

# A tentative connection between Energy and Light speed

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## Abstract

This article presents the hypothesis that the only independent entity is Energy. This is based on conclusions derived from several published articles, by the author of this article, which conclude the following:

1. Electric Charges are forms of Energy, analogous to Mass being recognized as a form of Energy.
2. Space is also a form of Energy.
3. Space and Time are always interweaved into one interwoven Space/Time entity, which is also a form of Energy.

This hypothesis might also provide an explanation to why Light speed must be a constant value and the maximum speed.

Based on the conclusions of these published articles, mentioned above, this article suggests a tentative connection between Energy and Light speed which might provide an explanation to why Light speed is a constant value, causing Light speed measurements by any spectator which monitors that Light speed, to result always to be that constant value, and this is not dependent on the spectator velocity relative to the velocity of that measured Light speed.

This also might explain why the maximum attainable velocity is that constant value attributed to the speed of Light. These statements, about Light speed being the maximum attainable velocity and being a constant value were presented as axioms by Einstein's Special Relativity Theory, without providing any proof why these statements are correct. Now, this article might provide explanations to why these statements are correct.

## 1. Introduction

From the dawn of civilization, humans are struggling to understand Nature. Many theories were developed in attempts to narrow down the elements in understanding Nature. Such ideas started early. Examples are Aristo's four elements theory [1], [2], and the ancient Greeks idea that Matter is composed of Atoms [3], [4]. However, Physics today still uses many elements to explain Nature, such as *Energy, Mass, Electric Charge, Forces, Fields, Space, Time* etc.

Energy and the Energy Conservation Principle might be the most important building blocks of the Physical Sciences. Until the discovery, in the 20<sup>th</sup> century, that the Universe expands much faster than the expansion that can be justified by the amount of the calculated Energy in the whole Universe, the Energy was believed to be composed of only Traceable Energy components. After the above-mentioned discovery, the notion of Untraceable Energy (or Dark Energy) was introduced in the science of Physics. However, the exact origin of this Dark Energy is still a mystery. The acceptable notions are that Dark Energy must be looked for in Gravitation using Einstein's General

Relativity Theory. Several articles published by the author of this article argue that the origin of most of the Dark Energy might be in Electromagnetism. These articles also provide other new insights into the Energy entity, which might also explain additional issues and paradoxes that were yet ignored.

This article presents the hypothesis that the only independent entity is Energy, based on these published articles mentioned above, by the author of this article, as will be further explained in the following sections of this article.

This hypothesis might also provide an explanation to why light speed must be a constant value and the maximum speed.

## **2. All the tangible, perceptible Matter in the universe might be forms of Energy**

The basic Building Blocks of all the tangible, perceptible Matter in the universe is Elementary Particles. Each Elementary Particle contains *Mass* or *Mass plus Electric Charge*. Thus, all the tangible, perceptible Matter in the universe contains three distinct entities: Mass, Positive Electric Charge and Negative Electric Charge.

Mass is already recognized as being a form of Energy via the equation:  $E=m \cdot c^2$  [5].

In addition, an article published by the author of this article, titled: "Energy Analysis of a Null Electromagnetic Wave" [6] presents an astonishing, surprising scenario, relating to the Consolidation of Electromagnetic (EM) Waves from Separate Sources, contrary to the acceptable notion [9], that such consolidation cannot occur. That scenario was not analyzed yet, and it seems to violate the Energy Conservation Principle.

In an extreme case of such EM consolidations, a Null EM wave is composed, without any Electric or Magnetic fields. In another extreme case of such EM consolidations, Energy seems to be created out of nothing. And in almost all cases of such EM consolidations, the Energy embedded in the resultant consolidated EM wave embeds either more or either less Traceable Energy, as compared to the Traceable Energies embedded in the original consolidating waves.

Thus, in all these EM consolidation cases, the Energy Conservation Principle Seems to be violated.

That article introduced the novel Energy Pairs Theory which resolves these paradoxes by arguing that the Energy which seems to be missing in the Null EM wave, is conserved as Untraceable Energy in the photons of the resultant consolidated EM wave.

An additional published article, by the author of this article, titled: "Consolidating Electromagnetic waves might embed more traceable Energy than the sum of the traceable Energies embedded in the waves before consolidation" [10], explains that the seemingly Energy that was generated out of nothing, is Untraceable Energy embedded in photons, that converted back to Traceable Energy.

Article [6] also explains other paradoxes in the famous Electron-Positron Annihilation process [11], and in the famous Pair Production [12] process. This also provides a new insight into the nature of the Electric Charge, which might be a form of Energy, as Mass is recognized as a form of Energy, following the introduction of Einstein's Special Relativity Theory.

Thus, article [6] concludes that *Electric Charges* are also forms of *Energy*.

Thus, all the tangible, perceptible Matter in the universe are just forms of *Energy*.

The science of Physics recognizes also detectable **Energy Fields**. Energy Fields that are closely related and interact continuously with Matter are the Gravitational Fields and the Electric and Magnetic Fields. However, as the names of these Energy Fields indicate, all these Fields are recognized as forms of *Energy*.

Other Energy Fields are not closely related to Matter. Such Energy fields are Electromagnetic Waves or Gravitational Waves, which move independently from **Matter**. Such Fields, again, as their name indicates, are recognized as forms of *Energy*.

Thus, all the tangible, perceptible **Matter**, and all forms of **Energy Fields**, in the Universe are just forms of **Energy**.

### 3. Space might also be a form of Energy

Following the publication of article [6], the author of this article published an additional article, titled: "The Nature of Space and Dark Energy, Based on Electric and Magnetic Fields' Behavior in Space in the Energy Pairs Theory Framework" [7], which presents that what the Science of Physics recognizes as Space, manifests a phenomenon like what was presented in article [6], in which Electric fields in Space always annihilate each other, and the same applies to Magnetic fields, which seem like a violation of the Energy Conservation Principle. Based on the above, article [7], uses the novel Energy Pairs Theory introduced in article [6], to explain this paradox, and the article concludes that Space itself is also a form of Energy, that contain continuously, and at each point of it, Traceable and Untraceable Energies, and the relative intensities of these two Energies changing everywhere at each instant of time, which implies that most of the Untraceable (Dark) Energy, is of Electromagnetic nature. That article [7], also calculates the total amount of the Dark Energy and concludes that the Energy embedded in the Dark Energy is about two thirds of the total Energy, which complies with the acceptable agreement about the amount of Energy embedded in the Dark Energy in the Universe.

### 4. Is Time entity also a form of Energy?

Einstein's General Relativity Theories explained why Mass objects attract each other, by introducing the Interwoven Space/Time notion, which replaced the Gravitational Field (which was introduced by Newton), to explain Mass objects attraction. Since the Gravitational Field is a form of Energy, then, the Interwoven Space/Time Entity should also be a form of Energy. In a speech, in the University of Leiden on May 5th, 1920, [13], Einstein claimed that Aether

should exist to provide physical properties to his Space/Time entity, which implies, that Einstein also agreed that his Space/Time Entity is a form of Energy.

Although the origin of Mass bodies attraction was resolved by Einstein's General Relativity Theory, the origins of Electric Charges attractions or repulsions remained a mystery. The author of this article published an article [8], which explains the origin of Electric Charges attractions or repulsions by arguing that Electric (or Magnetic) Fields are forms of Acceleration, as Newton's Gravitational Field (and Einstein's Space/Time Entity) are forms of Accelerations, which also implied that the Electric (or Magnetic) Fields are also Space/Time Entities and are also just forms of Energies.

This article [8] predicts that there are two **additional** four-dimensional Interwoven Space/Time Entities, in addition to Einstein's Gravitational Interwoven Space/Time entity, one related to the Positive Electric Charges in Nature, and the other related to the Negative Electric Charges in Nature. In this model these **additional** four-dimensional Interwoven Space/Time entities and Einstein's interwoven Space/Time entity are also **all** forms of Energy, and thus, Space and Time are not independent notions. They can be considered as components of each of these three interwoven Space/Time entities. This article also predicts that Newton's second law of motion should be updated, an update which relates to the acceleration between Electrically Charged bodies, and it proposes an experiment how to check this prediction, which might provide validity to the prediction of the **additional** four-dimensional Interwoven Space/Time Entities proposed in this article.

The science of Physics uses now just **one** Space and just **one** Time Entity. However, as already mentioned, that article [8], introduces **three independent** and **separate** interwoven Space/Time Entities, which implies that if each of these Interwoven Space/Time Entities really contain each a Space and a Time Entity, these Space and Time Entities must be **three independent** and **separate** Space and Time Entities, and, thus, this article concludes that the Space and Time entities don't really exist as independent entities, as the nowadays science of Physics presents.

This article concludes that although the notions of Space and Time don't exist as independent entities, by attributing to each of these three forms of Energy, the three Interwoven Space/Time entities, a separate Space and a separate Time component, these components can be useful for understanding and calculating the motions in the universe.

Thus, if Mass is a form of Energy (derived from Einstein's Special Relativity Theory), and Electric Charges are forms of Energy (suggested by article [6], by the author of this article), and the notions of Space and Time are not independent notions because there are three separate Space entities and three separate Time entities, and each such entity is just an element in one of the three separate Space/Time Entities, which are also forms of Energy, then, Energy is not only the most basic building block of the Physical Sciences, it might be the only independent Entity.

## 5. A possible connection between Energy and Light speed

The conclusion that the Existence is composed of only one distinct entity, the Energy, might also provide an explanation to why Light speed is a constant value and the maximum possible speed, a claim that was presented by Einstein's Special Relativity Theory as an axiom, without any proof.

If Energy is the only independent entity in the universe, then, all the movements in the universe **must be** just a result of **Interactions** between Energies, whose outcome is perceived by humans as an Energy (or Energies) which is moving.

Also, Space and Time do not really exist, because, as stated before relating to article [8], the operation of each of the three Interwoven Space/Time entities implies that humans can attribute to each of these entities a Time element to perceive, or be able to explain and calculate, its operations which relates to the Time notion, and another Space element to perceive, or be able to explain and calculate, its operations which relates to the Space notion, and each of these elements in a specific Interwoven Space/Time entity is **separate** from the relating element in another Interwoven Space/Time entity. And if there are three **separate** such elements of Space and Time, then, Space and Time, as we perceive them, cannot really exist.

However, humans are used to perceive any motion only by using the terms Time and Space, because velocity is perceived (and calculated) by humans as the first derivative of Space as related to Time ( $v_x = dx/dt$ ). Then, velocities can be compared to one another, only if each of these velocities is **affected** by **both**, a **Space** element, **and** a **Time** element.

Thus, if one of these elements, either Time or Space, does not affect at all the velocity of a specific Energy movement, the velocity of this Energy movement cannot be compared to any other velocity of any other Energy movement.

According to article [8], the only Energies that humans need to attribute to them Time and Space elements, to perceive or explain their Interactions with other Energies, are the three Interwoven Space/Time entities. In all other forms of Energies, for example, Mass or Electric Charges, humans don't need to attribute to them any elements which are used to represent the notions of Space or Time.

Then, the ability to compare the measured value of the velocity of a specific Energy movement, to the value measured of any other velocity, is dependent on how this Energy Interacts with the three Interwoven Space/Time entities (or any one of them).

Thus, if this Energy movement is affected by the three Interwoven Space/Time entities (or any one of them) such that **both** elements of Time and Space embedded in these (or that) Interwoven Space/Time entities Interact with that Energy movement, then, the measured velocity value of that Energy movement **can be** compared to the measured velocity value of any other velocity.

But, if only one of the elements, embedded in these (or that) Interwoven Space/Time entities, Interacts with that Energy movement (for example, the Space element), and the other embedded element (for example, the Time

element), does not participate in the Interaction with that Energy movement, then, it will be impossible to establish a measured value of the velocity of that Energy movement, which can be compared to the measured value of any other velocity, because it will be impossible to establish the first derivate of Space in relation to Time in relation to that Energy movement. In such a case, humans might still perceive that Energy movement as an active movement, but since it will be impossible to compare its measured velocity value to any other measured velocity value, humans might end up in concluding that this Energy movement always move with the same velocity value.

In all movements of entities in the universe that are movements of **Particles**, what are moving are either Mass or Mass plus Electric Charges, because all Particles are composed, as already presented in a previous section of this article, of Elementary Particles, which are composed of either Mass or Mass plus Electric Charges.

As presented in article [8], all movements in the universe which are movements of Particles, are initiated by one or more of the three Interwoven Space/Time entities, and such Energy movements also continue to Interact with these Interwoven Space/Time entities, such that **both**, the elements of Space **and** the elements of Time embedded in these Interwoven Space/Time entities participate in these Interactions. This implies that the measured velocities embedded in these Energy movements can be compared to any other measured velocity. For example, the velocity in the movement of a Mass movement caused by the Interwoven Space/Time of another Mass, can be compared to the velocity of an additional, third Mass, caused also by that Interwoven Space/Time entity, because the Space and the Times elements attributed to that Interwoven Space/Time entity are both involved and participate in the Interactions of all these Energy movements.

However, in addition to Particles, two additional entities are moving in the universe. These two additional movements, which are not movements in which Particles are moving, are the movements of entities which are pure Energies, and still move in the universe, mainly, the movements of Electromagnetic or Gravitational Waves, which both move at the speed of Light.

These movements of these entities, (the Electromagnetic or Gravitational Waves), also Interact with these three Interwoven Space/Time entities.

Einstein's General Relativity Theory predicted, and that prediction was supported later by observations, that Light which pass near a star is bended according to the Space bending that this star Mass induces by its Gravitational Interwoven Space/Time entity. However, the velocity of this Light remains the same constant velocity attributed to the speed of Light.

Thus, based on this prediction and observation, it can be concluded, that Interactions between Interwoven Space/Time entities and pure Energies, such as Electromagnetic Waves, result in **only the Space element**, embedded in the Interwoven Space/Time entities, **affecting** the movements of Electromagnetic or Gravitational Waves in the universe, while the Time element, of these Interwoven Space/Time entities, does not participate in affecting the movements of Electromagnetic or Gravitational Waves in the universe.

Thus, in view of the above, the velocity of Electromagnetic or Gravitational Waves in the universe, **cannot** be compared to any other velocity, for example, to any velocity of a moving Particle in the universe, because the Time element embedded in an Interwoven Space/Time entity that might affect that velocity, is missing in affecting the velocity of Electromagnetic or Gravitational Waves in the universe.

As stated above, this might imply that any spectator, monitoring the velocity of any Electromagnetic or Gravitational Wave in the universe, will end up concluding that this Electromagnetic or Gravitational Wave travels at a constant speed value, because the velocity of this Electromagnetic or Gravitational Wave cannot be compared to any other velocity in the universe. And this constant speed value is the known Light speed, which is the velocities of all Electromagnetic or Gravitational Waves.

This might explain why the speed of Light is a constant value, monitored by any spectator that monitors that Light to establish its velocity value. That statement, that Light speed is a constant value, was presented by Einstein's Special Relativity as an axiom, without any proof. However, that statement might be explained now by the explanation provided above.

Einstein's Special Relativity also stated that Light speed is the maximum possible velocity value, again, a statement that was presented by Einstein as an axiom without any proof.

However, one possible explanation also to the statement that Light speed is the maximum possible velocity value might be as follows: if the universe embeds only one independent entity, the Energy entity, as this article claims, then, the maximum possible velocity value would be the velocity of the Energy that moves at the highest velocity value. Since Electromagnetic or Gravitational Waves are pure Energies which their velocities are the highest velocity value, which is the velocity attributed to Light beams, then, this might imply that Light speed should be the maximum possible velocity value.

## 6. Summary and Conclusions

This article summarizes a broad theoretical research work done by the author of this article. The conclusions derived from the first two research works [6], [7], are that all the Tangible, Perceptible Matter in the *Universe* are forms of *Energy*, and *Space* **might** be also a form of *Energy*. The third research work [8] also attributes to Space the Energies embedded in **three separate** Interwoven Space/Time Entities which are all forms of Energies. Thus, the Space and the Time Notions are **redundant**, or can be presented only as elements, **embedded** in each of these three Interwoven Space/Time Entities, to assist in understanding and calculating the motions in the universe.

Space and Time (and all the other Notions used by Physics, such as *Fields or Forces*) may still be **very useful** in analyzing the details involved in how the **interactions** between forms of Energies occur, but, still, all these Notions are **not independent Notions**.

Thus, the Existence might be composed of only one independent Entity: *Energy*. And this Entity, the Energy, is always **conserved**, *nothing* of it can be annihilated or destroyed, it appears in various forms, which continuously interact with each other, and each form of Energy can be converted to another form of *Energy*, and these conversions and interactions between Energies create all the Activities in the Existence.

Also, **parts** of this Entity, the Energy, can be Traceable, and **parts** of it might be Untraceable and Untraceable forms of Energies can convert back to Traceable forms of Energies, and vice versa.

Also, the hypothesis that the universe contains only one independent entity, the Energy, also provides a possible explanation to why the light speed is a constant value and the maximum possible speed.

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