} .$$

In other words, using Keplerian or Newtonian calculations, one finds that the spinning Solar-mass white dwarf will have the same gravitational footprint as an inert four-Solar-mass body. Vorticular drag can have a powerful gravitational amplifying effect indeed.

The thing to note is that the orbital period astronomers may observe says nothing about how much of the motion is *through* aether and how much is *with* aether. If the central body's rotation rate and associated drag effect are unknown, then knowing the orbital period or the apparent orbital velocity cannot be used to determine the actual mass value (nor the centrifugal effect). Moreover, all this applies not only to contiguous bodies but also to large-scale gravitating structures.

It is this unknown aspect of vorticular motion that manifests as the biggest problem in the analysis of spiral galaxies. Namely, the observed rotation curves, of the rate at which stars orbit the galactic core, suggest that there should be much more mass present than is actually observable. In the words of science writer Tim Folger, "In every single [rotating] galaxy ever studied, the stars and gas move faster than Newton's laws say they should, as if gravity from a hidden mass in … the galaxy were yanking them along, boosting their speed."[11] Instead of recognizing the gravity amplifying aspect of the aether-vorticular effect, astronomers have reified the "missing" mass by concocting *Dark Matter*. In an effort to match the quantity of gravitating mass that should be there according to Newtonian gravity, the star-stuff accounting books are made to balance by cooking up huge amounts of mysterious matter.

4.1.1. Centrifugal Effect Reduction

Turning now to the most fascinating feature of the relationship between aether drag and the centrifugal effect; it can actually lead to the total cancellation of the latter.

The most fundamental condition for the manifestation of the centrifugal effect was famously demonstrated by Isaac Newton with his simple but ingenious bucket experiments.

His rotating and swinging water-filled buckets established the fact that the effect only manifests when there is rotation relative to the "background." Clearly, there was something special about the surrounding world. Motion relative to this "something" imparted an absoluteness quality to the motion and bestowed centrifugal forces.

Ernst Mach (1838-1916) reaffirmed the surrounding-world idea, but a true causal mechanism failed him. The centrifugal force is produced only if the rotation is relative to the surrounding universe; in his words, "relative to the fixed stars."

"For me only relative motion exists … When a body rotates relative to the fixed stars centrifugal forces are produced; when it rotates relative to some different body and not relative to the fixed stars, no centrifugal forces are produced."[12] In other words, for Mach, absolute motion is only meaningful in the sense of being relative to the universe as a whole.

Now, if Ernst Mach is correct, then the following argument must be true: Assume a body rotates; it can be a large or small body; it does not matter. If the universe were to rotate around the body, *at the same rate* about the same axis, then there would be no centrifugal effect. There would be no rotation "relative to the fixed stars"; and, therefore, there would be no tendency of recession from the rotation axis. The rotation would be quite undetectable.

Ernst Mach's assumption that the universe-as-a-whole is the special determining factor was wrong; and yet, the argument of centrifugal cancellation was correct. Mach and his contemporaries had overlooked an intermediary element.

In the modern view, there is a new determining factor, one that changes the way matter relates to the rest of the universe. It is not the distant stars that are important but, rather, the evanescent medium between the stars and between all bodies (and all particles). A body's entire "sensory" connection with the surrounding universe is by way of the universal space medium —the aether that empowers gravity. The entire universe need not rotate in lockstep for centrifugal cancellation. Only the body's local universe, the surrounding aether, needs to rotate in sync, in order to produce the same negating effect. When aether and body are rotating tightly together, the body will "believe" itself to be stationary. It will manifest no centrifugal effects.

It turns out there is one object —a type of collapsed star— for which this situation arises. It is an end-stage collapsed star; which means that it cannot undergo further collapse —not by the mechanism of gravity and not by any other mechanism. Its total mass and radius are fixed; only the rate of rotation and polar emission may vary. This unique type of object is called a Superneutron Star. The term "Superneutron" refers to the density of the star's matter, which may be greater than neutron/nuclear density. Its most relevant aspect as far as the centrifugal effect is concerned is that it has a critical-state surface, meaning that the aether inflow at this surface equals the speed of light. A Superneutron Star (SnS) has a no-escape boundary/horizon (except at the poles) [13]. And let me immediately clarify an important distinction: it

has no empty region within —it is NOT a black hole, it merely may look like one.

An enclosing lightspeed boundary —an unique situation for contiguous mass— means there is almost no way for mass or radiation to escape from a SnS. Wherever the boundary is active (which is everywhere except at the magnetic poles), there can be no centrifugal effect. Furthermore, regardless of the structure's spin rate, the centrifugal negation is total. See **Fig. 9**.
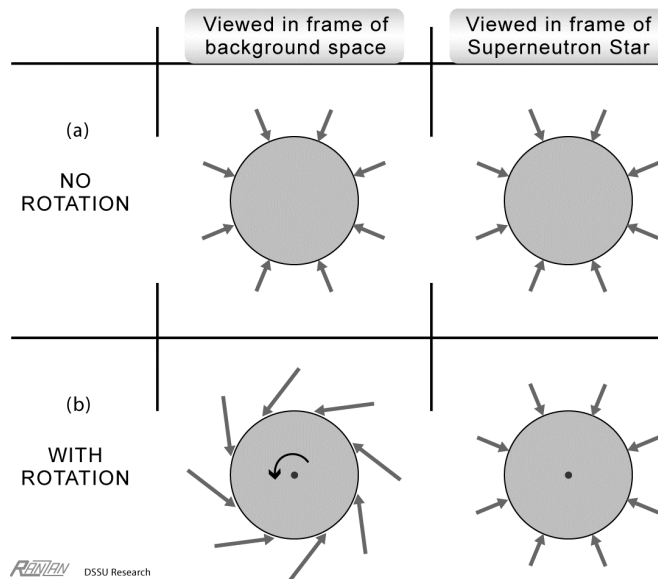

Fig. 9. *Unique in its ability to cancel centrifugal effects, the Superneutron Star (SnS) is shown from two perspectives. Row (a) shows a nonrotating SnS along with its aether flow vectors, as viewed in the background-space frame and in the SnS reference frame. Row (b) shows a rotating SnS with its aether flow, again as viewed in the background frame and in the SnS's own frame. From the perspective of the SnS, the direction of the aether streaming onto its surface is always perpendicular to the surface —regardless of rotation. The space medium inflow is perpendicular to the surface exactly as it would be if the body were not rotating. Hence, it is a situation of rotation with no centrifugal effect whatsoever.*

With the Superneutron Star, the intensity of gravity attains its ultimate manifestation. Nothing in nature equals or exceeds its surface gravitational acceleration.

The following discussion briefly addresses possible concerns regarding special-relativity issues, namely with respect to surface energy, subsurface mass, and superluminal rotation.

4.1.2. The Surface Situation

Aether streaming onto the SnS surface would seem to suggest a violation of relativity. And indeed, from the perspective of the rotating SnS, the aether is streaming onto its surface (streaming from a direction that is perpendicular to the surface) with the full speed of light. But relative motion of this magnitude between mass and aether is simply not possible. Such a situation cannot exist between surface mass and incoming aether. However, it can exist between surface energy and the incoming aether. For this reason, the

SnS's "surface" consists of pure radiant energy (photons and neutrinos) which does propagate at this speed. The photons and neutrinos propagate outward with the exact same speed that the aether is streaming inward. The result is a stationary energy layer —with no violation of physical law.

4.1.3. The Subsurface Situation

The energy layer is a voracious consumer of aether. The aether enters at lightspeed but emerges at less than lightspeed. Thus, when it penetrates the mass region it will do so in conformity with the special-relativity rule —as may be easily confirmed by doing a surface flow calculation for any concentric sphere having its "surface" in the interior (that is, having a radius less than the SnS's radius).

4.1.4. The Situation Regarding Unlimited Speed of Rotation

Once a lightspeed boundary forms on the surface of an astronomical structure, the structure totally loses its ability to sense its own rotation. The reason is straightforward. Aether is dragged along at the same tangential speed as that of the surface rotation (a speed that is maximum at the equator). Since aether itself is not subject to any speed restriction, it can spiral around a SnS and match the demands of any spin rate. Thus, the SnS can have an equatorial rotation speed —with respect to the background space— that far exceeds the speed of light. The special boundary is the key. It is the nature of the lightspeed boundary that prevents any contiguous structure from possessing or acquiring any circumferential motion (earlier called lateral velocity) *with respect to aether.*

4.1.5. Thickness of the Energy Layer

A related issue is the question of the thickness of the surface energy layer.

The basic argument is that as the aether passes through the energy layer a portion is absorbed/consumed by the energy particles so that upon leaving the layer the aether will have slowed to subluminal speed. But this raises a question regarding the structural nature of the boundary. What has to be appreciated here is that the energy layer is not a dimensionless boundary —it does have some thickness. The rate-of-flow decrease surely does not instantaneously bring the speed below lightspeed.

It may be argued that the thickness of the energy layer is more than microscopic. In other words, the aether inflow might well sustain its lightspeed and remain constant for some small-but-significant depth.

In the absence of matter being present at the lightspeed boundary, the speed of the aether would increase; this is exactly what physicists predict is the case for singularity-type black holes (although they use the term "spacetime," not aether). Picture, in the mind, the situation as shown in **Fig. 10a**. Each thin shell witnesses an incremental increase in the flow speed; rapidly, with no mass present to attenuate the flow, the speed rises far above lightspeed.

However, when occupied by matter (photons and neutrinos), these same thin shells absorb sufficient aether to cause a reduction in speed and compensate for the increase

that otherwise would have occurred. So, instead of increasing from c to $c + \Delta v$, it now remains at speed c. This process repeats for a number of layers as shown in **Fig. 10b**. Nonetheless, absorption and self-dissipation quickly attenuate the flow. Speed becomes subluminal. Aether enters the interior neutron-mass region.

Unfortunately, there seems to be no way of determining the thickness of the SnS's energy layer. My guess is that it is not more than a few centimeters deep. The only certainty is that the aether enters at lightspeed, slows as it penetrates the structure, and ends with a zero velocity at the center of gravity.
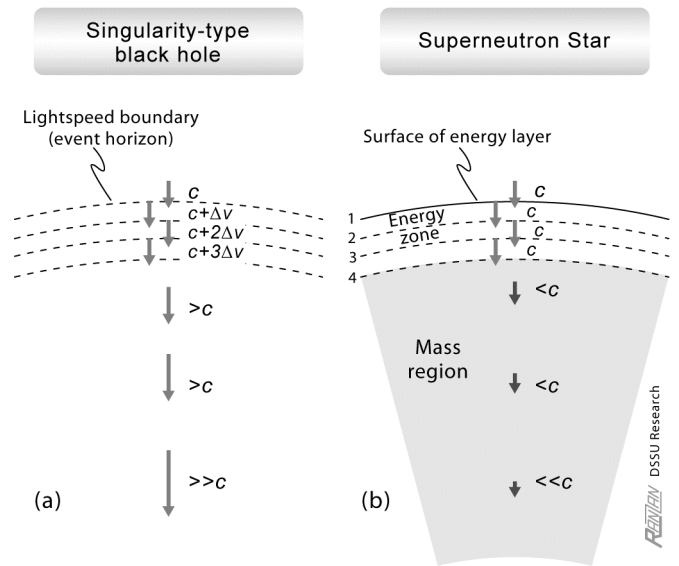

Fig. 10.   How thick is the energy layer? First examine the singularity situation. If the mass were concentrated at a central singular point, the space-medium flow would continue to increase after passing through the lightspeed boundary, as in part (a). In the contrasting case of the SnS as in part (b), each elemental surface layer consumes and self-dissipates a quantity of aether thereby reducing the flow velocity by Δv. For instance, during passage from surface (boundary 1) to boundary 2, a certain quantity of aether will vanish; so that at boundary 2, instead of a flow velocity of c + Δv, the flow will be (c + Δv) minus Δv, which equals net c. In other words, in (b) we remove the Δv increase that would have occurred under condition (a). This is done for a number of thin layers until at some depth the velocity becomes subluminal. (Velocities are with respect to the center of gravity or, equally valid, with respect to background space.)

4.2.   Vorticular Stress Effect

The universal medium interacts with the observable world via stresses placed upon it. In the context of the aether theory of gravity, this means that the medium becomes dynamic in response to the stresses of the material world; then, in its dynamic state, the aether interacts with the material world. As detailed earlier, the stress of mass causes primary gravitational acceleration; the stress of convergent flow causes additional gravitational acceleration; and the stress of cosmic tension causes the gravitational acceleration to be extended beyond the Newtonian domain (**Fig. 6**). In addition

to the compression and tension stresses, there is also a shear stress. When aether is dragged into vorticular motion it suffers shear stress.

Aether is a fluid, albeit a nonmaterial one. It is the nature of fluids that when undergoing vorticular or torsional motion there will be laminar flow —layer upon layer each moving with slightly different speed.[B] When one layer of the aether fluid is made to slide over another, each will exert an action against the other in opposition to the relative movement —that is, a tangential force/stress will act against the sliding motion. It is this tangential "force" that is identified with the shear stress suffered by the aether. Another attribute of the laminar flow is that the stress is proportional to the speed with which the successive layers slide over each other. The faster a gravitating body rotates, the greater is the shear stress. And, as is the nature of aether, it responds to the stress by intensifying its self-dissipation.

Thus, there is an augmentation of the self-dissipation caused by convergent-flow stress (compression stress) with the dissipation caused by torsional-flow stress (the shear stress). Although it is being called a shear stress, it is, on the microscopic scale, really not much different than a compression stress —a condition where aether units are being pushed together.

Before explaining how shear stress affects orbital motion, it is worth pointing out that the previously described vortex-drag effect does not involve an energy change, that is, it does not entail any additional change in the self-dissipation of aether; however, the vorticular stress effect does. Aether dragging, in and of itself, does not involve a change in energy at the fundamental level; but the shear stress that accompanies it does.

The shear-stress-induced additional self-dissipation of aether causes an intensification of gravity and this, in turn, causes otherwise circular and elliptical orbits to become inward-spiral orbits. It is this added boost to gravity that causes the inward spiral of stars in rotating systems and the merger spirals of close binaries.

The classic example of this is the neutron binary discovered in 1974. The pair has a mutual orbit that is about the same as the diameter of our Sun and has an orbital period of 7.75 hours. Precise orbital timing measurements were made possible because one of the neutron stars, named PSR 1913+16, is a pulsar. Since its discovery in 1974 (for which Joseph H. Taylor, Jr. and Russell A. Hulse were awarded the 1993 Nobel Prize in Physics) over many years, the stars in this binary have been observed spiraling inward at an increasing rate. The mutual orbital period has been shortening as the separation distance has been diminishing [14]. "Taylor and his colleagues have been able to follow the evershortening [sic] separation of the two stars and the ever higher speed they attain as they slowly spiral in toward an ultimate catastrophe some 400 million years from now."[15]

Assuming that the significant spin is being generated solely by the PSR 1913+16 pulsar, then it may be said that the pulsar is inducing the shear stress and is therefore responsible for the spiral orbit. If its partner also has a high spin rate (which for some reason is not detectable), then it will share the responsibility.

It should also be mentioned that a binary system is responsible for producing another gravity effect —gravity waves.

Historical note on torsion stress.   The discovery of torsion —called the "fifth force"— is generally credited to research done by Russian professor N. P. Myshkin (with the physical-chemical society) in the late 1800s [16]. In 1913, the historical record notes that the first theoretical works devoted to a theory of gravitation containing a force relating to a twisting movement through the fabric of spacetime was performed by Dr. Eli Cartan. He termed this force "torsion." Cartan's gravitation theory, however, never obtained support [17]. Although Eli Cartan was a colleague of Einstein, the torsion idea did not catch on; and so, Einstein's gravitational theory turned out to be free of torsion [18]. Even though General Relativity describes gravity as a curvature of space resulting from stress induced by various forms of energy, torsional stress is missing. It stands as another example of the incompleteness of the theory.

Recapping: Both the vorticular-drag effect and the vorticular-stress effect tend to amplify the intensity of the gravity of the rotating body or structure; they just do it in different ways. One does it by weakening the centrifugal tendency; the other does it by intensifying the aether self-dissipation. These are clearly predicted by the aether theory of gravity.

Non-aether gravity theories make no such predictions. The reasons? (i) While the aether theory sets the rotation speed limit with respect to the aether medium, which itself partakes in the rotation to varying degrees, the non-aether theories set the rotation speed limit with respect to undefined space. In other words, the aether theory has virtually no rotational speed limit with respect to background space; non-aether theories, on the other hand, are strictly limited to the speed of light. (ii) Without aether, there obviously can be no space-medium self-dissipation. And without stress-induced vanishment, there can be no torsional stress effect. General relativity, notably, has no torsional property pertaining to the "distortion" of space. (iii) Aether is essential for the most fundamental reason. No realistic models for gravity (or the universe itself) are possible without incorporating a subquantum process of energy. This requires a subquantum medium.   But as things stand, the conventional wisdom has no such medium and no conception of a subquantum process of energy —particularly, no process for aether self-dissipation.

[B] For an analogy, one only needs to look at the shear disturbances generated in the atmosphere of the planet Jupiter and resulting from just the rotational differences in latitude.

5.   Gravity Waves

An axiomatic property of DSSU aether is that it strives to maintain a constant spacing density of its constituent subquantum entities. It is not an inflexible constant. Some very small deviations do occur. For instance, when aether is stressed towards a greater-than-normal spacing density, the self-dissipation process becomes active and maintains the spacing in conformity with the tolerance range. The greater the stress, the greater is the quantitative vanishment of aether units. On the other hand, when aether is stressed towards a lower-than-normal spacing density, there will be an emergence of new aether units in an ongoing effort to maintain the normal spacing value. This is what happens in the cosmic Voids where new aether emerges in reaction to the tension stress induced by the surrounding galaxy clusters.

As long as there is this tolerance range in the spacing density, it follows that the universal space medium has the ability to convey waves of compression and rarefaction. Although these are waves in a nonmaterial medium, they are analogous to those of a material medium. And in this sense, they are the acoustic waves of our Universe; and are, no doubt, extraordinarily weak.

The two mechanisms for the generation of these acoustic-like waves: One involves imploding-exploding stars and generates spherically propagating waves of compression and rarefaction. The other mechanism requires orbital motion, most commonly close-binary systems. Orbital motion produces outwardly spiraling acoustic waves, in aether. They are most intense in the orbital plane of the source and diminish to irrelevance along the axis of revolution.

Gravity waves are longitudinal waves of compression and rarefaction in the aether medium itself. Continuous wave patterns are generated by gravitating bodies in orbital motion. (See **Fig. 11**.) Being the weakest of all the gravity effects, gravity waves require significantly massive binaries with extreme rates of barycenter spin or mutual orbital motion. For the waves to carry energy and have any effect on the immediate surroundings, the masses need to be neutron stars or supermass structures.

Aether gravity theory predicts that waves have a limited ability to propagate energy. Gravity waves carry energy only to the extent that there is aether self-dissipation within the compression phase of the wave. This is an inviolate requirement of the DSSU fundamental definition of energy. If the waves become so weak that there is no loss of aether, then the gravity wave can no longer be said to carry energy. If the density of the compression phase lies within the aether's spacing tolerance, then there will be no aether vanishment —no energy manifestation. This, however, does not in itself mean that the waves have become undetectable. Nor does it mean that the waves stop propagating. It simply means that if such waves are detected, then it would represent an observation at the subquantum level of existence. It would be the detection of the acoustics of the subquantum medium.
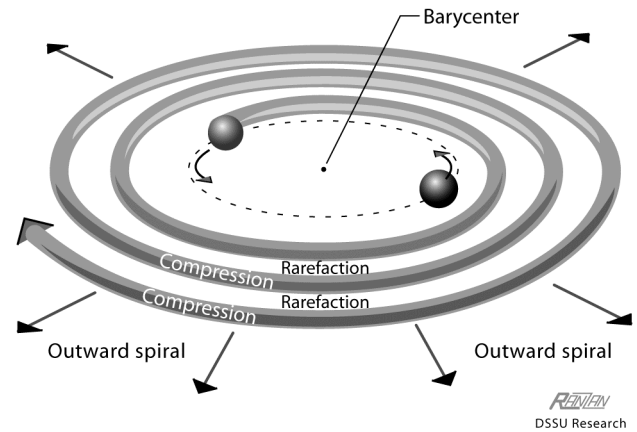

Fig. 11.   *Orbital motion generates acoustic-like waves in the universal space medium. These gravity waves propagate outward in spiral pattern of compression and rarefaction (of the aether). The waves, which presumably travel at the speed of light, are most intense in the plane of the orbital system and diminish to zero at the axis of revolution. (For the sake of clarity, only the waves generated by one of the stars are shown.)*

In 2015, on September 14, two highly sensitive Earth-based interferometers, known as the Advanced LIGO gravity wave detectors, recorded the signature signals of the merger of two large-mass black holes. One had a calculated mass equivalence of 36 Suns and the other 29 Suns, as determined from a computer simulation of the merger Event. Researchers turned to the simulation, which provided an idealized reconstruction of the many high-speed cycles of the spiral orbits, because only a small part of the merger was actually detected. There simply was not enough useable data.

It was reported that "LIGO saw only just over one cycle of the Event's ringdown waves before the signal became buried once more in the background noise …" The hope is for "LIGO [to] detect black-hole mergers that are larger than this one, or that occur closer to Earth than the Event's estimated distance of 1.3 billion lightyears, and thus give 'louder' waves that stay above the noise for longer."[19]

Following the initial 2016-February publication of the Event, there have been several other reported gravity wave observances, including one supplemented with optical data. It is therefore reasonably safe to assume the phenomenon is real.

Given the vast distance of the source at 1,300,000,000 lightyears; and the diminishment of the effect by the inverse square rule over that great distance; and the extraordinary weakness of the waves in the first place; and the relative quickness with which the compression wave would weaken and settle within the stress-tolerance range; it seems highly probable that the detected waves were not gravitational *energy* waves but rather subquantum-level gravity waves.

The 2015 Advanced LIGO event may very well have been the first direct detection of a subquantum nonenergy phenomenon —the reception of a signal outside the normal domain of energy. The source event, the spiral merger, was an energy generating/transmitting phenomenon; however,

during the transmission of the signal (the gravity waves), its intensity fell below the range of definable energy. From that point onward, the waves' compression phase no longer induced any self-dissipation and, therefore, by definition, the gravity waves carried no energy. Nevertheless, the remnant gravity waves continue to propagate and, if the instrumentation is sufficiently sensitive, may be detected at the subquantum level.

Rotating systems may generate gravitational energy waves but what are detected are the ghostly nonenergy remnants.

The key points regarding gravity waves as they pertain to the aether theory of gravity:

First and foremost, they are spatial-density waves of the nonmaterial aether generated by orbital motion. Gravity waves are longitudinal waves; they propagate as phases of compression and rarefaction in the aether medium itself.

Second, they "carry" energy only to the extent to which the process of aether self-dissipation accompanies the compression. They are energy waves only while there is a loss of aether units.

Third, energy conveying gravity waves represent a THIRD form of stress-induced self-dissipation of aether. (The other two are convergent stress, and vorticular/torsion stress.)

Fourth, as wave intensity decreases with distance from the source they eventually become gravity waves at the sub-energy level.

6. Summaries and Concluding Comments

6.1. The Stress and Strain in Gravity Theory

According to Einstein's gravity theory, matter produces a stress in the region (in the spacetime fluid) over which it has influence. As any structural engineer knows, stress is accompanied by strain —meaning that there is some form of deformation. The strain —the deformation— that the spacetime fluid of general relativity theory produces comes in the guise of spacetime curvature. The presence of mass somehow determines, in a systematic way, the numerical values of the spacetime coordinates of a region. Those values represent curvature —a purely geometric concept— and are interpreted as being equivalent to gravity.

Quoting textbook author, Edward R. Harrison, "The Einstein equation of general relativity states that the curvature of spacetime is influenced by matter; or the strain of spacetime is stress produced by matter. … We can interpret the Einstein equation to mean that curvature is equivalent to gravity."[20]

In the tradition of Pythagoras and Plato, the curvature numbers, the abstractions of spacetime geometry, are elevated to a status more real than the mass objects and the space medium and its motions.

Mass produces stress. Under the general relativity paradigm (**Fig. 12**, left column), the resulting strain manifests as spacetime curvature. But in the Dynamic Steady State

Universe, the strain manifests as space-medium contraction or as space-medium expansion (depending on location within a total gravity cell). See **Fig. 12**, right column.
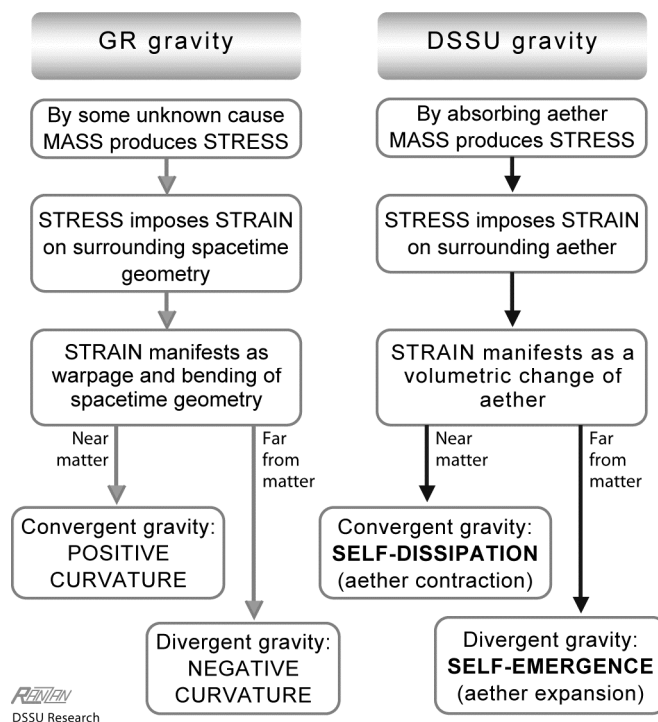

Fig. 12. *How stress and strain fit into fundamentally different gravity theories. General Relativity treats matter as a form of stress that produces geometric strain —the strain of curvature of space. Under this geometric view the strain manifests as either positive or negative curvature. The DSSU aether-gravity theory treats matter as the primary stressor of aether. The resulting strain on the surrounding aether manifests as either medium self-dissipation (aether contraction) or as medium self-emergence (aether expansion).*

When the vacuum of outer space (*spacetime* in one theory, *aether* in the other) is undergoing strain, it means there is a self-interaction taking place. Edward Harrison again: "*Self-interaction of space is the essence of general relativity.*" [21] It is something the vacuum is doing on its own. And what is the mechanism of this self-interaction? In the theory Harrison is describing, it is an interaction of geometric curvatures —abstract strain of a mathematical spacetime. In the theory that underlies the DSSU, it is space medium contraction, the *self-dissipation* of aether; it is also medium expansion, the *self-emergence* of aether.

6.2. Summary of Stresses

The table below (**Table 4**) summarizes the major stresses to which the universal medium is subjected.

Mass (and energy particles) represents the most concentrated manifestation of stress in aether. Because of its tendency to aggregate, it is the primary stressor and therefore, the primary cause of gravitation. Aggregated mass causes a secondary stress on the surrounding aether; and on the largest

Table 4.   *Summary of the major stresses to which the universal medium is subjected.*

Primary stress (Concentrated stress)	Secondary stress (on surrounding aether)	Tertiary stress (across cosmic Voids)	Torsion stress (Shear stress)
⇓⇓	⇓⇓	⇓⇓	⇓⇓
Manifests as MASS (& energy particles) —the PRIMARY ABSORBER of aether	Manifests as negative aether strain: SELF-DISSIPATION	Manifests as positive aether strain: SELF-EMERGENCE	Manifests as negative aether strain: More SELF-DISSIPATION
⇓⇓	⇓⇓	⇓⇓	⇓⇓
PRIMARY CAUSE of GRAVITY	CONVERGENT GRAVITY	DIVERGENT GRAVITY	GRAVITY INTENSIFIER

scale, it causes a tertiary stress across cosmic Voids.

Rotating mass augments the secondary stress with the additional stress of torsion.

In each and every one of these stress situation there is a volumetric change of aether.

6.3.   *The Unifying Factor*

The DSSU aether theory of gravity is based on a mechanical (discretized) aether consisting of nonmass, nonenergy, fundamental units —entities described as subquantum pulsators. It has a unique property that is rooted in the belief that any theory of gravity founded on aether or any other type of "fluid" medium, material or evanescent, must incorporate some mechanism for a volume reduction when modeling convergent gravity. DSSU gravity does this by way of a stress-induced process of self-dissipation and a postulate of *constant spatial density*. By the process of self-dissipation, aether maintains an innate spatial density (among its discrete units).

Table 5.   *Aether theory of gravity. The various gravity effects are identified with stresses in the aether and the aether's response to those stresses. One factor acts as a unifier.*

Gravity component	Type of stress involved	Aether response
Convergent effect:	Compression (convergent flow stress)	Vanishment (self-extinction)
Divergent effect:	Tension (cosmic tension)	Emergence (expansion)
Vorticular drag effect:	n/a	Spiral inflow
Vorticular stress effect:	Shear (laminar flow stress) (compression at the microscale)	Vanishment
Wave effect (energy carrying):	Compression in compaction phase	Weak vanishment
Wave effect (no energy):	Subquantum	No vanishment

But the maintenance of aether density goes beyond familiar convergent gravity. It is the determining Factor for how different stresses produce the various gravity effects listed in **Table 5**.

While for convergent gravity, the Factor causes aether contraction; for divergent gravity, the Factor causes aether expansion. In the case of the vorticular stress, the Factor causes an amplification of gravity (by additional aether contraction). Lastly, the Factor makes possible gravitational energy waves and sub-energy gravity waves (depending on the intensity of the cyclic stress-disturbance of aether).

Such is the nature of gravity where we have this one Factor underlying gravity's convergent, divergent, vortex, and wave effects. It is the key to the unification.

6.4.   *Theory Subsummation*

Aether-based gravity is a broader theory —a theory able to accomplish considerably more than Newtonian gravity and more than Einstein's gravity. Newtonian gravity does not work for cosmic Voids and spiral galaxies; general relativity fails for spiral galaxies and black holes. And they both fail when it comes to explaining cosmic-scale cellularity. Aether gravity works for all cases.

It is the antidote for the bafflement burdening physical-science thinkers implementing the incomplete, poorly constructed, overly extrapolated, and even plainly wrong, theories of the previous century. Physicist Janna Levin expresses the predicament this way,

> *"Is there a theory beyond Einstein's that will avoid the ugliness of infinite singularities; a theory that can handle … black holes without becoming singular? … We're inspired by the predictions of relativity to look for an even greater theory, a theory that looks like Newtonian gravity when gravity is weak and looks like general relativity when gravity is strong, but may look entirely different when gravity is strongest."* –J. Levin, *How the Universe Got Its Spots*

When gravity is based on aether, it leads to a deeper understanding of the Universe itself. It provides the explanatory details underlying the observable systematic patterns of our Cosmos —the grand structural features of our *steady-state cellular universe*. Its applicability extends to

infinity, yet avoids the ugliness of the infinity paradox.

DSSU gravity encompasses a full range of manifestations, from autonomous cosmic gravity domains, down to the maximum compaction and intensity of Superneutron Stars *without becoming singular*.

<p style="text-align:center">*   *   *</p>

Appendix: Basic Aether-Inflow Equation

"Pure logical thinking cannot yield us any knowledge of the empirical world; all knowledge of reality starts from experience and ends in it." –Einstein's Herbert Spencer Lecture of 1933

Let us follow Einstein's somewhat ironic advice and see what the test mass, shown in **Fig. A1** resting at the surface of a large mass (an isolated-and-free-floating body), is "experiencing."
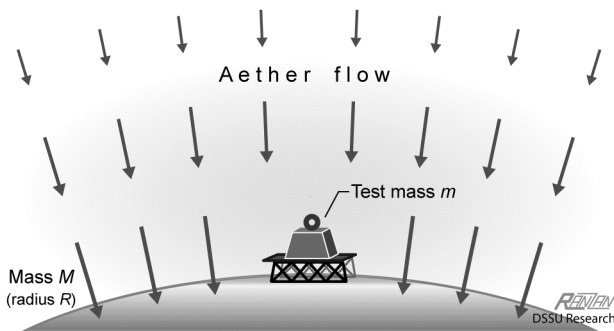

Fig. A1.   *Aether streams and accelerates towards and into the large mass. The "stationary" test-mass "experiences" the inflow acceleration as a gravity effect. And it "experiences" the inflow speed as aether-referenced motion according to the formula $(2GM/r)^{1/2}$.   (The large body is assumed to be at rest within the universal medium.)*

Although seemingly motionless, the object is experiencing acceleration. From one perspective, the test mass is being accelerated upward (into the aether) by the platform on which it rests. But from an equally valid perspective, the inflowing aether is accelerating the test mass downward toward the center of gravity. The downward acceleration of the aether is perfectly balanced by the upward acceleration of the test mass, as evident by the lack of motion (with respect to the surface).

The accelerating flow of the aether —the radially inward inhomogeneous flow— is the essential cause of the acceleration "experienced" by any object that is prevented from falling.

The object's upward acceleration a (through aether) multiplied by its mass gives the expression ma, which is a force (by definition) —an upward force experienced by the test mass m. So, the platform is applying an upward force.

But of course, the test mass is also experiencing a downward force of gravity. We don't need to define what this force of gravity is, we just need its empirical representation. Newton found that the gravitational force between M and m, having a distance r separating their centers-of-mass, was proportional to Mm/r^2. With the addition of the constant of proportionality G, the downward force equals GMm/r^2.

And since the object is stationary in the frame of the large body (with mass M), the two forces must be equal (and oppositely directed). Which means

$$ma = -G\frac{Mm}{r^2}\,;\qquad\text{(A1)}$$

$$a = -G\frac{M}{r^2}\,,\text{ where } r{\geq}R\text{, the radius of }M.\qquad\text{(A2)}$$

Replace a with its definition $d\upsilon/dt$ and apply the chain rule:

$$\frac{d\upsilon}{dt} = \frac{d\upsilon}{dr}\frac{dr}{dt} = -\frac{GM}{r^2}\,.\qquad\text{(A3)}$$

Then replace dr/dt with its identity υ, rearrange terms, integrate, and solve for the velocity:

$$\int \upsilon d\upsilon = -\int \frac{GM}{r^2}dr\,;\qquad\text{(A4)}$$

$$\frac{\upsilon^2}{2} = -\frac{GM}{-r} + C\,.\qquad\text{(A5)}$$

Now, since the test mass (in **Fig. A1**) is stationary, located as it is at a fixed distance to the center of the large body, it means the velocity in the equation must be with respect to the aether. Again, there are two perspectives here: The aether is streaming *downward* past the test mass; or one could say, the small mass is travelling *upward* through the aether. Both interpretations are embedded in the equation (and are made explicit in the next set of equations). The integration constant C is a placeholder in case there is a *constant* inflow component present. But in practice, it can be dropped by noting that when the radial distance is extreme then obviously the aether inflow, due specifically to mass M, must be virtually zero. Thus,

$$\upsilon^2 = \frac{2GM}{r}\qquad\text{and}\qquad \upsilon = \pm\sqrt{2GM\big/r}\,,\qquad\text{(A6)}$$

where G is the gravitational constant (whose experimentally determined value is $6.673{\times}10^{-11}$ N·m^2/kg); and r is the radial distance (from the center of the mass M) to any position of interest (at the surface of M, or external to M). The positive

solution expresses the upward motion of the test mass *through* the aether (in the positive radial direction). The negative solution represents the *aether flow velocity* (in the negative radial direction) streaming past the test mass.

The negative solution represents a spherically symmetrical inflow field —giving the speed of *inflowing aether* at any radial location specified by *r*.

In vector form: $\quad \vec{v}_{\text{flow}} = -\sqrt{2GM/r} \times (\vec{r}_{\text{unit}})$.   (A7)

When a background aether flow is also present, as happens with objects within galaxies, the expression is

$$\vec{v}_{\text{net flow}} = -\sqrt{2GM/r} \times (\vec{r}_{\text{unit}}) + \left(\vec{v}_{\text{background}}\right) . \qquad (A8)$$

A more detailed analysis of aether flow, in which a second gravitational constant "α" is included, is available in the works of physicist Reginald T. Cahill [Index of Research Papers: www.mountainman.com.au/process_physics/index_of_papers.htm (accessed 2018-8-27)].

In conclusion, it is fitting to say that mass "experiences" gravity as the dynamic flow of aether.

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