

THEORETICAL FOUNDATION AND PILLARS OF THE DYNAMIC STEADY STATE UNIVERSE

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2008

Natural science has two main projects. One is to understand the laws that underlie natural phenomena. The other is to understand the processes that [shape] the world as we know it. — David Layzer¹

The supreme task of the physicist is to arrive at those universal elementary laws from which the cosmos can be built up by pure deduction. . . —Einstein (1918)²

Abstract

I present four axioms, and argue their reasonableness. I postulate four processes (two pairs of symmetrical processes) or causes, and argue their reasonableness. Together they constitute the foundation and pillars of DSSU theory.

KEYWORDS: Cosmology, Non-expanding universe, Dynamic Steady State Universe, Steady State, Cellular universe, Cellular structure, DSSU postulates, Metaphysics, Aether space, Expanding space, Contracting space, Causeless process, Primary process, Initial conditions, Entropy.

The *Dynamic Steady State Universe* (DSSU) is the first **static-and-stable universe** in the history of cosmology-as-a-science. Moreover it is a **static** and **stable** universe consisting of non-static, non-stable aether space. In other words the DSSU is a universe consisting of dynamic space —space that expands and contracts.

The DSSU is also the first paradox-free universe in the history of cosmology-as-a-philosophical-speculation. It has no beginning-of-time paradox; no regressive cause-of-causes paradox; no entropy paradox; no creation-from-nothing paradox; no relative-versus-absolute-motion paradox.

The following theory incorporates three key principles missing in conventional cosmology. (1) At the truly fundamental level of existence, things (or more properly, processes) are as simple as they could possibly be. We may safely assume that at such a level, at the most basic level, *nothing could be simpler*. (2) There exists a fundamental and essential process *that exists without prior cause*. (3) Full compliance with the strong version of *the cosmological principle*.

The long history of cosmology has been the search for a simple, yet powerful, set of laws that define the Universe. The evidence suggests that simplicity is best achieved through symmetry; unrivalled power is best achieved through a symmetry of opposites —a *harmonious* symmetry of opposites. Here lies the recognized direction of the ultimate quest, for

... through the work of Einstein and his successors, have we come to understand that symmetry principles are deeper than specific physical laws ... — David Layzer³

In the assembly of the following axioms and postulates, the lesson of symmetry is fully exploited.

1 The Four Axioms

The following are the premises of the DSSU theory and in a process of deductive reasoning are taken as being axiomatic and serve as the source of postulates derived in later sections.

The Fact and Necessity of Existence and the First Axiom

By the mere state of being conscious, we are all cognizant of existence. In Roger Penrose's words "Consciousness ... is the phenomenon whereby the universe's very existence is made known."⁴

But why does it, or anything, exist?

Philosophers tell us that existence is not logically necessary; existence cannot be deduced from general logical principles.⁵ According to Bertrand Russell, "Existence by itself alone is a vicious abstraction."⁶

The fact of existence is not in question; the *necessity* of existence is the core ontological problem. The Universe exists and, as some physicists, including Stephen Hawking, have pointed out, science can solve many of its problems but it cannot answer the question, *Why does the universe bother to exist at all?*

Maybe the universe exists because it cannot do otherwise. It cannot *not* exist. A simple common sense argument—or rather a reasonable intuitive assertion—can be made that precludes non-existence.

I would argue that the necessity of the existence of the Universe is the consequence of the impossibility of total non-existence. The concept of total non-existence is not even conceivable. It is only possible to conceive of existence as opposed to absolute nothingness. Although one can conceive of non-existence within a larger domain of existence, it is not possible to think of the domain of existence as not existing. For instance, a star may fall into a black hole and literally disappear from the universe. That the ingested star is now non-existent is entirely conceivable. The surrounding domain containing the black hole still exists. We may further imagine all the stars in the universe being extinguished within a black hole. A surrounding universe of aether-space still exists. Imagine this also being absorbed. Then a three-dimensional region of 'emptiness' still remains. Something called 'space' always remains. The universe always remains.

The inconceivability of non-existence is not due to any inherent limitation that some would attribute to the human mind. It is simply not possible to have nothing whatsoever—an *unconditional nothingness*.

The alternative then is that something must exist—even if it is only vacuous space! Space with an absence of matter still has its own existence.

Now given that this something exists—and having spatial dimensions, as any meaningful definition of existence requires—then it must exist within something of greater spatial dimensions. Since we have eliminated the possibility of absolute nothingness, then whatever exists must be surrounded by a larger domain of existence. This argument can be repeated indefinitely. Since a realm of existence cannot be surrounded by nothingness, existence must be infinite! Or as Melissus of Samos of the 5th century BC argued: the void [nothingness] being ruled out, we are compelled to regard the material universe as infinite in all directions.⁷ One must conclude that the Universe is infinite and existence is infinite.

Let us turn our attention to the essence of existence and then come up with a statement of the first axiom.

Now it is easy enough to conceive of a universe without mass and without real particles. Willem de Sitter, in the early part of the twentieth century, did just that when he came up with his empty-and-expanding universe (often called the "motion without matter" model). The challenging part was formulating this expanding-and-empty universe-model using Einstein's recently developed *general relativity theory*. De Sitter showed that matter is not an essential ingredient—at least in theory.

What about space itself? ... The foregoing discussion precludes any notion of a universe without a space substance. *Space*, it turns out, is the essential ingredient for the construction of any realistic universe. 'Space' not as some empty 3-dimensional volume (or shell) but 'space' as a dense collection of some fundamental entities. Physicist Julian Schwinger pictured them "as a continuous collection of harmonic oscillators, spread throughout the universe." One harmonic oscillator at each point of space.⁸

In physics there is an argument for the existence of an essence. The idea that there's no such thing as empty space stems from the finding that a particle can't have both an exact speed and location. A point of 'empty' space is mathematically identical to a weightless particle with a speed of zero and a perfectly defined location, that being the point itself. This knowledge (of both exact location & exact speed) isn't allowed. Therefore, physicists postulate that empty space is actually full of fundamental entities that flash in and out of existence.⁹ **Simply put, if space exists (which, of course, it does) and this space cannot be empty, then whatever constitutes space (such as fundamental fluctuations) serves as the *essence* that permeates the universe.**

The first axiom states that since it is not possible to have absolute nothingness, there must be a ubiquitous essence. The essence of existence—and therefore the essence of the Universe—is aether-space. Furthermore, the supply of aether-space is infinite.

But as we will see next, the essence of the universe is not so much a 'thing' as it is a 'process.'

Axiom 2: the Essence of the Universe —Aether-Space— is Dynamic.

The DSSU picture of *space* is that of a quantum foam consisting of countless units of fundamental fluctuations (units of vacuum energy if you will). Consider each unit as an oscillator pulsating between positive and negative energy states. See Figure 1. While the *plus-energy* is momentarily in the real state the *minus-energy* is in the virtual state. This means that in each cycle the ‘energy’ pulse that appears is borrowed from the virtual state; it also means the space quanta are only quasi-real. Furthermore —and here our picture exemplifies a common philosophical belief that at the foundation level things are so utterly simple that they could not possibly be simpler— there is no need to explain where the energy came from. The accounting of the real and the virtual balances. The sum of the borrowed energy and the virtual energy is zero. This is known in physics and metaphysics as a bootstrap process.

We make no effort to define the nature of the energy involved other than to specify that it represents energy in its most primitive state.

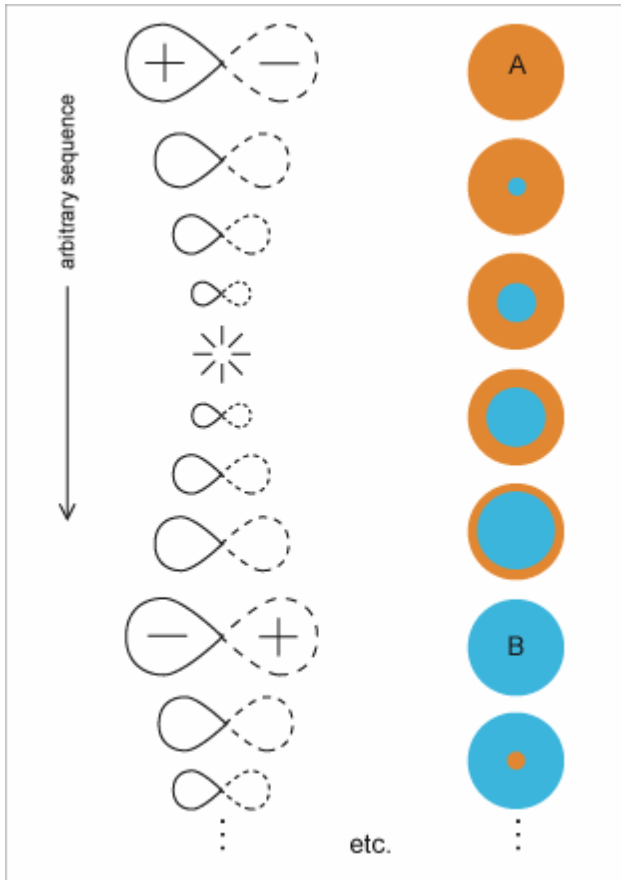


Figure 1. The Fundamental fluctuating quantum —an intuitive definition leads to two representations. Positive and negative forms of the most fundamental form of energy pulsate between the realms of the real and the virtual. The energy of a (+) pulse (solid outline, top) is borrowed from the virtual (dashed outline, top); then is replaced, as the sequence indicates, by a (-) pulse likewise borrowed from the virtual. The energy need not necessarily be called positive and negative, it could just as well be called color A and color B and the pulsations visualized accordingly.

An intuitive definition fulfills its purpose if it evokes an appropriate image. —David Layzer, *Constructing the Universe*, p72

And so, aether-space, at the sub-microscopic level, is dynamic. In a bootstrap process, energy is momentarily borrowed then returned in unimaginably rapid succession.

On the macroscopic scale aether-space has two basic dynamic properties or processes. Space can expand and it can contract. In fact the theory of *general relativity* demands it.

“Einstein’s theory does support such a description, and it predicts that a uniform, unbounded medium can’t be static; it must either expand or contract.” —David Layzer¹⁰

And when Einstein constructed his famous 1917 universe he incorporated *both* dynamic properties.

“In his 1917 cosmology paper, Einstein had tried to put together the broadest possible framework for how the universe might be constructed. He therefore envisioned two general kinds of influences that could affect the dynamics of the cosmos as a whole. Gravity bends space from without, causing collapse [i.e., space contraction]; Lambda unbends space from within, causing expansion [i.e., space expansion].” —Corey S. Powell¹¹

Although the 1917 universe was an admitted failure —it lacked stability and lacked a mechanism for gravity— its two dynamic properties were perfectly valid. It was an elegant mathematical universe (the first of many) in which reality was of secondary importance. Based on 4-dimensional geometric spacetime, it had no use for real 3-dimensional aether-space.

Recapping **Axiom 2:** Quantum space-units expand and contract (pulsate) on the ultra-small scale. Vast regions of space expand and contract on the large scale. Aether-space is dynamic. (Axiom 2, in qualitative agreement with general relativity, is a most reasonable premise.)

Axiom 3: the Essence of the Universe —Aether-Space— is Interactive

The fundamental energy fluctuations —the essence of the universe in its quantum form— have the ability to interact and enter into a formation process. In some slow, relentless, and mysterious way some of the dancing patterns of (+) and (–) energy combine to form new and increasingly real-and-stable patterns.

The quantum units of fundamental fluctuations (or oscillators) are called precursors. They are not only the ultimate units of aether-space (and existence itself) as described earlier but they are also the primitives of real particles. The name reflects the fact that in DSSU theory these ultimate units of space serve as the precursors of all mass and energy particles.

Axiom 4: the Dimension of Non-Existence

Our physical universe, the DSSU, has three spatial dimensions and a virtual dimension which effectively is the ‘dimension’ of nonexistence. Note that *time* is not an axiomatic dimension. *Time*, as will be discussed later, does *not* have an independent existence.

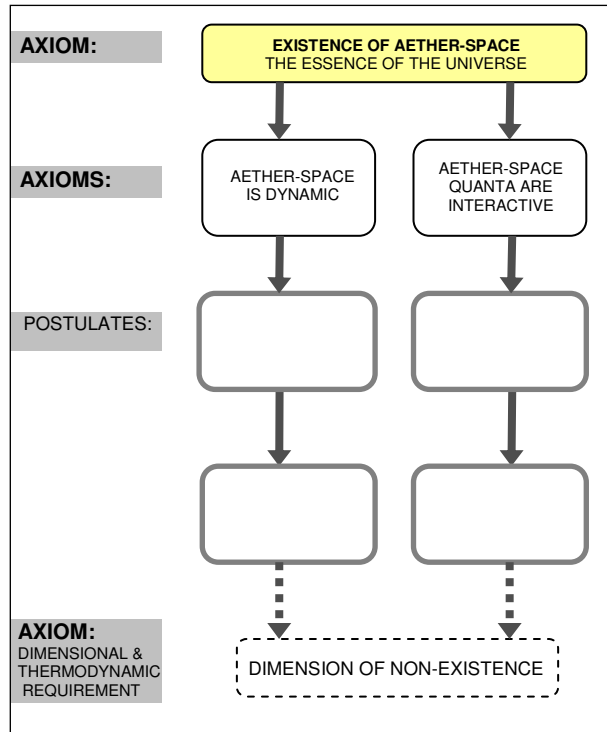
Needless to say, this set of four dimensions is unlike any other universe model.

The many models based on *general relativity* all have three spatial dimensions and a time dimension. Examples include the inflation models, the hot- and cold- BB models, and the current favourite, the Lambda-cold-dark-matter model. There are also complex universes —the ones based on string theory— which have a minimum of nine spatial dimensions!¹² And in the wonderland of pure speculation there are multi-verse models with unlimited dimensions — a case of abundance (as if more is better) winning and displacing reasonableness.

The realm of non-existence plays a vital role in the origin and demise of the fundamental fluctuations. In a region subjected to gravitational tension, there is a postulated spontaneous appearance of new space-existence units. On the other hand, in a region subjected to gravitational pressure, there is a postulated spontaneous extinction of space-existence units (in proportion to the intensity of the gravity). The former accounts for the process of space expansion, the latter for space contraction.

This ‘fourth’ dimension also plays a key role in the functional significance of the cores of black holes.

Axiom 4 provides simple symmetry to *Axiom 1*. Since there is a domain of existence, symmetry demands there also be a domain of non-existence.



Flowchart 1. The core ideas of the *New Cosmology* are charted as the four premises of the DSSU model of the universe. These are the axioms that provide the functional support for a pair of space postulates and a pair of matter postulates.

2 The First Postulate: The Essential Causeless Process

The spontaneous appearance of space-quanta, leading to the exponential macro expansion of space, is the essential causeless process of DSSU theory.

The *First Postulate* is the space-expansion postulate. It accounts for the observable phenomenon known as the Lambda effect. It also accounts for the non-Doppler (and non-relativistic) spectral redshift of astronomical sources. Space expansion is the direct cause of the *cosmic redshift* of the light from distant galaxies.

But the paramount significance of the *First Postulate* is its **etiological** nature. It represents a *cause independent process*.

It may be convincingly argued that every theory of the universe is ultimately based on some *causeless process*. If it is not, then it will be unable to stand up to the cause-of-causes paradox. Consider Einstein's original model (1917). It was based on a theory of gravity and a mysterious effect called Lambda (the cosmological constant). Gravity, which in some unexplained way is caused by the presence of matter, was obviously not a causeless process. But Lambda, which coded an antigravity effect, was different. *It had no cause* —for how could the vacuum, the nothingness of empty space, be the cause of anything at all? The cosmological constant represented a causeless effect! Of course, since the study of physics is the formal attempt to explain the causality of all things, the essential causeless nature went unrecognized.

Then, a decade or so later, along came the hypothesis of the universe as a big-bang explosion. Einstein's original general relativity equations (the ones without Lambda) were perfectly capable of describing an expanding universe that somehow started with a big bang.¹³ The new model, known as the Einstein-DeSitter universe (of 1932), did away with Lambda and away with the causeless process it represented. But now the question became, *What caused the initial big-bang of the BB hypothesis?* Was there a cause at all? Or was the primordial explosion simply the Big Bang (BB) model's very own causeless process (or event)?!

During the 1980s, in an effort to correct major problems with the contemporary BB version, the Inflation model of the universe was developed. A brief quote by physicists Martin A. Bucher & David N. Spergel sums up its core ideas. “The inflation field imparts an ‘antigravity’ force that stretches space.”¹⁴ Let's analyze the chain of causes being suggested. The phenomenon is the expansion or ‘stretching’ of space. This phenomenon, as Bucher & Spergel contend, is caused by “an antigravity force” which is in turn caused by “the inflation field.” Now, an inflation field is the name of the mathematical description of (logically enough) some kind of inflation effect. But what causes the *inflation effect*? Is *inflation* a causeless process? ... No answer —at least not within conventional physics.

If inflation is not a causeless process then it must be ‘an effect’ reacting to some other prior cause. The argument repeats itself either in circular fashion or as a pointless regression. The circular route leads to: *inflation, either directly or after some intermediate steps, is caused by inflation*, which is like saying the effect precedes its own cause! A paradox.

The last decade of the 20th century saw the introduction of the hypothesis of a universe undergoing *accelerating* expansion. And again the general relativity equations¹⁵ would work just fine. In this *accelerating* big-bang model Lambda becomes reincarnated as the expansion of space itself. Lambda is often thought of as vacuum energy manifesting as cosmic space expansion. So now the universe is expanding because of the nature of the process of space expansion. Moreover, the universe is expanding faster and faster because of exponential space expansion. And again we inquire into the underlying cause. What motivates the *space* of the universe to expand? We can briefly delay the inevitable by suggesting that the vacuum energy causes space expansion. But the question does not go away. What then causes the vacuum energy to appear? More specifically, what causes the vacuum energy to appear continuously maintaining a constant energy density even as space is expanding?! One would normally expect energy dilution with expansion; yet we have a constant vacuum-energy density even while space is expanding. (And the latter statement is supported by the authority of almost all practicing astrophysicists.) Maybe we could propose the converse, that space expansion causes the appearance of the vacuum energy. No point. In the end, or at the bottom, one must encounter *a process that simply has no cause whatsoever*.

Space expansion, or the appearance of vacuum energy if one so chooses, as a fundamental micro- and macro-scale process, is *the* causeless process of our Universe.

What does it mean to have a causeless process? Yes, it immediately solves the cause-of-causes paradox (a circular sequence of causes or an endless regression of causes). But there is an even more profound aspect. Consider what space expansion supplies to the universe. Whatever it may be, it is being supplied without limit. The expansion process serves as an infinite source! Consider now what happens if this logic is ignored.

Empty space (the vacuum) according to relativistic quantum field theory is filled with, or consists of, harmonic oscillators in their lowest energy state. But the energy level is not zero; physics demands that the harmonic oscillators have some energy even in their lowest energy state. Thus vacuum energy exists at every point in space and one of its manifestations is evident in the expansion of space.

Physicists have found that *any* relativistic quantum field theory predicts that empty space

The first postulate is the physical expansion of aether-space —a process without prior cause.

What does it mean to have a causeless process? For one thing, it unequivocally solves the cause-of-causes paradox. For another, and this is both logical and profound, it means that whatever the space-expansion process conveys to any region where the process is active *it conveys perpetually*. In other words it means there is an infinite supply of new space-quanta (and whatever is subsequently derived from them).

Now think about this for a moment. ... The resolution of the cause-of-causes paradox has led to the miracle of miracles! An infinite font of all forms of higher existence!

In the field of physics and cosmology I can't imagine anything evoking greater awe and wonder. The primary nature of this process is the reason it takes top honors as Postulate #1.—CR

will be filled with these energy fluctuators and hence vacuum energy. Furthermore, it seems that this vacuum energy theory just may be able to solve a deep mystery in BB cosmology known as the dark energy problem. However, when physicists try to calculate how much vacuum energy there is in the field they find something unexpected. An authority on the subject, Dr. Robert Oerter, tells us, "Embarrassingly, relativistic quantum field theory predicts an *infinite* amount of dark [vacuum] energy. ... Is there a way to avoid the embarrassment of infinite energy and explain the dark energy at the same time? Unfortunately the answer seems to be no."¹⁶ Physicists have long sought to explain away what, to them, seems—but really is—an infinite source of energy.

In an effort to tame the 'infinity', the energy of the space quanta was limited to the Planck-scale energy (for the simple reason that no smaller scale and no higher energy density is realistically conceivable). This facilitated a popular comparison but did not moderate the embarrassment Oerter refers to. The energy density was still far too great.

Here is the comparison. On the one hand: according to the supernova observations, which made science headlines in 1998 and implied the existence of the energy, the actual amount of vacuum energy contained in a thimbleful of empty space is equivalent to the mass of a few electrons. On the other hand: "According to relativistic quantum field theory, though, the amount of dark energy in that same thimble of empty space is equivalent to a mass greater than that of all the known galaxies. Clearly, something is wrong with this picture." The observations say the vacuum energy (Lambda) is extremely small; yet theory says it should be extremely large. And so the vacuum energy puzzle is one of the greatest unsolved problems in physics today.¹⁷

The good news is that it is only a problem in BB cosmology—in the context of which it is probably quite unsolvable.

Physicists have failed to recognize the infinite vacuum energy for what it is. The vacuum—aether-space—truly represents an infinite source of energy. It means space expands. A thimbleful of space can expand forever. (And by Postulate #3 it can even, eventually, replace all the visible galaxies!) In the absence of normal (i.e., contractile) gravity, space expands perpetually. Relativistic quantum field theory predicts an *infinite* amount of vacuum energy precisely because space has the potential to expand forever and ever.

The natural tendency for aether-space to expand is the Universe's one and only *causeless process*.

The real mystery is why cosmologists, compelled as they are to look at the whole world picture, have failed to see this. There is, of course, no mystery as to why physicists fail to recognize the essential causeless process—the study of physics, as conventionally defined, precludes causeless processes. Cosmologists and philosophers are not so restricted. They are, after all, fully aware that the vacuum energy is intimately tied to the process of space expansion. Furthermore, they are, or should be, aware that the conservation of energy law does not (and cannot) apply to the Universe. The fact is stated clearly in one of the most popular cosmology textbooks. "The conclusion, whether we like it or not, is obvious: Energy in the universe is not conserved."¹⁸

Axioms 1 & 2 have led us to the space expansion postulate. If we think of *Axiom 1* as a striving for existence, as a process in which new units of existence manifest as ghostly entities (somewhere between almost real and almost not-real), undetectable on the quantum scale, but collectively powerful enough to shape the universe ... If we think in those terms then *Axiom 1*, along with *Axiom 2* (which simply makes the 'striving' more explicit), leads to the expansion postulate and the resolution of the cause-of-causes paradox.

Postulate #1 represents a specific dynamic activity of space. If our goal is an equilibrium universe then we will need a symmetrically opposite dynamic activity.

The next step in the formulation of DSSU theory is to specify a process which opposes space expansion. We need the balancing process of space contraction.

3 The Second Postulate: Space Contraction Process and the Causal Mechanism of Gravity

Space contraction postulate: All matter contracts aether-space, (1) directly through a process of assimilation or *direct absorption* and, (2) indirectly through a process of *self dissipation*¹⁹ within the *space contraction field* that surrounds each and every object or 'particle'.

The *space contraction postulate* stated as the *causal mechanism of gravity*:

(1) All matter contracts aether-space directly. The *direct absorption* or *assimilation* of aether-space is the **primary cause of gravitation**.

(2) All matter contracts aether-space indirectly. The *indirect contraction* by means of a process of *self dissipation* within the *space contraction field* that surrounds each and every object or ‘particle’ is the **secondary cause of gravity**.

The space contraction postulate codes the essential reason why all objects (all matter) are gravitationally attracted to each other.

The space contraction postulate describes the dynamic activity of aether-space that causes gravitational acceleration (the effect whereby matter accelerates towards other matter in proportion to mass or mass-equivalent).

The second postulate is more than just the symmetrical opposite of space expansion. We have here the key to understanding the mechanism of gravity —the key that was missing in Newton’s *force theory* of gravity and also missing in Einstein’s *curved spacetime theory* of gravity.

Newton’s theory provided a numerical description of how matter-to-matter attraction works but did not explain what gravity **is**.

I have not been able to discover the cause of those properties of gravity from phenomena, and I frame no hypotheses; —Isaac Newton

In 1916 Albert Einstein perfected the mathematical analysis of the phenomenon. His general theory of relativity has long been accepted as the standard theory of gravitation. The theory gives an amazingly precise description of the gravitational distortion of space; *matter tells space how to curve, while the curvature of space tells matter how to move*. But why? and how? is left unexplained.

*Gravity as a warping of space was a credible notion, though it gave not the least hint as to the nature or origin of gravitation; why the presence of matter should affect ‘space’ was left **unexplained**.— Edward Milne²⁰*

And it remained unexplained for the rest of the twentieth century. The deficiency and mystery was underscored by Einstein’s distinguished student, Peter G. Bergmann, when he wrote a book on the subject and titled it *The Riddle of Gravitation* (1992. Dover Publications, Inc., New York). The book has gone through several editions and revisions but the riddle remains.

Then, in the early years of the present century, some independent thinkers recognized that the problem lies with the traditional concepts of space. Newton’s space is static and non-participatory. Einstein’s space is 4-dimensional and mathematical (since space has no absolute nature, it is defined by its coordinates, hence mathematical). Both lack the fundamental processes of a dynamical 3-space.

What is missing is the 3-space self-interacting effect. —Professor Reginald Cahill²¹

Standard Cosmology, rejects the aether-space concept, and remains committed to the unrealistic marriage of space and time into 4-dimensional spacetime. In general relativity models it is a mystery how matter manages to curve the space around itself. It is a mystery how matter senses and responds to space curvature. How indeed does matter/energy curl up physical or coordinate space?

In DSSU theory, 3-space contracts in the region surrounding a gravitating body; and it contracts proportionally to the inverse of the radial distance raised to the power 3/2. (The fractional unit rate of contraction is $1/(r^{3/2})$ per second.) The remaining space —the uncontracted portion of the aether-space— flows radially inward with an accelerating speed. The acceleration is $a = (\text{constant})/r^2$ and agrees, as it must, with the familiar inverse-square law for gravitational acceleration.

It is this inhomogeneous contraction, or self-dissipation, of space that ‘carries’ objects and particles towards the center of the gravitating body. Professor Reginald Cahill of Australia describes the process,

... it is a[n] ongoing re-structuring of space itself, that manifests as an inhomogeneous flow of space towards matter. It is this inhomogeneity rather than the motion itself that actually is the phenomenon we know as gravity.²²

The key is the contraction of space.

Let us return to the process of space contraction as the balancing opposite of space expansion. This *harmony-of-opposites* aspect of Postulate #2 is the practical mechanism and theoretical reason why the universe does **not** expand. The quantitative volume of new aether-space formation is harmoniously balanced

by the quantity consumed/contracted. The two processes occur in separate, and distinct, recurring regions. In other words the cosmos is ordered into balanced dynamic-space regions. See [Figure 2](#). Under these conditions, the universe does not expand. As an aside there is also a sound philosophical reason why the DSSU does not expand. If a universe is infinite in its three spatial dimensions (as is the DSSU), then it is surely meaningless to suggest that it expand and grow larger.

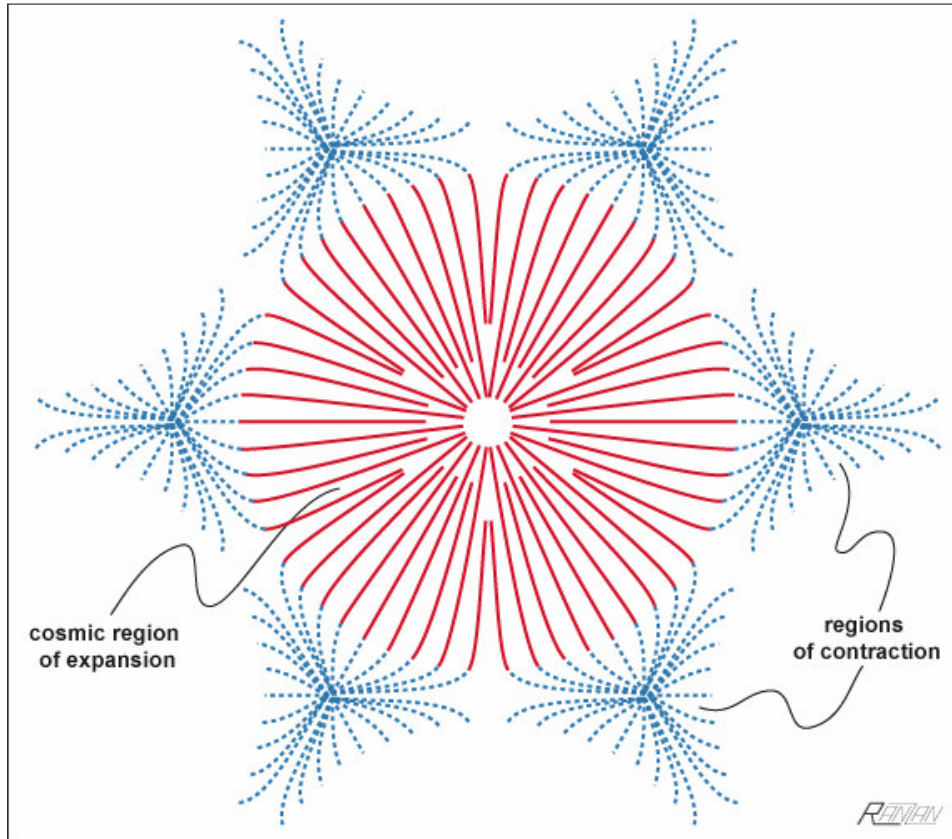


Figure 2. Idealized regional distribution of the space expansion of *Postulate #1* and the space contraction of *Postulate #2*. Given that the aether-space—the essence of the Universe—is dynamic, it is predicted and confirmed by observations, that there are vast space-expanding voids (such as the one shown with red flow lines). And it is predicted that there are *space-contracting zones* (blue-dotted flow lines) surrounding the relatively empty regions—confirmed by the fact that gravitating regions are found here, at the periphery of voids.

The **space contraction** postulate provides the causal mechanism of gravity, balances space expansion, and prevents the universe from expanding. But there is more. It has two corollaries that provide the explanation of the property of mass and inertial resistance.

(1) **The direct contraction/absorption sustains the property of mass:** The precursors (the space quanta) are involved, as explained below, in a bootstrap process of mass and energy formation. But the formation process is only the beginning. A steady stream of space quanta seems to sustain the existence of all particles of mass and energy. Dr. Johan Masreliez describes an interesting version.

*Spacetime is filled by vibrations at extremely high frequencies carrying out a complicated dance that sustains everything there is including our own existence. ... The shapes and intermingling of these oscillations carry the information that sustains the existence of particles and all matter.*²³

What we have is a process by which precursors are absorbed by all particles. The process involves the flow of aether-space into mass. This is a profound effect! It is one of the two mechanisms by which aether-space is dissipated (or contracted).

If we picture the process this way: mass is ‘pulling’ aether-space into itself; then we immediately grasp how it is that mass objects are able to grab into their surrounding space and acquire their property of inertia (the property of resisting a change in the state of rest or motion).

(2) **The process of indirect contraction bestows inertial resistance.** It is the contraction of space in an object's immediate vicinity that is the means by which objects 'grab' into their surrounding aether-space and is responsible for its inertial mass —its resistance to any change in its state of rest or motion.

Space Contraction is a remarkable phenomenon. We experience it as the gravitational effect. We witness its effect in the motions of celestial bodies. We feel it as inertial resistance when moving any object that is freely suspended or unconstrained on a 'frictionless' surface.

4 The Third Postulate: Particle Formation Process

The Particle Formation Process

During the dance of the quantum oscillators of aether-space, some will interact and form distinct patterns. Those that are reasonably stable become the primitive forms of various species of mass and energy particles. The formation of primitives represents a first-stage matter-formation process —providing the universe with its 'seed' matter.

The rate of seed formation is a fixed rate per unit volume of aether-space. (Thus if space expands exponentially, so does the quantity of seed. However, its distribution density does not significantly change.)

A second stage particle formation process involves the subsequent growth —an exponential growth — of seed matter. It involves the production and combining of the basic components that make up sub-atomic and atomic particles. This independent compound growth, over time, overpowers the growth of space and its further expansion.

All particle formation is achieved by incorporating the energy of the fundamental fluctuations.

Why the need for second stage growth of matter? ... Physics demands it. Without it the average mass density could never increase in a region expanding according to Postulate #1. If both space expansion and matter formation are positive exponential growth processes, then, no matter how the rates are adjusted, it is physically and mathematically impossible for the density of matter distribution to increase in a cosmic region. Thus, the third postulate includes a second stage growth of matter, independent of space expansion (or contraction).

The space-expanding cosmic voids are the nurseries for primitive matter, sub-atomic particles, and even the light elements. When light-weight elements are subsequently baked within stellar furnaces all the heavier elements are formed. The nuclear processes involved are well understood by physicists.

Background and Grounds

The problem of how change occurs and how things come to be had perplexed the Greeks for centuries — even before Aristotle. They wondered, what is the original change that produces "matter and form"? How can anything come into existence? It cannot come from what is not, they argued, since that is non-existence. And it cannot come from what *is*, for then it would already have been in existence. Aristotle introduced a distinction between potential and actual existence. For example, a tree owes its actual existence to a seed and the seed exists as a potential tree. But the argument is somewhat circular, hence, the distinction is more illusory than real.

DSSU theory accepts the conclusion of the ancient philosophers: no 'thing' can confer its own existence on itself. Real matter depends for its existence either directly or indirectly on something that exists of necessity, and this 'something' is the quantum unit of space/existence —partly real, partly virtual; partly existing, partly non-existing. Think of it as a threshold form of existence. Space itself does not require the pre-existence of anything other. It has necessary existence by virtue of the *two inconceivables*: non-existence and infinity.

Matter, then, is formed from what exists of necessity but what is not quite a material thing itself. Matter forms from units of *aether-space* (units which are not quite real but have a virtual-real duality). Matter begins its formation from the interactions between *precursors*.

Equations in advanced physics attribute energy fields in the vacuum with an average value of zero, but it is recognized that an average doesn't rule out a localized value for energy in one place being equal and opposite to an energy value someplace else (in a near or even an adjacent place).²⁴ Fluctuations having some favorable pattern and magnitude can, and do, result in the birth of matter.

Under the right conditions precursors react with each other in some unknown way. A momentary energy boost and the product gains access *to*, and remains *in*, the observable universe. A real particle is born. Such an event, repeated endlessly, represents a process for the continuous birth of seed matter.

The subsequent growth of seed matter involves interactions with space quanta (the fundamental fluctuations); interactions that lock ever more energy into the real state, and ever more energy into the frozen state we call mass ($m = E/c^2$). In this simplified way all the subatomic particles are formed.

In our picture, every subatomic particle is an evolved collection of fundamental fluctuations (i.e., our precursors). And what is more, every subatomic particle is sustained by the continuous flow of precursors. In the standard physics picture, there is pleasing agreement. Fritjof Capra (1939 -) the famous Austrian-born theoretical high-energy physicist has written: “Modern physics has thus revealed that every subatomic particle not only performs an energy dance, but also is an energy dance; a pulsating process of creation and destruction. ...”²⁵

On the Reasonableness of the Third Postulate

Practically all theories of the universe contain a process for matter formation or creation. Let’s take a brief look at expanding universe models.

BB cosmology is, of course, matter formation-creation with explosive intensity on the cosmic scale. In dealing with matter formation BB theories may be divided into two types. The first is the singularity type of universe which begins with matter of infinite density within an infinitely small point-volume. The second type treats universe as a probability wavefunction of a form requiring no prior initial states. The absence of prior conditions, as physicist John Barrow explains, “allows its transition probability to be interpreted as that for a universe that has been created out of nothing at all.”²⁶ Two scenarios; neither explains the origin of matter. One assumes its prior existence (in a theoretically and physically impossible state) the other proposes a philosophically unsound creation *ex nihilo*.

In neither the singular big-bang creation nor the quantum [wavefunction] creation is there any information as to what the universe may have come into being from, or why. —John Barrow²⁷

Whatever the creation process, one may safely assume that it occurred rather suddenly, hence the name Big Bang.

The traditional Steady State Theory dealt with matter creation by postulating a Creation-field. With this C-field theory, in the words of one science writer, it was

... proposed that matter leaches into existence from out of the vacuum of space. A steady state universe can expand and yet be infinitely old, the newborn matter compensating for the matter density lost through cosmic expansion. To the criticism that a C-field creation of matter seems rather mysterious, the steady state advocates could and did restate that it was no more mysterious than the alleged origin of all matter at the beginning of time in the big bang model. —Timothy Ferris²⁸

The reasonableness of the DSSU *Particle Formation Postulate* rests on the fact that it violates no physical laws. If equal amounts of positive and negative energy participate in the process then there will be no violation of the energy conservation law. Furthermore, the process is not an inexplicable creation-from-nothing but rather a natural increase in the self-organizing complexity of that which pre-exists. Reason favors *formation* over *creation*.

The Ancients had a remarkably sound notion of matter formation. Anaximander postulated “The ‘boundless’ an infinite fund of material extending in all directions.”²⁹ From the *boundless* everything arises. Heraclitus taught that things are always in a state of becoming.³⁰ Another veritable belief of the Ancients was that all things undergo a process of change, nothing is permanent. In Anaximander’s universe all things are in flux. Heraclitus taught the doctrine that all things are involved in some kind of motion; that the whole universe was forever in a state of complete flux or change.³¹ The process of change, they believed, is very logically the result of the struggle of opposites.

Matter in the Dynamic Steady State Universe is involved in this flux. Via the process of formation matter ‘flows’ into existence, prevails during some finite cosmic interval, then vanishes. It vanishes by ‘flowing’ into the realm of non-existence (the realm of Axiom 4). That which Postulate #3 places into the Universe the next and final postulate erases.

Whether we call it the ‘logical struggle of opposites’ or the symmetry of process, in determining the final postulate we are simply following the consequences of the four axiomatic assumptions —wherever they may lead.

5 The Fourth Postulate: Suppression-Annihilation Process

Postulate #4. *All mass, all matter, all energy particles, without exception, are compressed out of existence inside a Superneutron Star (a non-singularity 'black hole') by a process of suppression-annihilation (SU-AN). The process occurs within the region of maximum mass/energy density: the SU-AN core deep within a Superneutron Star (SNS).*

Postulates #3 (the formation process) and #4 (the SU-AN process) are intimately linked to each other. According to Postulate #3 matter is not only formed from quanta of space but also sustained by them (hence the property of inertial mass). Cut off the supply of aether-space and matter becomes unsustainable. But cutting off the space flow to some chunk of matter—celestial or terrestrial—is not easy. Ordinary matter has the ability, under certain conditions, to extract new space quanta from the vacuum. In fact there is only one way to block the supply. The 'object' to be *suppressed-annihilated* must be compressed to a density at which the normal interstices of matter disappear! Upon reaching a hyperdense state, even greater than neutron density, aether-space can no longer penetrate matter. And the only way to achieve this density on a large scale is through gravitational collapse. The equivalent of multiple solar masses must first collapse. The neutron star so formed must then accumulate additional mass, say from a binary companion; thus forming a superneutron star (SNS). The core density reaches an ultimate value. The core 'material' now cut off from the vital flow of aether-space becomes a SU-AN region.

Inside any sufficiently massive SNS, a progressive unification of forces takes place as matter is pushed towards and into the SU-AN core. In the process the quantized existence of the fated matter ends: positive and negative fundamental energy reunite and cancel each other. And since nothing accumulates, the process has no limits.

There is also a quantitative connection. The SU-AN transition into non-existence balances the formation, or coming into existence, of the particle entities of Postulate #3. While matter continually arises and exits, the *net quantity* of matter present in the universe is stable. The DSSU, after all, is a steady state universe.

What about the spatial allocation of all the matter being formed, reacting, and being 'destroyed'? The two processes (Postulates #3 and #4) manifest in a characteristic density distribution of matter. The predicted large-scale distribution is shown in Figure 3 as a 2-dimensional representation of a 3-dimensional region of the universe.

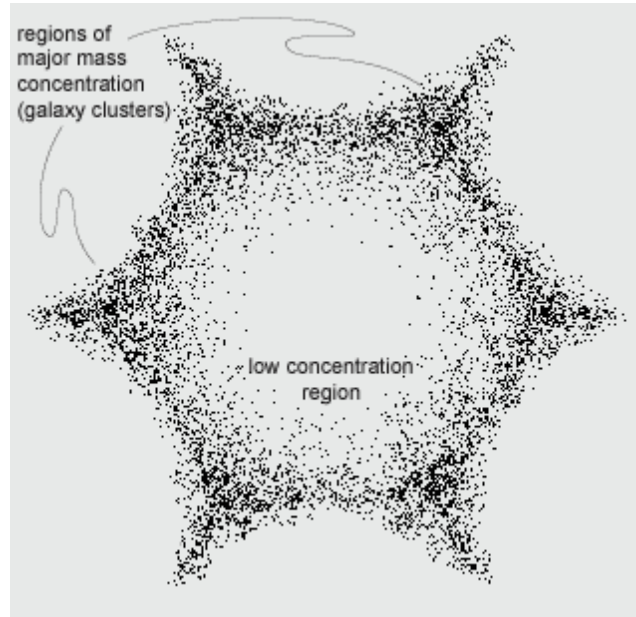


Figure 3. Cosmic regions of matter concentration. While *Postulate #3* matter formation is ubiquitous, the degree of concentration of precipitated matter varies from the negligible density in the space expanding voids, the low density gas and dust in interstellar and intergalactic regions, through a wide variety of star densities, to the ultimate density of *Postulate #4* suppression-annihilation.

So that there is no confusion I must emphasize that the SU-AN interaction is *not a conversion*: Unlike the annihilation of particle and anti-particle pairs, which actually releases a substantial amount of energy (radiation energy from mass conversion), the SU-AN interaction produces nothing—no energy, no particles, no radiation. It is a negation of the process or processes that originally brought the particles into existence.

On the Reasonableness of the Fourth Postulate

From the perspective of conventional cosmology, the SU-AN process is dismissed as a clear violation of the conservation of energy law. But, of course, conventional theories do not have an ‘axiom four’ *dimension of non-existence*. They do not have the means to model the extreme limits of density and pressure. (The singularity hypothesis, although it may serve as a mathematical model, is physically quite untenable.) Nevertheless, theorists are convinced of the presence of some strange phenomenon taking place in the interior of what are called black holes.

It is well known that Einstein rejected the reality of black holes (arguing that a star’s physical radius could *never* fall within, or become less than, the Schwarzschild radius). However, he recognized, or at least suspected, that the gravitational collapse of matter would involve some kind of new physics:

*“He did not trust ... the equation of state, because he anticipated that, under sufficiently exotic conditions of density and pressure, the relativistic behavior of the constituent particles of matter might give rise to new phenomena ...”*³²

Now if the SU-AN phenomenon represents a limiting pressure then one would certainly expect the phenomenon to likewise represent a limiting temperature. It would logically be the highest temperature that is possible to attain. Is there any evidence that temperature actually reaches a limit? Indeed there is.

Groups of researchers led by Reinhard Stöck and Shoji Nagamia, at the University of California’s Bevalac, conducted successful experiments involving high energy collisions between heavy nuclei. Using ever higher energy and special techniques based on the thermodynamic analysis of the collision fragments, it was possible to measure the temperature and show that it increased with available energy until it reaches a value of about *two trillion degrees* (about 165 MeV equivalent), *where it levels off!* This leveling off—this approach to a limit—is in itself a very important observation. “The fact that the temperature appears to saturate at about two trillion degrees is ... a matter of crucial importance not only to elementary particle physics but also to ... the very last instants of gravitational collapse of a giant star, during which gravitational energies become sufficiently large to create these [high temperatures].”³³ There clearly seems to be a physical limit to the concentration of energy. Not only does this support the reasonableness of the SU-AN process, occurring deep inside a superneutron star, but it strongly suggests that the temperature is in the range of two trillion degrees!

The SU-AN process represents an intuitive outcome—a philosophical reasonableness. Physicists know that when matter undergoes gravitational collapse standard physics fails them. They instinctively sense an innate terminal aspect. John Barrow tells us that when a particle falls into a collapsed region it has reached the edge of space and time. It literally disappears from the universe.³⁴

Suppression–annihilation is a phenomenon that is both intuitive and detectable (as it affects the behavior of SNSs); a phenomenon in which the essence of the universe and its higher-level manifestations (as particles of matter and energy) return to the dimension of non-existence.

6 Causeless Process Question: Does Postulate #1 Make the DSSU a Perpetual Motion Machine?

It is important to understand that the normal conservation laws apply to restricted systems; they do not necessarily apply to the universe as a whole.

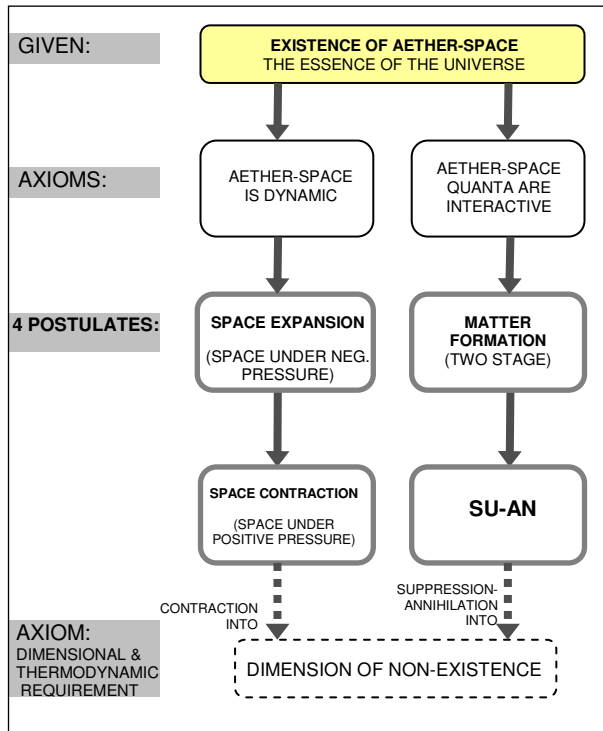
The great invariance principles of nature may be relied upon within the domains of their application, but they are not a priori self evident or necessarily of universal application. —Philip Morrison³⁵

Leading cosmologists do acknowledge that one law in particular, the conservation of energy law, does not apply to the universe itself. By suspending the energy conservation law, theorists can accommodate a BB universe that repeatedly cycles between a big bang and a big crunch.

Nevertheless, let us retain the energy conservation law and test the DSSU model. We are mainly concerned with the *space-expansion postulate* (our causeless process) and its dynamic opposite. Together they constitute a perpetual flow of space into existence and out of existence. The question is, *Does continuous space-expansion and subsequent space-contraction constitute a perpetual motion ‘machine’?*

Interestingly, there are three kinds of perpetual motion machines: The first kind violates the principle of conservation of energy; the second kind violates the 2nd law of thermodynamics (the entropy law); the third kind, however, violates NO known laws.³⁶

A **perpetual motion machine of the third kind** is defined, according to a McGraw-Hill reference tomb, as “A device which has a component that can continue moving forever; an example is a superconductor. If a direct current is caused to flow in a superconducting ring, this current will continue to flow undiminished in time without the application of any external force.”³⁷ Such a ‘system’ violates no known laws.



Flowchart 2. The physical and metaphysical concepts of the *DSSU Cosmology*. The core ideas involve the *Essence of the Universe* (aether), its dynamic nature, its stable manifestations, and a dimension of non-existence. The four core ideas lead to the *four Postulates*: two *space processes* and two *particle processes*.

It may therefore be conceded that, yes, the DSSU is a perpetual motion ‘system.’ However, being of the ‘third kind’ no physical laws are violated. Aether-space is the *component that moves forever* — a perpetual flow into existence and out of existence.

We have then one pair of postulates for the ethereal essence-stuff of the universe and another pair of postulates for the ponderable mass and energy particles. The flowchart is now complete. Amazingly, there are only four fundamental processes that drive (or sustain) the universe. In a strange coincidence or possibly something deeper Aristotle came to the conclusion more than 24 centuries ago:

The study of truth requires a study of causes. The causes through which everything comes to pass are four in number ... — Aristotle, Metaphysics Book II

Flowchart 2 summarizes the theoretical foundation of the Dynamic Steady State Universe. But what about *time*? — an important concept, conspicuously missing! Among all the axioms and causes in the chart not one of them refers to *time*. ...

7 Time

Aristotle, in his famous work *Metaphysics*, draws attention to a contemporary argument that says time does not exist, for the past no longer exists and the future does not yet exist. Having weighed this argument, he rejects it and defines *time as motion which can be enumerated*. For Aristotle *time itself is motion*, the flow of time is the motion of the arrow of Zeno’s famous paradox or of the Sun and Moon across the sky.

Aristotle concluded that “time is either the same as motion or a condition of motion.” [*Metaphysics, Book XII*] DSSU theory adopts this conclusion but expresses it more forcefully. Time in and of itself does NOT exist. Time is simply a concept that emerges from change — any real change in anything or any process. And change always involves motion — even if it is merely that of a speeding photon. If there is no change then time has no meaning.

“If there is nothing that can change, there is no way to make time an observable quantity.” — Astrophysicist, Henning Genz³⁸

Time is just a convenient and arbitrary way (using arbitrary but standardized symbols) to quantify the rapidity (speed) with which change, any change, takes place. This quantifying process requires that the change being observed *must* be compared to some other observable change. Every expression of time, implicitly or explicitly, involves such a comparison.

Time is simply a **comparison of the coincidence of two separate motions**. Whenever one makes a statement about time or the measure of a time interval it is always possible to substitute the phrase: *motion A has a simultaneity correspondence to motion B*; suggesting that time is not something independent but is simple a relational term (an expression of comparison).

Clocks simply measure some arbitrarily chosen motion or change. The meaning, hence the usefulness of clock time, is derived from a numerical comparison with some other motion or change. For example, what we call ‘one second of time’ is simply a 6-degree rotational change in one of the arms of a mechanical clock. One *time-second* is also the fractional rotation of the Earth about its axis. One time-second is approximately 1/86,400 fraction of a full-duration rotation. If the incremental change in the clock arm is to serve as a useful standard unit of time then the 6-degree change on the clock must occur while the Earth makes 1/86,400 fraction of a turn. Without this, or some similar comparison, one *second* means nothing. If we want to know how fast in time the Earth is *really* changing its rotation—without reference to the *second* or its multiples—we still must compare the Earth's change with some other change. (It can be any other change we please; of course some changes are more convenient than others. The convenient ones we call clock time.) There simply is no deeper meaning of *time*.

Expressing **the passage of time is simply an assertion that an event or series of events have occurred.** Stating, as an ancient Egyptian farmer might have, that wheat seeds were planted *four moons ago* would be an assertion of a number of full-moon events or lunar cycles. Stating the official meaning of a time duration of one second, as a physics practitioner is likely to do, involves the assertion that 9,192,631,770 vibration-events of the light emitted by a cesium-133 atom have occurred.³⁹ The only quantitative meaning that can be attached to any statement of time is to give a count of the number of sequential events (motions) that have occurred. Regular sequential events (motions) are, of course, most useful.

Arguments in favor of absolute time are thoroughly unconvincing.

Plato expressed the traditional argument. He promoted the idea of created time. How was it created? Naturally—or rather supernaturally—it involved the hand of a creator. But what value can we, or should we, place on an idea (created time in this case) spawned in the mind of a man who rejected sensory perception of the real world in favor of contemplation and revelation?

Then there is Newton's version. Newton had a profound vested interest in the nature of time. The whole description of his mechanical universe as detailed in the *Principia* of 1687 depended on the concept of time. And so, Newton's great work began by defining time as,

... absolute, true, mathematical time, [which] of itself, and from its own nature, flows equably without relation to anything external.

This was a radical new idea. “No longer was time determined by the universe, but rather Newton postulated an absolute clock, external to the universe, which measured time independently of the universe itself. With his ideas Newton put time into a new place in mathematics.”⁴⁰

However, and here lies the problem, whenever you propose something “external to the universe” you are invoking Plato's Creator. Any meaningful understanding of Newton's absolute time must remain elusive, for

... nobody has understood what Newton meant by his definition of time, except that time is objective and physical and is not purely subjective and psychical. —Edward R. Harrison⁴¹

Newton, and Galileo before him, had made *time* a fourth dimension in the world. This classical time, as we just saw, is absolute.⁴² Einstein with his famous works on relativity did his part to deepen the connection of time with a fourth dimension. However, Einstein's time is not absolute. It cannot be absolute; it depends very much on the observer. “Each of two systems moving relatively to each other has in fact its own time, perceived and measured by an observer moving with the particular system.”⁴³ Furthermore, the concept of simultaneous events (say two explosions occurring at different places) for all observers does not exist. The two events may appear simultaneous to one observer but sequential to another! This only makes sense if time is non-absolute.

In fact, the *time* used by relativity theory has an imaginary quality.

The difficult that Einstein faced was the apparent contradiction in the fact that all velocities are relative and the assertion that the velocity of light is non-relative. Einstein found a way out, as explained by the Russian philosopher P. D. Ouspensky, “by understanding time itself ... as an imaginary quantity resulting from the relation of the given velocity [of the observer] to the velocity of light.”⁴⁴

In order to give due prominence to this relationship [between spacetime and Euclidian geometric space], however, we must replace the usual time coordinate t by an imaginary magnitude $(-1)^{1/2}$ ct proportional to it. Under these conditions the natural laws satisfying the demands of the (special) theory of relativity assume mathematical forms, in which the time-coordinate plays exactly the same

role as the three space-coordinates. Formally these four coordinates correspond exactly to the space-coordinates in Euclidian geometry. —A. Einstein⁴⁵

In essence Einstein geometrized time by making it an imaginary quantity. Only by treating time in this way is he able to mould *relativity* into a workable theory.

The point is (and a point well taken) that Einstein's *time* does not have absolute and independent existence.

The time-duration t is multiplied by the velocity of light c and by the square root of minus one, $(-1)^{1/2}$ which without changing the magnitude makes it an imaginary quantity. —Ouspensky⁴⁶

The conclusion for the DSSU is this: *Time* only has meaning as a measure of comparative change or motion. ***Since time does not have an independent existence, there can be no such thing, or concept, as absolute time. While space does have an absoluteness quality, time does not.***

8 Cell Structure

Now let us return to the two pairs of postulates and see how they determine the shape and structure of the universe.

It is a well known fact, in our everyday world, that expansion and contraction will generate a cellular structure. And it does not matter whether the two processes are simultaneous or sequential. Consider, for a sequential example, a mudflat or barren plain. A spell of rain saturates the ground causing it to expand; a period of hot and dry days evaporates the moisture in the surface layer causing it to contract —resulting in a pattern of cracks, a pattern of polygonal cells.

Another example. Heat is generated in the Sun's interior causing thermal expansion of the solar gas; simultaneously heat is lost at the Sun's surface causing thermal contraction. The heated gas rises to the surface while the 'cooled' gas sinks. The result is a pattern of dynamic cells —thermal convection cells. Astronomers call this process granulation.

Although the surface of the Sun is disruptively turbulent, the more favorable conditions of constant heat flow through an undisturbed homogeneous fluid will often produce thermal convection cells with a pattern of truly remarkable regularity.

Now let us look at the situation for a three dimensional universe of aether-space.

The postulates tell us that there are regions of the universe where space expands and regions where space contracts. These are the necessary two dynamic processes. But how do we know where each occurs?

Knowing that space expands where it is under tension (which is determined by the distribution of matter), and space contracts where there is a concentration of energy and its mass equivalent, does not help much. That is, knowing that matter distribution dictates where space is under tension and where space is subject to contraction is not enough.

So now the question is what determines the distribution of matter? ... Well, the two dynamics of space, of course. And we are back where we started. ... So which came first? How *did* this dynamic system get started?

We avoid the classic chicken-versus-egg paradox by simply invoking the corollary of *Axiom 1*, that the universe is infinite, and the argument that time does not exist. There was no 'first' event, the dynamic system never started. Period. The two pairs of postulates constitute an infinite (in the sense of infinitely repeating systems) and perpetual system (driven by the causeless process). As the postulates make obvious, it operates as an integral system. But what is truly remarkable is that the four processes form a self-sustaining and self-regulating system.

It is this self-regulating feedback mechanism that leads to an understanding of cosmic structure.

Let us, just for the sake of convenience, start with a small region of expanding aether-space. During billions of years of expansion, matter formation is taking place. The sphere grows and matter content increases. Now because matter formation is a two-stage exponential process the precipitation density will be greatest at the leading shell of our expanding sphere. This should be self evident, as the leading 'surface' of the sphere contains the matter that originated at the long ago time when the sphere started expanding and is therefore older and more advanced; while the region at and near the center only has young, newly seeded, matter (see *Postulate #3*). This leading edge precipitation-density continues to increase —until the moment when the volume of space expanding inside the sphere equals the volume of space being contracted by all the

matter present (which will be, by far, the matter in the leading shell). The growth of the sphere is then halted. The expansion of space inside the sphere, naturally, continues but the size of the sphere stops growing.

We are not finished yet. Still need to introduce the *Postulate #4* process.

The sphere has stopped growing but the matter continues to accumulate in the sphere's outermost shell. Material, radially comoving with the space flow, continues to be deposited at the peripheral region — somewhat like a glacier dumping its load of till.

The increase in the quantity of matter does two things. (1) The presence of more matter means ever more space contraction. Since we have assumed a fixed rate of space expansion (even though it is exponential), the increase in the space contraction must eventually result in a reduction of the size of the cosmic sphere. (2) More matter means ever more gravitational collapse into Superneutron Stars. And by the SU-AN postulate this involves the destruction and disappearance of matter. With the reduction in the quantity of matter the sphere stops shrinking.

All four processes represent fundamental principles of nature. Therefore their rates are fixed. Since the rates are constant, the size of the cosmic sphere will also be constant —by virtue of the self-adjusting mechanism just described.

Furthermore, since the *rates* are the parameters of a self-adjusting mechanism of sphere size, then changing the specific rate of one or more of the processes can **only affect the size of the sphere!** Regardless of the actual rates, size-stability can always be regained and sustained. The system effectively bestows a bonus benefit.

In physical theories this is as good as it gets, for there is no compelling need to explain why each of the four rates is what it is. Hey! No fine tuning required. Any rate or rates will permit a functional universe. The only change that would be noticeable in the make-up of the universe would be in the size of the cosmic spheres.

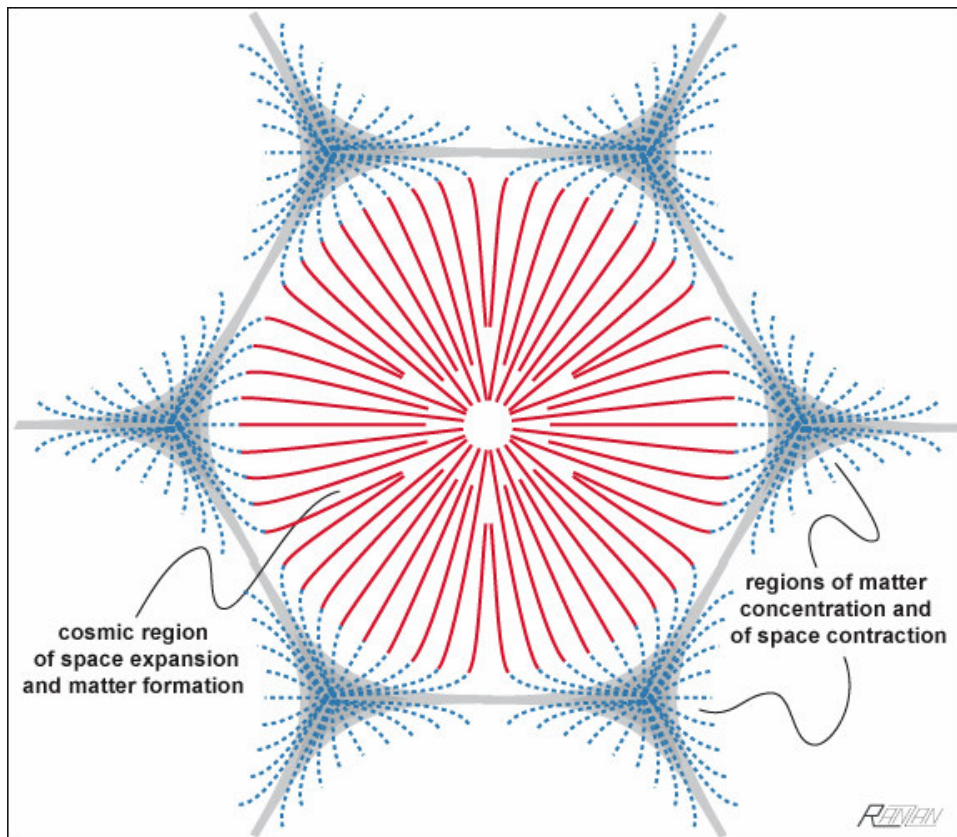


Figure 4. *The balanced interaction of the four causes* (processes) of the DSSU sustains a stable Euclidean structure —a cosmic cell (approximately 300 million lightyears in diameter). The central space expansion is quantitatively balanced by the peripheral space contraction. Matter formation and matter destruction are also quantitatively balanced; the net extant matter is concentrated mainly at the node regions (shown as grey areas).

Now for the final and most self-evident step. The universe consists of cosmic cells —cells that are the same systems just described. A two dimensional representation of one of these cells is shown in [Figure 4](#). The universe consists of nothing but these cosmic cells. This means there are no gaps between them. In fact, the cells interface with each other —that is, they share boundaries.

The universe is cellular.

And that is the key to the structure of the universe. The universe is cellularly structured. The interior of the cells are the familiar voids found in deep sky surveys. Galaxy clusters are sustained at the nodes of the cells. Filamentous clusters are the galaxies strung out haphazardly between neighboring nodes (as shown schematically in [Figure 5](#)). Many more structural features are detailed in other papers.

It appears that, on the largest scales, galaxies and galaxy clusters are not clustered in pancakes [as conventional theories predict] but are concentrated in the interstices of enormous ‘bubbles’ — roughly spherical regions that are significantly underdense. — David Layzer⁴⁷

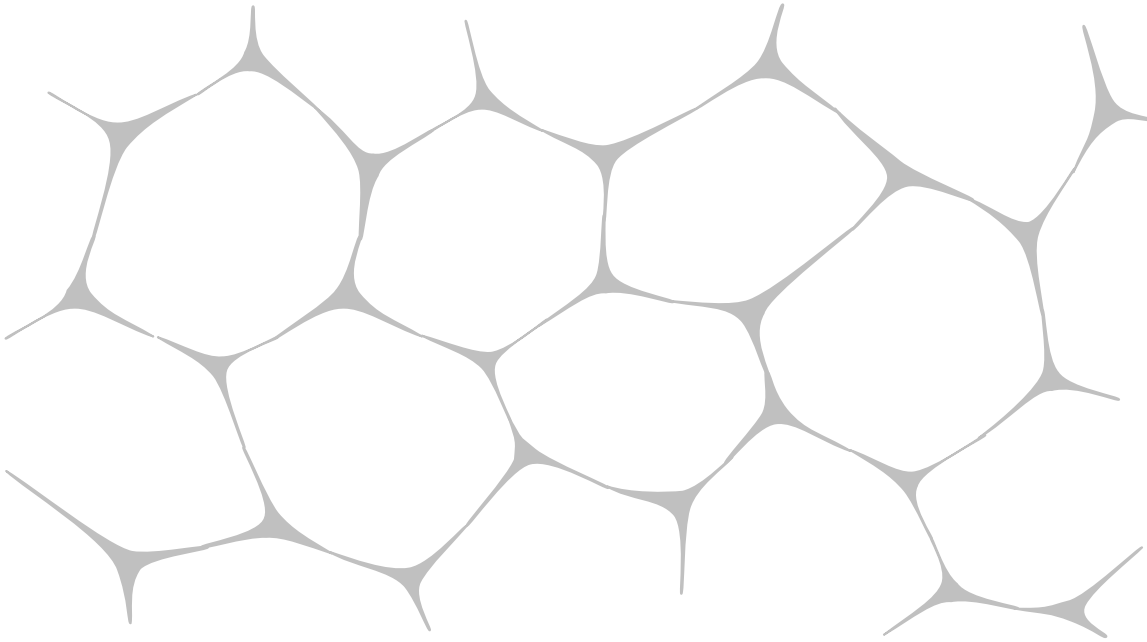


Figure 5. *Schematic view of the cellular universe.* The Dynamic Steady State Universe consists of the simultaneous, but spatially-separated, expansion and contraction of space. These balanced dynamic processes produce a quasi-static polyhedral pattern. As a compelling validation, what DSSU theory predicts agrees with what astronomers observe. The galaxy clusters of the astronomical universe are the nodes of cells; the voids of the astronomical universe are space-expanding interiors of cells.

If there is a profound and climactic twist in the DSSU story it is probable this: DSSU theory predicts that the Universe is cellular. What is more, it predicts that the Universe is, more or less, *statically* cellular. By this I mean the cellular pattern is non-dynamic. While amazingly all the *space* throughout infinity is dynamic (in the sense that it expands and contracts). And it is this quality of being **dynamic** that Einstein’s theory demands of space —regardless of how space is otherwise defined.

The Dynamic Steady State Universe is unquestionably an equilibrium universe —all its processes are balanced. The profoundness in the DSSU story is that we have a **stable** equilibrium universe. A **stable** equilibrium universe is what Einstein sought in his 1917 cosmos model but failed to achieve. And very little has changed, in this regard, in the many years since 1917. My understanding is that no stable equilibrium model *based on dynamic space* was ever developed during the twentieth century.

That failure had a profound affect on the broad field of cosmology and astrophysics. Without a functional stable model theorists had little choice except to turn to some type of non-stable model. They turned to the explosive-expansion models, including the Friedmann-Lemaître model and Einstein’s 1932 revised model, and the steady-state-expansion models of Herman Bondi, Thomas Gold, and Fred Hoyle. History is littered with countless variations of these expansion models.

It is one of the overlooked gems in the history of cosmology but the failure to find a stably balanced universe is the root cause of the disastrous situation of modern cosmology plagued, as it is, with the most outrageously unscientific extrapolation ever to be tolerated by truth-seekers particularly cosmologist, physicists, and philosophers. It is a story that has yet to be written. ...

What the pioneers in cosmology failed to find is that the secret of the stability of the universe is in its cellular structure. Yes, they understood that space is *not* Euclidean (does not obey all the axioms of Euclid's geometry) but then failed to grasp that the structural pattern of the universe *is* Euclidean. What they failed to see and what the DSSU embodies is that non-Euclidean space produces (sustains, to be precise) stable Euclidean cosmic structure!

Next we will look at another kind of cellularity of the universe. It also involves cells of cosmic proportion, like the structural cells, but these cells have no structure at their boundaries. The Dynamic Steady State Universe is divided into distinct unified-gravity cells.

9 The Gravity Cells of the DSSU

Our Universe is cellular, not on one, but on two levels.

Just as the Universe is structured into physical cells, the ones that have long been observed by astronomers, it is also structured into distinct gravitation cells —or *gravitational fields* to use the mathematical term. There is, of course, a definite relationship between the structured cells of the Universe and the gravitation cells. In terms of the schematic representations, [Figure 4](#) is a single *structural* cell; [Figure 6](#) is a single *gravitational* cell. The former contains portions of 6 individual gravitation cells. Our Universe consists of an ordered arrangement of the 3-dimensional versions of the two types. Of the structural units, only their filamentous skeleton and vertices are visible in the astronomical universe. Of the gravitation units, only their core concentrations are visible.

If we define the effect of gravity at any point in space as the mass of a test particle multiplied by its comoving acceleration (realizing that the comoving acceleration is curved towards the center of the galaxy cluster, the central node in [Figure 6](#)) then the acceleration proceeds along a freefall trajectory —slowly, but relentlessly, increasing all the while— regardless of the region the particle happens to occupy. Whether the particle is in the expansion region or the contraction region the acceleration proceeds, and follows the direction dictated by the space flow. Now if we identify the space expansion process with Einstein's anti-gravity effect (his famous cosmological constant, Λ) and identify the space contraction with his normal gravity effect (which Einstein, himself, calls contractile gravity) then it would be hard to deny that the two effects act together as a *unified gravity effect*. Despite the fact that gravity and Λ are truly opposites — opposite effects in general relativity and opposite processes in DSSU theory— with different causes, combining normal gravity and repulsive Λ under one umbrella called *unified gravity* is in agreement with the above definition and justified.

A unified gravity?! This is so unexpected that one has to pause for a moment and reflect on what just happened (and did not happen). ... No mathematical trick, no sleight-of-hand, no logical contortion, no esoteric knowledge. ... Just pure unadulterated self-evident reasoning.

Let us take a closer look at the unified field. There is a simple —and at the same time dramatic— way to characterize a typical DSSU unified gravitation field: It is the largest possible region of cosmic space in which any and all comoving bodies are on a common collision course. The field lines determine the trajectories, the comoving paths —diverging in the *cosmic* portion of the gravity field, then converging in the *normal* portion of the field. The nodal supergalaxy —the focus of the trajectories —is the common collision point. Bodies may temporarily deviate from the purely comoving paths, as in the case of interface interactions and collisions. And bodies may transform and evolve, as is the nature of stars and galaxies. But ultimately —always keeping in mind the enormous multi-gigayear time scale— the fateful paths of the survivors resume and the final freefall collisions do occur.

The unified field consists of three types of local space: expanding, flat, and contracting, in agreement with general relativity which is purely a local theory. General relativity measures (in mathematical terms) the geometry or curvature of each regional volume of space —whether that volume is expanding, flat, or contracting. But ...

Neither relativity nor standard cosmological observations say anything about how those volumes fit together to give the universe its overall shape —its topology. ...Determining the topology requires some physical understanding beyond relativity. —Jean-Pierre Luminet⁴⁸

To repeat, for the determination of the shape and topology of our Universe some *physical understanding beyond standard cosmology, beyond relativity, is required!* And sure enough, the DSSU provides the vital pieces of the puzzle for just such a physical understanding. It tells us precisely how the three types of regional-space “volumes fit together” to form the characteristic pattern of a unified field. And, by way of the stable-equilibrium nature of the cell sustaining processes, it tells us how those unified fields “fit together to give the universe its overall shape —its topology.” DSSU theory provides the *physical understanding beyond standard cosmology* of how non-Euclidean space is responsible for both stable Euclidean cosmic structure and stable Euclidean unified-gravity cells.

Solving the topology problem is a major achievement for DSSU theory. But no less powerful is the resolution of the *dark matter mystery* which some physicists consider to be the greatest unsolved mystery in astrophysics.

We have seen that gravity and Λ together form a *unified gravity* cell (or field) —a patterned combination of contractile gravity and expansionary Lambda. Each field is centered on a rich (dense) galaxy cluster; and the trajectories of space and comoving matter through regions of the field are unmistakable. As shown in [Figure 6](#), the flow lines are obvious. What is important to understand is that the motions are accelerating. Any comoving or freefalling particle is accelerated towards the center of the cluster by **both Λ and gravity** —first by one then the other. Both effects act in unison to hold the cluster together!

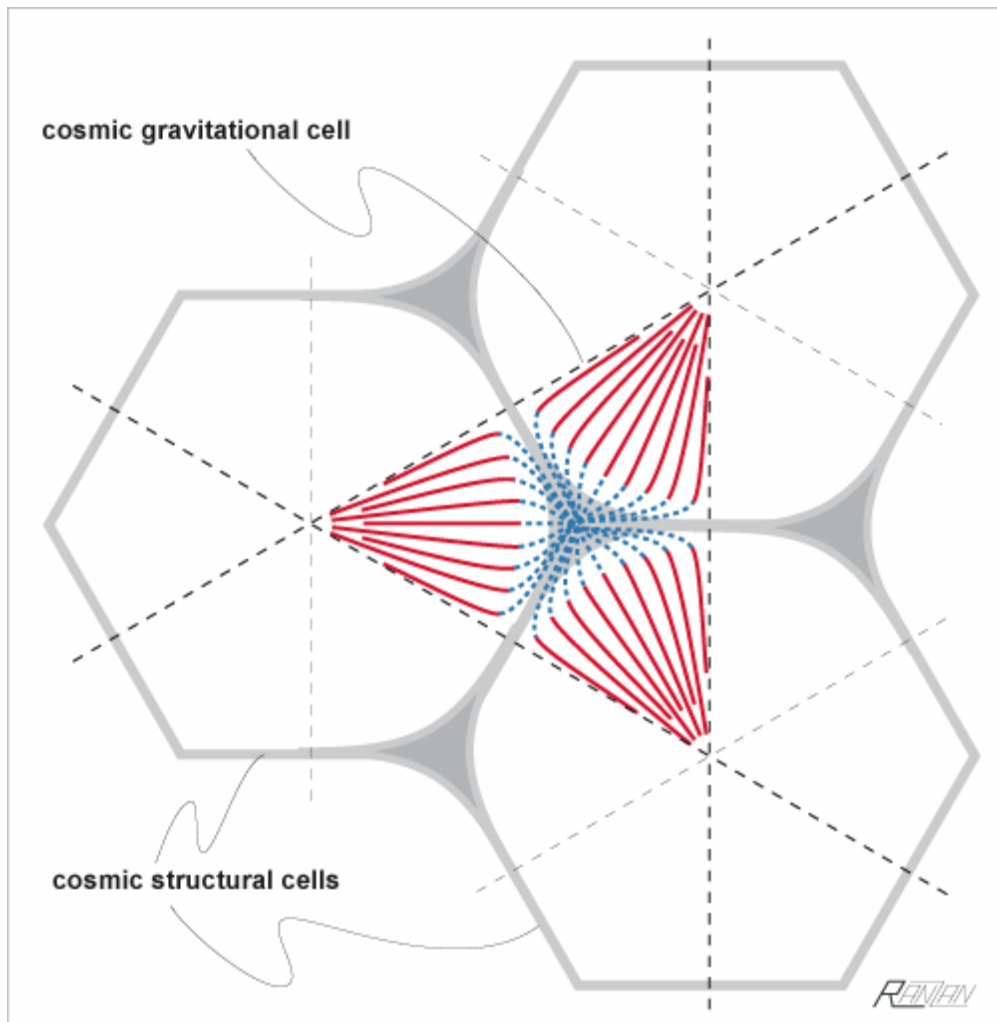


Figure 6. *Isolated unified gravitation field* is outlined by the dashed triangle, which marks the limits of its influence. A *unified gravity field* comprises several Lambda-effect regions (red flow lines) and one contractile-gravity region (blue flow lines). Anything comoving inside the triangle will freefall in a curved direction *toward* the field’s central node. Anything outside the triangle will freefall in a curved direction *away* from the field. The unified field shown cannot gravitationally influence any external object. The trefoil is a 2-dimensional representation of a single 3-space unified gravity field the simplest of which is shaped as a tetrahedron.

The interpretation in conventional cosmology is not only different (that is to be expected) but it is the exact opposite! Lambda is viewed as an effect tending to oppose the contractile-gravity effect. In simplified terms, Lambda is supposed to push structures apart while gravity alone pulls structures together. With gravity and Λ opposing each other it becomes a mystery as to what maintains the galaxy clusters integrity. Faced with a seemingly irresolvable problem, astrophysicists proposed the presence of some kind of *dark matter* — which then became its own mystery! Oh well ...

While Conventional Cosmology struggles with its mysteries, non-cognizant of the existence and nature of the *unified gravitation cells*, unaware that the infinite Universe is a polyhedral assembly of such *unified gravitational fields*, we must move on. Next, I want to explain DSSU's supreme advantage. When it comes to explaining why the Universe is as it is the cellular universe has a supreme etiological advantage.

10 Laws, Initial Conditions, and Supreme Advantage

What law of physics determines the values of the constants of Nature? The Universe operates according to certain basic (fundamental) constants such as the gravitational constant G , the fine-structure constant α , the speed of light constant c , etc. These parameters are deeply involved in determining the standard laws of physics and the composition of the Universe. But what law (or laws) of physics determines the values of the constants? Or as Einstein expresses the query, *did God have any choice when He designed the universe?* ... And the textbook answer goes something like this. As far as we know, there could be a more fundamental law under which the parameters of physics must have the values they do: that the values of the various physical constants aren't really 'tunable' and thus couldn't have been 'set' to anything other than the values we find any more than the ratio of a circle's circumference to its diameter could be anything other than π .

Unfortunately, we are not told the nature of such an underlying law or principle?

In keeping with the theme that at the root of Nature, at the truly fundamental level, things (processes) are as simple as simple gets, I would argue that the specific values of the constants are determined by the essence substance of the Universe described by *Axiom 1*.

The fine-structure constant α is determined by the *quantum characteristics of the quantum units of aether-space*.

The contractile gravitation constant G is determined by the *bulk characteristics of aether-space under positive pressure*.

The other 'gravitation' constant Λ is determined by the *bulk characteristics of aether-space under negative pressure*.

The speed of light c is determined by the *rapidity with which the space quanta convey or conduct the energy pulse of a photon*.

It is predicted that other constants such as the elementary charge e , the electron mass m_e , are determined by *specific and highly stable patterns of quanta of space*.

Not just the value of each constant, but everything *in* and *of* the DSSU is determined by its axioms and postulates. Other laws and principles are so determined. For example the *strong cosmological principle*, which some theorists consider indispensable and insist that a universe without it is unintelligible,⁴⁹ is simply the consequence of the steady state nature of the basic perpetual processes.

In assembling the DSSU model, in all of the discussion so far, we have employed only basic principles and fundamental laws. It is a reasonable but radical approach. This is definitely *not* the way academic professionals have been constructing their models.

Almost all theories of the universe, and certainly all expanding-universe models, employ the following three types of specifications. (To an engineer or a demiurge these contain the design specs.):

- (1) Initial conditions.
- (2) Underlying principles: Axiomatic laws and physical laws.
- (3) Evolutionary process(es).

Let us look at these more closely. While laws express *universal* and *necessary* aspects of phenomena; initial conditions express *particular* and *contingent* aspects of phenomena.⁵⁰ While laws express the *regularities* underlying phenomena; initial conditions may be arbitrary (or freely chosen if the phenomena are arranged by an experimenter). If the phenomenon, as ruled by Galileo's law of motion, is the arching trajectory of an iron ball fired from a cannon then its initial conditions are the initial position, speed and

direction. If the phenomenon, as ruled by Newton's law of gravity, is the orbital motion of the planets the initial conditions are the angular momentums. Every observable phenomenon *in* the universe includes initial conditions. If the phenomenon is the Universe, *what then*, cosmologist ask themselves, are the initial conditions?

But there is a problem with initial conditions; as physicist David Layzer argues, "... certain kinds of initial conditions are unknowable in principle." Actually this is an artificial problem (it does not arise) as we will see in a moment.

As far as the *underlying laws and principles* (in the second category above) are concerned, a universe designer desires them to be as few and as simple as possible. And they should be as complete as possible. Unfortunately the designers of the past and present centuries have been handicapped with a critically important law that is, to put it bluntly, incomplete. The officially recognized theory of gravity based on general relativity, as is well known, is missing a causal mechanism. As a result models designed around general relativity end up being —to use physicist Sean Carroll's term— "preposterous."

Whatever phenomenon cannot be explained by (1) and (2) must presumably be the outcome of some evolutionary process. While the laws of gravity, in principle, explain how galaxies rotate; how they acquire their rotation in the first place is not known (at least not in big bang cosmology) but is assumed to be part of galactic evolution. Now, since our main concern is explaining the phenomenon of the Universe itself, the evolutionary process refers to the universe as a whole. Categorically, all the BB models of the universe represent evolving universes. They evolve from initial conditions one of which is the matter density. As a big bang universe evolves its average density changes.

Here is another example of how the *evolutionary process* is invoked when (1) and (2) specification methods fail. Confronted with the ubiquity and regularity of cosmic structure (the cell structure DSSU predicts) and having found that neither initial conditions nor any known laws can account for this,

*"... some cosmologists argue, the large-scale uniformity and isotropy of the universe ... needs to be explained by an evolutionary process, not attributed to an initial condition."*⁵¹

And, in case the reader has any doubts about the failure of the textbook laws of physics, the ones whose infallibility seemed beyond doubt; the reader should heed the warning of Harvard's respected astrophysicist David Layzer:

*"There is no escape from the conclusion that density fluctuations large enough to give rise to the present clumpiness [observed in our universe] must have been present before our present physical laws began to apply."*⁵²

The practical problem in utilizing all three specification methods is that they allow for far too many possible outcomes —an overabundance of universe models. It is easy to see why. Each of the three categories specifies its own set of parameters. The more variables the more ways to combine them; the more combinations the more possible universes that may be cooked up. Even though astronomical observations severely restrict what a model is allowed to 'predict' for

Initial Conditions: Temporal versus Axiomatic

The meaning of initial conditions depends on the presence or absence of a genesis event.

On the one hand, if a universe is designed as having a beginning in the remote past and, therefore, having an initial state, then it most definitely has initial conditions. However, they are forever unknowable. The Big Bang is a model with a beginning, an 'event' referred to as $t=0$. It has an initial state (at $t=0$) but its specifics are unknowable. If the initial state is a singularity (as is the case with some Big Bang versions) then the initial conditions are not only unknowable but are also meaningless. Infinite density and infinite smallness have no meaning.

On the other hand, if a universe is designed as a perpetual steady-state then it has no beginning. Then we could quite accurately say it has no initial conditions, no $t=0$ equation of state. But cosmologists also use the term *initial conditions* to refer to a model's fundamentals: "Like Euclid's axioms, these cosmic initial conditions can't be deduced from anything else. They contain information about the world that we will never be able to explain" * at least not by anything more fundamental. In other words for a perpetual steady-state the initial conditions of category (1) (see text) are one and the same as the principles and laws of category (2). Significantly, with no $t=0$ barrier to contend with, these axiomatic "initial conditions" are, in principle, knowable.

The meaning also depends on whether the universe is evolving or non-evolving.

An evolving universe transforms itself from some set of initial conditions at $t=0$. But for practical purposes the initial conditions can only be determined for some small time later. It means that the initial conditions may vary widely depending on how closely $t=0$ is approached. It means too many theoretical outcomes.

A non-evolving universe, in contrast, has no temporal initial conditions. And its non-temporal Initial conditions are not subject to evolution, hence are fixed —hence are axiomatic. And being axiomatic the theoretical outcome is determined by the specificity of the axiom(s).

The hope of most scientists, David Layzer tells us, is that after finding the correct initial conditions the "residue of the unexplained and unexplainable is small or even nonexistent." And there is good "reason for assuming that the cosmic initial conditions are as simple as possible." *

The "good reason", by the way, is Ockham's Dictum. As for the assumption: it leads to the DSSU model embodying **axiomatic initial conditions that are as simple as possible.**

* Layzer, David. 1991. *Cosmogogenesis, the Growth of Order in the Universe* p23

the state of the universe, there are countless ways to predict identical states! This is embarrassingly serious and a sure indication of a weak theory. But that may be an understatement. There are those, Heinz Pagels for instance, who claim that having too many possible outcomes is as bad as having no theory at all. ...

The problem, however, is more fundamental (even philosophical). The problem with this method of constructing a universe is that it involves highly questionable assumptions. No, they are downright invalid assumptions. Invalid, in the sense that we are supposed to be modeling the real Universe and not some small or large portion of it —no matter how large one's definition of 'large' may be. Invalid, because they cannot be applied to the real Universe.

The real physical Universe has no temporal initial conditions. Furthermore the real universe does not evolve. The important thing to understand is that the Universe IS. Period.

The Universe, as explained earlier, is the manifestation of existence and has no conditions, no modifiers, no limits. There are no temporal initial conditions, no universe-wide evolution process. Only a contrived model of the universe, such as a mathematical construct, can have temporal initial conditions and then evolve from those initial conditions.

The DSSU model as a representation of the real Universe has no beginning and therefore needs no temporal initial conditions. Nothing further needs to be said with respect to category (1). But what does it mean to say "the universe itself does not evolve"? —to say specifically "the DSSU does not evolve."

It means the *two systems* that drive the universe do not evolve. The aether-space system and the particle formation-and-annihilation system are unchanging. However, the components produced by those systems do evolve. For example, the products of Postulate #3 *particle formation* undergo extensive evolution —and under favorable localized conditions evolution leads to the unimaginable complexity of conscious and intelligent life forms— eventually to be erased by Postulate #4 *SU-AN*. Being, as they are, two of the fixed laws of the universe, neither the *particle-formation* process nor the *SU-AN* process evolves.

And so the Dynamic Steady State Universe has no temporal initial conditions and no universe-altering evolution process. All it has is category (2). By selecting principles that have proven their validity (Postulates #1, #2, and #4) or reasonableness (Postulate #3 and the four axioms) and bringing them together as a system it severely restricts the possible outcomes. In fact, the principles, dictate that the universe can only be cellular! In the synergy of the four-process system is the most remarkable inevitability —it allows only a simple narrow outcome!⁵³

This is a supreme advantage!

11 Aether-Space Theory

But the difficulties of interpreting the everyday world and the phenomena that astronomers observe stem from their complexity. [Yet] Everything may be the outcome of processes at the subatomic level ... —Sir Martin Rees⁵⁴

It is amazing to see how a handful of simple rules can generate such complexity. Likewise, it is impressive how the rules of atomic combinations in the real world can generate the complexity of living things. —Heinz Pagels⁵⁵

Biological evolution is a fact —a proven fact. The evolution of domesticated animals and plants through selective breeding and pollinating is a fact. How evolution, specifically natural evolution, does its thing, so to speak, is determined primarily by *the theory of natural selection*.

Analogously, existence is a fact. How existence manifests (does its thing) is determined primarily by *the theory of aether-space*.

What is *the theory of aether-space*? ... The four axioms and four postulates we have been discussing, when considered individually, are the elements of the DSSU *theory of aether-space*. But as an instance of the whole being greater than the sum of its parts, when the axioms and postulates are considered as a functional synergistic whole they represent a theory of a stable, steady state, infinite universe consisting of dynamic space and structured as large-scale cells.

Before going any further there are two points to be aware of. (1) The classical ‘aether’ that is often ridiculed and whose existence is denied is a fluid that was believed to exist *in space*; whereas the aether of our theory *IS* space. (2) Einstein never explicitly denied the existence of aether-space he simply asserted that there was no experimental way to detect its presence.⁵⁶ The ‘space’ of the theory of special relativity, Einstein claimed, is to some extent the analogue of H. A. Lorentz’s absolute aether-space.⁵⁷

The popular belief is: there is no physical evidence for aether. But, among professionals, there is considerable uncertainty.

Now, no one who highly values his time would construct a scientific theory on the mere supposition of the existence of aether—a hypothesis yes, but not a solid theory. No, the development of DSSU theory is not based on the mere hypothetical existence of aether-space. DSSU theory developed from the conclusive evidence of aether's actuality. Contrary to standard textbooks, contrary to numerous references, the famous Michelson-and-Morley aether-experiment of the long ago year of 1887 did not show a 'null' result. Albert Michelson did not report 'null' results, but he did urge that the experiment be refined and repeated.⁵⁸ Unfortunately Michelson never did fulfill his own recommendation. However, others did. And it was because of the 1887 *non*-null results that the younger Dayton Miller devoted well over 30 years in repeated experimentation measuring the relative velocity of the aether (with respect to the Earth)—and he did not obtain a null result either. In fact his measurements showed a pattern consistent with the Earth's motion through what was called the aether wind.⁵⁹

Search the records of the original Michelson-Morley and Miller experiments; search the conclusions of several other similar experiments conducted throughout the 20th century; and you will not find the 'null' results. (Note, however, a null result only occurs when the Michelson-type interferometer is placed in a vacuum chamber; but this is entirely consistent with both the aether theory and special relativity theory.) For the “stunning” details of the various experiments for the detection of aether see *The Aether Experiments and the Impact on Cosmology*.⁶⁰ Anyone willing to look will find that there have been 8 successful experiments for aether detection during the last 120 years or so (since 1887).

Meanwhile conventional Physics and Cosmology deny the existence of absolute space. These Sciences prefer to use a non-real *space*. And yet, ironically, they endow *space* with some suspiciously real and absolute qualities—qualities like geometric curvature, the dynamic ability to expand and contract, and the ability to produce particle pairs. This non-real space even has the ability to somehow dictate the very real motions of astronomical objects. But how *space* manages this magical-feat of action-at-a-distance is never explained. ... And without a space substance it is quite unexplainable.

The theory of aether is firmly based on laboratory evidence. The existence of aether is well documented and cannot be ignored if one’s goal is constructing a reality-based universe.

No theory of the universe would be complete without a discussion of the 2nd law of thermodynamics. No universe can be considered a functional universe without complying with this law. The flow of entropy, the flow of increasing disorder, must be logical and consistent.

12 Entropy

The term entropy refers to the changes in the thermodynamic state and the gravitational state (degree of boundedness) of the matter of the universe. The more disordered the thermal state of matter, say a gas, is, the higher the entropy. The greater the gravitational clumping, say a system of gravitating bodies, is, the higher the entropy state of the matter. A ‘black hole’ represents the highest entropy state of matter.

The DSSU is a steady state universe. Therefore, by the definition of *steady state*, the entropy of such a universe must remain constant.

However, since the DSSU is also a dynamic universe, there must be a flow of entropy. Specifically, there must be a source of low entropy, a mechanism for increasing entropy, and a sink for decreasing entropy.

It is this flow of entropy that needs to be explained. But how do we do this for an infinite universe? We don’t. We need only to consider one of its cosmic cells. Whatever we conclude for one cell will also apply to every other cell of the infinite universe.

As suggested at the outset of the discussion, the universe is utterly simple at the smallest scale and at the very largest scale. The real complexity—sometimes mind-boggling complexity—lies in the scale between the two extremes.

Now the closest thing we have to an isolated system in the DSSU is the unified-gravitational cell (see [Figure 6](#)). No interaction of mass occurs between cells; and as far as radiation is concerned the cells behave

as thermal *black bodies*. A typical unified-gravity cell is sustained as a steady-state unit. To understand the thermodynamics of the cosmic cell we simple need to understand the thermodynamics of its four processes.

The 2nd law of thermodynamics states: *If a process occurs in a closed system, the entropy of the system increases for irreversible processes and remains constant for reversible processes. It never decreases.*

We do not apply the 2nd law in the normal way. We do not say, *the cell is a closed system, so let's analyze the processes that occur in the system*. No, the processes are not in the system—the processes are themselves the system! The processes themselves even form the boundaries of the system.

Our approach is to assess each of the four processes on the basis of its contribution to increasing or decreasing the entropy state of matter present within the cell.

The first process, space expansion, in and of itself lowers entropy. It is the 3rd law of thermodynamics that makes this so. As space expands photons loose energy (frequency decreases as wavelength increases) and momentum of free particles decreases (also the separation among free particles increases);⁶¹ which means the temperature of the space environment and the temperature of the of matter decreases. In the limit as temperature approaches absolute zero the radiation and mass system approaches zero entropy.

*“Note that we are not concerned with the actual value of the entropy, but only with the change in entropy from one state to another. ... Actually, the zero of entropy is meaningful, in that zero entropy for any system corresponds to a temperature of absolute zero.”*⁶²

Although the space expansion process theoretically has no limit, in practice it is curtailed and confined by a boundary region of space contraction. (See the cosmic structural cell of [Figure 4](#))

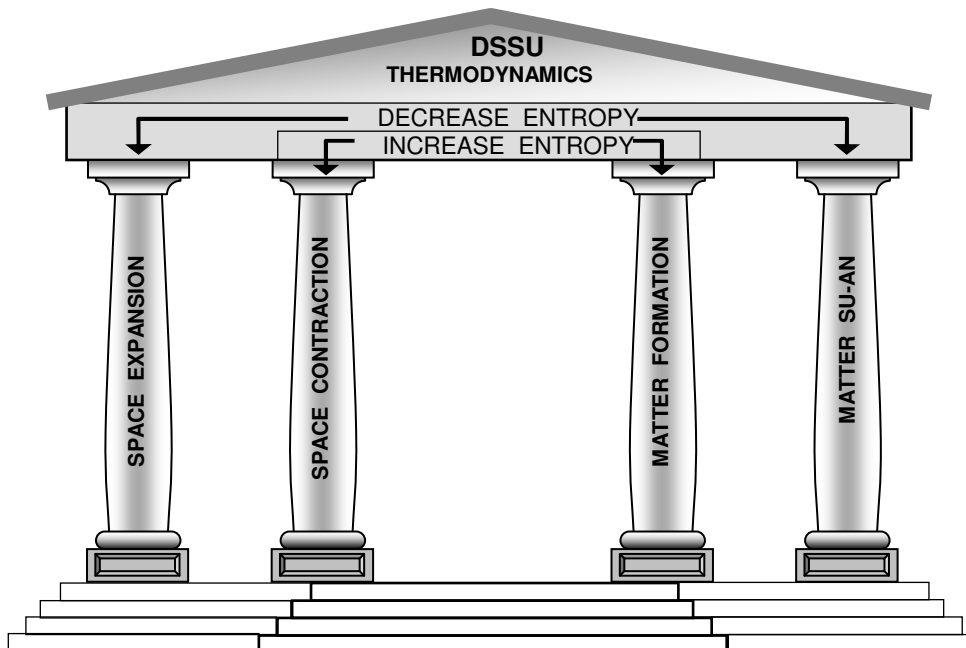
The second process, space contraction, increases entropy. If expansion lowers entropy then not surprisingly contraction does the opposite.

But the overriding impact of the second process is as *the mechanism of gravitation*. Gravity pulls matter together; and there is always a gain in entropy as free-floating masses are brought together.

*For a system of gravitating bodies ... High entropy is achieved by gravitational clumping—and the highest of all, by collapse to a black hole. —Roger Penrose*⁶³

The third process increases entropy. Matter formation and growth (and particle evolution) represent a flow of increasing entropy. The primitive matter that forms has extremely low entropy—consistent with the 3rd law of thermodynamics in which a low temperature state implies low entropy. With the progression of exponential formation, as more and more matter precipitates into existence, the spatial density (or particle count density) increases—and so does its entropy.

As particle evolution progresses entropy continues to gain. “Entropy is gained in the combining of light nuclei (e.g. of hydrogen) ... into heavier ones.”⁶⁴



The fourth process. The SU-AN process lowers entropy—catastrophically. SU-AN is an essential entropy-decreasing process totally absent in standard physics. It completes the logical flow of entropy; it returns the entropy state of matter back to zero!—by destroying matter itself!

The process occurs, as described earlier, in the active cores of superneutron stars (DSSU's equivalent of

black holes). Amazingly, Isaac Asimov, many years ago intuitively suggested that “like tiny samples of contracting universe, perhaps in those black holes the second law (of thermodynamics) is reversed [and entropy decreases!] ...”⁶⁵

Two processes increase entropy and two processes decrease entropy. So, does it mean the DSSU is a compliant system? Let’s review the textbook requirements.

“[T]he ultimate statement of the 2nd law of thermodynamics: The entropy of the universe can never decrease.”⁶⁶

The DSSU, as pointed out, is a steady state universe in which the entropy of each cosmic cell does not decrease. Thus we have compliance.

Now what about the individual processes —the two entropy lowering ones? Do they violate thermodynamic laws? ... No. The entropy lowering process of space expansion is not a violation because it is not a closed system (remember the 2nd law applies only to closed, or isolated, systems). It is not a closed system because new space is continually being added. New quasi-physical *space* comes into ‘existence’.

Similarly, the SU-AN entropy-lowering process is not a closed system and therefore not a violation. In this case the matter derived from the energy-of- space leaves the system. It becomes non-existent.

To recap, the system works like this: Postulates #1 and #3 together act as a source of low entropy. Postulate #2 concentrates matter for gravitating systems to form and then progressively raises the entropy of those systems. The gravitational concentration continues until matter is literally locked into neutron and superneutron stars —the environ of maximum entropy. Then within the SU-AN core (the core of an active SNS) the entropy accumulated in the core ‘material’ drops precipitously from maximum to zero. The ‘material’ and its entropy disappear from the universe.

13 Summary and Closing Remarks

In standard cosmology the cosmic flow of entropy is a mystery. Unlike the DSSU cosmology, the expanding-universe (Big Bang) cosmology has no self-consistent explanation of the entropy flow. For instance, the BB universe is believed to be running down and becoming ever more disorderly, i.e., entropy is continually increasing (on average), despite the fact that it started out already in a state of maximum entropy! But the state of maximum entropy should come much later —*not at the beginning!* Part of the problem is that there are so many versions of the big bang scenario —the many-outcomes problem. Another part of the problem is that there are far too many unresolved related issues —everything from an incomplete theory of gravity⁶⁷ to the uniformity-versus-non-uniformity paradox of cosmic structure.⁶⁸ (Like a jigsaw puzzle — there can never be *just one* piece incorrectly placed.) But the main source of the difficulty is the insistence on treating the Cosmos as a closed physical system in a vain effort to conform to the *2nd law*.

The unavoidable truth is that while normal-scale systems can be isolated *and considered closed* with varying degrees of efficiency, cosmic-scale systems cannot at all be isolated and considered closed.

Let me emphasis this by saying that cosmic-scale systems and processes cannot function as isolated/closed systems. What is generally overlooked (and it is overlooked because of aether-phobia and denial of physical space), is that once you introduce *space expansion* (and likewise, space contraction) you no longer have a true isolated system. Treat such systems as “closed” and thermodynamic consistency becomes elusive. It is that simple.

The highlight of any DSSU research article is always a point by point comparison with the standard cosmology. [Table 1](#) below presents a summary of the principles of DSSU theory and a selective comparison with standard cosmology. While [Table 2](#) below compares the viability of the two radically different cosmologies. Together the tables provide a useful summary of the present article as well as some additional information.

Table 1. Summary and Comparison

DSSU PRINCIPLES	DSSU COSMOLOGY	Expanding Universe* (Standard Cosmology)
AXIOM 1 Necessity of existence	Existence of aether-space; Essence substance of the Universe	No aether-space; No essence substance
AXIOM 2 Space is dynamic	Aether-space is dynamic	Geometrized space-time is dynamic

AXIOM 3 Space quanta are interactive	Aether-space is quantized; The space quanta have the ability to interact	Space is not quantized; Space-time is a continuum
AXIOM 4 Dimension of non-existence	Has a dimension of non-existence: it is somewhat like a 4 th dimension. (Time does not have independent existence)	Time is treated as a 4 th dimension of geometrized space-time
POSTULATE 1 Expansion process	The physical expansion of space by the addition of space-quanta. The essential primary process of the Universe	Scaling factor (a measure of coordinate length) increases with the Hubble expansion of the universe
POSTULATE 2 Contraction process	The physical contraction of space by the dissipation of space-quanta. The natural opposite process of space expansion. The mechanism of gravitation	Scaling factor decreases with the hypothesized recollapse of the Big Bang universe. Contracting geometrized space is used as a theory of gravity
POSTULATE 3 Matter formation process	Continuous matter formation (via a two stage process) involving the interaction of space quanta	Cataclysmic matter formation at a special instant in the history of the BB universe
POSTULATE 4 Su-An process	A continuous and localized process of the suppression-annihilation of matter	No comparable process. (Essentially because standard cosmology does not recognize the "dimension of non- existence" which this process depends on)

Special mention should be made of the *cosmological principle* —the extremely important requirement that the Universe be uniform on the large scale. Although the *cosmological principle* is a foundation premise in most cosmos models, it is not listed among the Principles of Table 1. In DSSU theory the large scale homogeneity (and cosmological-principle compliance) is an automatic outcome; while in rival cosmologies, in which homogeneity is not a predicted attribute, it is necessarily axiomatic. The *cosmological principle* is the Achilles heel of almost all cosmologies as they struggle to comply. As for compliance to the *perfect cosmological principle*, which includes time-dependent uniformity, they fail miserably.

Table 2. Viability Comparison

PROPERTY or PHENOMENON	DSSU COSMOLOGY	Viability	Expanding Universe* (Standard Cosmology)	Viability
DEFINING FEATURE:	Cellular structure	natural	Whole universe expands	unnatural
Dimensions:	3 spatial + non-existence	necessary for thermodynamic consistency	3 spatial + time	mathematically valid
Infinity:	3-dimensional Universe is infinite and supply of aether-space is infinite.	comparatively natural	Black holes are infinitely dense. Singularities are infinitely small.	comparatively unnatural
Age of Universe:	Infinite	natural	15-20 Giga-years	leads to beginning-of-time paradox
Size of Universe:	Infinite	natural	16 Giga-lightyears and growing	leads to cosmogenesis paradox
Fate of Universe:	Perpetual steady state	natural; implies physical laws are constant	Depending on model: Heat death (aka the Big Freeze) Cyclical (BB & Big Crunch)	unnatural; implies physical laws are not constant
Visibility Limit (Horizon):	No limit	natural	Boundary of the Hubble sphere	mathematically valid
HOMOGENEITY and the cosmological principle	Spatially and temporally uniform. Cosmic density and structure do not change	conforms to strong cosmological principle	Cosmic density and structure change with time	conforms to weak cosmological principle
Largest Scale Structures:	Rombic dodecahedra; Rombic-trapezoid dodecahedra cells	natural Voronoi cellular structure	Undefined random shapes. Observed cosmic structure comes as a big surprise	no theory to account for this
Conservation of Energy Law:	Only applies in flat space, not in expanding or contracting space	valid	Only applies in flat space, not in expanding space	valid
Particle Formation:	Continuous (per Postulate #3)	a natural formation process	Cataclysmic (via a primordial atom)	requires an unnatural special event

PROPERTY or PHENOMENON	DSSU COSMOLOGY	Viability	Expanding Universe* (Standard Cosmology)	Viability
Space is defined as:	Aether-space (per Axiom 1)	natural essence of the Universe	Geometry (per general relativity)	mathematically valid
Aether-Space Flow:	Outwards from voids. Towards and into anything that has mass or mass-equivalent	natural explanation for voids and their surrounding matter concentrations	Not applicable	N/A
Existence:	Same as space units	Axiom #1	No explanation	N/A
Formation Of Elliptical Galaxies:	Each forms from a vast hydrogen cloud and is shaped by the tidal effect of the void from which it spawned	Yes. A natural outcome of continuous matter formation in expanding space region	1. Spawned by existing spiral galaxies 2. Form from vast hydrogen clouds	inconsistent and problematic
Formation Of Spiral Galaxies:	By the joining of two or more ellipticals via a gravitational (orbiting) close encounter	Yes. A natural outcome of the meeting of galaxies from neighboring cells	No meaningful explanation	no
Source of angular momentum of galaxies:	Interface interaction, as a result of the meeting of opposing comoving aether-space	yes; as above	Unexplained	no
Non-rotation of supergiant galaxies:	A consequence of stable nodal position	yes	No explanation	no
Randomness of galaxy rotation:	A result of the random meeting of galaxies from opposing comoving aether-space	yes	No explanation	no
Galaxy morphology:	Spirals at boundary edges. Ellipticals most abundant at high-density nodal regions	yes	Unsolved mystery	no
Galaxy clusters:	Located at the nodes of the dodecahedral structures	yes	Distributed randomly	poor
Galaxy cluster arms:	Coincide with the boundary edges where three dodecahedral structures meet	yes	Unexplained	no
Gravitation:	Comparable to general relativity but based on aether	yes; agrees with experiments including 6 famous aether experiments	General relativity based on geometry	incomplete; gravity theory lacks a causal mechanism!
Space Expansion:	Postulates #1	valid	Space does expand	valid
Space Contraction:	Postulates #2	natural opposite process of expansion	Space may contract in a future reversal of the BB	speculative
Simultaneous Space Expansion & Contraction:	Yes (per Postulates #1 & #2)	yes; a natural harmony of opposites	Only expansion in the present epoch	N/A
Universe Shape (or Geometry):	Uniformly Cellular	natural	Depending on model: Open, closed, or flat. (Hyperbolic, spherical, or Euclidean)	mathematically valid
Curvature:	Contracting space is analogous to spherically curved space. Expanding space is analogous to hyperbolically curved space	valid	Gravitation produces spherically curved space. Lambda-force produces hyperbolically curved space	mathematically valid
Unified Gravitational Fields:	Yes. A regional combination of Lambda (repulsive) and contractile (normal) gravity	valid; consistent with gravity based on aether-space	No explanation; no unified gravity	N/A
Cosmological Constant Λ:	Generic term for space expansion. Sustains the shape of cosmic cells. Is 'cancelled' by space contraction	valid per Postulates #1 and #2	An expansion 'force' applied to the universe as a whole. Its observed cancellation is a mystery!	mathematically valid
Property of Mass:	Caused by the absorption of aether-space	validity is related to Axiom #1 and Postulate #2	Searching for the Higgs particle believed to be responsible for mass	doubtful

PROPERTY or PHENOMENON	DSSU COSMOLOGY	Viability	Expanding Universe* (Standard Cosmology)	Viability
Gravitational Behavior of Matter:	Always attractive	yes; solidly based on Postulate #2	Generally attractive but <i>dark matter</i> has unusual behavior	doubtful
Cosmic Background Radiation:	High-Z starlight: Thermal emission from distant stars	valid in the spirit of Ockham	Thermal emission from the beginning of the big bang	no validity; the explosive genesis is pure speculation
Special Relativity:	Aether-space serves as the medium for the propagation of light waves	yes; based on at least 6 famous aether experiments	Electromagnetic waves do not require a medium but travel through empty space	no; leads to contradictions
Space Pressure:	NEGATIVE in voids. Thus, voids experience cosmic tension. POSITIVE at interfaces	natural	Not applicable	N/A
Space Formation:	Continuous aether formation in voids	valid per Postulate #1 and Axioms 1 & 2	Since space is geometrized new space means an increase in the scaling factor	mathematically valid
Matter Formation:	Continuous low-energy 2-stage exponential growth process	valid per Postulate #3 and Axiom 3	Single-event catastrophic creation	no validity; the explosive genesis is pure speculation
Black Holes:	are Superneutron Stars that possess a SU-AN core in which matter is literally compressed out of existence	valid per Postulate #4 and Axiom 4	are singularities	no validity; theory breaks down
Entropy Flow	Low-entropy matter formation. High-entropy matter destruction via SU-AN	natural and consistent entropy flow	Entropy starts high in hot big bang	paradoxical

*Expanding Universe Cosmology refers mainly to: Einstein-DeSitter universe; Hot Big Bang universe; Inflationary universe; Accelerating universe, etc.

The tables expose a truly striking irony. There can be no disputing that DSSU and BB cosmologies are radically different. Yet both are based on the same valid foundation principle, the postulated expansion of space with the backing of observations. Upon that shared foundation DSSU crafts a perfectly natural and stable cellular cosmos —while BB theory builds an unnatural, unstable, cancerous cosmos succumbing to uncontrolled expansion.

The defining feature of the DSSU is its cosmic cellular structure. The defining feature of the BB is the expansion-of-the-whole-universe. Given the enormously incompatible outcome, it is ironic indeed that they actually share the same causal ‘mechanism’!!

Modern astrophysical observations give the empirical foundation of cosmological models. The main task of observational cosmology is to compare predictions of cosmological theories with real data and to select viable models. —Yurij V. Baryshev⁶⁹

The Rise and Fall of an Invalid Theory

I believe it is not coincidental that the Big Bang (BB) model was developed primarily during that period in history in which the greatest and most powerful empire on Earth, and in the history of civilization, experienced its greatest expansion of power, influence, and wealth. The intoxicating spirit of limitless potential influenced its people and their institutions. The exuberance infiltrated scientific theories. Yes. ... How else does one even begin to explain the adoption and promotion of *the biggest unscientific extrapolation of the scientific age?*

But now we sadly witness the Empire’s rapid and relentless decline. Many observers will wonder what went wrong, what happened to the former greatness. The truth seekers among them will reassess cherished fundamental beliefs —social, political, and scientific. As part of such a reassessment we may yet see the invalid BB expanding-universe-model transferred to the book of history —and its applicability to the real world relegated to the dustbin of failed theories. —CR

I leave the reader to ponder the following question. In view of the foregoing discussion, of the viability comparison chart (Table 2), and of the self-evident statement by Baryshev: Why are professional cosmologists wedded to an embarrassingly unviable model? What is the mysterious opiate allurements of the *expansion paradigm* that has managed to cripple the judgment of these members of the learned elite? □

Glossary of Special Terms

Active Superneutron Star: A *Superneutron Star* with a *SU-AN core*.

Nodal supergalaxy: the monstrous spherical (non-rotating) galaxy that dominates the center of a rich cluster of galaxies. Each node of a cosmic cell contains one such structure.

Precursors: (1) quantum units of fundamental energy fluctuations (energy oscillators); (2) the ultimate units of aether-space (and existence itself); (3) the primitives of real particles.

Suppression–annihilation (SU-AN): The process by which mass and energy is extinguished. Matter, after attaining its ultimate temperature and density, is unable to withstand further pressure and is compressed out of existence. **This is the one fundamental law, absent in standard physics, that had to be introduced—a new law that defines the process that lowers the entropy of matter.**

SU-AN core: is the ultimately dense region at the heart of a *Superneutron Star*. The region where *suppression–annihilation* occurs.

Superneutron Star (SNS): Basically a none-singularity black hole. A star in which matter exceeds the density of neutrons.

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