# DSSU Validated by Redshift Theory and Structural Evidence

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## Contents



**Abstract:** It is first shown that the Expanding universe model rests primarily on one pillar; then its grave weakness is revealed. It is argued that since this lone pillar is founded on an incomplete explanation of the cosmic redshift, the superstructure it supports becomes unsustainable, and the cosmology model it underpins cannot be a representation of the real Universe. The recently developed cosmic redshift mechanism, based on a non-mass, non-energy, space medium (which serves as the luminiferous and gravitational substrate), is presented. It is a surprisingly elementary interpretation of cosmic redshift —one that was oddly overlooked in the history of modern astrophysics. According to the new interpretation, called the *velocity differential* redshift, wavelength elongation (and wave train elongation) can occur in both expanding *and* contracting portions of the universe. The immediate implication is that the radical extrapolation that leads standard cosmology to an expanding universe is avoided. In the course of the discussion a profoundly compelling cosmology unfolds. The model's predicted cellular structure is compared to observed cosmic scale structure, revealing a remarkable agreement and thus resolving some of the most intractable anomalies in modern cosmology/astrophysics. (Doi: http://dx.doi.org/10.4006/0836-1398-28.4.455 )

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**Keywords:** Cosmic Redshift; Photon Propagation; Gravity Cell; Dynamic Aether; Cellular Cosmology; Redshift Distance; Cosmic Structure; Galaxy Clusters; Gravity Domain; Big Bang; DSSU*.

* **Dynamic Steady State Universe (DSSU)** is the cosmology theory, based on a dynamic aether space-medium, in which aether continuously expands and contracts *regionally and equally* thereby sustaining a cosmic-scale cellular structure. It models the real world on the premise that all things are processes. Historically, it is the first *true* Steady State (SS) universe —SS nonexpanding, SS cellular, SS infinite, SS perpetual.

## 1. Heart of Modern Cosmology

### *1.1. Twentieth-Century Developments*

Chroniclers of the history of science invariably report that the expansion of the universe ranks among the greatest and most startling discoveries made in the 20th century.[1] The revolutionary finding involved several eminent experts working independently during the 1910s and 1920s. But the man most credited with the "discovery" was the American astronomer Edwin Hubble (1889-1953).[2] Oddly, no one, not Hubble or anyone else, ever received a Nobel Prize for the great discovery. After the publication of his historic 1929 paper, Hubble became a world famous, highly acclaimed, astronomer and continued studying the heavens for many more years, until 1953. For 24 years the Nobel staff had the opportunity to consider the merits and eligibility of the claims. Did the Nobel selection committee find the "discovery" too startling, too implausible? Because of the oath of secrecy committee members are sworn to, we will probably never know for certain. As it happened, Hubble was slated to be nominated for the award that final year. But it was too late. Hubble died of a cerebral thrombosis on the 28th of September 1953. The specifics of the work to be officially recognized are not known, due to the confidential nature of the discussions; but it is generally acknowledged that it was for the work in settling the Great Debate of 1923 by proving the existence of galaxies (then called *island universes*) beyond the Milky Way, and the contribution to the law of galactic redshift.[3]

Presumably the selection committee carefully examined the facts and found that there was no discovery of the expansion of the universe. What had been discovered was something called *the cosmic redshift*, commonly known at the time as the *astronomic redshift*. It was the culmination of years of research, into the functional variation in the wavelength of light from distant galaxies, conducted by Hubble and independently by several other astronomers including Vesto M. Slipher, the German Carl W. Wirtz, and the Swede Knut Lundmark; and also the American cosmologist Howard P. Robertson. What had been discovered, and was certainly deserving of Nobel honors, was a remarkable relationship between the spectral redshift of observed light and the distance of the source galaxy.

The discovery was the relationship between the degree of wavelength elongation and the cosmic distance of the light source —the greater the lightwave elongation (the more redshifting), the greater the cosmic distance. And the question in the minds of many was this: Was light being weakened during its journey? Or could it be that the galaxies were receding?

During the first half of the 20th century, the development of a theory of the universe was dominated by the realization that there are countless other island universes extant beyond our own *Via-Lactea* island and the discovery of the cosmic redshift —the apparent recession of distant galaxies.

The second half of the century witnessed the discovery of the background temperature of the universe and a growing awareness of the cosmic-scale cellular structure. During those decades the extent and regularity of a network of near-empty voids and interconnected galaxy clusters became incontrovertible.[4]

The cosmology that was constructed upon these discoveries was essentially an *expanding* universe —a universe of scattered galaxies but whose scattering was strangely inhomogeneous. The *apparent* recessional velocities that astronomers had discovered were interpreted as *actual* recessional motion. Hubble's cosmic redshift was interpreted as an expansion-of-space redshift. The cosmic background radiation (the temperature of the universe) was used to support the contention that the universe —originally in a superhot superdense state— had expanded until cooling down to its current 3 K. Everything seemed to fit the theory; however, there remained the question of the interpretation of the cellularity. Cellularity was a vexing issue. It didn't quite fit the expansion scenario and so was simply deemed to be a phenomenological feature, a chance regularity in the overall randomness inherent in universal expansion, a chance inhomogeneity in the competition between local gravity and global expansion. There was more.

Near the end of the century came one rather unexpected "discovery." Distant supernovae were found to be considerably farther away than had been predicted. This was, as it turned out, interpreted as evidence that the universe, instead of slowing down, was expanding at an increasing rate.

But something was not right; and to see where things went wrong, we must go back to those early years. Theorists, following the Hubble discovery, correctly understood that the expansion of space, or the space medium, causes the redshifting of light. In the search for a cause of the cosmic redshift they had examined other possibilities such as the *tired light* proposal of Fritz Zwicky (1898-1974), the *gravitational shift* predicted by Albert Einstein, and the basic *Doppler shift* associated with motion through space. But for sound reasons these were rejected as unimportant factors in the context of the cosmic redshift. There were other proposed redshift mechanisms; but they were either too speculative or easily discredited.

The *expansion of the space* (or space medium) between us and the distant galaxies was adopted as the overriding cause of cosmic redshift. The problem lies in what the theorists did next. In the face of enormous physical and philosophical obstacles, the *regional expansion* underwent a conceptual extrapolation into a fanciful expansion of the entire universe. The root of the problem in modern cosmology centers on this extrapolation. Once this commitment had been made, it was simply a matter of determining how the universe expands. Was it a steady state expansion, or an explosive expansion?

### *1.2. The Pillar of Twentieth-Century Cosmology*

The extrapolation of space expansion became the central pillar of $20^{th}$-century cosmology. In order to have a sound structure, one must have more than one pillar. So when Wilson and Penzias detected the background temperature of the universe, the discovery was immediately enlisted as evidential proof that the universe had expanded from some primordial hot-and-dense state. The cosmic microwave background radiation (CMB) became the second pillar. A Cambridge University website promotes the "Origin of the cosmic background radiation" as the second pillar of the "Hot Big Bang."[5] But it is not that easy. The CMB cannot be used as a pillar for a cosmology theory because it represents a feature that fits any cosmology whatsoever. It is simply the ambient temperature of the universe regardless of how one wishes to theorize about its nature. In one theory it is the "now" temperature of an evolving universe, in another theory it is the "now-and-forever" temperature of a steady state universe. To claim the CMB, the background temperature, as a pillar for one's cosmology is entirely bogus. It is comparable with finding one person guilty even though the evidence is equally damaging to all the other suspects of a crime. The other problem with this pillar is that, like the primary pillar, it incorporates an extreme extrapolation. In one, the regional space expansion is extrapolated to the entire universe; in the other, the 3-degree temperature of the present time is extrapolated to trillions of degrees associated with a fanciful creation scenario in the distant past.

The evidence commonly used in support of the Expanding universe is the fact of the darkness of the night sky —it resolves Olbers' paradox.[6] But why invoke such a radical explanation? Consider, if the universe were *not* expanding, the night sky would still be dark —as long as the cosmic redshift exists, *as we know it does*. The resolution of Olbers' paradox depends on the cause of that redshift, be it due to universal expansion, tired light, or some other mechanism. The relevant point is that night-sky darkness cannot serve as a pillar of an expanding universe. Night-sky darkness can just as easily support a non-expanding universe.

Also cited as evidence that the universe is expanding is the *time dilation* found in supernovae light curves.[6] Although great emphasis is placed on this evidence, it is essentially just another way of measuring the *cosmic redshift* whereby light waves are stretched in proportion to distance travelled. Not only are the waves subjected to elongation, so are the gaps between the waves. Waves, gaps, the time duration of events, and the duration of pulse sequences, all are stretched —including the complex patterns of pulses that constitute a supernova's emission profile. Although the evidence revealed in supernovae profiles cannot serve as proof of an expanding universe, it does serve to disprove *tired light* as the cause of cosmic redshift.

Then there were features of the astronomical universe that could not be made to fit the theory. The ever growing evidence of cosmic cell structure posed the biggest ongoing challenge. The observed universe, with its intricate voids-and-clusters-network, was just too orderly. Cosmologists kept asking, "how, if everything came flying uniformly out of the Big Bang, did it end up forming complicated structures like huge galaxy clusters and long filaments of galaxies?"[7] And as the decades passed, the degree of regularity of the cellularity became ever more apparent. The Expanding model desperately needed another supporting pillar, but there was no way the cosmic cellularity could be used to serve a model built around a cataclysmic chaotic expansion.

What about the other "evidence" cited in defense of the Expansion model? … Such as the abundance ratio of light elements to heavy ones, the variation in galaxy count distribution, and the supposed support that younger galaxies are more distant. It is interesting to note that in each and every case the available evidence is assigned an explanation of lesser plausibility than is actually available. (A typical example will be given in a moment.) The reason is simply that the model had been chosen early in the game and once chosen it had to be defended. The chance discovery of some obscure radiation in 1965 was heralded as the key evidence supporting a big bang —the CMB was invoked as the remnant evidence of a hot dense beginning. Evidence had been found and accepted as the long-sought proof; and ever since, there has been an unshakable dedication on the part of academic cosmologists. The interpretation of all observations must be within the bounds of the Expansion paradigm.

The interpretation of the small-scale anisotropy in the cosmic radiation is a good example. We are told that the angular power spectrum of the CMB anisotropy, which demonstrably exists at the several-parts-per-million level, is consistent with a dark-matter-dominated Big Bang that went through an inflationary-expansion scenario. Cosmologists claim this to be the best model, the best explanation.[6] In the constrained search for an explanation, the commitment to the paradigm takes priority and the physics is subordinated. And so they came up with an unknown hypothetical type of matter, *dark matter*, as well as an ultra-fast expansion process, *inflation*. Meanwhile, ignored or unrecognized was the elementary fact that cosmic cellular structure will always cause variation (anisotropy) in measurable radiation; large variation for relatively nearby structures and miniscule (parts-per-million) variation for ultra-distant structures.

When all is said and done, it is found that $20^{th}$-century cosmology rests solely on one pillar! The expansion-of-space pillar. As an eminent cosmologist stated, in his book *Masks of the Universe*: "The expanding space paradigm lies at the heart of modern cosmology."[8]

The viability of the pillar —the viability of 20th-century cosmology— depends entirely on the interpretation of the cosmic redshift. Amazingly, there was one explanation that no one noticed, a mechanism that no one took into account.

## 2. The Overlooked Cosmic Redshift Mechanism

*We must sometimes doubt what everyone is sure about.* –Cosmologist Edward R. Harrison

### 2.1. Nature of Space

Let it be quite clear, the expansion of *space*, or the dynamic growth of *the vacuum*, is a perfectly valid feature of the real World. Furthermore, there is no disputing the fact that space expansion causes light waves to elongate and that uniform space contraction causes light waves to shorten.

And let it also be clear regarding what is meant by "space." *Space* is the substrate of the universe; it is a *medium* with the ability to expand, to contract, and to conduct photons. The properties of expansion and contraction, being, as they are, in agreement with Einstein's concept of spacetime, are quite noncontroversial. Moreover, there should be no controversy with the idea of *space* as a medium for the conducting of light signals. Einstein asserted, in his Leyden University lecture of 1920, that "*there exists an aether. … space without aether is unthinkable; for in such a space there not only would be no propagation of light, …[etc]*"[9] and "*To deny the aether is ultimately to assume that empty space has no physical quality whatever.*"[10] Clearly, *space* is not some volume of emptiness; and clearly, aether has three highly-relevant properties. It should also be mentioned that the aether of the real Universe is not like the ones proposed in earlier centuries. Aether, as a medium, possesses no mass and, in its static state, has no physical energy. Although this too is in agreement with Einstein who noted that it is *not physically ponderable*, the difference is that for Einstein it was a geometrized continuum medium while its true nature is that of discrete entities.

Three important aether properties —the regional expansion of aether, the regional contraction of aether, and the luminiferous nature— along with a characteristic of light quanta are all woven into the new redshift mechanism. The properties were long familiar, but their connectedness was never properly recognized and remained unexploited. Theorists had missed a great opportunity to align modern cosmology with reality.

The problem of 20th-century cosmology is that one quite elementary interpretation of the cosmic redshift was overlooked. What theorists missed was the *velocity differential interpretation* as a causal mechanism of spectral shifting.

The velocity differential interpretation depends on (i) the fact that a quantum, or wave, of light has a longitudinal dimension, (ii) that it propagates within the non-material aether, and (iii) the fact that the aether is most everywhere in dynamic motion. The aether's dynamic motion is the inhomogeneous motion related to, and in fact defines, gravity. In other words, the new redshift interpretation depends on the three aether properties —luminiferous, expansion, and contraction— and the elementary fact that light possesses a wavelength (light propagates as transverse waves). The remarkable feature of the velocity differential redshift is that wavelength elongation can occur in both expanding *and* contracting portions of the Universe.

### 2.2. Cosmic Cell

Now, in order to explain how the new interpretation of the cosmic redshift works, a basic understanding of the cellular structure of the universe is necessary. This means turning to the cosmology theory of the DSSU, a non-expanding cosmos structured as stable non-expanding cosmic cells. Each individual cell consists of balancing regions of space expansion and space contraction. Aether, of course, is the active component; and let me emphasize, the cosmic cells do not, in any meaningful way, change in size. Each cell has a central region, or Void, which volumetrically dominates the cell; it is here that aether expansion occurs. The cell is bounded by galaxy clusters and "surfaces" where similar adjacent cells meet; it is here, at the galaxy clusters and interfaces, where aether contraction occurs. The DSSU should be understood as a representation of the real World, not as a mere conjectural model.

Obviously the regional expansion and contraction of aether involves a flow field —a flow of aether from the Void and toward (and into) the galaxy clusters. It is a flow from source region and into sink regions. The velocity of the flow, along an axis joining clusters on opposite ends of a cosmic cell, is shown in Fig. 1.

It should be pointed out that the cosmic cells are distinctly not convection cells. The flow of aether is *not* cyclical. The "source" is the axiomatic expansion of aether within the central Void of the cell; it may be thought of as a simple emergence process of the essence medium of the universe. The "sink" consists of two factors. All matter particles, mass or energy, act as the *primary sink*. The gravity fields surrounding all gravitating bodies and particles act as the *secondary sink*. The flow between source and sink constitutes a perpetual steady state balance.

### 2.3. Redshift Acquisition Within Contractile Zone

Now consider a photon propagating along such an axis (Fig. 1) from one galaxy cluster to another. Take a close look at the next figure, Fig. 2; it should be easy to see that the front end of the photon is moving forward faster than the back end. The front and back ends are, as a consequence, actually moving apart.

$$\begin{aligned}&\text{(Relative velocity between ends of photon)}\\ &= \textit{(vel of front end)} - \textit{(vel of back end)}\\ &= (c + \upsilon_1) - (c + \upsilon_2)\\ &= (\upsilon_1 - \upsilon_2) > 0\ . \qquad (1)\end{aligned}$$

Since $\upsilon_1$ is higher on the velocity scale than $\upsilon_2$, the expression must be positive. Hence, there is a velocity of separation between the two ends of the photon. Note, this is not a Special Relativity situation. Consider the question of where to place the "observer" to whom *the velocities to be summed* are to be referenced. An *observer* at the center of gravity (at $r = 0$, Fig. 2) obviously cannot see a receding photon. An *observer* riding the back end of the photon attempting to measure the change in the distance to the front end faces a different problem: Moving at the speed of light, his time stops and he will therefore be unable to measure anything. Moreover, Eq. (1) is not a relative motion in the conventional Einstein sense. The velocity difference is the consequence of the constancy of the speed of light with respect to the conducting medium —a medium whose own velocity is not exactly the same at the front and back ends of the photon. While the constancy of the propagation speed *is* a Special Relativity feature, the variation in the motion of the aether is not.

The point is: It is not an observable situation. Only the accumulated result is observable when the photon is eventually detected and its wavelength measured.

This moving-apart velocity of Eq. (1), the elongation of the photon wavelength, can be expressed as $d\lambda/dt$. Furthermore, it is proportional to the wavelength λ itself. That is, $d\lambda/dt \propto \lambda$. Expressed as an equation,

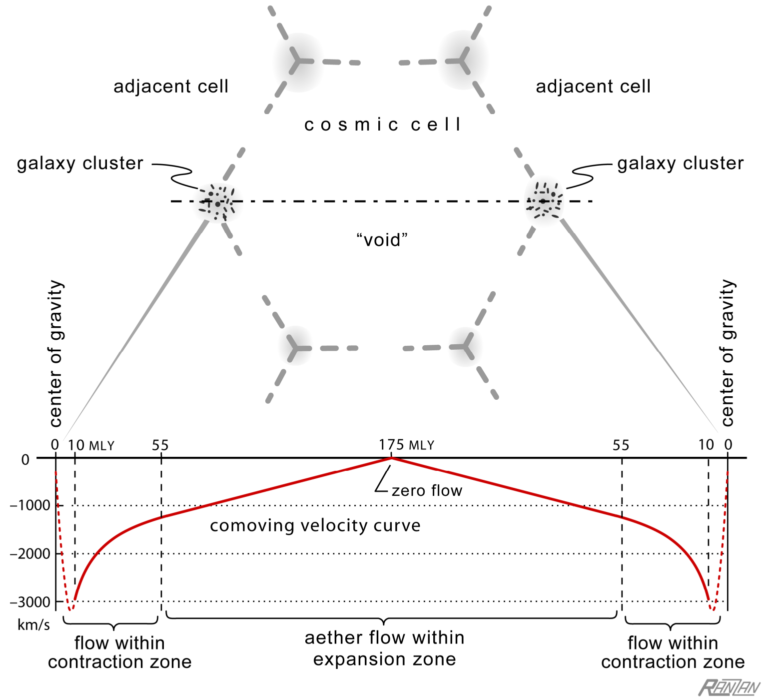


**Fig. 1.** Cosmic cell structure and associated aether flow. A cosmic cell is defined by its central region of space expansion and peripheral regions of space contraction. The associated velocity profile of the aether motion includes curved portions, in accordance with contractile gravity, and linear portions in accordance with homologous expansion (an antigravity effect). Note that each galaxy cluster's profile —or range of influence— extends 175 million lightyears (Mly) to the center of the "void." The cell's nominal diameter, therefore, is 350 Mly. (Cluster specs: $3\times10^{15}$ Solar masses; radius 10 Mly. The dashed portion is based on the unrealistic assumption that the cluster is completely homogeneous.)

$$\frac{d\lambda}{dt} = k\lambda\,, \tag{2}$$

where *k* is the parameter of proportionality, the fractional time-rate-of-change parameter, and

$$k = \frac{1}{\lambda}\frac{d\lambda}{dt}\,. \tag{3}$$

Notice, in Fig. 2, that the photon's wavelength is $\lambda = (r_1 - r_2)$. And $d\lambda/dt$ is simply the velocity difference between the photon's two ends, which difference, from Eq. (1) above, is $(\upsilon_1 - \upsilon_2)$. Then,

$$k = \frac{(\upsilon_1 - \upsilon_2)}{(r_1 - r_2)}\,, \tag{4}$$

which, by definition and by simple inspection, is just the slope of the curve (in this case, the aether-flow velocity function).

The expression for approximating the aether-flow velocity, as derived in the research article *Cosmic Redshift in the Nonexpanding Cellular Universe: Velocity-Differential Theory of Cosmic Redshift* [11], is

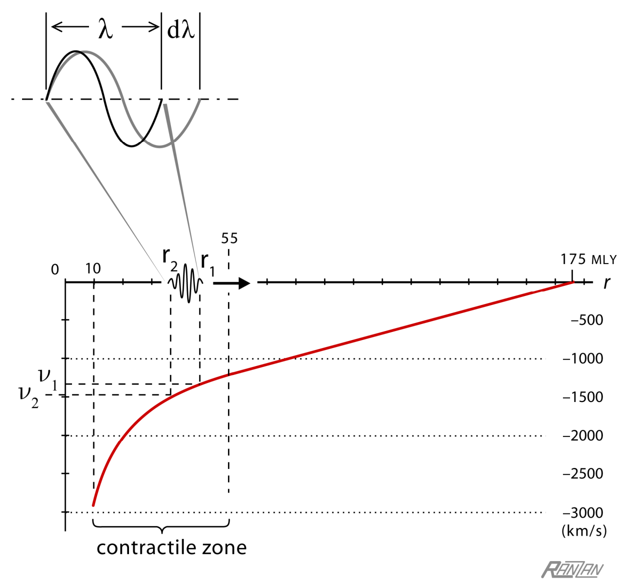


**Fig. 2.** Photon elongation during outbound propagation through the contractile zone surrounding the galaxy cluster. The photon is being conducted by a space medium whose speed-of-inflow decreases with radial distance. As a result, the front and back ends of the photon "experience" a flow differential.

$$\upsilon_{\text{aetherflow}} = -\sqrt{2GM_{\text{CL}}/r}\,, \tag{5}$$

where $r \geq$ (radius of cluster "surface"), $G$ is the gravitational constant, and $M_{\text{CL}}$ is the mass of the cluster.

The expression for the slope of the velocity curve is just the derivative

$$\frac{d\upsilon}{dr} = \frac{d}{dr}\left(-\sqrt{2GM_{\text{CL}}/r}\right) = \frac{1}{2}\sqrt{2GM_{\text{CL}}}\left(r^{-3/2}\right). \tag{6}$$

Thus the slope $k$ can be expressed for any radial location, $r$, as,

$$k(r) = \frac{1}{2}\sqrt{2GM_{\text{CL}}}\left(r^{-3/2}\right). \tag{7}$$

With the substitution of Eq. (7) into Eq. (2), the λ growth expression becomes

$$\frac{d\lambda}{dt} = \frac{1}{2}\sqrt{2GM_{\text{CL}}}\left(r^{-3/2}\right)\lambda\,, \tag{8}$$

or equivalently (by using the chain rule)

$$d\lambda\frac{dr}{dt} = \frac{1}{2}\sqrt{2GM_{\text{CL}}}\left(r^{-3/2}\right)\lambda dr\,. \tag{9}$$

But *dr/dt* is just the speed of the photon itself, the speed of light $c$; and so

$$\frac{d\lambda}{\lambda} = \frac{1}{2c}\sqrt{2GM_{\text{CL}}}\left(r^{-3/2}\right)dr\,. \tag{10}$$

The wavelength, as a function of radial distance along the cluster-to-cluster axis, is found by simply integrating Eq. (10):

$$\int_{\lambda_i}^{\lambda_f}\frac{d\lambda}{\lambda} = \frac{1}{2c}\sqrt{2GM_{\text{CL}}}\int_{ri}^{rf}\left(r^{-3/2}\right)dr\,. \tag{11}$$

$$\ln\lambda\Big|_{\lambda_i}^{\lambda_f} = \frac{1}{2c}\sqrt{2GM_{\text{CL}}}\left(-2r^{-1/2}\right)\Big|_{r_i}^{r_f},$$

$$\ln\lambda_f - \ln\lambda_i = -\frac{1}{c}\sqrt{2GM_{\text{CL}}}\left(r_f^{-1/2} - r_i^{-1/2}\right),$$

$$\ln\left(\frac{\lambda_f}{\lambda_i}\right) = \frac{1}{c}\sqrt{2GM_{\text{CL}}}\left(r_i^{-1/2} - r_f^{-1/2}\right),$$

$$\frac{\lambda_f}{\lambda_i} = \exp\left(\frac{1}{c}\sqrt{2GM_{\text{CL}}}\left(r_i^{-1/2} - r_f^{-1/2}\right)\right). \tag{12}$$

With $c = 3.0\times10^8\ \text{m}\cdot\text{s}^{-1}$; $G = 6.677\times10^{-11}\text{N}\cdot\text{m}^2\cdot\text{kg}^{-2}$; $M_{\text{CL}} = (3\times10^{15}$ Solar masses) $= 6.0\times10^{45}$ kg; $r_{\text{initial}} = 10$ Mly $= 9.46\times10^{22}$ m, and $r_{\text{final}} = 55$ Mly $= 52.0\times10^{22}$ m,

$$\lambda_f = \lambda_i \times e^{\frac{1}{c}\left(1.667\times10^6\,m/s\right)} = \lambda_i \times e^{0.005566}\,,$$

$$\lambda_{\text{final}} = \lambda_{\text{initial}}\left(1.005582\right). \tag{13}$$

And the corresponding redshift is,

$$z = \frac{\lambda_f - \lambda_i}{\lambda_i} = \frac{\lambda_f}{\lambda_i} - 1 = 1.005582 - 1\,,$$

$$z_{\text{contractile part}} = 0.005582\,. \tag{14}$$

### 2.4. *Redshift Acquisition Within Expansion Zone*

For the propagation through the expanding-space region, the front end of the photon is still moving faster than the trailing end; but now, as shown in Fig. 3, the slope is constant:

$$k = \frac{1}{\lambda}\frac{d\lambda}{dt} = \frac{\left(\upsilon_1 - \upsilon_2\right)}{\left(r_1 - r_2\right)} = \text{constant}\,. \tag{15}$$

This time, $\frac{d\lambda}{dt} = k\lambda$ is integrated as follows:

$$\int\frac{d\lambda}{\lambda} = k\int dt\,, \tag{16}$$

$$\ln|\lambda| = kt + c_1\,,$$

$$\lambda = e^{kt+c1} = e^{kt}e^{c1}\,,$$

$$\lambda = c_2e^{kt}\,. \tag{17}$$

If $t$ is set to zero when the photon initially enters the expansion zone (the linear portion of the graph), then $\lambda = \lambda_i$ , and $c_2$ must equal $\lambda_i$. Thus, the wavelength as a function of time is

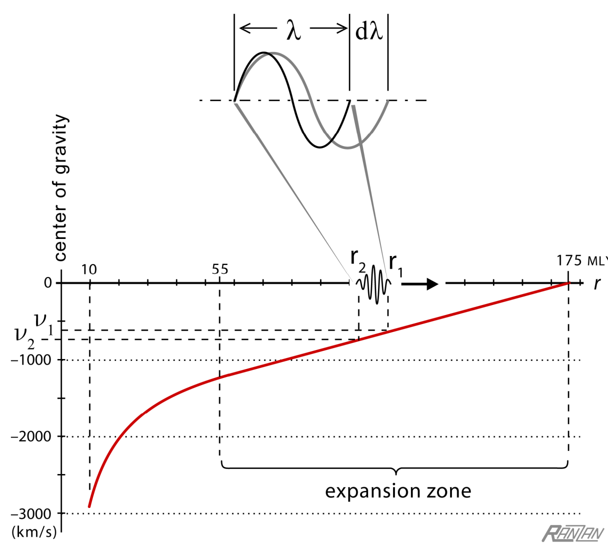


**Fig. 3.** Photon elongation during propagation through the expansion zone. The photon is being conducted by a space medium whose speed of inflow, toward the center of gravity, decreases by 10.3 km/s every million lightyears. As a result, the front and back ends of the photon "experience" a flow differential. Throughout the expansion zone, the slope (10.3 km/s/Mly) remains, more or less, constant.

$$\lambda(t) = \lambda_i e^{kt} . \quad (18)$$

And when inserted into the definition of spectral shift,

$$z = \frac{\lambda - \lambda_i}{\lambda_i} = \frac{\lambda}{\lambda_i} - 1 ,$$

$$z = \left( \frac{\lambda_i e^{kt}}{\lambda_i} - 1 \right) = \left( e^{kt} - 1 \right) . \quad (19)$$

Thus, $(e^{kt} - 1)$ expresses the intrinsic shift acquired within the expansion zone.

Here is how we find the total redshift acquired during the journey from $r = 55$ to 175 Mly: We know the value of $t$; it is just the time it takes for the photon to travel the 120-million-lightyear distance; so $t$ equals 120 million years. The slope $k$ is 10.3 km/s/Mly, which, with a conversion of units, becomes $3.436\times10^{-5}$ /Myr.

The acquired (intrinsic) redshift is,

$$z_{\text{expansion zone}} = e^{kt} - 1 = e^{(120\times3.436\times10^{\wedge}-5)}$$

$$\approx 0.004132 \quad (20)$$

The wavelength elongation and redshift experienced by the photon escaping from a gravity well is, of course, expected. The escape from a gravity well is, after all, associated with a loss of energy. But what is remarkable, is that *wavelength elongation also occurs when a photon descends into a gravity well.*

### 2.5 Redshift Acquisition During Second Half of Journey

Once the photon crosses the midpoint of the cosmic cell, it is in the domain of the second galaxy cluster (Fig. 1) and within this domain the space medium is flowing towards this second center of gravity. Whereas previously the photon was travelling against the aether flow, it is now moving *with* the flow. But because of the *flow differential* (the incremental difference of the aether inflow), the front end of the photon is still moving faster than the back end —relative to the destination cluster. More importantly, and more relevant to the intrinsic nature of this redshift, *the photon's two ends are moving apart*, albeit ever so slowly.

The redshift increments acquired during the second half of the journey across the cosmic cell are much the same as during the first half. Based on similar calculations, the photon acquires an additional $z = 0.004132$ in the expanding zone, and an additional $z = 0.005582$ in the contractile zone.

Now what about the portion of the journey that passes through the "interior" of each cluster? —the portion within 10 Mly of each cluster center? This is a region "filled" with large and small gravity wells —the overlapping gravity wells of all the individual galaxies and objects that comprise the cluster. The rule is: Whenever light traverses any gravity well, it acquires a velocity-differential redshift. And so, the process of intrinsic redshifting continues within the interior of the galaxy cluster. As photons pass through those sub-domains, they continue to acquire velocity-differential redshift. A reasonable assumption is made: For the region within the interior of the cluster, an index of 0.00226 is assigned based on one-half of the peak redshifting rate from the external contractile zone. That is, the estimate is based on ½ of the per-million-lightyear rate taken from the steepest part, between $r = 10$ and 11, of the cluster's external *contractile region*. (The redshifting rate is 0.0004533 per Mly there; and is found by using Eq. (12). Applying ½ this rate to the cluster's radius of 10 Mly gives $z_1 = 0.00226$.)

### 2.6. Total Intrinsic Redshift Across a Cosmic Cell

During a photon's unobstructed ascent journey from one center of gravity and its descent into the opposite center of gravity, the velocity-differential mechanism is active. The increments of the fractional wavelength elongations are shown in Fig. 4. To find the total redshift acquired, a simple summation will give an approximate, although slightly under-evaluated, total. Because of the compounding nature of the wavelength elongation process, the proper method of calculating the effective total $z_{CC}$ across the cosmic cell is as follows:

$$1+ z_{CC} = (1+ z_1)\,(1+ z_2)\,(1+ z_3)\,\ldots\,(1+ z_6)$$

$$= (1.00226)(1.005582)(1.004132)$$

$$(1.004132)(1.005582)(1.00226) = \mathbf{1.0242}$$

Thus, the estimated total redshift is 0.0242.

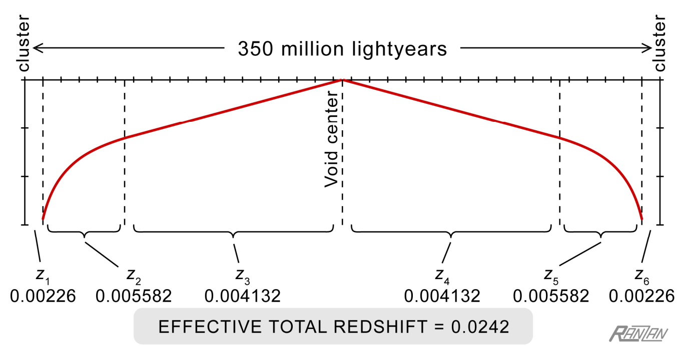


**Fig. 4.** Total redshift acquired. The photon's total redshift, a measure of fractional wavelength elongation, attained during its traverse across the cosmic cell, is calculated to be $z_{CC} = 0.0242$.

### 2.7 Prediction and Observational Evidence Compared

Knowing the redshift across a typical cosmic cell makes it possible to construct a *cosmic-distance vs redshift* graph. The solid line in Fig. 5 represents the distance predicted for the non-expanding cellular universe (the DSSU). The ***redshift-distance law*** that applies specifically to the DSSU, with its intrinsic-and-stable cellular structure, is [12]:

$$D(z) = \frac{\ln(1+z)}{\ln(1+z_{CC})} \times D_{CC} \ , \quad (21)$$

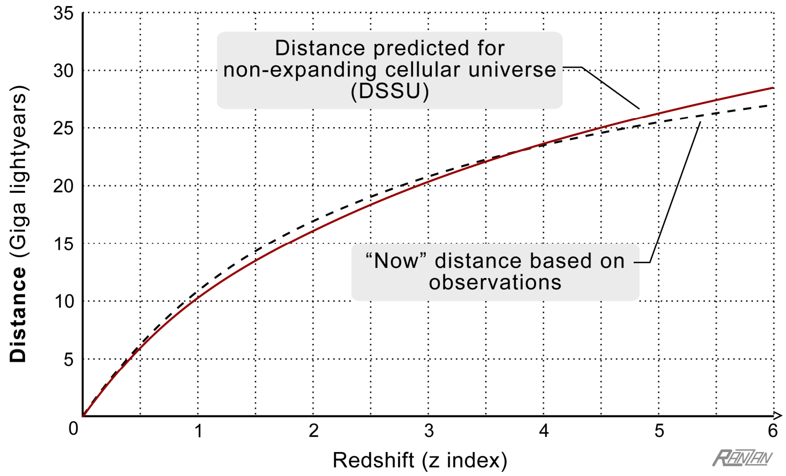


**Fig. 5.** *Cosmic redshift* versus *cosmic distance*. The solid curve represents the predicted correspondence between the redshift index of received light and the distance of the light source —as determined with the stable cellular universe (the DSSU). Notice the remarkable agreement with the now-distance curve (dashed), based on astronomical observations, which is claimed to be accurate within 5 to 10%. Clearly, the new velocity-differential interpretation of cosmic redshift fits the observational evidence just as competently as the expanding-space interpretation. (DSSU model specs: $z_{CC} = 0.0242$, $D_{CC} = 350$ Mly) (The observation curve is compatible with the ΛCDM model having specs: $H_0 = 70.0$ km/s/Mps, $\Omega_M = 0.30$, $\Omega_\Lambda = 0.70$, as calculated with Edward Wright's *Cosmology Calculator*, www.astro.ucla.edu/~wright/CosmoCalc.html .)

where $D_{CC}$, is the cell diameter, 350 Mly. The expression has only two empirical quantities, the diameter $D_{CC}$ and the redshift $z_{CC}$ across a single cell. The value of $z_{CC}$ is based on two observable features: cell diameter and cluster mass. This is significant; it means the DSSU distance function has no arbitrarily adjustable parameters.

The dashed curve in Fig. 5 represents what astronomers have determined to be the best correspondence between the measured redshift (measured directly or indirectly) and the now distance of the emitting sources. The astronomical observations included methods independent of the redshift, methods such as the use of "standard distance candles" and, notably, the use of intrinsic properties of a certain class of supernovae. The distance curve also makes use of the final results of the Wilkinson Microwave Anisotropy Probe which determined that $H_o = 70^+/_- 2.2$ km/sec/Mpc.[6] The parameter is a key component of the Lambda-Cold-Dark-Matter model, which many consider to be the "standard model" of Expansion cosmology because of its agreement with observations.[13] The margin of error, for the dashed distance curve, is claimed to be within 5 to 10% (the greater the distance, the wider the margin).

A comparison of the two curves shows a striking agreement between prediction and observation! The DSSU prediction curve is well within the observational tolerance, within 10% of the dashed curve.

Two theories, two curves, both of which agree with the evidence of measured distances, but are based on different interpretations of the cosmic redshift.

### 2.8. *Foundational Shift*

By using existing and quite ordinary properties as previously detailed, by using standard physics, it has been shown that a non-expanding cosmos fits the observational evidence (as presented by the redshift-distance graph), just as well as the "standard" Big Bang model does. But, and this is the critical point, the DSSU accomplishes the fit without invoking the outrageously extraordinary claim that the entire universe is exploding. The consequence is that the Big Bang claim is now completely undermined; universal space expansion is no longer a viable concept. Without such expansion, how does one claim, or explain, whole-universe expansion? Everyone is familiar with the saying *an extraordinary claim requires extraordinary evidence*. In order for cosmologists to henceforth seriously claim that the universe is expanding, they will need to come up with some new hypothetical mechanism; they will need to find some new-and-extraordinary evidence.

The situation is this: If the universe, in its ontological entirety, does nothing but just sits there, neither expands nor contracts, and the cosmic redshift still manifests as a detectable distance indicator, then what? Obviously, universal expansion becomes an obsolete concept. The Big Bang supporters lose their narrow interpretation of the cosmic redshift. Having failed to foresee the power of the velocity-differential interpretation of the spectral shift and having no other evidence for their Hubble expansion, they are left with no other supporting pillars.

The overlooked redshift mechanism —by virtue of the fact that it not only agrees with the observational evidence but also makes no extraordinary claim, imposes no extraordinary burden on the real Universe— effectively destroys the main pillar (really, the only pillar) of the Expanding universe paradigm.

The velocity differential redshift is one of the effects produced by an aether theory of gravity. That is to say, the DSSU gravity mechanism predicts this type of redshift. And, it predicts cosmic cell structure. In fact, the cell structure it predicts is quite specific and most remarkable in its ability to explain many observable features and to resolve long-standing anomalies.

It is the peculiarities of this cell structure to which we now turn our attention.

## 3. Structural Feature 1 (an Orderly Sequence)

DSSU theory predicts cosmic cell structure. Even better, it actually predicts the basic shape of the cells. And best of all it predicts three unmistakable features that manifest exclusively for the predicted cell structure; it predicts fingerprint features that identify a particular shape. The three features thus serve as incontrovertible tests of validity.

If the features can be shown to exist in the observable universe, it would mean irrefutable proof of the correctness of the DSSU model.

### *3.1. Amazing Anomaly*

In the direction of the rich galaxy cluster Abell85, noted for its powerful X-ray emissions, astronomers have found that galaxy clusters are arranged in a distinctly orderly sequence. For one thing, the clusters are all lined-up one behind the other and, for another, there is an unmistakable regularity in their spacing, as evident in the analysis of the spectral redshifts (Fig. 6).[[14]]

Astronomer F. Durret and his colleagues had, in 1996, noted the banded structure of a graphical representation (similar to the one shown in Fig. 6) of the A85 region and recognized the significance of the pattern regularity. They stated [[15]]:

> *Behind the [Abell 85] cluster, there is a large number of galaxies following a velocity distribution suggestive of a certain periodicity that could correspond to voids and sheets of galaxies and could therefore be used as an indicator of large-scale structures in this direction.*
>
> *We can see from this figure that there is indeed a "sheet" of galaxies with velocities of about 6000 km/s, as mentioned by previous authors.*

The orderly nature and regularity of spacing of the "sheets" of galaxies is even more pronounced when the galaxy plot is extended to encompass an angular separation of 120 arc minutes. In Fig. 7, a portion of the previous graph is laterally extended to include galaxies within a wider angular domain. The galaxy clusters are marked by horizontal dashed lines through their estimated midpoints. Between the observer at the bottom of the vertical axis and the limits of the graph, there are 12 Voids and 12 clusters (13 clusters if the observer's own cluster is included). When the *cz* distance of 70,000 is divided by 12 intervals the result is an average spacing, between galaxy clusters, of 5833 km/s. This corresponds to an average redshift distance of $z \approx 0.0195$. If the same calculation is performed for the most obvious stratifications, those from 0 to 47,000 km/s, the average center-to-center distance is found to be 5875 km/s or $z \approx 0.0196$.

Note relating to the use of radial velocity as a measure of distance: It has long been common practice among astronomers to take the measured redshift z and multiply it by the speed of light and use the resulting velocity as a measure of distance. The practice is unfortunate as it is misleading, since it has now been proven that the galaxies are not receding (excepting in the case of a galaxy's temporary local motion).

In any case, the nominal redshift distance between clusters is 0.0196 based on this analysis. The question is, how does this compare with the redshift calculated in Fig. 4? Although the comparison is reasonably favorable,

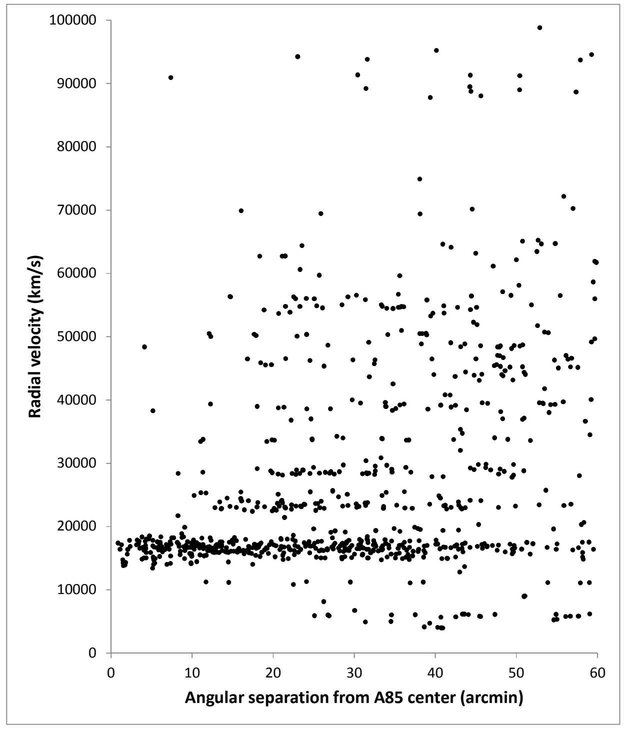


**Fig. 6.** Each dot represents a galaxy with its radial distance given on the vertical axis and its lateral distance, from the center of cluster A85, given on the horizontal axis. The radial redshift distance is expressed, in accordance with common practice, as *cz*; and the angular distance from A85's center is expressed in arc minutes. The regularity in the spacing of the clusters is unmistakable. The important thing to realize is that these clusters are all lined up along one line-of-sight (which is here defined by the Abell85 coordinates RA 00h 41m 50.1s; DEC −09d 18m 07s). Image reprinted by permission of Ari Jokimäki (website: https://arijmaki.wordpress.com/).

what it suggests is that the 350-Mly cell diameter may have been too large. If a cell diameter of 290 Mly and a $z_{CC}$ value of 0.0196 had been used instead, the result in the prediction-versus-observations test of Fig. 5 would have been equally conforming.

Among conventional theorists, here is the problem: Within the Expanding universe paradigm there is really no way to explain any sort of regularity in the spacing of clusters. Within a worldview where randomness rules, the spatial regularity of galaxy clusters along the line of sight makes no sense. The only available option, it seems, is to assume that the anomaly is not a location-in-space effect but rather a redshift-quantization effect. That is to say, a significant portion of the redshifts is not due to the action of the intervening space medium but rather the action of the radiation source. The cause, for instance, is supposedly a quantization relating to the energy level of the emitting source particles.

Many did adopt the quantization view. But this implied a radical change; it meant abandoning, or at least significantly altering, the use of cosmic redshift as the standard of cosmic distance. Halton Arp (1927-2013), a

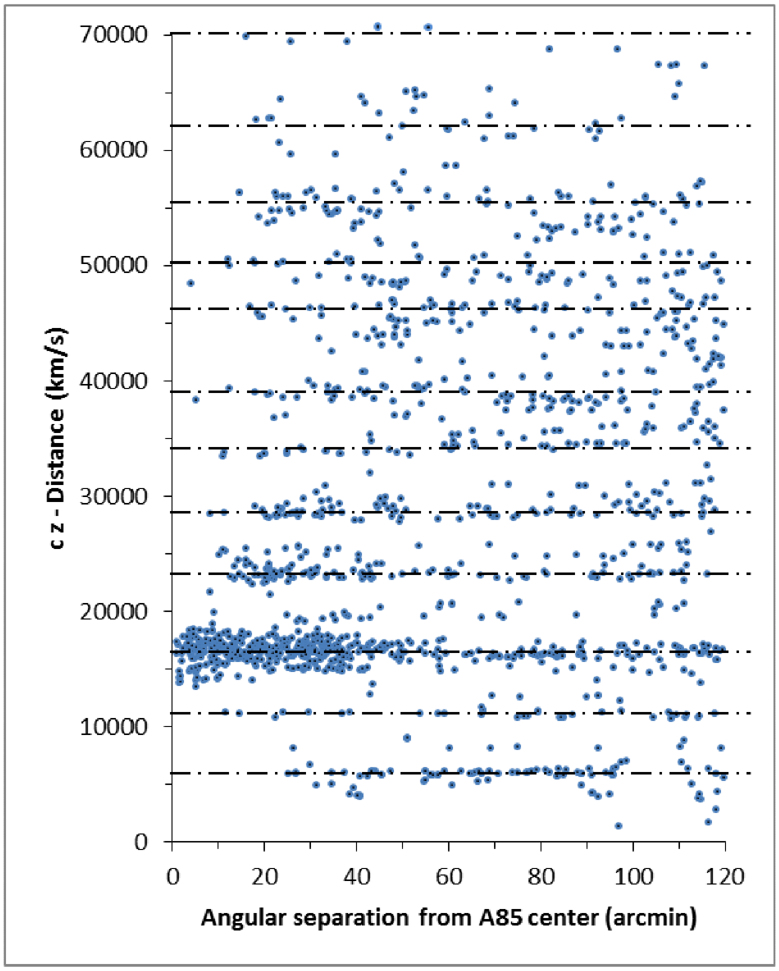


**Fig. 7.** A portion of the previous graph is extended to include galaxies within an angular-separation domain of 120 arc minutes. The overdense region is, again, the Abell85 cluster. Each horizontal line (dashed) indicates the approximate midpoint distance of a cluster. The average redshift interval separating the clusters (including the observer's own cluster at zero distance) is $z \approx 0.0195$ (see text). The average for the most distinctly stratified clusters, those from 0 to 47,000 km/s, is $z \approx 0.0196$. (The plot includes 1350 data points. Data compiled by Ari Jokimäki with the aid of the search feature of the NASA/IPAC Extragalactic Database.)

staunch supporter of the redshift quantization idea, made it clear, "The discretely larger redshifts of the galaxies in this cluster cannot be attributed to background sheets and filaments of galaxies …"[16] For H. Arp most of the galaxies in the Fig. 6 graph were located at about the same distance within the same cluster. His argument was that the galaxies were too closely concentrated toward the center of the A85 main cluster; the angular separations were too small.[16]

The quantization idea, however, lacks a workable causal mechanism, makes no meaningful predictions, fails to relate to the measured evidence, and serves merely as a phenomenological speculation. (The phenomenological approach works like this: The existence of some redshift quantization mechanism is adopted on the basis that the redshift *appears* to be quantized, in the same manner in which it was once argued that the Sun revolves about the Earth on the basis that it *appears* to revolve so. It is the adaptation or conversion of an apparent phenomenon into the real thing.)

### *3.2. Anomaly Resolved*

The DSSU resolution, on the other hand, does not require changing the interpretation of the cosmic redshift as a measure of distance. The answer is readily found in its unique cellular structure. Cosmic cells are shaped as dodecahedra, primarily as rhombic dodecahedra, with vertices or nodes corresponding to the location of galaxy clusters. A critically important feature of the rhombic dodecahedron is that it has two distinct types of nodes —major and minor (Fig. 8).

The Universe, it turns out, is a tessellation of linked galaxy clusters, a tessellation in which the links form the framework of a dense packing of dodecahedra. In this structural framework the Minor nodes have four links, while the Major nodes have eight.

Now, the amazing thing about the dodecahedral tessellation is that *any line of sight through opposite Major nodes will present a sequence of alternating galaxy clusters and voids* (Fig. 9). The reason this should strike one as being amazing is because such an alternating pattern arises *only* along opposite Major-node alignments. *The pattern is not found along the extended axis through opposite Minor nodes*. It will be shown in the next section that along the line of sight involving Minor nodes the pattern is entirely different.

There is no need here to explain why the dodecahedra actually align as shown. However, a cut-out template of a rhombic dodecahedron, as a printable pdf-type document, is provided at the following link: www.cellularuniverse.org/S4DodecCutout.pdf. It gives the reader a simple way to verify the truth of Fig. 9 by constructing and assembling several model structures.

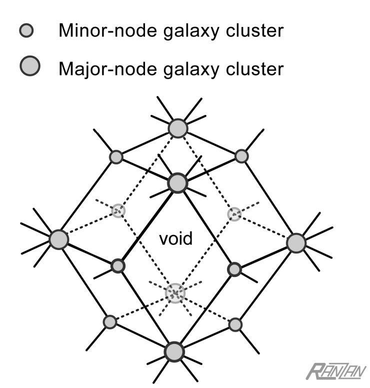


**Fig. 8.** Structural cosmic cell of the DSSU has the shape of a rhombic dodecahedron. Nodes are of two distinct types, and represent the locations of rich galaxy clusters.

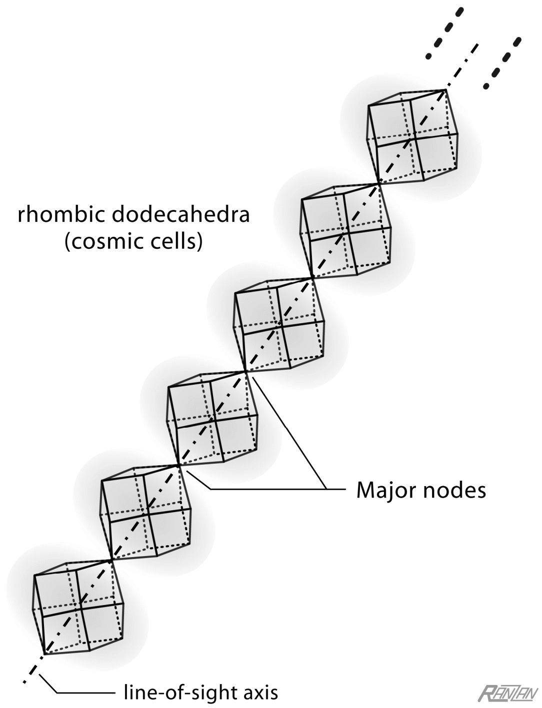


**Fig. 9.** When an axis passes through opposing Major nodes of a dense packing of cosmic cells, the result is an alternating void-and-cluster sequence. The pattern of galaxy clusters and voids only occurs for the extended axis through opposite Major nodes. It does not occur for alignments of Minor nodes. Note: The "string" of dodecahedra is part of a *dense packing* of such structures. For the sake of clarity, all the surrounding cell structures have been removed.

In concluding this section, let me point out that DSSU theory predicts not only the repeating cluster-void sequence but it also predicts the redshift distance between clusters. Recall, the predicted redshift, as determined in Section 2 (Fig. 4), is 0.024, while the redshift interval extracted from the observation graph (Fig. 7) is about 0.020. This represents reasonably good agreement between theory and observation.

## 4. Structural Feature 2 (Linear Cluster & Void Sequence)

The previous section described how cosmic Voids alternate with single galaxy clusters. In terms of the geometry, the cosmic Voids were shown to be separated, along an extended axis, by single nodes of the dodecahedral structure. The present section examines the structural pattern whereby Voids are separated by Linear galaxy clusters (or multiple nodes).

When an axis is drawn from a Minor node to the opposite Minor node (again passing through the Void center) and extended within a dense packing of cosmic cells (rhombic dodecahedra), an alternating pattern of Linear clusters and Voids will emerge. A portion of such a sequence appears in the well-known CfA map of galaxies produced by John Huchra, Margaret J. Geller, and Valérie de Lapparent back in 1989. As shown in Fig. 10, the axis passes (from bottom to top), through the Coma void, the lengthy Coma cluster, and continues into an unnamed void. Notice, in the schematic of the predicted pattern, that the Linear cluster consists of a Major cluster at the midpoint, Minor clusters at the ends, and two filamentous links.

Assuming idealized cosmic cell shape and stability, the filament or boundary link that joins neighboring nodes is predicted to be 150 Mly in length. The length of the Linear cluster joining its three nodes must then be 300 Mly long. A further prediction is that Linear clusters have lengths identical to the distance across the Voids. The Voids, then, spanned by the extended axis, are expected to measure 320 Mly each. Here again, the cardboard cut-out models would be helpful in visualizing the various aspects of the galaxy-distribution pattern.

Another example of a Void-Linearcluster-Void configuration is the Fornax cluster which is distinctly elongated and bounded by the Eridanus void at one end and the Local void at the other. (The Local void has coordinates $18^{h}\ 38^{m}$, +18°; the center has a redshift distance of 0.0083 or about 125Mly.) Still another example is the Norma cluster, also known as A3627, an obvious Linear formation. An image of cluster A3627 is available at http://ned.ipac.caltech.edu/level5/Sept02/Fairall/Atlas.html (as http://ned.ipac.caltech.edu/level5/Sept02/Fairall/Figures/figure26.jpg) where it is shown to lie near the Galactic Plane at galactic longitude 326°.

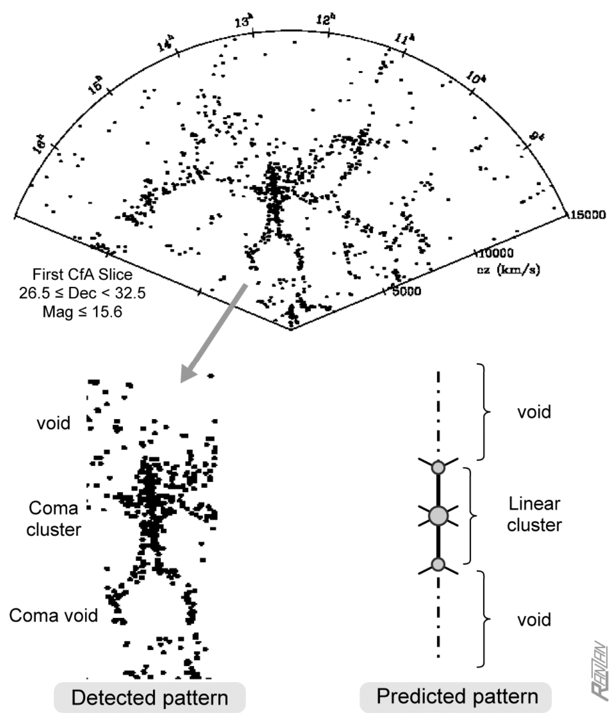


**Fig. 10.** *Linear cluster along axis through void centers.* There is a remarkable match between the "Detected pattern" and the "Predicted pattern" (as predicted for idealized close-packed dodecahedra). The prediction also holds that the length of the Linear cluster joining the three nodes is identical to the distance across the Void. The galaxy plot represents the position of galaxies within a thin 6-degree wedge whose point-of-origin is the Milky Way galaxy. (Galaxy-survey image: reprinted by permission of the Smithsonian Institution.)

The two structural patterns discussed so far are compared in Fig. 11. Note the difference in the distance across voids. The predicted distance for opposing Major nodes is 350 Mly and for opposing Minor nodes is 305 Mly.

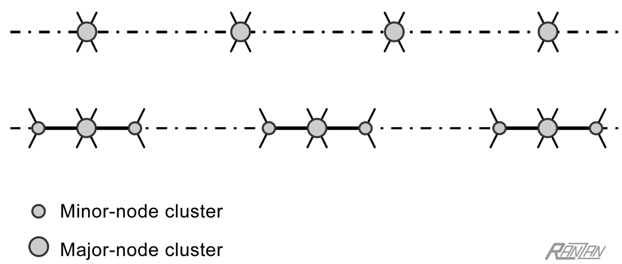


**Fig. 11.** Galaxy cluster patterns compared. Two characteristic patterns are predicted for axes passing through Void centers within an idealized packing of rhombic dodecahedra. When the axis is aligned with Major nodes, as in the upper sequence, the distance across Voids is about 350 Mly. When the axis is aligned with Minor nodes, as in the lower sequence, the distance across Voids is smaller (about 305 Mly).

## 5. Structural Feature 3 (Walls, Right-Angles, and Holes)

### *5.1. Examples of Great Walls*

Long thin sheets and filaments of galaxies, or *Great Walls* as they are called, are undeniably the largest known cosmic structures in the universe. The first Great Wall was discovered by John Huchra and his team as part the Harvard-Smithsonian Center for Astrophysics galaxy survey conducted back in the 1980s. Since then, astronomers have discovered many more. The original discovery is now called the CfA2 Great Wall, but it is also known as the Coma Wall (there seems to be no standardization in the naming of these structures). See Fig. 12.

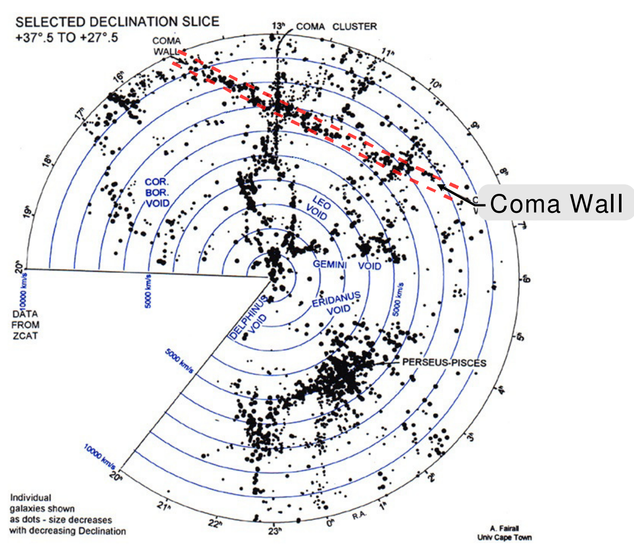


**Fig. 12.** Extended structure of galaxies known as the Coma Wall (and also as the CfA2 Great Wall). When first discovered in the 1980s by M. Geller, J. Huchra, and V. Lapparent, it was the largest known structure in the Universe. (Galaxy-map image by permission of Estate of Anthony Fairall)

The year 2003 brought the discovery of the Sloan Great Wall (the SDSS Great Wall), which is estimated to be between 2 to 3 times longer than the CfA2 Great Wall.[17] Subsequent mapping, as reported in 2005, confirmed the existence and extent of the Sloan Wall.[18] Additional details and related graphics and references may be found at http://en.wikipedia.org/wiki/Sloan_Great_Wall. But the record holder must surely be the Hercules–Corona Borealis Great Wall. Discovered in 2013, it is an extremely long wall-like filament measuring more than 10 billion lightyears.[19,20]

There is also a Cetus Wall: The Cetus Wall was first reported in a 1990 paper summarizing the extensive redshift data from the *Catalogue of Radial Velocities of Galaxies* and the *Southern Redshift Catalogue*. The data were presented as sets of galaxy plots (slices in Right Ascension and slices of Declination intervals) covering the entire celestial sphere with the focus being, as the authors put it, on "a visual presentation." The evidence of the wall structure was unmistakable; and there was more. "Not only is it very long, with an overall velocity range in excess of 20 000 km/s, but," wrote the authors, drawing attention to a remarkable pattern in the structure, "it appears to make two sharp right-angled bends." Upon further study of the Cetus structure, "… we conclude the bends are real features in one continuous structure."[21] A schematic of the Cetus Wall and its right-angled components is shown in Fig. 13.

Anthony Fairall and his astronomer colleagues clearly understood the importance of right-angled walls when they stated: "If the bends are real," as it is believed they are, "then they could be [used as] critical tests for any theoretical model."[21] Before applying this test to the DSSU, one more pattern of walls will be examined.

In the South Celestial Hemisphere, in the region of the Sculptor Void, there is a remarkable pattern of a pair of Great Walls positioned parallel to each other and a third Great Wall that runs perpendicular to the other two. In fact the Sculptor Void is defined by these walls on three sides: The Fornax Wall and the extremely long Sculptor Wall are parallel to each other, while the Grus Wall is perpendicular to both (Fig. 14).[22]

### *5.2. The Geometric Explanation of Walls*

These structures have long baffled astronomers and cosmologists; within the paradigm of conventional cosmology, they simply manifest too much order. For example, science writer Irene Klotz, headlined her report of the Hercules–Corona Borealis Great Wall, as: "Universe's Largest Structure is a Cosmic Conundrum." The article states, "The discovery poses a conundrum to a fundamental tenet of modern cosmology, which posits that matter should appear to be distributed uniformly if viewed at a large enough scale."[23]

Dodecahedral cells, again, provide the explanation. As one should expect, there is a geometric cellular order, but it comes in a kaleidoscope of guises. Figure 15 shows just how radically different a dodecahedron, as a stick model or as a cosmic-cell representation, may appear. The hexagonal profiles of the first two views are to be expected, but the appearance of a perfect square should raise some eyebrows. A quick hands-on examination of a cut-out model confirms the right angles.

It turns out that dodecahedra actually pack together with a rectilinear pattern. One continuous row is illustrated in Fig. 16a in the manner of idealized stick structures; additional rows, running parallel, could easily be added on all sides (without leaving any gaps so to speak, without disrupting the rhombic dodecahedral tessellation). A single row, however, is all that is needed to adequately demonstrate the nature of the geometry of cosmic walls. The explanation behind parallel and right-angled walls is immediately obvious (Fig. 16a) and really needs no further discussion. But there is a less well-known aspect worth examining. It is yet another remarkable feature of great walls that can readily be explained with DSSU's intrinsic cellularity. Here are the details. In the Fairall 1990 article, which has been cited several times above, one may find this striking and bewildering statement:

> "… the wall does indeed have a limited two-dimensional extent, though its plane is … not constant along the length of the wall, but *appears to twist slightly, causing the wall to take on an almost ribbon-like characteristic*. … This is also the case for the Great Wall through the Coma supercluster." (Emphasis added)

How in the world can a cosmic wall of galaxies appear twisted like a ribbon? How indeed!

What can now be demonstrated, using the single-file configuration, is a rather wonderful feature of Great Walls. If the stick structure is tilted downward by a very small angle, downward toward the bottom of the page, the relevant aspect of the wall will be revealed (Fig. 16b). The next step is to remove much of the distracting details presented by the confusion of boundary edges revealed in this tilted view; Fig. 16c shows the wall completely isolated. And thus, in the zigzag filaments lies the explanation of the wall's ribbon-like appearance.

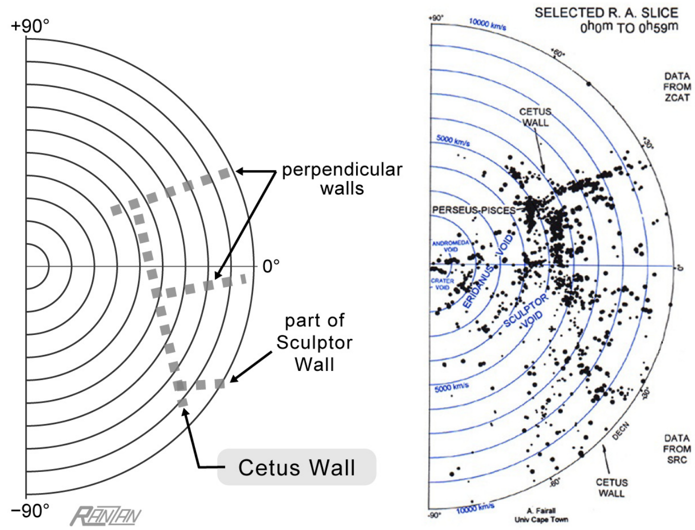


**Fig. 13.** Cetus Great Wall is joined by perpendicular structures as shown in the Right Ascension slice between $0^h$ and $1^h$. (A larger version of the galaxy plot is available at http://ned.ipac.caltech.edu/level5/Sept02/Fairall/Atlas.html)

### 5.3. *Cosmic Holes*

Within the "packed" cosmic structure, the under-dense regions (the Voids) are separated by rhombic-shaped interfaces. Each rhombic structure, appearing like a piece of the aforementioned twisted "ribbon" (see Fig. 16c), is actually a section of a Great Wall. Galaxies tend to concentrate at nodes and along boundary edges while leaving a paucity of galaxies and other star systems in the mid-region of the rhombic-shaped interface. These sparse areas are very much like holes in the walls of galaxies,

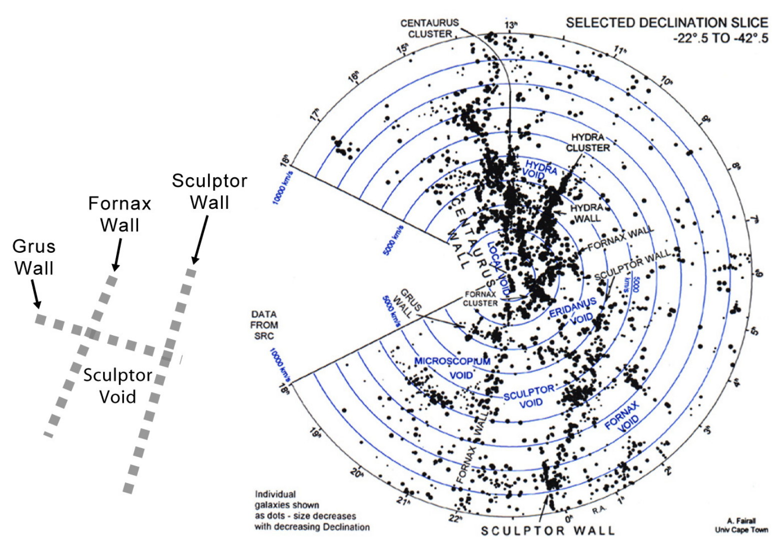


**Fig. 14.** Sculptor-, Fornax-, and Grus- Great Walls define the Sculptor Void on three sides. The Grus Wall separates the Sculptor Void from the Eridanus Void. The schematic on the left corresponds to the Walls shown in the galaxy plot (by A.P. Fairall), which maps an 18hour slice defined by Declination −22°.5 to −42°.5. (A larger version of the galaxy plot is available at http://ned.ipac.caltech.edu/level5/Sept02/Fairall/Atlas.html. Galaxy-map image by permission of Estate of Anthony Fairall)

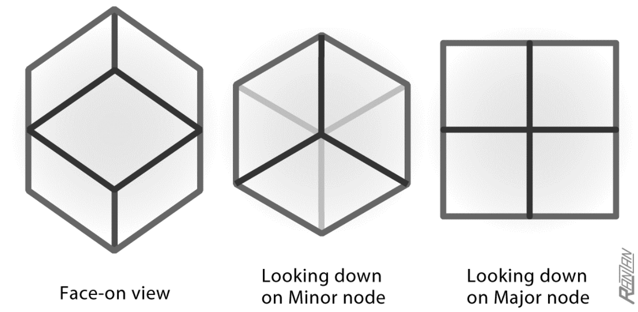


**Fig. 15.** Guises of the dodecahedron: Stick model of a rhombic dodecahedron viewed along three axes of symmetry reveals two hexagonal profiles and an unexpected perfect square.

holes within "the thin walls of galaxies." In the descriptions of large-scale structures, it is commonly stated that *holes* in the cosmic web join adjacent void regions, that holes in the Great Walls are the *interconnections* joining voids. Astronomer Anthony Fairall typically speaks of "various interconnections between voids" such as between the Sculptor and Eridanus Voids; and of "holes" within the Sculptor Wall, Fornax Wall and Grus Wall.[22]

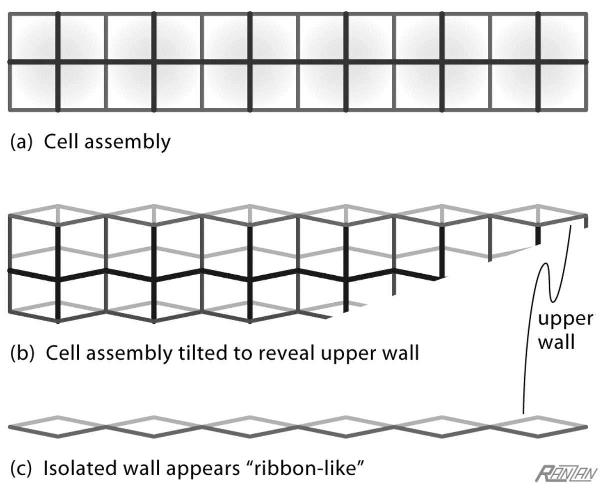


**Fig. 16.** (a) Assembly of rhombic dodecahedra is oriented to reveal perpendicular and parallel walls. (b) The cell assembly is tilted slightly, toward the bottom of the diagram, to reveal the theory-predicted shape of a typical "Great Wall." (c) When isolated, the wall gives the appearance of a twisted ribbon.

A. Maurellis and his colleagues (including A. Fairall) refer to the Southern Eridanus void being connected to the Eridanus void by a hole in the distribution of galaxies separating the two. Similarly, a hole in the distribution of galaxies connects the Southern Eridanus and Sculptor voids; and another hole connects the Sculptor and Microscopium voids; and still other holes connect the Sculptor and Southern Eridanus voids.[24,25]

In each case the hole size is estimated to be 1250 km/s, which corresponds to about 60+ Mly.[25] The observation-based hole size is compared, in Fig. 17, to the typical interface predicted by DSSU theory.

### 5.4. *Connecting Geometry and Cosmology*

There is only one geometric configuration that can possibly display the observed features. Only one cell shape possesses all the characteristics described above —the important ones being the void-and-node sequence, the void-and-triple-node sequence, the two types of multi-branched nodes (Major and Minor), and the parallel and perpendicular walls. And there is only one cosmology that predicts this geometry.

Only the Euclidean geometry of closest-packed dodecahedra —manifesting as rhombic-type dodecahedral cellularity— possesses the patterns that have been discussed. The only other possible volume-dividing (or space-filling) shapes —the cube and the truncated octahedron— are unsuitable. The cube is unstable and the truncated octahedron has an unfavorable surface-area-to-volume ratio (compared to the dodecahedron).[26] DSSU cosmology stands alone in predicting the polyhedral geometry reflected in the astronomical observations.

The DSSU is founded on two pairs of steady state processes. Four fundamental processes sustain a geometric pattern that manifests as the two distinct kinds of void-and-galaxy-cluster sequences, the multi-branched clusters, the cluster-linking filaments, the parallel and perpendicular Walls of galaxies, the interfaces connected in ribbon-like fashion, and the great Voids and the "holes" that connect them.

DSSU's four fundamental processes —involving the space medium and its modes of excitations, and acting in accordance to a self-balancing mechanism— predict the dodecahedral cosmic structure.[26,27]

## 6. Comparative Cosmology

Since the discovery of the DSSU, the cosmic cellular structure and the processes that sustain it have been the unifying theme of reality-based cosmology. The development of cosmic-cell cosmology has brought about a whole new level of understanding, much as the

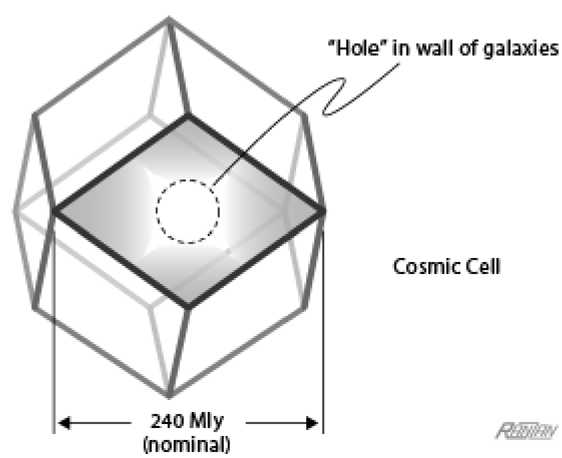


**Fig. 17.** Schematic of a cosmic cell showing a rhombic-shaped segment of a wall of galaxies. The rhombus's shape and size are theory predicted. The hole in the mid-region is said, by astronomers, to be about 60 Mly across.

discovery of the cellularity of the structure of living organisms by Theodor Schwann (1810-1882) back in 1839 unified life and elevated the study of the living realm into the modern discipline of biology. An understanding of living organisms requires awareness and knowledge of cells. Without intrinsic cellular structure, modern biology makes little sense —and neither does modern cosmology.

This new understanding of cosmic structure has led to the explanation of what must surely be the most unusual, and previously unresolved, configurations of galaxies.

### *6.1. Masterpiece of Misconception*

So where does all this leave the expanding-universe idea and the Big Bang model? What are the implications for the model that has been built by several generations of highly-accredited academicians into an elaborate finely-tuned patchwork of time-adjustable events and epoch-varying matter, matter of which the greatest proportion has never been observed and remains a complete mystery? With its central pillar removed, a situation exists in which the extraordinary claim that the universe is expanding is still awaiting the required extraordinary evidence. The same applies to the even bolder claim of the radial acceleration of expansion; not to mention the claim of a cosmos genesis.

But what about the contention of irrefutable evidence accumulated and arrayed in defense of the Big Bang? What about the celebratory pronouncements, the congratulatory awards, and the declaration of the end to a revolution in cosmology? Yes, there are experts, who, convinced of having found the answer, have proclaimed the end to a revolution in cosmology.

Getting back to the evidence, what about the Big Bang's other pillar? —the one supporting the claim that CMB radiation is the relic evidence of the primordial explosive event? In the 1990s, the COBE discovery of tiny (1 part in 100,000) temperature variations was hailed as the definitive confirmation of an expanding universe. George Smoot of the University of California, referring to the blotchy false-color image representing the data of temperature variation gathered by the Cosmic Background Explorer (COBE) satellite, is reported to have enthused, "Well, if you're religious, it's like seeing the face of God." Stephen Hawking said, "It's the discovery of the century, if not of all time."[[28]] But without the main pillar the CMB support is useless. If it had not been for the prior interpretation of universal expansion in setting up the main pillar, the detection of the CMB would have been interpreted as the background temperature of the universe —a thermal radiation whose photons originated from ultra-distant stars. And its miniscule variation, as found by the COBE mission, would have been interpreted as the impressions of inherent cell structure —as the distorted imprint of structure from enormously vast distances.

For the celebratory declarations, we turn to Simon Singh, a highly-acclaimed expert on cosmology and author of *Big Bang, The Origin of the Universe* [[29]]:

> "At last, the challenge to prove the Big Bang model was over. Generations of physicists, astronomers and cosmologists —Einstein, Friedmann, Lemaître, Hubble, Gamov, Alpher, Baade, Penzias, Wilson, the entire COBE team, and many others— had succeeded in addressing the ultimate question of creation. It was clear that the universe was dynamic, expanding and evolving, and that everything we see today emerged from a hot, dense, compact Big Bang over 10 billion years ago. There had been a revolution in cosmology, and the Big Bang model was now accepted. The paradigm shift was complete."

It turns out that the pronouncements were naively premature and disconcertingly presumptuous.

What about the congratulatory awards? Quoting from the book, *Guide to the Construction of the Natural Universe* [[30]]:

> "When an official theory lacks good evidence, then other methods are available for 'validation.' There is always validation by committee consensus. And sure enough, in 2011 the Nobel Prize in Physics was awarded (to Paul Perlmutter, Brian P. Schmidt and Adam G. Riess) '*for the discovery of the accelerating expansion of the Universe through observations of distant supernovae.*' "

Now notice, in the Nobel's written citation above, the capitalization of one very significant term. The term "the universe" refers to a theory of the Cosmos; while "the Universe" refers to the real world we live in and are a part of. This intentional usage means that the award is in recognition of *the discovery of the accelerating expansion of the REAL Universe*! It makes an enormous difference. Since the same supernovae observations on which the Award was based support a different theory (a superior model, a non-expanding universe), the claim is unwarranted. The 2011 Award was flawed, that is to say, the award statement was a gross misrepresentation.

Official recognition had occurred several decades earlier. For what it's worth, Pope Pius XII in 1951, during a Vatican conference of the Pontifical Academy of Sciences, bestowed his blessing upon the Big Bang hypothesis. He was evidently partial to its cataclysmic flash-of-light genesis.

Once the main premise has been undermined, there is no hope. Once the core pillar holding up your theory is toppled nothing can save the theory; all those supporting sub-pillars, awards, and grandiose claims that the Big Bang has been proven, all become irrelevant! There is no salvation.

When the long-ago pioneering experts interpreted Hubble's historic discovery, when they wedded observations to theory, they correctly invoked the phenomenon of *space expansion*. Were they then, one must wonder, distracted by a sensational possibility? The possibility of turning *expansion* into something really big —*the universal extrapolation of expansion*! In the excitement that surely must have accompanied the extrapolation, they forgot to take into consideration the age-old Heraclitean principle of *the harmony of opposites*. They overlooked the overwhelming probability that space-medium expansion is balanced by space-medium contraction.

Three other aggravating factors: The experts ignored Einstein's 1920 retraction about the non-existence of some form of aether; they failed to understand the underlying mechanism of Newton's gravity and its refinement coded in Einstein's gravity; consequently, the velocity-differential effect on light travelling through gravity domains/fields was never considered.

Consider the profound implications. The Big Bang model can no longer be defended as a valid scientific theory. It will serve as a modern example of an official cosmology built around an hypothesis that turned out to be wrong. No doubt the Big Bang will also continue to serve many (as it has for several decades) as a pseudo-scientific religion —where faith-based beliefs rank higher than objective evidence and reason. As Corey S. Powell effectively argues in his book *God in the Equation*, by the late 1960s, "The big bang was the official creation mythology of sci/religion, and its details were inscribed in the pages of the *Astrophysical Journal*." With respect to the big bang's famous background microwaves, Powell wrote, they "glowed from above like a heavenly blessing on the theory."[31] In 1978, Arno Penzias and Robert Wilson were bestowed with honors for the detection of that blessed glow, and the world witnessed the public endorsement of the Big Bang as the 20th-century's official story of creation. "The notoriously conservative Nobel Committee had now officially converted to the faith of sci/religion."[32]

Reality cares not about belief systems, consensus of expert opinion, or about official seals of approval. The Big Bang model will go down in history as an elaborately woven masterpiece —a masterpiece of misconception.

### *6.2. Selection of Important Differences*

There are two approaches to understanding cosmic structure. The first focuses on understanding the *intrinsic nature* of the structures, on gaining insight into the driving mechanism. The DSSU follows this approach by concentrating on the mechanical modeling of the theory's underlying processes —the underlying four processes (aether expansion and contraction, and matter formation and annihilation) driving the universe.

The other approach is to focus on the *statistical nature*. It is the approach dominating conventional cosmology. Typically the view is that understanding of the *statistical characterization* of these structures, of the statistical distribution of galaxies, of n-point correlation functions, is the key to any physical theory dealing with their formation. This line of investigation is well suited for a model which itself is based on randomness —well suited for the big bang which is said to have been a chance occurrence. And it is well suited for a model which places great emphasis on appearances (as it does in the case of the *apparent* recession of galaxies being accepted as *actual* recession motion); understanding, then, becomes heavily influenced by the well-established fact that galaxy distributions do appear strongly irregular and arrayed in complex patterns. The conventional conclusion seems to be that if the galaxy distribution and the void distribution appear random then they are actually so.

But the difference goes deeper. One approach involves a search for understanding how these structures are sustained; the other involves a search for understanding how these structures were formed from a state in which they originally did not exist. The difference lies in a theory of how cell structures are *sustained* by steady state processes *versus* a physical theory of processes by which cell structures *evolved* (from some primordial state to their present state and will evolve to some different future state). There is no way to bridge this difference.

The following are aspects of the observable Universe, aspects which in conventional cosmology require whole-universe expansion, but which in DSSU cosmology do not: large-scale voids; galaxies and galaxy clusters; filamentous galaxy clusters; CMB temperature and its variation; the cosmic redshift; a non-linear cosmic-distance-versus-redshift relationship.

**Then there are predictions made by DSSU which conventional cosmology misses entirely:**

It predicts multi-armed galaxy clusters, and indeed multi-armed galaxy clusters are observed.

It predicts stationary supergiant elliptical galaxies, and indeed such galaxies, known as cD galaxies, are observed.

It predicts the onset of large-scale galactic rotation, and indeed spiral galaxies are observed.

It predicts the process by which galaxies acquire their observed ellipticity.[33]

It predicts systematic cosmic cell structure such as parallel and right-angled walls.

It predicts the void, cluster, void, cluster, … etc. sequence (as observable in the direction of A85).

It predicts the *velocity-differential* cosmic redshift (and the cosmic-distance-versus-redshift graph it produces agrees with what is observed).

It predicts the triple-process causal mechanism of gravitation.[34]

It predicts that the same mechanism that accounts for mass acquisition also serves as the primary cause of gravitation.[26]

It predicts a fundamental connection between the photon and the gravitational effect.[26]

**Some aspects are simply treated differently by the two cosmologies:**

In the treatment of gravity, the difference is in an aether theory of gravity *versus* a geometric space-time theory of gravity.

In the treatment of *space*, the difference is in a luminiferous-gravitational aether *versus* a mathematical construct often called a quantum foam.

In the treatment of gravitational lensing, the difference is in an inhomogeneous aether flow *versus* general relativity.

In the treatment of gravitational collapse, the difference is a perfectly natural terminal-annihilation process *versus* a black hole concept and the breakdown of physical law.

In the treatment of post-gravitational collapse, the difference is a continuous terminal annihilation of matter *versus* a black hole undergoing an extremely slow process of matter recycling.

A difference of fundamentals: The Big Bang model has two very peculiar aspects. For one, its foundation is built upon appearances. The model is unusual in that it places great emphasis on the appearance of things rather than grasping the underlying intrinsic nature. Galaxies appear to be receding and space seems to be expanding; and so, these features are adopted as the theoretical foundation. The universe appears to be evolving and so evolution becomes part of the model's foundation. The universe appears to be, for the most part, chaotic and chaos becomes part of the model. The other peculiar aspect is that it overlooks metaphysical/philosophical necessities, ignoring essential fundamental principles — such as a Primary cause, the principle of limited existence, and the primacy of motion over time (which basically means that time has no independent existence).[[35]] The DSSU, in contrast, does include these essential principles and adamantly focuses on the intrinsic nature of things.

### 6.3. *Quick Summary*

Observationally, DSSU cosmology is based on the velocity-differential interpretation of the cosmic redshift. Because of the balance between regions of space expansion and space contraction, there is absolutely no need to invoke an expanding-cosmos concept; no need for a speculative extrapolation of a hot dense early universe; no need for a speculative extrapolation of a future entropic demise.

One of the simplifying aspects of DSSU cosmology is that there is no need to explain how the universe came about; no need to explain how cosmic cell structure came to be. Since the universe has no evolutionary history, it is only necessary to explain how everything in-and-of the universe is sustained. And the cosmic structure is sustained essentially by means of its steady state processes, two pairs of processes acting in accordance to a self-balancing mechanism —in consequence of which the Universe must manifest as a dodecahedral tessellation.[[26]]

There is this undeniable fact, with respect to the material presented herein: The astronomically observed evidence matches the theoretically rooted explanation of that very evidence. The DSSU can use cell structure as a supporting pillar, the Big Bang cannot. See Table 1.

### 6.4. *On Making Extraordinary Claims*

The DSSU cosmology makes the extraordinary, but justifiable, claim of representing the real Universe, a claim that has been substantiated by compelling evidence across a broad spectrum of phenomena. The remarkable agreement between predicted dodecahedral cell structure and the supporting evidence presented herein is but a sample, a powerful example of the theory's ability to explain grand structural features, features considered by other models to be the most intractable structural anomalies of the cosmos. All the evidence (a wealth of which is presented in other research papers) point to the Universe as existing in a perpetual *steady state*.

The claim made by Big Bang cosmology, in contrast, is extraordinary to the point of being preposterous (a term Big Bang proponents often apply to their model). There is the incredible contention that the Universe is undergoing an explosive expansion! The extraordinary evidence is in the form of mathematical proofs.

But there is a deeper level to the extraordinariness implied in the Big Bang's claim.

Compare claims and consider, consider carefully, which is the more extraordinary claim: On the one hand, the universe is, as it is with the DSSU, in a *perpetual state*; or on the other hand, the universe is, as with the Big Bang, *changing and evolving*. The first (the DSSU) functions on the basis of a set of basic unchanging laws of Nature. The second, however, requires not only the functioning of basic laws but also an explanation of why the universe, as a whole, is changing —and doing so in a major way— in the sense that the laws of Nature themselves are changing. It is claimed that the Big Bang is changing its rate of expansion, its temperature, its density and composition, its entropy, and its equation of state. Evolution of this scope would undermine the repeatability of experiments and so undermine the cornerstone of scientific methodology[[36]]. Ask yourself, *How is such change possible?* It is almost as though the Big Bang universe requires a physical law (or laws) outside itself —an influence acting on the universe from *beyond* the universe. In order to model the real Universe, however, there can be nothing outside, nothing beyond. The Universe, by definition, must encompass everything; so attributing variability to the laws of physics places one's theory outside the domain of science. Changing the laws of physics, changing the behavior of the universe, are truly extraordinary claims!

Table 1. Quick Summary

| Main/Key Characteristics | Expanding Cosmos (in general)<br>Big Bang (in particular) | **D S S U**<br>The Cellular Universe |
|---|---|---|
| Cosmic redshift: | ● caused by expansion of space medium | ● caused by expansion AND contraction of space medium |
| Background temperature of cosmos: | ● about 3° NOW<br>● different in the past<br>● will be different in the future | ● about 3° NOW and forever |
| Large-scale cellular structure: | ● phenomenological & random | ● intrinsic & ordered |
| Galaxy cluster periodicity:<br>(as in the direction of A85) | ● irresolvable anomaly | ● explicitly predicted |

The DSSU, infinite and cellular, never changes —it is forever in a steady state of renewal in accordance with *unchanging laws of Nature*.

## 7. Theory Evaluation and Validation

*The key to understanding the universe is and has always been the cosmic redshift.*

### 7.1. Explanatory Theory with No Competitor

It is always easier to evaluate an explanatory theory when held up and scrutinized alongside competing explanations. But there are no other theories; no other explanations for the "anomaly" (the phenomenon analyzed in Figs. 6 and 7) and the other structural features described. And let there be no doubt, these systematic structures are surely the strangest astronomical aberrations in the context of an expanding model. As far as I am aware there are no alternate theories or hypotheses offering a meaningful explanation. There are, as might be expected, strange new speculations. Astronomer professor William G. Tifft has suggested replacing our concept of one-dimensional time with *three-dimensional time* if we are to explain some pressing cosmological anomalies, such as the periodicity of quantized redshifts. A radical speculation indeed. If one dimension won't work let's try several; let's try the extrapolation of time into multi-time dimensions. And if adopted, it would be one more extrapolation to add to the others already plaguing conventional cosmology. It seems the DSSU theory stands alone, firmly planted in reality.

In providing a perfectly reasonable explanation of "baffling" cosmic structures and as a model of the real World, the DSSU has no competitor. Big Bang models, being primarily mathematical models with only superficial connections to reality, are for the most part irrelevant. They are gravely handicapped by being rooted in forward and backward extrapolations of a grossly misinterpreted phenomenon —space expansion.

The key to understanding the universe is and has always been the cosmic redshift. Of all the possible mechanisms that have ever been advanced for this lightwave-stretching phenomenon —including Doppler, space expansion, tired/weakened light, gravitational, and velocity differential— the last one, the velocity-differential redshift, is by far the most compelling, the most plausible. The DSSU is the only cosmology that exploits the explanatory power of the velocity-differential effect. This superior mechanism agrees with the wave properties of light, the influence of both *space-medium* expansion and contraction, and does not require an evolving (i.e., expanding, contracting, oscillating, or accelerating) universe. Not only do light waves and individual photons become elongated but so do entire trains of light pulses including any in-between gaps (all in agreement with extensive supernova studies). Thus, we have a cosmology with unprecedented explanatory power — and no competitor.

### 7.2. Theory Validation

Philosophers of science tell us that for a theory to have validity it must be *empirically correct*; it must be compatible with the empirical data. It must also have *explanatory power*; there must be at least one class of empirical facts which can be explained only through the new theory, or in which the new theory replaces a totally unsatisfying and preliminary older explanation or interpretation with a clearer one. A case in point: There can be (and there are) many theories that explain CMB temperature and CMB patchiness, but there is only one theory that explains the broader evidence featured above. One more requirement: Theory sentences, theory claims, are only meaningful if they are supported through a *verification scheme*. Validation hinges on empirical correctness, explanatory power, and a verification scheme.[37] By fulfilling these requirements the validity of DSSU theory and its claim of being the real Universe are firmly established.

A powerful factor in establishing validity has to do with the unexpectedness of an explanation, or the extraordinariness of a phenomenon resolution. The Abell85 anomaly (and the related evidence) has been impossible to resolve within conventional cosmology; and so, with the passing decades the unexpectedness of any plausible resolution has grown considerably. One might hope for a reasonable explanation of an anomaly; but who would dare expect an anomaly to provide proof of a theory! If one finds the resolving hypothesis, one gains confirmation for such hypothesis. As explained by Professor J. L. Kasser, "Thus, the more unexpected a given bit of evidence is apart from a given hypothesis and the more expected it is according to the hypothesis, the more confirmation the evidence confers on the hypothesis."[38]

Professional skeptic Michael Schermer has a working rule for establishing the validity of a theory. It does not depend on any one particular piece of evidence but rather on *the convergence of all the available evidence*. "In fact, proof is derived through a convergence of evidence from numerous lines of inquiry —multiple, independent inductions, all of which point to an unmistakable conclusion."[39] One may safely conclude that the DSSU represents the real Universe because of the convergence of evidence —the evidence detailed in Sections 1 to 5, the evidence mentioned in Sections 6 & 7, and the evidence elaborated in other DSSU-cosmology works.

One more point relevant to theory validation: The DSSU, it has been stated, is a non-evolving universe (although it does have mechanisms of evolution acting within the universe's unchanging perpetual processes). Validation of the theory, however, does not require advancing a proof of the non-evolving nature. Only a theory that asserts, in the affirmative, that the universe is evolving requires such proof. As pointed out earlier, cosmic cell structure is a *sustained* structure —it never evolved. It never formed from some structureless state. It has always been cellular. In contrast, evolving universes, like the Big Bang, are the ones burdened by the demand for proof. Proof, which in the form of hypotheses, has led to what some physicists call a preposterous universe;

proof, which in the form of observations, has led to ever more contrived interpretations of basic phenomena, notably the ultra-redshifted starlight (interpreted as a primordial CMB glow) and the *apparent* recession of galaxies (interpreted as the Hubble expansion); proof, which in the form of cosmic-redshift-distance equations fails to take into account the cosmic cellularity; and proof, which in the form of the *apparent* epoch-dependent recession has led to an accelerating-expanding universe. As discussed in Section 6.4, treating the universe as something that evolves demands physical laws acting *on* the cosmos from *outside* the cosmos. Such is not possible, not scientific. The burden of proof is not on the DSSU; the validation of DSSU theory stands.

The Dynamic Steady State Universe is the *real Universe*. It functions *perpetually* without evolving. But rest assured, it contains profound mechanisms of evolution through which matter sometimes attains its greatest complexity —as manifestations of various levels of consciousness. Matter of the universe, occasionally, here and there, evolves to contemplate its own existence, and to seek an understanding of the nature of the universe and existence itself.

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