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# Nature's Entropy-Lowering Processes: How Nature Circumvents the Second Law of Thermodynamics and Maintains Cosmic-scale Entropy Neutrality

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***Author's contribution***

*The sole author designed, analyzed, interpreted and prepared the manuscript.*

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## ABSTRACT

Examined are Nature's two incomparable processes that operate outside the domain of conventional thermodynamics. The first is the process of energy generation/amplification by *Blueshift Accrual*. It is the non-interaction process by which energy particles are *Blueshifted* to greater energy. By way of this process an electromagnetic zone (the surface layer of Terminal stars) can generate more energy (significantly more energy) than it absorbs. The second is the process of *Mass Extinction by Aether Deprivation*, the process by which subjected mass ceases to exist —it literally vanishes from the Universe. Both are features of which only Terminal stars are capable. Both are entropy-lowering activities, yet do not violate the laws of thermodynamics. Both are rooted in DSSU theory —the most successful cosmology documented in the scientific literature.

*Keywords: Entropy reduction process; energy amplification; Blueshifting process; thermodynamics; dynamic space medium; Terminal star; Mass Extinction; Mass Vanishment; Aether Deprivation; gravity theory; DSSU cosmology.*

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## 1. ENTROPY-LOWERING PROCESS I: ENERGY GENERATION BY BLUESHIFT ACCRUAL

Examined is a non-interaction process of energy amplification and its subsequent emission. This process supplies the rejuvenating energy by which the universe is compensated for its existing energy degradation —its ongoing entropy-raising processes.

### 1.1 The Challenge of Reducing Entropy

In the study of thermodynamics, as well as the enquiry into the nature of the cosmos, there is a quantity called entropy, which in simple terms is a measure of the disorder of a system. In general, if heat is added to an object, its entropy is increased. If heat is removed from an object, its entropy is decreased. According to the conventional Second Law of Thermodynamics, the entropy of an isolated system can increase or remain the same, but it can never decrease. (How gravitational aggregation affects entropy will be discussed later in connection with Entropy-Lowering Process II.)

Notwithstanding the above statement, it is also true that a decrease in entropy can only be brought about with the expenditure of energy. But there is a catch-22, a price to be paid. Every previously known energy generating process, as an unavoidable side effect, also increases the entropy (of the system and its environment). It is what all the textbooks present and underscore — there is simply no way to 'output' more energy than enters as 'input.' However, there is one exception. It is never mentioned.

Remarkably, Nature does have a way of generating energy for the purpose of reducing entropy. There exists a simple entropy-lowering process.

Before proceeding, let us be quite clear as to what is meant by an entropy-lowering process: If an isolated system generates more energy than it absorbs, then it is an entropy-lowering system. If, in such a system, output exceeds input, some entropy-lowering process must be at play.

Where does such a process actually occur?

The essential element of the process takes place within the surface layer of *end-state neutron stars*. They are also known as *Terminal* neutron stars.

An *End-State neutron star* is the end product that results when a sufficient quantity of mass undergoes total gravitational collapse. It is not important to the present discussion how the gravitational collapse comes about, whether by catastrophic implosion or gradual aggregation. What is critically important is that mass has a bulk compressibility limit. Gravitational collapse cannot cause mass to exceed a certain limiting density. The reasonable assumption is that the limit is not far in excess of nuclear density — about $10^{18}$ kilograms per cubic meter.

This density condition along with an important law of physics automatically sets a size limit preventing such a gravitating object from collapsing further. (What happens to any additional infalling mass will be explained later. There is a second reason precluding further collapse.)

The important law of physics is this: the speed limit between mass and the space medium is about 300,000 kilometers per second. It is the well-understood rule of Albert Einstein's special relativity.

The ultimate density and the ultimate speed are next brought together —combined in a conceptual construction of the Terminal star.

The following was derived [1] from a basic equation of gravity:

$$\upsilon^2 = \frac{2GM}{r}$$

Where $G$ is the customary gravitational constant and $r$ is the radial distance (from the center of mass $M$) to the surface of $M$, or external to $M$. The symbol υ represents the speed (or velocity) of the space medium inflow (but it can also serve as the escape velocity, as is the common practice).

A total mass of 3.4 Suns ($6.77\times10^{30}$ kg) when collapsed down to a nuclear density state will form a sphere of radius 10 kilometers ($r$ = 10,000 meters).[1] Basic elementary geometry.

Substitute those values, including $G$ = $6.673\times10^{-11}$ $N\cdot m^2/kg^2$, into the above expression.

[1] *It is not a coincidence that this spherical size (radius 10 kilometers) is also found in academic astrophysics (with its emphasis on mathematical interpretations) for its minimal stellar black holes.*

It will be found that the surface inflow, u, will be about 300,000 kilometers per second.

In other words, the surface is in a critical state (in the context of special relativity); thus, by definition, making this object a Terminal star. What this means is that the surface layer cannot be a material zone —it must be a zone of radiation. It must be a zone of pure energy (photonic and neutrinoic). Within this zone the space fluid is streaming in at about 300,000 km/s and the contained radiation (photons and neutrinos) is propagating outward at the same speed of 300,000 km/s. Essentially, the Terminal star has an energy layer in which radiation is propagating in 'stationary' fashion.

Theoretically, the radiation could just propagate there, in place, forever. And the story might end there if it wasn't for the next factor.

It is now known that mass and energy are sinks of space medium; that is, mass and radiation particles absorb/consume the subquantum aether fluid [1]. As the universal medium streams/flows into the Terminal star, it is gradually being consumed. As it is consumed, its inflow speed diminishes. At the center of the structure all of the universal fluid has been absorbed and the speed has gone to zero. The complete flow profile is shown in Fig. 1.

The key factor is that the magnitude of the flow speed is decreasing within the interior of the structure. We'll come back to this feature in a moment.

But first consider the radically different approach used by a purely mathematical interpretation of total gravitational collapse. The collapsed mass is treated as a point mass —a singularity. The surrounding universal medium continuously flows inward (to feed the point mass). The 'boundary' where the inflow speed reaches lightspeed defines the nominal size of the structure —which for obvious reason is called a *black hole*. The thing to note is that the inflow speed increases indefinitely. See Fig. 2. Categorically there are two problems: The special relativity issue becomes irresolvable (think about it, what happens when the superluminal flow reaches the singularity!?); and, secondly, the space medium in such a situation cannot be exploited for an entropy-lowering process.

## 1.2 Process I Specifics

Returning to the Terminal star and its critical-state surface, of utmost importance is the fact that the subsurface flow speed is decreasing. Why is it decreasing?

Obviously the reason relates to the fact that the gravity effect diminishes the deeper one looks into the structure. The flow speed decreases as it decelerates because the mass and energy through which the aether is flowing is absorbing/consuming a proportion of that aether. Such is the veritable cause of gravity and the reason why there is a flow gradient.

Although awareness of the aether flow gradient provides a deeper understanding, the Blueshift Accrual mechanism will be presented here from a simpler perspective.

Consider the following argument based on gravity as a force/effect.

As is well understood, the influence of gravity applies to electromagnetic radiation. It can cause a change in the direction of propagation and the spacing between light pulses and the wavelength of light itself. Gravity's ability to influence and accelerate light has long been known from the proven phenomenon of gravitational lensing.

The force-effect argument, then, depends only on self-evident factors: Light quanta are extended entities, in that they possess wavelengths; an understanding that a photon can change its dimension, its extension, unlike a mass particle; and further, that gravity 'pulls' on photons (and neutrinos).

Turning to Fig. 3, the peak effect of gravitational acceleration is at the surface of the body. Below the surface the effect decreases. The greater the depth, the smaller will be the gravity effect. And for a constant density structure, as is the case with the Terminal star, the force-effect decreases linearly. At the center, gravity equals zero.

A representative light pulse or photon is shown propagating in-place in the positive direction. The leading end experiences a stronger force (a greater acceleration magnitude). The gravitational pull on the front end is ever so slightly more intense than is the pull acting on the back end. There exists a gravitational acceleration differential. The leading pulse-end 'feels' a stronger backwards pull than does the back end. It follows that there will be an intrinsic shrinkage between the two ends —manifesting as wavelength contraction.

In other words, radiation (photons and neutrinos) trapped within the Terminal star's energy layer *gains* energy. It does so continuously. This is the Blueshifting process that is the heart of Nature's entropy-reducing activity. And the deceleration of the medium flow is of key importance.

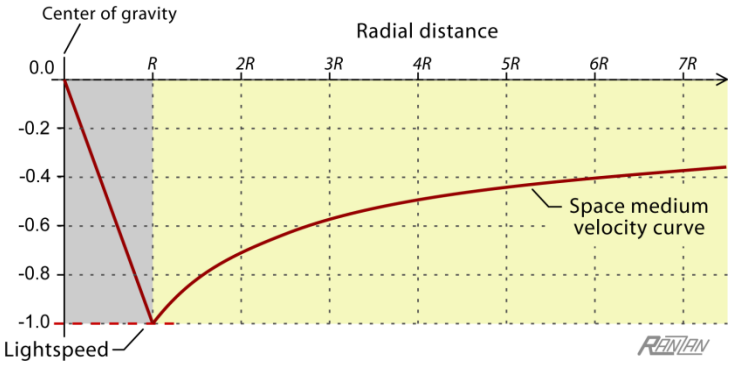


**Fig. 1. Velocity profile of an *End-State neutron star* (Terminal star). The defining feature of such a star is that the speed of the inflowing space medium attains the speed of light at its energy surface. (Notice, at the center of gravity, the velocity of the flow is zero.) Importantly, the time rate of change of this velocity is equal to the Newtonian gravitational acceleration. This acceleration of aether, it turns out, is the actual cause of the gravity effect. (The velocity scale is divided into fractions of the speed of light.)**

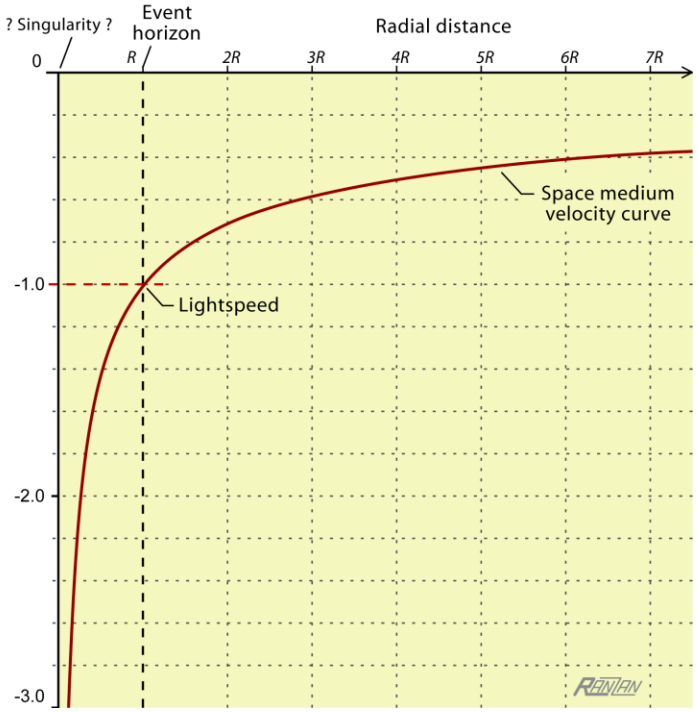


**Fig. 2. The radically different interpretation in which the gravitationally collapsed mass is treated as a singularity. Shown is the velocity profile for a totally collapsed 3.4 solar mass, according to pre-DSSU physics. This velocity profile reflects two unrealistic aspects: A mass singularity where the laws of physics break down; and the super-lightspeed inflow on the inner side of a so-called "event horizon." The structure (known as a black hole) associated with this kind of profile can never serve as a mechanism for reducing entropy**

For a mathematical proof of the energy amplification process, see the Appendix.

Focusing next on the output and input aspects of the entropy-lowering system. See Fig. 4.

Here is the situation. We have amplified energy trapped within the Terminal star's surface layer. Much of it is high energy radiation, which if released would be considered to be low-entropy emission —just what is needed to revitalize the external world. The question is *How does it escape*?

As it turns out, Terminal objects, being neutron stars, have powerful magnetic fields. Rotation causes them to become strongly collimated and prodigious aether absorbers. The result is that no energy layer can form where these collimated force fields pierce the structure —at its north and south poles. What this means is that any trapped radiation able to reach these polar gateways can simply escape [2,3].

As an aside, one can immediately see why black holes cannot have integral magnetic fields and, worse, can have no escape mechanism. The hypothetical superluminal inflow, inherent in black-hole physics, makes for an effective theory-destroying dead-end.

Now for a look at the Terminal star as a system. See Fig. 5. Consider the system in its most quiescent state —no mass infall, no collisions, no cannibalizing an orbiting gaseous partner. Only the ubiquitous background radiation bathes the Terminal star. We have both the *cosmic thermal radiation* and the *cosmic neutrino radiation* as input, on the one hand, and their eventual emission at the poles, on the other. Of course, no incoming radiation can reflect off the surface, nothing can be reflected outward —something precluded by the rule of special relativity.

Keep in mind, as long as they find themselves trapped within the energy layer, radiation particles are being Blueshifted —they are gaining energy. Over great eons of time, this admittedly weak effect produces the most potent, most energy-laden, particles Nature is capable of generating. No other process comes close. Some of the gamma photons and neutrinos that emerge are individually thousands of times more potent than anything ever generated within any man-made particle accelerators —vastly exceeding the extremes being spun at CERN.

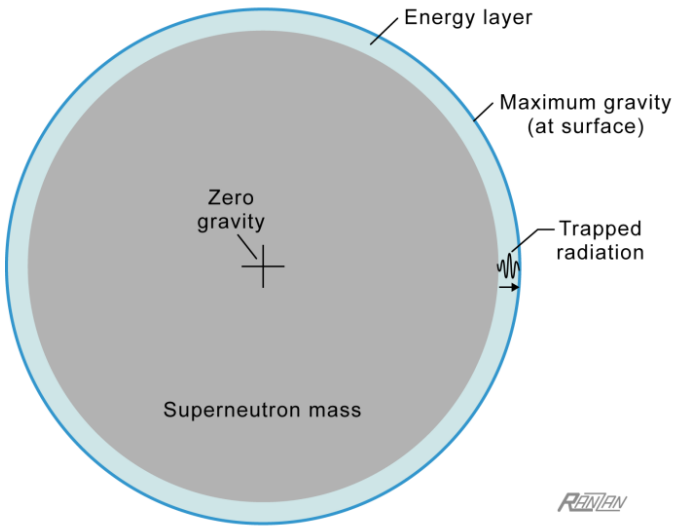


**Fig. 3. Schematic cross-section of Terminal star. Trapped within the Terminal star's energy layer, radiation particles are subjected to a gravitational effect differential. The leading end of the radiation particle (photon or neutrino) is 'experiencing' a stronger gravity effect than is the trailing end. Consequently, there is an ongoing slow contraction of the wavelength —the particle undergoes energy amplification while propagating in-place. In terms of the velocity profile of Fig. 1, the propagation is happening within a blueshifting region (in accordance with the Principle of velocity differential propagation). (Thickness of energy layer is greatly exaggerated)**

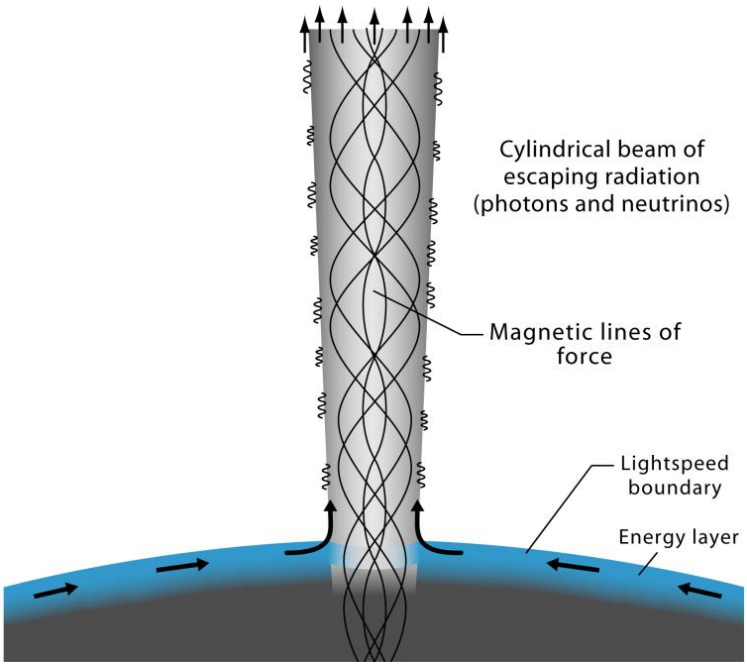


**Fig. 4. Escape mechanism for releasing surface-residing photons and neutrinos. Shown in cross section, radiation escapes from the Terminal star by means of the opening in the lightspeed boundary. Two such openings originate with the neutron star's magnetic field and are maintained in the open state by the collimated nature of the magnetic field and the intense particle beam itself, both of which are voracious absorbers of aether. Both diminish the radial inflow of the space medium. Within the surface energy layer, there is considerable lateral pressure (due to the ultra-extreme density present). This drives the radiation particles toward the edge of the portal from which they emerge as a ring of radiation. The streaming of escaping energy is a continuous phenomenon —sustained by the ongoing energy-generating Blueshifting process acting upon in-fallen background radiation. (Thickness of the energy layer is greatly exaggerated)**

Essentially, in the quiescent state just described, more energy exits the structure than enters it. And in this sense it is a system that reduces entropy. It reduces the entropy of the larger system (a cosmic region) in which it is embedded —offsetting the countless entropy raising processes, events, and transformations that animate the external physical world.

The energy expelled by a Terminal star serves as the 'fuel' for the production of new mass particles (as is routinely done in laboratory accelerators) and relentlessly increases the thermal energy of anything along the emission beam's path. Comparing the entropy quality of the output versus the input: Comparing equal amounts of energy, the high energy radiation corresponds to low-entropy emission; while weak radiation corresponds to a high-entropy state.

Thus, by producing new mass and making new thermal energy available, Terminal stars reduce the surrounding region's entropy.

But be aware of something that Process I does not do: The entropy-lowering process does not lower the entropy of the Terminal star itself —its thermodynamic or energy state is fixed. It never changes. (This will be elaborated in the next section.) It is most probable that the interior temperature of a Terminal star is as close to absolute zero as Nature allows.

In summary, injecting amplified energy into a cosmic environment reduces its entropy. The mechanism of which Blueshift Accrual is the key element operates by exchanging low-energy radiation for high-energy radiation.

## 1.3 Discussion

### 1.3.1 Natural versus paradoxical

The entropy-lowering structure/mechanism initially depends on the presence of magnetic fields and channels. They facilitate the subsequent escape of energy particles. Now contrast this with the conventional view. As mentioned above, black holes cannot have magnetic fields emanating from the collapsed mass and there is no way for particles to escape; all because of the presence of a greater-than-lightspeed barrier. Be reminded, this super-lightspeed barrier is built into the black hole's definition. But there is another problem. As everyone knows, Conventional Physics does not explicitly use the universal space medium as part of its theory of gravity —Einstein's general relativity. Consequently, black-hole theorists are confronted with the irresolvable paradox of the central singular mass somehow able to extend its gravitational influence out to the event horizon —and beyond! Their faith in the verity of such a possibility lies in the magic of geometry. But for believers in the existence of gravitons, the problem is even worse. For them the paradox is having their force-carrier particles travel faster than light!

The point is, a black hole cannot serve as a means to reduce entropy. In fact, black hole physics predicts the opposite. These hypothetical objects are said to increase entropy, as will be explained in Section 2.

### 1.3.2 The obvious question

Is the entropy-lowering process a violation of the First law (energy conservation) and Second law (entropy) of thermodynamics?

- This depends on how the system in which the process operates is defined. It's a matter of what is included as the domain of influence.
- If the Terminal star alone is the system, then yes, it may be argued that there is violation —since the system can generate (and expel) more energy than it takes in.
- If a large enough region defines the system and a second entropy-lowering process is included (see Section 2, below) then no violation occurs. Entropy is simply maintained. There is a perpetual self-balancing entropy state when Process II is included.
- Furthermore, it may be argued that the process is outside the domain of conventional thermodynamics, plain and simple. The Terminal star's energy state is absolutely unchanging. Regardless of mass-energy input or quantity of energy expelled, the object's total mass and temperature remain unaltered.

### 1.3.3 The Third law and the Terminal star

A related question has to do with the Third law of thermodynamics and the Terminal star. The mass of the Terminal star exists in the ultimate density state (a DSSU[2] foundational premise). To say that the Terminal star's neutron mass manifests an *ultimate* state of density means that there can be no particle motion, no vibratory kinetics. (If vibratory motion could occur, it would be evidence that the maximal density has not yet been attained.) Now connecting this state to temperature: Temperature is a measure of the internal energy of a system —its contained kinetic and potential energy. Since the ultimate density precludes any kinetic motion and potential energy is zero, one must conclude that the neutron mass (or whatever the identity of the actual mass particles may be) can have no temperature —it exists at absolute zero.

However, the Third law of thermodynamics, said to hold for any system (classical or quantum mechanical), basically states that absolute zero (0 K or −273.16°C) cannot be reached. Since temperature is proportional to internal energy, at absolute zero all particles in the system would be completely at rest in their positions and the internal energy of the system would be zero. But this means that the particles will have a definite position and a definite momentum (i.e., zero). This violates the Heisenberg Uncertainty Principle which states that the product of uncertainty in position and in momentum must always be greater than, or equal to, Planck's constant. Thus, all mass all particles must have a temperature greater than absolute zero.

Such argument supporting the Third law is based on a strict mathematic interpretation —a deference to the sacrosanctity of the Uncertainty

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

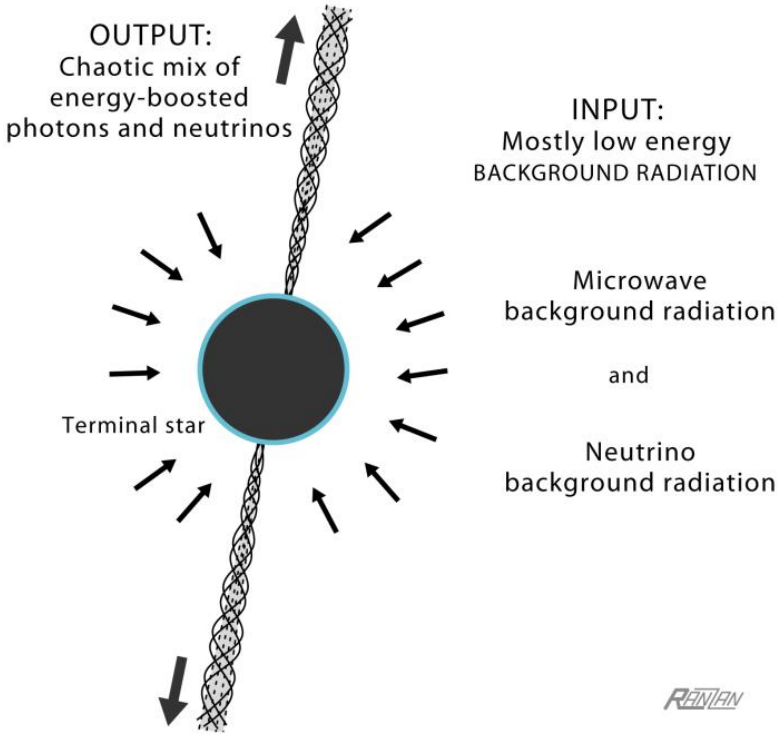


**Fig. 5. Looking at the entire system while it is in its most undisturbed steady-state state. The energy entering the system consists mainly of low energy CMBR —the Universe's background 3K thermal energy— and also the enormously abundant neutrino background radiation. The energy escaping from the system consists of a chaotic mixture of energy-boosted (Blueshifted) photons and neutrinos. As long as radiation particles are trapped within the energy layer, they are continuously gaining energy. Although the process is a slow one, the results, as cosmic ray detectors have confirmed, are truly staggering. The key point: More energy comes out than goes in**

Principle. But with the Terminal star, Physics is dealing with a unique realm. It should not be assumed that the Uncertainty argument can be extrapolated to ultimately-dense matter. It is probably more reasonable to focus on the basic definition of temperature —for something to have a temperature there must be motion, some kinetic energy; and this is deemed to be absent in the ultimate-dense mass. And so, it is claimed, as was done for Process I, this is outside the domain of thermodynamics. Thus, having the Terminal star's mass at zero temperature cannot be said to violate the Third law.

Nevertheless, if priority goes to compliance with Heisenberg's Uncertainty Principle, which in this case means a precise temperature cannot be specified, then we would simply assert that the mass's temperature is the very lowest that Nature allows. The Terminal star interior then manifests the universe's minimal temperature and maximal density —simultaneously.

### 1.3.4 Matter formation based on evidence versus speculation

The entropy-lowering system described has high-energy emission entering the surrounding universe and leading to new matter formation. It is straightforward; when the emitted high-energy particles strike preexisting matter, new mass and radiation particles are formed. Historically there have been several speculative ideas on the subject. English astronomer James Jeans back in the 1920s proposed (in his book *Astronomy and Cosmology*, 1929) that newly created "matter is poured into our universe from some other, entirely extraneous, spatial dimension." Raw speculation. British mathematicians Herman Bondi and Thomas Gold simply put it into their equations in their construction of their Steady State universe of the 1940s. Like magic, they invoked the continuous creation of matter in space itself. Astronomer Fred Hoyle did likewise. But the current speculation, the academically approved view, is that expanding space/vacuum

purportedly causes matter formation (while ignoring the fact that the vacuum also contracts). Physicist Frank Wilczek promotes the notion that by the act of expanding, space, that is, the vacuum, gains energy and therefore its mass increases and allows the density of the space/vacuum to remain constant [4]. Professor Peter Atkins has this to say: "Indeed, we could even think of the stress of stretching space as generating the atoms, so matter creation is not *a priori* absurd; but particle creation appears to be an abnegation of the law of conservation of energy, and therefore distasteful however discreet." [5, p243] Astronomy expert Mark Whittle, by including inflation (a hyper version of expansion), manages to compound the speculative aspects of matter creation. In his widely distributed cosmology lectures, M. Whittle claims that "during the Big Bang's inflationary launch a space [region] expands and is converted into matter."[6] Now, which is more plausible: the speculative phase of a failed cosmology? Or a perfectly natural process (the Blueshifting mechanism and energy expulsion)? … Which is more convincing: a hypothesis with no evidence backing it or a provable process with confirming evidence?

### 1.3.5 Energy amplification/generation by other means

It should be pointed out that theoretical (mathematical) cosmology includes a method, radically different of course, for energy amplification and matter creation. It stands in sharp contrast to the natural process of Blueshift Accrual. Ponder the wildly speculative "inflaton field" long promoted by big-bang cosmologists. One such cosmologists, Brian Greene, a believer in whole-universe expansion, has described *energy amplification by inflation* as follows:

> "*Through a chance but every so often expectable fluctuation from an unremarkable primordial state with high entropy, a tiny twenty-pound nugget of space achieved conditions that led to a brief burst of inflationary expansion. The tremendous outward swelling [expansion] resulted in space's being stretched enormously large and extremely smooth, and, as the burst drew to a close, the inflaton field relinquished its hugely* ***amplified energy by filling space nearly uniform with matter and radiation.***" –B. Greene, The Fabric of the Cosmos, p.321. [Bold emphasis added.]

There is certainly nothing subtle about this scenario. Supposedly, that hugely amplified energy and matter and radiation, generated in a "brief burst of inflationary expansion" in a brief moment of time, ultimately became the observable universe. It makes one wonder, did Professor Greene, and his colleagues and followers, actually believe this? Nevertheless, it unintentionally underscores the reasonableness of the DSSU's natural approach.

### 1.3.6 The cosmic mainspring

The Terminal star's energy generation and emission is the answer to an age-old question going back thousands of years: Where does the universe's ultimate source energy come from?

The Ancient Greek philosopher Lucretius (95–45 B.C.) asked, "*Whence does the aether draw nutriment for the stars*? For everything consisting of a mortal body must have been exhausted by the long day of time, the illimitable past. If throughout this bygone eternity there have persisted bodies from which the universe has been perpetually renewed, they must certainly be possessed of immortality."[7]

Modern thinkers simple resign themselves to the assumption that the universe does not have a rejuvenating energy source. It has no cosmic mainspring. Astronomer James Jeans held the view that the energy of the universe undergoes "wastage", in the entropy sense of the word. "[T]he energy of the universe must continually lose availability."

> *"The energy is still there, but it has lost all capacity for change; it is as little able to work the universe as the water in a flat pond is able to turn a water-wheel. […* ***And so]*** *the universe as a whole cannot so go round and round.*"[8]

Along with his contemporaries, James Jeans believed the universe had no extraneous font of energy. He thus forecast a cosmic lack-of-heat death.

Peter Akins, a believer in the hypothesis of whole-universe expansion, projects this sentiment when he wonders "whether the dissipation of matter and energy can continue forever. Or will the universe become so infinitely disorderly that entropy can no longer increase and events come to an end?"[5, p132] It's called the thermodynamic death of the universe.

Physicist Paul Davies says, "[E]ssentially all physical processes that we observe in the Universe are finite and nonrenewable. … The supply of material for new stars is limited."[9, p123.] Davies is telling us that Academic Astrophysics is unaware of an ultimate-source energy.

They have all failed to recognize that the objects resulting from *the total-and-final gravitational collapse of mass* actually become the generators of the radiant energy that drives the Universe. These source energy objects (the mainsprings so to speak), distributed as they are throughout the Universe, continuously generate renewed energy via *the Law of Blueshift Accrual*.

Incidentally, Lucretius (and Epicurus of Samos before him) did come up with a wonderfully plausible answer. *Nature drives the universe entirely by herself*:

> "*Bear this well in mind and you will immediately perceive that nature is free and uncontrolled by proud masters and runs the universe by herself without the aid of gods*."[10]

#### 1.3.7 Resolves greatest mystery in high-energy physics

Terminal stars provide the explanation for ultra-extreme energy particles —particles that have long been detected in association with cosmic rays and gamma-ray bursts, particles whose energy is far beyond what can be produced by any known mechanism and any theoretical process and any imagined action.

The Terminal star's natural energy amplification process explains the cosmic-ray particles with the astonishing energy of $10^{20}$ electron volts. This amount of energy is *ten billion times greater* than a single proton's mass energy! Such particles have actually been detected [11].

Reporting on the detection of neutrinos by the IceCube Neutrino Observatory located on the Antarctic continent, the journal *New Scientist* (2016 April 30) had the experts admitting "Neutrinos captured at the South Pole carry more energy than we can explain." They keep finding "neutrinos with anomalously high energy … with energies in the peta-electron-volt region —that is, a million billion electronvolts." This corresponds to about a million times the mass-energy of a proton! The problem is "we [experts] have no clue what process could have given these neutrinos that much energy."

American physicist Spencer Klein underlined the mystery, "These neutrinos have energies more than a thousand times higher than any neutrinos that we have produced in particle accelerators." Canadian astrophysicist Ray Jayawardhana advised, "we may have to look to distant celestial sources to uncover the violent origins of these neutrinos."[12]

In summary, Terminal stars generate energy *without* involving any transformation. And there is only one way to do this. Gravitationally collapsed bodies described as *End-State neutron stars* absorb ambient energy, subject it to a unique energy amplification process based on the principle of the velocity differential propagation of radiation, and broadcast the boosted energy through polar portals. It is our Universe's energy generating mechanism of (more precisely the amplification of) already existing energy particles (the photons and neutrinos) fortuitously located. The process operates without actually adding any other form of energy, without any particle-on-particle interaction, to bring about the amplification. It is like heating an object without any source of external heat or energy! For obvious reason, it is outside the domain of conventional thermodynamics.

The Terminal star's process of energy expansion/amplification and its emission stands as Nature's primary entropy-lowering mechanism.

## 2. ENTROPY-LOWERING PROCESS II: MASS EXTINCTION BY AETHER DEPRIVATION

The most remarkable aspect of what has so far been presented is this: It required no new physics. Realize that the above discourse introduced no change to the laws of physics. Introduced was only what may be called a new assumption —the reasonable assumption that there is such a thing as a natural limiting density state. And yet, a new fundamental process has been detailed —a process discovered during the development of DSSU theory[3]. It is a process that first appeared in the scientific literature in 2014 [13].

[3] *For more information on the DSSU, the problem-free cosmology, visit www.CellularUniverse.org*

The second entropy-lowering mechanism is different —radically different. It *does* require new physics.

## 2.1 Process II specifics

The second entropy-reducing process/ mechanism involves *mass vanishment*. It goes into effect under certain conditions. This entropy-lowering feature is triggered when excessive mass falls into the system, or melds with a similar collapsed structure. Examples include, impact collision, orbital merger collision, and cannibalism of orbiting uncollapsed star.

Section 1, above, revealed the two factors that together determine the spherical size of the Terminal star; those being the absolute limit on density and the absolute limit on speed (the relative speed between mass/matter and the universal space medium). Now we will examine the all-important third factor —the process that guarantees spherical size invariance regardless of any additional mass. It is the process preventing the Terminal star from growing more massive; and functions as the second way that Nature has for reducing entropy.

Recall, an End-State neutron star is a final state structure because, by definition, the addition of more mass does not change its volume or its total mass content. So, what then would happen if additional matter impacts the structure? … Say, it is joined by another Terminal star.

Consider this a thought experiment; and refer to Fig. 6. Invoke the now-familiar assumption; meaning that the mass density cannot be increased further. In the absence of any other factor or restriction, the volume would have to increase. But now, as can be seen in the drawing, there is a serious problem. If we now calculate (using the inflow velocity equation from Section 1) the necessary inflow required[4] by the combined mass, we find that it significantly exceeds lightspeed. This is serious. It means the thought experiment fails and is providing proof that the volume of the structure simply cannot increase. (In fact, the structure's volume cannot be changed at all.)

Here is where the mass vanishment, or extinction, enters the picture. Note carefully, a key defining feature of DSSU theory is that matter exists as a process of aether excitation *and consumption*. Matter, absolutely, cannot exist without aether. It logically follows that mass when deprived of aether, absolutely, must disappear —literally vanish from existence. Called *Mass Extinction by Aether Deprivation*, it is not just something being thrown in here. It is an unavoidable consequence of a fundamental premise of the most successful cosmology in the scientific literature, having been validated by the remarkable match between theory and observational evidence [14].

The extreme example of the process occurs when two End-State neutron stars merge. A significant quantity of mass vanishes. The mass vanishment occurs at the core, as shown in Fig. 7.

Now for the connection with entropy.

Normally, when mass aggregates, whenever gravitationally bound bodies drift closer together, there is an increase in entropy. Understand, this is how entropy works for gravitational systems. (And, yes, it is the opposite of how entropy ordinarily works.) Mathematical physicist Roger Penrose confirms this situation by contrasting it to a distribution of gas. For a gas, entropy increases when a localized gas disperses.

> "*For an ordinary gas, increasing entropy tends to make the distribution more uniform. For a system of gravitating bodies the reverse is true. High entropy is achieved by gravitational clumping —and the highest of all, by collapse to a black hole*."[15, p338]

But now there is a *new physics* factor to take into account. When dealing with objects that have undergone Terminal collapse the entropy rule changes. With the gravitational merger of Terminal stars there is a loss of mass. Essentially, mass is removed from the system. This obviously reduces its entropy. The revolutionary new factor leads to the logically consistent conclusion that the entropy decreases.

A simple supporting argument follows. One of the meanings of entropy is this: it is the measure of disorder of a system. Stated another way, entropy is the number of possible arrangements of a system. The more particles (or objects) in a system the greater the number of ways they can be distributed, or disordered, and the higher

[4] *This inflow is to provide the volume of aether required by the mass to sustain its existence. Without a continuous supple of aether, matter cannot exist.*

would be the entropy. Conversely then, a reduction in the number of objects (or particles) in the system *diminishes* the number of ways they can be distributed and, thus, would result in a reduction of the system's entropy.

## 2.2 Discussion

### 2.2.1 When one plus one equals one

The full implication, the most dramatic implication, of the Mass Extinction feature is this: The end product of the collision, or the merger, of two Terminal stars is just a single Terminal star. The equivalent mass of one of them totally vanishes from the universe. This loss is the mass equivalence of 3.4 Suns. Underscored is the fact that the Terminal state is an ontological state that cannot be altered in any way (other than changes of rotation). Its state of existence is unalterable.

Our real World is ruled by processes, and the fact that the 'sum of masses' in this case is not related arithmetically is unimportant. In conventional physics, on the other hand, Platonic/Pythagorean philosophy permeates and mathematics rules supreme.

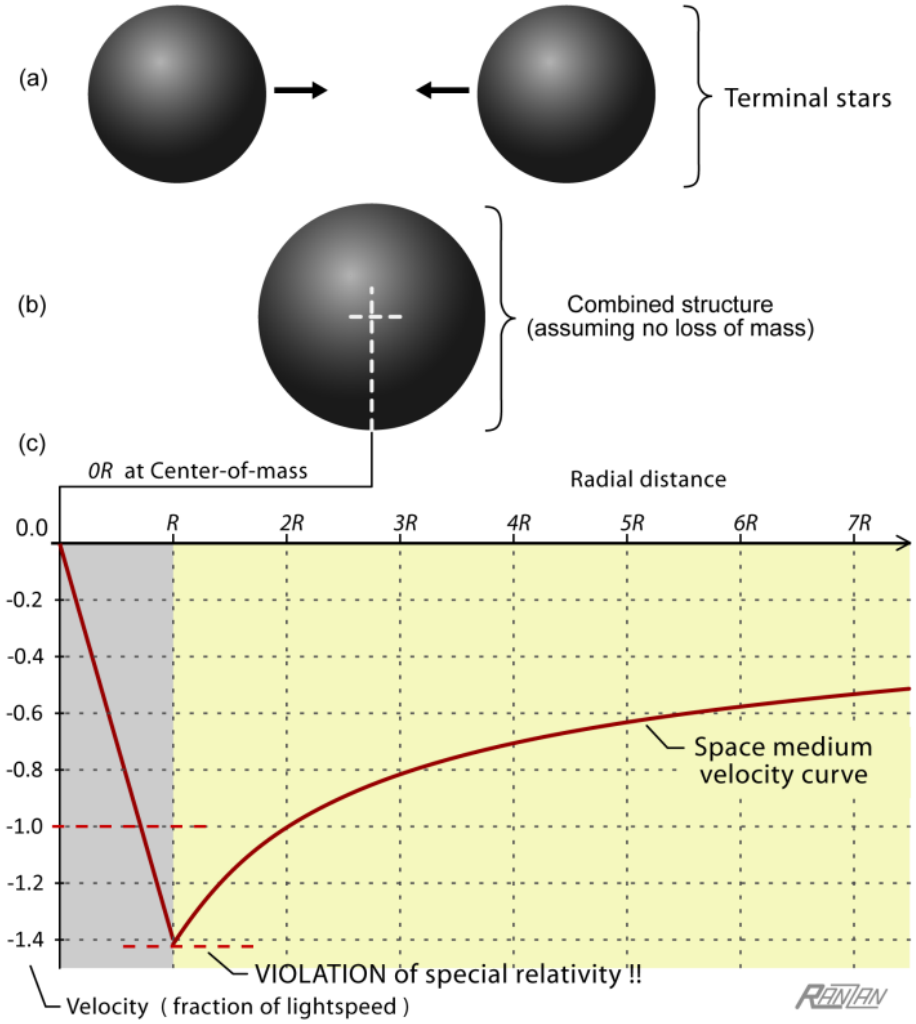


**Fig. 6. Thought experiment merger (a) of two Terminal stars (radius 10 km) to form (b) a combined structure (radius 12.6 km). The only assumption here is that the mass density cannot increase in spite of the resulting much greater intensity of gravity, as shown by the graph in (c). The experiment reveals a serious violation of special relativity. The surface inflow (and extending below the subsurface), calculated to be 1.41*c*, greatly exceeds lightspeed. Something critically important is missing here**

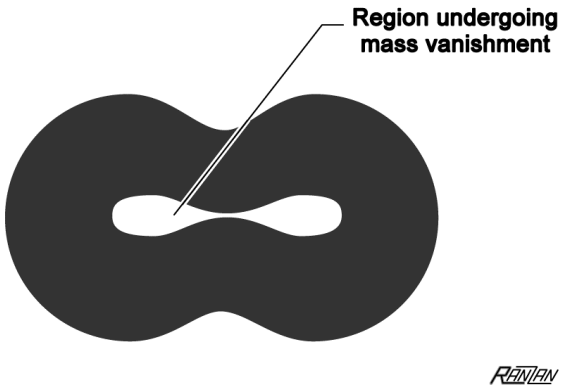


**Fig. 7. Cross-section view of a pair of Terminal stars in the act of merging. Because of the limited surface and the strictly limited inflow speed, the volume rate of aether able to enter the structure is insufficient to sustain the existence of the combined mass of two merging Terminal stars. Consequently, the core region suffers *aether deprivation* and associated *mass vanishment***

And so it is that Standard Cosmology (or Physics more broadly) has no way of extinguishing mass. The abstract rules of math and a rigid adherence to thermodynamics prevent such seeming magic. According to the conventional view, when gravitationally collapsed objects (black holes) merge, the mass is added together (except for a portion that is said to be converted to gravitational waves). The relevant question regarding such merger is, *What, then, happens to the entropy*? And the answer, consistent with the rule for gravitational aggregation (as should be expected), is that it rises.

Giving us the authoritative 'textbook' view on the entropy, and on the merger, of gravitationally collapsed objects is, again, Professor Penrose[5]:

> *"[T]he entropy of a black hole is proportional to the square of its mass … Thus, the entropy per unit mass of a black hole is proportional to its mass, and so gets larger and larger for larger black holes. Hence for a given amount of mass … the greatest entropy is achieved when the material has all collapsed into a black hole!"*
>
> *"Moreover, two black holes gain (enormously) in entropy when they mutually swallow one another up to produce a single black hole!"*[15, p341]

[5] *Roger Penrose, a mathematical physicist, received half of the Nobel Physics Award (for the year 2020) for a mathematical finding. The citation reads, "for the discovery that black hole formation is a robust prediction of the general theory of relativity."*

So there it is. Nobelist Penrose's words leave no doubt and reflect the conventional wisdom. The view favored by most theoretical physicists holds that the merger of gravitationally collapsed objects (descriptively called black holes) brings about a large increase in entropy. In contrast, the DSSU view holds that the merger of gravitationally collapsed objects (termed Terminal stars) brings about a large *decrease* in entropy.

The two views are radically opposed to each other:

- One view holds that matter is forever conserved, the other that mass vanishes.
- One maintains that merger increases entropy, the other that merger decreases entropy.
- One says that a merger makes the structure more massive, the other says the combined structure is identical to a single premerger partner.

For mergers under the latter view (ruled by processes), one plus one turns out to equal one.

## 3. SUMMARIES, LIMITS, PARADOXES, AND PROBLEMATIC ALTERNATIVES

### 3.1 Background

#### 3.1.1 Background to gravity's root cause

The cosmology known as the DSSU is based on an aether theory of gravity [1]. As a way of giving credit where credit is due, here briefly are

highlighted some of the pioneering thinking on the use of aether as the causal mechanism of gravity:

It was probably René Descartes (1596-1650) who was the first to propose and promote the idea of an aether medium of which all parts are in motion. He advanced the aether concept in his *Principles of Philosophy* published in 1644. Descartes envisaged a plenum composed of whirlpools, eddies, and other kinds of turbulent motion. Significantly, *gravitation was attributed to some special substance, some kind of aether, which enters a body and has the property of seeking to reach the center of mass*.

It is well known that Newton himself speculated about the mechanism of gravitation. In his Trinity notebook, one finds sketches of an *aether-stream model of gravitation* and suggestions for several relevant experiments to test the model.

As one of the three possible causes of gravity, Newton came up with this astonishingly profound view: Gravity may be caused by the consumption of aether. In a letter to Henry Oldenburg[6] (1675) and in a letter to Robert Boyle (1679), he speculated on such an aether hypothesis. Gravitation between the sun and the planets might be explained as an absorption: the sun 'feeds' on the aetherial spirit, which conserves [read sustains!] its shining, and whose sunward motion draws the planets with an attractive force [16, p151].

Another early proponent of aether gravity theory was the philosopher and exponent of Newtonian Physics Samuel Clarke (1675-1729). He had recognized the rather obvious flaws in the, then popular, impulse model for explaining gravity's cause. Clarke believed that gravity must be due to something 'immaterial' (a type of aether) which *penetrates matter* [16, p163]. The significance of Clarke's aether lies in its nonphysical nature. As such, it could have no mass or energy!

Likewise, DSSU aether, itself, possesses no mass or energy.

## 3.2 Quick Summary

The accompanying table provides a convenient summary of the processes of Blueshift Accrual and of Mass Extinction. It is important to realize that neither process reduces, in a holistic sense, the net entropy of the Universe. The overall entropy of the Universe remains forever, nominally, constant. Global entropy remains balanced between its rise due to various thermodynamic and gravitational processes and its drop due to Processes I and II. Entropy, after all, is a statistical concept.

### 3.2.1 Summary of the main points

- Two factors determine the Terminal star's limited and invariant size: (1) a stable mass-density limit; (2) and a sufficient amount of surface area through which the space medium must flow to sustain the matter within, all the while remaining in compliance with the lightspeed rule imposed by special relativity.
- Process I, energy generation by Blueshift Accrual, lowers entropy by taking in low-energy radiation and expelling it at higher energy.
- Process II, Mass Extinction by Aether Deprivation, lowers entropy by removing mass from the system.
- Mass Extinction is a feature unique to DSSU theory.
- Together these processes act to counter the many entropy raising transformations occurring within the surrounding cosmic region.
- Expelled radiation (from Process I) —so long as the individual photons and neutrinos remain collision free (i.e., fail to interact with anything in their path)— will undergo gradual, relentless redshifting (itself an entropy raising process).
- Both processes are deemed, for good reason, to be outside the domain of conventional thermodynamics.

## 3.3 Limited Domain of Thermodynamics

Expanding on the last bullet point: Upon initial encounter, one might think that Mass Extinction represents a violation of the First Law of thermodynamics which states that energy cannot be created or destroyed. The rule, however, has a deeply embedded restriction. The unstated, but understood, aspect of the First Law is that no *physical* process —meaning no *thermodynamic* process— can destroy/extinguish matter (including energy). The First Law restricts itself to the physical realm of existence. It turns out, Process II is not brought about by any direct physical activity. Aether —that is, its absence— is the cause of the mass loss. Since the aether

[6] *Henry Oldenburg was the Secretary of the Royal Society.*

medium is not physical [7], the cause of Mass Extinction is a sub-physical one. Thus, clearly, Process II is not a thermodynamic activity.

Similarly, it might be argued that Process I, energy generation by Blueshift Accrual, constitutes a violation of the First Law of thermodynamics. The energy of surface-embedded 'particles' is not conserved; rather it is being amplified. Here again, the cause is not a physical one. It is not some physical process causing the energy gain. No thermodynamic process is involved in the actual Blueshifting. The cause of Blueshift Accrual is sub-physical. The cause is the dynamic property of a nonmass-and-nonenergy aether. Thus, Process I is not a thermodynamic activity.

#### 3.3.1 Examining an interesting parallel between blueshifting and redshifting

Continuing to delve into the limits of applicability of thermodynamics, explained here is the reason why blueshifting as well as the more familiar redshifting of light do not fit into the proper domain of thermodynamics. They are not thermodynamic processes.

Thermodynamics refers to the branch of physical science that deals with the relations between heat and other forms of energy such as mechanical, electrical, or chemical energy. This is the realm of relating all things physical. By 'relations', what is meant is some form of interaction (with the physical world, with mass or energy). 'Thermodynamics' requires interaction; that is, for thermodynamic rules/laws to be applicable there needs to be some form of interaction (even if it is only the spatial separation of objects/particles). But the interaction of mass or energy particles with the aether is excluded, and justifiably so, for the simple reason that it is not a physical medium —*its discrete units have no mass or energy*.

Now, the *cosmic redshift* (the phenomenon extensively researched by Edwin Hubble) is caused by radiation interacting with non-mass non-energy aether. But such interaction is outside the definition; it does not count. Hence, the process that causes the *cosmic redshift* is not a thermodynamic phenomenon. And if redshifting of radiation is not a thermodynamic activity then neither is the blueshifting of radiation. Again there is the conclusion: Process I, energy gain by Blueshift Accrual is not a conventional thermodynamic activity.

### 3.4 Key Component Definition

In light of its great importance to DSSU cosmology in general and to the understanding of entropy in particular, the extended definition of the Terminal star is presented here.

A Terminal star is a compact star (maximally-dense) in the 'Terminal' state —an ontological state that cannot be altered in any way other than changes of rotation. Such an object is truly in an end state of existence. It is both a destroyer of energy (specifically, mass energy) and a generator of energy (specifically, it amplifies the energy of photons and neutrinos). The defining feature: It is enveloped by an energy surface/layer onto which the space medium (aether) flows at the speed of light and *decelerates while passing through this layer*. Moreover, this energy layer encloses a fixed quantity of mass existing as nature's ultimate density state. Rotation feature: When rotating, it is unlike any other rotating object —possessing a feature unique in all physics. It manifests no centrifugal effect. The only restraint on the rate of rotation is the resistance from the magnetic lines of force (from its self-produced magnet field). In the absence of a magnetic field, there would be no theoretical spin limit and, of course, no way of measuring it.

Synonymous terms: *Terminal-state star, Superneutron star, End-State neutron star*.

### 3.5 Instructional Dichotomy

#### 3.5.1 A most instructional contradistinction

In research, there is nothing as useful as having two theories with clear and opposite predictions. One is a mathematical theory, the other is a process-centric theory.

The Math theory hypothesizes that total gravitational collapse results in a point mass (a singularity) hidden within what is termed a black hole. The Process theory predicts that a total collapse results in an End-State neutron star (a Terminal star).

The Math theory supposes that mass can attain infinite density —a physical impossibility. The Process theory makes the natural and reasonable assumption that mass can never exceed a specific limiting density.

[7] *Despite being nonphysical, DSSU aether is mechanical. It consists of sub-physical (subquantum 'energy') discrete entities.*

Under the Math theory, when there is a merger of its gravitationally collapsed objects (black holes), the prediction is an increase —an enormous increase— in entropy. The natural Process theory predicts a decrease in entropy —a significant decrease.

The dichotomy even extends to the treatment of the very essence of the Universe. While the Math theory claims that the aether, called the Higgs field, possesses self-mass (Higgs particles are said to have a huge mass); the Process theory is simply based on aether being a substrate devoid of mass and energy.

While the Math theory adheres to a strict interpretation of the energy conservation principle; Process theory is based on something more fundamental, the ontological nature of all matter —all mass and radiation exist *conditionally* as the excitation-and-consumption of discretized aether. As bluntly stated earlier, one view holds that matter never dies and is forever conserved, the other has a process that allows mass to simply vanish.

The contrast in the treatment of energy amplification places the theories worlds apart. The Math version, confining its energy amplification to the beginning of a Big Bang event, has a wildly speculative "inflaton field" that, in some unknown way, according to Brian Greene, "hugely amplified energy by filling space nearly uniform with matter and radiation."[17] The Process theory ascribes energy amplification to the unambiguous natural process of Blueshift Accrual.

The Math theory has no ultimate source of radiant energy; the Process theory has its Terminal stars perpetually emitting blueshifted radiation (photons and neutrinos). What this

**Table 1. Summary chart of entropy-lowering Processes I and II. Processes I is responsible for the source of amplified energy injected into a cosmic environment thereby reducing the latter's entropy. Processes II is responsible for the removal of excess mass from a cosmic region. The Terminal star is the key component; because it cannot change in size or content, any bulk mass added to the structure leads to a corresponding Mass Extinction at the core**

| | **Processes I: Blueshift Accrual** | **Processes II: Mass Extinction** |
|---|---|---|
| **Modality:** | Active | Passive |
| **Key aspect:** | Preexisting energy particles (photons, neutrinos) are blueshifted to higher energy. | Mass, when deprived of a steady supply of aether, vanishes from the Universe. |
| **Where process occurs:** | Surface zone of Terminal stars (as defined in text). | Center of gravity of a Terminal star. |
| **How the process works and links to entropy reduction:** | ● The amplified energy escapes through the Terminal star's polar portals and along collimated magnetic channels.<br>● In simple terms, it is Nature's rejuvenating energy for counteracting the ongoing energy decay (i.e., the Second Law degradation of energy). The escaped Blueshifted radiation is low entropy energy injected into the high entropy cosmic surroundings. | ● A Terminal star cannot change in size, under any circumstances. Therefore, any additional bulk mass that happens to be absorbed into the structure causes an equal quantity to vanish at the core.<br>● This removal of mass from the larger system, obviously reduces its entropy. It is indisputable. |
| **Responsible for transformations:** | The emitted high energy particles interact with random targets and produce new mass. | Example: When two Terminal stars merge, the equivalent amount of mass of one Terminal star totally vanishes. |
| **How the cosmic region is affected:** | Process I (by suppling the energy to produce new mass) contributes to the maintenance of a balanced entropy on the large scale. The overall entropy of the Universe remains statistically unchanged. | Process II (by removing excess mass) contributes to the maintenance of a balanced entropy state. The overall entropy of the Universe is considered to hold constant. |

means is that while Terminal stars are 'alive' as they spew forth the universe's ultimate source of rejuvenating energy, black holes are virtually dead objects.

All in all, the differences could not be more polarized.

Strange as it may seem, the Math theory is the one favored by most theoretical physicists, and is what has led them to a failed cosmology, with its uncaused beginning and its unstoppable thermodynamic demise —an ultra-cold death by dilution.

## 4. CONCLUSION —IMPLICATIONS FOR COSMOLOGY

> *"[W]hen we come ultimately to comprehend the laws, or principles, that actually govern the behavior of our universe —rather than the marvelous approximations that we have come to understand, and which constitute our superb theories to date— we shall find that [the problems with the mathematical interpretation] will dissolve away. Instead, there will be just some marvelously consistent comprehensive scheme."* –R. Penrose [15, p352]

### 4.1 Entropy Becomes a Conservation Principle for Cosmic Scale Regions

According to the standard view: The key difference between First law and Second law of thermodynamics is that the First is a conservation rule and states that energy (including energy in the guise of mass) cannot be created or destroyed; whereas the Second law describes the nature of energy, a *non*-conserved aspect of energy. The Second is the physical law that describes heat and its loss in any energy conversion. It precludes the flow of heat from a colder location to a hotter one spontaneously. The simplest way of expressing the Second law is, "not all heat energy can be converted into work," a situation regarded as a rise in entropy (a measure of disorder).

In terms of the universe as a whole or a large portion of it, the First law (extrapolated) means the total quantity of *energy in the universe stays the same*, the Second law (extrapolated) means the total entropy is forever *increasing*. This extrapolation of the Second law is no longer viable.

The entropy-lowering processes that have been presented do not change the basic rules of the science of thermodynamics. The change they do impose, and it is a deeply profound change, is the extrapolation to the greater universe. Under the new interpretation the total energy and the total entropy in the universe (or some large portion of it) *both stay the same*. Self-balancing systems maintain energy and entropy stability (on a cosmic scale).

### 4.2 Entropy Paradox

For many decades, for far too long, astrophysicists and philosophers spoke of the 'paradox of entropy.' The paradox of the Second law is something that honestly and deeply baffled them.

Science popularizer Isaac Asimov stated the problem this way: "If the universe is constantly running down, how did it get wound up to begin with?"[18] The entropy of the universe is constantly increasing but how did it acquire its low entropy in the first place? Asimov continues,

> "*The best answer one can give to that question is that no one knows. As far as we can tell, all changes are in the direction of increasing entropy, of increasing disorder, of increasing randomness, of running down. Yet the universe was once in a position from which it could run down for trillions of years. How did it get into that position?*"[18]

Professor of mathematical physics Paul Davies, writing under the heading *Is the Universe Dying*, expressed the problem more graphically, "… if we think of the universe as like a huge clock slowly running down toward the inactivity of the heat death, what wound the clock up in the first place?"[9, p131] He suggested the universe started out in a wound up state. But Davies remained puzzled, "Is this simply because the Universe just happened to be 'made that way' — is it, in other words, an arbitrary initial condition beyond the scope of science?"[9, p133]

Mathematics professor Roger Penrose exclaimed, "What should surprise us is that entropy gets more and more ridiculously tiny the farther and farther that we examine it in the past!"[15, p317]

> "*Something forced the entropy to be low in the past. The tendency towards high entropy in the future is no surprise. The high-entropy*

> *states are, in a sense, the 'natural' states, which do not need further explanation. But the low-entropy states in the past are a puzzle. What constrained the entropy of our world to be so low in the past?*"[15, p317]

Incidentally, it was the irresolvable nature of the paradox within the context of an *expanding* universe that motivated cosmologists to hypothesize a Cosmos creation event with low entropy as an initial condition. (Strict interpretation of the Second law compelled theorists to come up with some sort of genesis!) It was an attempt that ended up creating more problems than it solved.

In a nutshell, an entropy-lowering process was necessary (at some stage in the past) BUT under the rules of the thermodynamics *that* is prohibited. Conventional cosmology demands such a process but paradoxically must reject it.

There is another facet to the entropy paradox, one specifically relevant to an expanding universe.

The consensus among academic cosmologists is that the universe is expanding and will expand forever. (It is understood that gross matter and its constituent atoms are not expanding, but just moving *with* the expansion.) While expansion is taking place the average temperature slowly and relentlessly drops. A decrease in temperature is associated with a decrease in entropy —like the decreased entropy of the food when placed inside your refrigerator. Over cosmic time stars die out, galaxies shrivel into black hole cores. Over limitless time the black holes evaporate by radiation (remember, this is the unenlightened orthodox view). All radiation (photons and neutrinos) undergoes wavelength elongation due to the ubiquitous expansion. Radiation temperature drops. Each and every region of the universe approaches the ultimate low temperature of absolute zero.
As an aside, it is immediately obvious that, along with an average density dilution, *the total energy decreases in an expanding universe* [19]. It's the indicator of yet another paradox, one that will not be discussed.

Here is the crux of the entropy problem. As the universe expands, as the temperature of thermal radiation drops[8] and approaches its lower limit, so does the entropy. But how can this be!? The wasting away of thermal energy is supposed to be an entropy increasing affair! Entropy is supposed to increase —not decrease! Yet the fact remains. If the only energy remaining in the aging, expanding universe is in the form of thermal energy (that's why it's called a 'heat death'), then heat has undoubtedly been removed from the system. And if there is any logic in thermodynamics, we can say with certainty: *when heat is removed entropy is lowered*!

Moreover, there is the Third law of Thermodynamics, Walther Nernst's famous Heat Theorem that says, as the zero temperature is approached the entropy approaches zero. This law is not something easily dismissed; it's an important part of thermodynamics. It gained German scientist Walther Hermann Nernst (1864-1941) the Nobel Prize in Physics in 1920.

It is a gem of a paradox: According to the Second law, the state of thermal equilibrium —thermal running down as the universe expands— is a state of high entropy; but according to the Third law, as the temperature approaches zero —as the universe perpetually expands— the entropy tends toward its ultimate low.

Two ways to resolve these paradoxes. One way is with the unfailing magic of mathematics. The other is …

The other is this: By removing the philosophically unsound (wholly untenable) assumption —the speculative notion that the universe had a beginning, that at one instant it did not exist and then somehow came into being— and recognizing and accepting the evidence that our World is a *steady state* universe, the paradoxes simply never arise.

In the history of cosmology there have been a number of steady state universe models, but never, *not ever*, has there been a *true steady state*. The DSSU is the first such construction — one that has been validated by reality-based theory and observational evidence [14].

### 4.3 Cosmology Revolution

It is well known that the experts in modern cosmology have invariably rejected the verity of any sort of steady state universe. The basic reason, in terms of the fundamental thermodynamics' concept of entropy, is that a steady state universe requires some entropy-

[8] *Radiation is weakened as it undergoes redshifting caused by space expansion.*

reducing mechanism in order to counterbalance the many entropy-raising activities (according to the Second law). The steady state models either had no process to keep the universe from running down, so to speak, or the process was not plausible.

The design of a *true* steady state cosmos (real or theoretical) must include some way of decreasing entropy —not in the sense of a cosmic net decrease of entropy, but more in the sense of countering (balancing) the usual entropy-increasing processes. A way to decrease entropy was needed. However, as everyone well knew, any decrease in entropy can only be brought about by the injection of energy. On the cosmic scale the injection would have to be continuous. Some sort of *ultimate* energy source is needed. A true steady state universe, categorically, has to have a primary energy source —one not subject to the conventional laws of thermodynamics.

The experts had no perpetual-type of energy source —their flawed cosmic model and rigid thermodynamic laws did not allow for such. Conventional cosmology has no source of sustaining energy. And the reason it lacks this vital ingredient lies in the nature of its gravitationally collapsed objects.

A major component of the cosmology of the 20$^{th}$ century was a bizarre scenario for the total collapse of overly massive stars. The end product of such gravitational collapse was a black hole —a virtually dead object. Black holes are considered to be 'dead stars.' They take material from the external universe and contribute nothing, nothing at all unless one counts hypothetical Hawking radiation. (The associated Hawking radiation, being ever-so weak, is completely insignificant; it is nothing more than an inconsequential speculation.) But under the new cosmology, those barren black holes are replaced by End-State neutron stars (Terminal stars). These objects are active and 'alive' as they spew forth the universe's ultimate source of rejuvenating energy.

The Terminal star is the key. Its set of Processes profoundly changes our understanding of the Universe —the Dynamic Steady State Universe. Its entropy-lowering processes, (i) energy generation by Blueshift Accrual and (ii) Mass Extinction by Aether Deprivation, both missing from all other models, mean that our Universe exists in true steady-state fashion.

The implications for cosmology are revolutionary.

## 4.4 No Cosmic Eschatology

### 4.4.1 No universe-wide eschatology

Possessing perpetual fonts of rejuvenating energy, the Universe dispenses with a Cosmic demise not to mention a grand genesis. Needless to say, this is in direct contrast to big-bang cosmology. The inclusion of a genesis event and a so-called 'heat death' is a major reason why all expanding-universe models fail (both technically and philosophically). The implication of having a limitless energy source is self-evident; while it is make-believe physics to ascribe a beginning for the Universe, and so too is any scripting of its demise.

It is incontrovertible. Having a limitless source of energy, and simultaneously a simple mechanism for disposing of excess mass, leads to a marvelously workable steady state universe. There simply cannot be a cosmic thermodynamic death. This new perspective on entropy —the lowering of entropy by processes beyond the scope of conventional thermodynamics— precludes any sort of cosmic necrology /termination. The Universe has no eschatological destiny.

The Universe is now understood to be "some marvelously consistent comprehensive scheme," as Roger Penrose had hoped for. And more. *It is eternal*.

The Cosmos exists perpetually as a "marvelously consistent comprehensive scheme."

## COMPETING INTERESTS

Author has declared that no competing interests exist.

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# APPENDIX

## Appendix: Proof of non-interaction energy amplification within Terminal star's surface layer

The process of non-interaction energy amplification involves radiation (electromagnetic wave/particles and neutrinos) undergoing wavelength contraction. It is essentially a blueshifting phenomenon and follows directly from the proven mechanism of *velocity differential propagation of light* [20][21]. Normally, the velocity differential mechanism leads to a *loss* of energy (as occurs in the *cosmic redshift* phenomenon), but under the unique conditions present within the Terminal star's surface, it works as an energy gain. Energy is gained by the elementary process of Blueshift Accrual.

While trapped and propagating 'in-place' in the surface layer, photons and neutrinos undergo a gradual, but relentless, wavelength contraction. The proof of this contraction is surprisingly simple.

Consider a representative photon trapped in the surface, as shown in Fig. 8. It is trapped while propagating at lightspeed, in-place, in the outward direction. Since the space medium is flowing inward at lightspeed, the photon just remains stationary within the Terminal star's energy surface. But the key aspect in this situation is that the medium flow is decelerating; its speed changes with respect to the radial distance. In accordance with the aether gravity theory, the magnitude of the inflow velocity (of aether) varies as indicated by the graph. Clearly there exists an inflow velocity gradient at the photon's location. The photon 'experiences' a velocity difference between its two ends. When analyzed, it is found that the front and back ends are actually moving closer together [2].

Given that the photon is an extended entity and each portion of it always travels at speed $c$ with respect to the aether medium, the following may be stated:

With respect to its radial position ($r_1$ in Fig. 8) the velocity of the photon's front end is $+c$ (lightspeed in the positive direction) plus the velocity of the aether $\upsilon_1$.

Likewise, with respect to its radial position ($r_2$ in Fig. 8) the velocity of the photon's back end is $+c$ (again in the positive direction) plus the velocity there of the aether $\upsilon_2$. Then:

(Relative velocity between ends of photon)

= (vel of front end) − (vel of back end),

$$= (c + \upsilon_1) - (c + \upsilon_2), \tag{1}$$

$$= c + \upsilon_1 - c - \upsilon_2,$$

$$= (\upsilon_1 - \upsilon_2) < 0. \tag{2}$$

Note that aether flows $\upsilon_1$ and $\upsilon_2$ are both negative (denoting the inward direction). But because $\upsilon_1$ is more negative than $\upsilon_2$, the bracketed expression in equation (2) must be negative —indicating a converging situation.

Consequently, any surface-embedded photons and neutrinos undergo blueshifting —they slowly gain energy.

### Alternative proof

In the previous proof $\upsilon_1$ and $\upsilon_2$ were treated as place-holder variables, for which values are assigned after deriving the final expression.

In the following proof, $\upsilon_1$ and $\upsilon_2$ are immediately assigned the values taken from Fig. 8. Velocity $\upsilon_1$, of course, equals $-c$ , and $\upsilon_2$, by inspection, equals $(-c + \Delta\upsilon)$. Then,

(Relative velocity between ends of photon) $= (c + \upsilon_1) - (c + \upsilon_2)$,

$$=\left(c+\left(-c\right)\right)-\left(c+\left(-c+\Delta\upsilon\right)\right), \tag{3}$$

$$=0-c+c-\Delta\upsilon\,,$$

$$=-\Delta\upsilon\ <0 \tag{4}$$

The negative result, as convention has it, is indicative of the two ends approaching each other. So, again, surface-embedded radiation undergoes wavelength contraction and, thus, slowly gains energy.

Additional elements of the proof for energy-accruing spectral shift are presented in reference [2]. (Details of the opposite effect —the velocity differential Redshift— are presented in [20] and [21].)

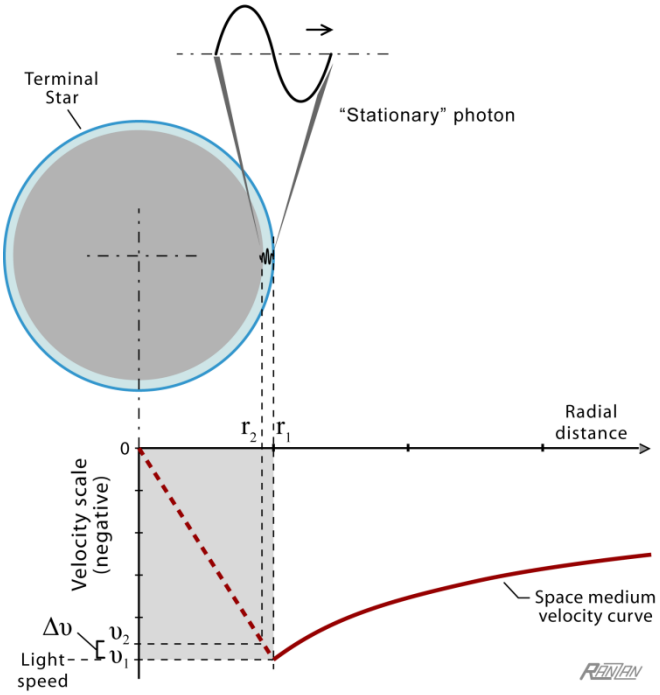


**Fig. 8. *Energy particle amplification*. The schematic reveals the cause of wavelength contraction of any surface-embedded photon (or neutrino). By virtue of propagating within a zone of decelerating aether, the surface photon undergoes continuous blueshifting. Essentially, it gains energy. The photon is being conducted by a space medium whose speed of inflow decreases as it passes through the energy layer and the interior mass; as a result, the front and back ends of the photon 'experience' a flow differential. As proved in the text, this differential turns out to be a diminishing quantity, which means the embedded photon undergoes contraction. (The "velocity-of-aether" curve is derived from the aether theory of gravity. The dashed curve approximates the interior aether-flow function. Photon size and radiation-layer thickness are, of course, greatly exaggerated)**



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