Neutrinos De-mystified;
Do Energetic, Negligible Mass Neutrinos Violate Einstein's E=mCC?

Carl Littmann
25 Washington Lane #313, Wyncote PA 19095 USA clittmann@verizon.net .
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Abstract:

Einstein's Relativity Theory emphasizes that "if a body radiates a given amount of Energy, that emitting body loses a Mass equal to that emitted Energy divided by the speed of light squared". But if that lost mass can't be fully found by adding up all the resulting products, including negligible-mass high-energy **Neutrinos**; where did that mass go? My paper asserts that the lost (hidden) mass was 'injected' into the 'aether', increasing aether's mass. As Einstein even said, in 1930, "**Space is Eating-Up matter**!" I use that "**Einstein Statement**" to estimate a minimum mass density of aether in **Space,** i.e., a key estimate but still likely much too low. And I also show that Neutrino propagation is likely an **Ethereal** Pulse or Stress, like a Twisting Spring Pulse (wave), instead of a forward or backward pulse. Thus, not likely a Particle mass flying through space, like a bullet or 'baseball'. And I give more details, and address related questions.

Introduction

This article is divided into 3 main discourses. First, the 'General Introduction Basics', to mainly provide the reader with a holistic, circumspect picture of how neutrinos fit into the universe as a whole. And we compare and contrast the behaviors of neutrinos with photons, and other related entities in the universe – to, hopefully, provide a fuller perspective.

Second, I present my 'Minimum Ethereal Space Density Calculation using neutrinos only'. There, I provide my multi-step procedure and my rationale behind each step in that calculation. 'Jumping ahead', my lowest such space density calculation comes out **3x10^-31 kg/cu meter**.

Third, I give a 'History – Evolution of Physics and Philosophy Relevant to all Above'. This section should, hopefully, enhance the reader's total conception of the universe and the advancing and changing concepts leading there.

Part 1: General Introduction Basics

There are two major ways that energy is radiated away from an emitting body at the 'speed of light'; i.e., by 'Photons' and by 'Neutrinos'. Photon and Neutrino actions are quite different. A photon is somewhat like the moving mass of a bullet. And so when the photon is launched, the emitting body receives a 'kick' backward, and when it hits and is absorbed by a target, that receiver receives a kick forward. (That is somewhat as Newton envisioned in his corpuscular concept of light; and what Einstein largely envisioned, too. And the emitted entity, 'flying' through space, was termed a 'photon' by 'Einstein theory advocates and followers. More on that topic later.)

Very importantly, (and ignoring gravity's slight effect); when two high-energy 'light photons' (i.e., 'Gamma rays'), are emitted, say in 'electron-positron annihilation'; there is **no** mysterious 'lost' mass by the escaping photons (Gamma-rays). Energy, momentums, and **mass**es of resulting rays - leave **no mass unaccounted for**. (i.e., typically, as A. H. Compton modeled.).

But that is **NOT** the case, when a high-energy Neutrino is emitted. I.e., the neutrino's emitter receives no 'kick' backward. The neutrino and its energy are conveyed forward without forward-traveling momentum or 'traveling mass'. And if absorbed by a receiver, the absorber receives no 'kick' forward. (This article views that as possible and true, because it envisions that the 'neutrino' propagates as a 'Spin-Angular Momentum' Pulse, in an 'aether' in space!).

But the main question arises – since the emitter lost mass, when emitting the energized neutrino. Where has this 'lost mass' gone? [1] Unless a rational answer is theorized, Einstein's 'Special Relativity theory', is violated! So my article proposes, that the 'lost' mass really exists, but has been 'dumped' into the universal 'aether', increasing aether's ultra-low density a pinch. And so, when Einstein said, "**Space is Eating-up Matter**" [2]; I regard that as commendable and very similar or equivalent to my main point! (((In some cases of neutrino emission, ((such as when a neutron (outside the nucleus), decays to a proton and a very low-energy electron, and a neutrino; that emitted neutrino can sometimes have great energy – in that case the energy equivalent may be about 1-1/2 electron masses! So, in that case, the 'aether' in 'ethereal space' is increased by 1-1/2 electrons worth of 'hidden' mass, i.e., by no means a small mass amount!)))

And the very important truth of that above paragraph should not be missed, obfuscated, or lost by glib evasions, as is sadly so often done, by many who are even otherwise knowledgeable about much of physics. But they wrongly often 'glib-out' with comments, like: "Mass is the same thing as Energy", or , "Mass is just a different Form of Energy". And, in my opinion, that is all too typical of too many often made 'glib rationalizations', in the treatment of many other physics and 'cosmic' topics, too. And I think such 'glib-outs', are at best, misinterpretation or vast over-reaches. ((I realize that if Einstein's main assertion, regarding emitter mass loss and radiated energy, (or my main development of it) is grossly wrong; my article is invalidated. But I see no such error; and, regardless, my article, logic, and conclusions are still worth noting.)) ((And, of course, if the length of a thin rod (connecting two mutually orbiting balls) is a very long rod; huge angular momentum can be developed – even although the balls may be, themselves, of very low mass. i.e., high angular momentum does not necessarily guarantee high mass!)

Importantly, there is at least one other major example, in physics, of an event involving, 'Ethereal' "**Space -- Eating-up Matter"** – that is, lost matter seeming to 'evaporate, so-to-speak,' into the aether or space, without finding the 'hidden' mass. I.e., when photons and 'gross' ('chunks') of matter, or particles are launched upward at high speeds, away from very massive bodies, against their very great 'pulling' gravity. Those launching velocities are sometimes so great that those upward-speeds exceed or equal the 'gravitational escape velocity' and thus never return to that massive gravitational body. So the 'launched velocity' is so great that, immediately after launch, the particle has 'greater so-called 'relativistic mass' than it will have after it slows down to nearly 'rest'; then the hardly moving mass is designated the (so-

called) ‘rest-mass’, i.e., its lesser or ‘normal mass’ before launch. This contrast is sometimes described as the ‘Relativistic Mass Increase’ of a high-speed particle.

So. when these particles have slowed down significantly, due to the ‘work’ of mostly escaping the gravity; they have lost significant mass and energy. So, the question again arises, where did that lost mass go? And again, the important answer is that it has been ‘dumped’ into the Aether, I.e., “**Space has Eaten-up Matter”,** thereby, increasing the density of the aether ‘a pinch’. And a reminder -- that that was also the end-result, when a high energy ‘neutrino’ was emitted from a body, as much earlier described, (but in the ‘neutrino case’ any gravity was irrelevant.)

(Incidentally, a sort of reverse of all the above can occur, under ‘opposite conditions.’ A particle being ‘pulled’ toward a high gravitational body, may, (as it speeds up faster and faster), ‘eat-up matter’ from ‘aether’, (‘space’). And a particle or system, if ever absorbing a neutrino’, may increase its ‘spin angular momentum’, or begin its fast spinning; and that absorbing particle or system, then ‘eats-up’ some mass from the Aether, i.e., ’space’.

Part 2: Estimate of a Minimum Aether Density of Space

There are many ways that neutrinos are produced in nature, but the way we focus on below -- considers only one of those ways, a very important and prominent way. (Often, we use the term ‘neutrinos’ in this article, and we mean that to include both neutrinos and antineutrinos or both, and usually that’s sufficiently specific enough, and saves ‘wordiness’.)

We will now consider the nuclear reactions near the center of Stars, like our sun -- the nuclear fusion that produces the Helium in our universe. And in that process – the emitting body also radiates away neutrinos, and the emitter also loses mass to ‘ethereal space’. And we’ll calculate, thus, how much mass has been transferred into ethereal ‘space’, because that real, but ‘hidden’ “mass -- "*has been ‘eaten-up’ by ‘space’*," (But that mass is not being carried along with the ‘propagating’ neutrino.) And that ‘lost’ mass, injected into the aether, -- gives us a way of estimating a ‘minimum density’ of our ethereal ‘mass per volume’ of space. So thus, we can and do calculate the ‘minimum density of ethereal space’ – as follows:

Step 1…In the fusion process near the center of stars, basically, **4 Protons** are converted to **1** Helium, plus **2** high-energy **Neutrinos** with 0.25MeV of energy, each; and some other products are also produced. Those **2** Neutrinos have a total of 0.50MeV of energy (or **0.0005035**amu, i.e., ‘mass units’ ‘equivalent’.) [**3**] But if that mass equivalent is **not** deemed carried by, or dragged by, the virtually zero-mass neutrino, we must presume that it is real mass **dumped into the aethe**r.) And the **4** Protons have a total mass of **4.03**amu, (i.e., ‘mass units’). Thus, for each **1 Proton mass fused, 0.000125**amu of **mass is added to ‘the aethe**r’, (I.e., again, as Einstein said, “Space is eating up Mass”, and that’s the amount of ‘lost’ mass in that, ‘neutrino-related’, ‘fusion’ event.)

Step 2. Let us roughly assume that protons and (slightly ‘heavier’) neutrons make up almost 100% of the mass of the universe. But that only some fraction of that 100% took part in the fusion actions that produced the helium of the universe. The universe is comprised of **24%** of the Helium (and about 75% Hydrogen. Then the total amount of ‘hidden’ mass dumped into the

ethereal space, for each pair of 'neutrinos' made (associated with fusion-made-helium) is roughly ('**0.000125** amu of mass times **24%**), which equals **0.00003** unit of aether mass for each 1 unit of mass of the universe.

Step 3…Now, we have a way of roughly estimating the density of ethereal space: I.e., just multiply that fraction, (**0.00003**) times the estimated mass density of the universe. (The universe's 'mass density' is roughly the total mass we can see with great telescopes, and subtleties, etc., per enough volume of the universe needed to encompass that mass**.** The latter 'mainstream estimate' is currently estimated as: 1x10^-26 kg/cu meter.[**4**]

[We now take the **Mass Density** est. of Universe as accepted by most 'mainstream**'** physicists **(**1x10^-26 kg/cu meter)] and multiply it by the fraction, (**0.00003**). and we get (**3x10^-31 kg/cu meter**), for my 'very conservative' estimated minimum ethereal density,]

Again, I consider the latter estimate, (using mainstream's own est. for the total mass of the measurable universe in that estimating), as resulting in a very 'conservative' minimum ethereal density estimate – i.e., too low. And that is because I think it is based on estimate by most experts for a 'total mass of measurable universe' – that is also much too conservative, that is, much too low.

Optional note: [So, if I use my own estimate for the Mass Density of Universe, **(**1x10^-20 kg/cu meter), based on some other factors, and then I take that **(**1x10^-20 kg/cu meter), and multiply it times (**0.00003**); I get (3x10^**-25** k**g**/cu meter), which is thus my own 'personal' preferred alternate estimated minimum ethereal density.

All, that said, Readers should still feel very 'free' to prefer the **bold**-typed ethereal minimum density, given a few paragraphs above -- which is based on the 'mainstream' accepted 'usual mass per volume in the universe', instead of my own preferred estimate, (given a few lines below it.)

Part 3: History -- Evolution of Physics and Philosophy Relevant to all above

Point 1… A major point of my article is that my treatment and de-mystification of Neutrino actions – yielded one more very convincing method for estimating a definite minimum density of aether in our universe. And raises that estimated minimum figure appreciably, compared to another earlier, good, convincing method, which yields a lower minimum density estimate. (That other method was based on matter hurled into outer space from a very massive gravitational body with at least its 'escape velocity'. And such thrown-upward matter loses a little of its energy and mass to the 'aether' in escaping.) Both major estimation methods are based upon loss of mass by the emitting body or the emitted entity, and not finally fully accounted for -- by the measurable mass of the products resulting. My article (and conclusion) is based on Einstein's 'Special Theory of Relativity', and on Einstein's 1930 lecture, where Einstein stresses, near its end, -- the importance of '**space**', and emphasizing that "**Space is Eating-up matter**!"

Point 2… A helpful overview of each new major advancing periods of Physics – will now be presented, ((and note that humans' repeated attempts to better understand **'LIGHT**' (or the more general term 'Radiation') -- was a major motivation in the needing to advance from one 'Age' to

the next)): First, was a major "important Shift -- the De-emphasizing of the Aristotelian 'Academic approach;' and advocating a more "Empirical-based approach, instead. This was strongly advocated by Francis Bacon, and helpfully developed during the "Bacon-Newtonian Period.". That is -- emphasizing careful observation, and including an accurate mathematical description – instead of 'pre-judging' or 'pre-guessing' Nature. A significant aspect of this 'new' age included Newton's advocacy of **LIGHT** being somewhat like a ballistic corpuscle emitted by a body. I.e., like from the sun, and the slight loss of mass by that emitting body, (the Sun), when it 'launched the (bullet-like) corpuscle.

The next major age or period, following that, might be called, "The Classical & Maxwellian Age' of Physics, and involved a huge avalanche of great discoveries, detailed description, and 'mathematical derivations' to explain the details. A major aspect of that new age – was a big emphasis on **LIGHT**, being like an energy moving wave, that is, a 'condition of stress' in an 'aether' existing in space, instead of a 'flight of material (like a bullet) through ethereal space'.[**5**] (So that sort of '**disposed**' of **the Newtonian concept** of the 'bullet-like emission of light'. And thus, **no** need for the emitter of light to lose appreciable mass, when emitting the light. Very importantly, (and even more-so than in the Bacon-Newtonian period) -- there was maintained a good toleration by 'Natural Philosophers' (later termed 'scientists') during that new 'Classical Physics-Maxwellian' age. Natural Philosophers could still believe in a seemingly invisible real entity, like the material aether, even though it might remain **non**-directly measurable. [**6**]

The next major age, sometime called the 'Modern Age of Physics' was the Age of Einstein, Heisenberg, Compton, and many others, and of quantum and wave mechanics, and so-call 'Particle Zoo', etc. Importantly, the concept of **LIGHT** reverted back to much like that in Newton's time, and, unlike in the 'Maxwellian-Classical' Age'. Per Einstein, the light-emitting body could, once again, lose a definite amount of mass -- an amount, (Energy / c^2) , when such body emitted the light , i.e., the photon -- which carried that 'quantum' of energy.

Point 3… But very sadly, I think -- this 'Modern Age of Physics', (perhaps partly due to misunderstandings of Einstein's and others' works) -- began to embrace an Intolerance of the 'Positivist Philosophy'.[**7**] And of its Dogma that, "if something can't be rather directly seen or measured, then it doesn't exist. Because, "even if it did, it would have no effect!" Maxwell and many others bemoaned this sad, wrong developing philosophy. (Perhaps they holistically realized, like Democritus and Dalton did -- that many entities, like 'atoms' should be regarded as likely to exist, even though it might take nearly 2000 years to rather directly measure them, (and, in fact, it did take that long.)

((Optional, I, believe, that the (mc^2) term that "Einstein used for light's Energy" -- seems to have contradicted what some erring scientists expected, [(1/2) (mc^2)] instead. And that is because those 'erring scientists' were wrongly considering light's 'kinetic energy' alone, instead of regarding light as a more complicated entity, a 'system', instead. I.e., a 'system entity', like Hertz and many others modeled in many cases, 'total energy', half 'kinetic' and half 'potential' (unseen) energy.[**8**]. (And may have other motions besides simple 'forward traveling'.) (But I'll save time and skip discoursing at length on all that).))

Point 4… Now, we come to what I strongly advocate: **A NEEDED NEW AGE** OF PHYSICS, Again, we and physics are motivated by the need to change paradigms – and, again, because of RADIATION, in this case, Neutrinos, a newer but very important type of RADIATION. And more specifically, this time, necessitated when we compare **Neutrino Radiation with Light Radiation**. That is – because of the case of Neutrinos (and neutrino perpetration of energy), the neutrino conveyance of energy occurs without it conveying mass. And very importantly, that necessitates our returning back to a Maxwellian concept for Neutrino-type Radiation. I.e., back to an energy pulse or "perpetration of a 'condition of stress' in an aether in space", so **without** a 'bullet-like' ballistic traveling through space.

So, again, as inferred, at least in some Neutrino cases -- the perpetration of energy though space is a 'transmission of a condition', like a "twisting spring's stress", in the 'aether' in space -- without needing to have a 'flying mass ballistic entity' moving through space. I.e., Note, by contrast, that a 'photon-light concept' is like a 'Compton' photon mass flying through space, but that is a 'different sort of radiation perpetration concept' than the 'Neutrino' radiation concept!

Without the neutrino de-mystification in my article, we can't have Einstein's ($E=mc^2$) apply for photon radiation, but seemingly violated for neutrino radiation, ($E \text{ not} = mc^2$) -- for that "m= 0" case! (And there are a few other important concepts and developments that also motivate the need for a 'New Age of Physics', and a 'pro-tolerance' attitude supporting it.)

Point 5… Another very important benefit of a Needed 'New Age of Physics' – is that such new age will tend to 'drag along with it' – like a long 'loaded train' -- many sensible supporting propositions, models, and descriptive statements. That is quite fortunate, because the then replaced 'Age of Modern Physics', despite its discovering and promoting many great things – also became infested with the 'disease' of the 'Positivist Philosophy'. And its many flawed, confusing, obfuscating, but still alleged supporting propositions, models, and its many **non**-sensible 'utterances'. (One such example I've heard is as follows: "That asking questions like, "what was going on. and how long it was going on, -- before the pre-big-bang high-energy concentration went 'Bang' --- is meaningless and silly, because 'time did not exist before the 'Big-Bang'.") And too many other examples, "pile-on-top-of-pile", of nonsensible and unsatisfying evasions – too many to list – outpacing by far, the 'attempted patchwork' and 'rationalizations' that helped bring down the much earlier "Ptolemaic Age".

Conclusions:

Per my paper's title; Einstein's famous '($E = mC^2$)' is violated when a high-energy Neutrino is emitted with Zero Mass, and propagates at the speed of light, ($E = 0\ C^2$) ---- that is, unless we accept Einstein's 'caveat as offered in his 1930 speech --- that '**Space is eating up matter**'. I.e., that in the case of Neutrino emission, real matter was deposited and transformed into 'aether' in space (thus increasing the aether) -- when space 'ate-up' what would otherwise be the missing mass.

"Modern physics" and its supporting concepts handle Photon Radiation well, but not so - for Neutrino Radiation. And, by contrast, the earlier so-called "Classical Physics" and its supporting concepts handle Neutrino Radiation better. But Classical Physics' inadequacies in handling

Photon radiation was a major motivator for it being superseded by so-called "Modern Physics" and some of its supporting concepts.

Now we need to create (its much over-due) – a "New Age of Physics", combining the best of the 'Classical and Modern' Periods, and correcting wrong supporting notions of both – at least those notions or misunderstandings as held by most present-day scientists. That New Age, is needed to handle Radiation better, (and some other things, too. [**9**]). And will open-up our minds, understandings, and realizations -- even far beyond that of the most exciting and inspirational 'science fiction' writers of the 20th and early 21st Century. (And those writers were great!) And people will say about that new age of physical science -- what Thomas Paine said about social science and etc.: In effect, "**We have it within our power – to make the world anew**." [**10**]

The specific technical 'Conclusions, of my article' (regarding de-mystifying neutrinos) were well stated in the Article's 'Abstract'. But the possibilities it opened were many, and included our making "a well-supported estimate of a new minimum ethereal density,"--which we indeed did. And that was only the 'beginning'. (And we only needed to assume and apply correctly and usefully -- the main assertion in Einstein's paper referenced in our first footnote.)

References, footnotes:

[**1**]…Einstein, A., Does the Inertia of a Body Depend on its Energy Content? Ann. Phys., Physical Review D, Vol.18, 639ff, 1905. (Note the 4th and 3rd sentences to the end of that paper.)

[**2**]…Professor Einstein's Address at the University of Nottingham; Science, Vol.71, No.1850, pp.608-610, Jun.13, 1930, (Note last few sentences in Einstein's address.)

[**3**]…Quora, https://www.quora.com/How-much-of-the-suns-energy-is-dissipated-through-neutrino-emission, comment some lines below heading by George Hagstrom, (est. around 2017 to 2019 and again noted 2-24-2025) and giving as his 'source': "section 1.2 of 'Principles of Magnetohydrodynamics', by Goedbloed and Poedts, in particular, equation 1.7 and 1.8."

[**4**]…Wikipedia, article entitled "Observable Universe", as noted 2-24-2025, in a summary of major data of article near upper right and under an illustration labelled "Visualization of the observable universe"

[**5**]…Maxwell, J.C., A Treatise on Electricity and Magnetism, topic: Action at a Distance, subject paragraphs: '866]', pgs. 492-493, Vol. 2, Third Edit., Dover Publications, Inc., New York, N.Y., (1954), basically a republication of same as 3rd. edit., by Clarendon Press, in 1891.

[**6**]… Hertz, H., The Principles of Mechanics presented in a new form, Hertz's Introduction, part III of that Introduction, 2nd paragraph, pgs. 25-26, Macmillan and Co., Ltd. London and New York, 1899, authorized translation into English by D. E. Jones, B.Sc., and J. T. Walley, M.A., and as 'regenerated', copyright 2012, by 'Forgotten Books' -- registered trademark of FB &c Ltd.

[**7**]…Wikipedia, Article entitled, "Positivism", as noted 6-14-2025

[**8**]…See footnote 6, above, except on p. 226, and following bold wording, 'Definition 3'. (Or, optionally, going by the layout of that Hertz's work; see section termed 'Book 2',

and in that – the major heading, “Conservative Systems”, and a few pages beyond that heading -- the designation “(605. Definition 3)“

[**9**]…The following links are to papers that support why a new Age of Physics is likely needed:

http://viXra.org/abs/1901.0299,

or my present 2025 website, http://www.causeeffect.org/articles/book.html,

or my Gen.Sci.J. paper: /Research Papers-Quantum Theory / Particle Physics/Download/6726

[**10**]...Paine, T., Common Sense, (Jan., 1776). Specifically, this quote appears in the appendix to the third edition of ‘Common Sense’, according to the ‘Online Library of Liberty’, I think.