

# Energy might be the only unique, distinct and independent entity in Nature

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## Abstract

This article is the last of four articles that summarize a broad theoretical research work. The first three articles intended to investigate the nature and characteristics of the Entity of the *Electric Charge*. The first two parts of this research, dealing with *Electric Charge*, *Energy*, and *Space*, were already completed, and published in two articles [6], [7]. The first article concluded that the Electric Charge is a form of *Energy*, similarly to Mass being recognized as a form of Energy by Einstein's Special Relativity Theory. And since all the tangible, concrete and perceptible matter in the universe is composed of only two Entities: Mass and Electric Charge, then, the first article concluded that all the tangible, concrete and perceptible matter in the universe is just a form of Energy. The Second article provided a reasonable explanation to the mysterious Dark Energy and concluded that also *Space* might be a form of *Energy*. The third article was also completed, and it studied the origins of the Electrically Charged Bodies' Interactions. It provided an explanation to what causes the Attraction/Repulsion between Electric Charges, similarly to the explanation of Einstein's General Relativity Theory to what causes the Attraction between Mass Objects. As such, the third article is an expansion of Einstein's General Relativity Theory to include in it not only Mass Objects but also Electric Charges. This article, which, as stated above, is the fourth in this theoretical research work, derives additional conclusions from all the previous articles, with the most significant conclusion being that Nature, or the Existence, is composed of only one distinct and independent Entity: *Energy*. All other Entities used by Physics in order to understand or explain Nature, are actually redundant, and are necessary only to help us percept Nature, and, this article concludes, that all these other Entities are facets of *Energy*, or tools we use to explain how Energies convert from one form of *Energy* to another form of *Energy*, and how forms of Energies interact with each other.

Keys: Energy, Mass, Electric Charge, Fields, Interwoven Space/Time.

## 1. Introduction

From the dawn of civilization, humans are struggling to understand Nature. Many ideas, tools and theories were developed during this quest, in attempts to narrow down the elements that are important in understanding Nature. Ideas that Nature contains only a limited number of independent elements start early. Examples are Ariso'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.

This article summarizes conclusions from three previous theoretical research works done by the author of this article. The bottom-line conclusion from these researches is that Nature might be composed of only one unique, distinct and independent Entity: *Energy*, as will be further elaborated in the following sections of this article.

## **2. All the tangible, concrete and perceptible matter in the universe are forms of Energy**

The basic Building Blocks, or Elements, of all the tangible, concrete and perceptible matter in the universe are Atoms, and Atoms are also built from Elementary Particles. Each Elementary Particle contains *Mass* or *Mass plus Electric Charge*. If we count Electric Charges as two entities, a Positive and a Negative Electric Charge, then, all the tangible, concrete and perceptible matter in the universe contain three distinct entities: Mass, Positive Electric Charge and Negative Electric Charge.

Mass is already recognized by Physics as being a form of Energy following the introduction of Einstein's Special Relativity Theory, stating that the relation between Mass and Energy is  $E=m \cdot c^2$  where E is Energy, m is Mass and c is the speed of light [5].

In addition to the above, the most significant conclusion derived from the first theoretical research work, mentioned above, and done by the author of this article, is that, *Electric Charge* is also a form of *Energy*, similarly to *Mass* being recognized as a form of Energy. This first theoretical research work, mentioned above, and done by the author of this article, was already published in an article titled: "Energy Analysis of a Null Electromagnetic Wave" [6].

Thus, since the basic Elements of all the tangible, concrete and perceptible matter in the universe are Mass or Mass plus Electric Charges, and Mass and Electric Charges are just forms of Energy, then, all the tangible, concrete and perceptible matter in the universe are just forms of *Energy*.

In addition to the tangible, concrete and perceptible **matter**, the science of Physics recognizes also detectable **Energy Fields** as Entities which are used in the explanation of Nature. Some Energy Fields have close relations and interactions with specific forms of **Matter**. Such Energy Fields are the Gravitational Fields and the Electric and Magnetic Fields. The science of Physics recognizes that the Gravitational Fields are generated by Mass Objects and these Fields also interact with Mass Objects, causing Mass Objects movements. The science of Physics also recognizes that the Electric and Magnetic Fields are generated by Electric Charges (static or moving at a constant velocity). These Fields also interact with Electric Charges, causing Electric Charges movements. However, as the names of these Energy Fields indicate, the science of Physics recognizes all these Fields 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**. The science of Physics recognizes that Electromagnetic Waves are manifested in two types of appearances: as Waves and as Particles (or Photons).

However, such Energy Fields, again, as their name indicates, are assigned as forms of *Energy*, by the science of Physics.

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

The next significant entities that Physics uses to explain Nature are **Space** and **Time**. However, the science of Physics still uses these two additional Entities as independent Entities, which, today, are assumed to be Entities which are independent from the Entity of **Energy**.

In the next sections *Space and Time* are discussed, and their relation to the Entity of *Energy* is elaborated.

### **3. Space, as we percept it, might also be a form of Energy**

The first theoretical research work, mentioned above, and done by the author of this article [6] provided also a reasonable explanation to the mysterious *Dark Energy*, that the science of Physics assumes, that it is responsible to the extended rate of expansion of the Universe. That first theoretical research work, mentioned above, provides this explanation by presenting a surprising scenario of two Electromagnetic Waves which collide and consolidate. This research shows that if these two Electromagnetic Waves travel together in the same direction, following their consolidation, some of their embedded Energy **seems** to disappear. This research also shows that in certain specific conditions, **all** their embedded Energy **seems** to disappear, and the Electromagnetic Waves become **undetectable**. From this scenario, that research deducts a reasonable explanation for the mysterious Dark Energy.

That explanation about the nature of the Dark Energy is significantly enhanced by the second theoretical research work, mentioned above, and done by the author of this article. That work was also already published in an article whose title is: "The Nature of Space and Dark Energy, Based on Electric and Magnetic Fields' Behavior in Space in the Energy Pairs Theory Framework" [7]. That article shows that Electric and Magnetic Fields in *Space* always manifest a phenomenon, that part of their embedded Energy **seems** to disappear, and this occurs at each point of Space, and continuously, all the Time. This research also shows that the Energy that **seems** to disappear is about 68% of all the Energy embedded in the Electric and Magnetic Fields in Space, which is in very good compliance with the estimated amount of the Dark Energy, which is also estimated to be about 68% of all the Energy embedded in Space. Since the Energies embedded in the Electric and Magnetic Fields in Space are significantly more potent than the Gravitational Energy embedded in Space, and another significant source of Dark Energy might be the Electromagnetic Waves traveling in Space, as the first research work, mentioned above, indicates [6], this significantly enhances the validity of the explanation of the Dark Energy, as presented in the first theoretical research work, mentioned above, and done by the author of this article [6].

This also implies that Space cannot be Vacuum or Complete Emptiness or Nothingness, Space must be a form of Energy, because, as that research shows, each point of Space, and continuously all the Time, Space contains two types of Energies: Detectable Energies, and Undetectable Energies (or Dark Energy) [7].

That research shows that the Energies responsible for generating the Dark Energy are the Electric and Magnetic Fields in Space. But Space contains also the Gravitation Field created by Mass Bodies. Thus, each point of Space, and continuously all the Time, Space contains a mixture of several types of Energies, and parts of these Energies are also Undetectable (or Dark Energy) Energies. Thus, Space is a form of *Energy*.

In the next sections of this article, the actual nature of Space will be further elaborated, relating also to the four-dimensional Interwoven Space/Time Entity introduced by Einstein's General Relativity Theory, which also cannot be Vacuum or Complete Emptiness, and, thus, must also be a form of Energy. Since in that Interwoven Space/Time Entity, Space and Time are Interweaved into one four-dimensional Continuum, and Space and this Interwoven Space/Time Continuum are already presented to be forms of Energy, one might wonder what are the implications of this on the nature of the Time Entity? Is it also a form of Energy? As stated above, this will be further elaborated in the following sections of this Article.

#### **4. What about the Time entity, is it also a form of Energy?**

The Time Entity is used by the science of Physics for only one purpose: to monitor Changes (for example, Motion, which is one facet of Changes). In relation to that, Space is also used, basically, to monitor Changes. Anything that undergoes changes, these changes are manifested, by the parts of that thing, that undergone these changes, by the different locations that these parts undergo in Space. If nothing would ever change, Space seems to be still useful in describing the relative locations of all the things in Space. However, even in such a hypothetical scenario, the operation of monitoring these relative locations should require changes to occur. Thus, since a situation in which nothing ever changes is not possible, the actual use of Space in the science of Physics is also for monitoring changes of things in Nature.

Einstein's General Relativity Theory recognized the above, by combining Space and Time into one four-dimensional Interwoven Space/Time Continuum Entity [8]. That four-dimensional Interwoven Space/Time Entity was used by Einstein's General Relativity Theory to explain **why** the Attraction between Mass Objects occurs, Attraction which generate Motions (Changes of Locations) of Mass Objects in Space, by stating that the *Distortion* of that Interwoven Space/Time Entity by any Mass dictates to all other Mass Objects how to move which results in the Accelerated Attraction between these Mass Objects.

Einstein also recognized that this four-dimensional Interwoven Space/Time Continuum Entity cannot be Vacuum or Complete Emptiness or Nothingness, because it must be composed of some "medium" in order to provide physical properties to it and enable its *Distortion*. As such Space must be a form of Energy, which further supports the

conclusion derived in the second theoretical research work, mentioned above, and done by the author of this article [7], which also concludes that Space is a form of Energy, as already elaborated in the previous section of this article.

Albert Einstein gave a speech in the University of Leiden on May 5<sup>th</sup>, 1920, and in that speech, he explained that his General Relativity Theory requires Space to be some sort of "medium", in order to enable its Distortion [9].

However, if Nature would contain **only** Mass Objects, and no other Elements besides Mass Objects would exist in Nature, and if Einstein's four-dimensional Interwoven Space/Time Continuum Entity is a form of Energy, and it is responsible for the Motions and Accelerated Attractions between Mass Objects, the notions of Space and Time should become redundant, or should be recognized as Elements, or Features, or Attributes, that are embedded in that four-dimensional Interwoven Space/Time Continuum Entity. Because, as stated above, Time and Space are used by the science of Physics to monitor and explain Changes and Motions. If Mass Objects were the only moving things in Nature, and Einstein's four-dimensional Interwoven Space/Time Continuum Entity already explains **how and why** Mass Objects move and, thus, can be used to monitor and explain these moves, nothing else is required for explaining these movements. In such a hypothetical scenario it would be enough to state that the Energy embedded in Einstein's four-dimensional Interwoven Space/Time Continuum Entity interacts with Mass Objects and that Interaction **causes** Mass Objects **movements**. Thus, in such a hypothetical scenario, where all the moving Elements in Nature are only Mass Objects, Space and Time would be redundant and should **not** be Independent Notions. Space and Time in such a scenario are either Features or Attributes **embedded** in the Energy **embedded** in Einstein's Interwoven Space/Time Entity, or are Notions that Physics may use only to enable us to **perceive** Motions which are the result (or outcome), of Interactions between forms of Energies, the Energy **embedded** in Einstein's four-dimensional Interwoven Space/Time Continuum Entity, and the Energy **embedded** in Mass Objects, which results in Mass Bodies' motions and explains Mass Bodies' motions.

However, Mass Bodies are not the only moving Entities in Nature. Electric Charges also exist and move in Nature, and Electromagnetic and Gravitational Waves move in Nature.

Einstein's Gravitational four-dimensional Interwoven Space/Time Continuum Entity is known to be able to control Light, or Electromagnetic Traveling Waves motions. This is manifested through the findings that Light and the Gravitational Waves are known to be bended by Einstein's Gravitational four-dimensional Interwoven Space/Time Continuum Entity. Thus if Einstein's Gravitational four-dimensional Interwoven Space/Time Continuum Entity is already known to affect Light, (or Electromagnetic Waves), and Gravitational Waves movements, this is in full analogy to the effect that the Gravitational four-dimensional Interwoven Space/Time Continuum Entity has on Mass Objects, in the sense, that the Energy embedded in Einstein's four-dimensional Interwoven Space/Time Continuum Entity is what affects Light or Gravitational Waves movement, and, analogy to the above, Space and Time are, **again**, redundant for explaining or monitoring Light or Gravitational Waves movements.

The remaining question is: what about Electric Charges movements?

The third theoretical research work, mentioned above, and done by the author of this article, relates to that question. This work was also completed, and it was inserted into the Vixra.org e-Print Archive in an article titled: "A New Theory Expands Einstein's General Relativity Theory to Include Both Electric Charge and Mass Entities" [10].

As its name indicates, this work is an extension of Einstein's General Relativity Theory to include in it not only Mass Objects but also Electric Charges. It provided an explanation to what **causes** the Attraction/Repulsion between Electric Charges, similarly to the explanation of Einstein's General Relativity Theory to what **causes** the Attraction between Mass Objects, by predicting that Einstein's four-dimensional Interwoven Space/Time Continuum Entity is not the only four-dimensional Interwoven Space/Time Continuum Entity in Nature.

This work states that there are two **additional** four-dimensional Interwoven Space/Time Continuum Entities, one related to the Positive Electric Charges in Nature, and the other relating to the Negative Electric Charges in Nature, and it presents a model in which the Electric Charges Distort these **additional** four-dimensional Interwoven Space/Time Continuum Entities, and these **additional** four-dimensional Interwoven Space/Time Continuum Entities **cause** the Attraction/Repulsion between Electric Charges via these *Distortions*, similar to how Einstein's four-dimensional Interwoven Space/Time Continuum Entity **causes** the Attraction between Mass Objects via its *Distortion*.

In this model these **additional** four-dimensional Interwoven Space/Time Continuum Entities are forms of Energy. The Energy embedded in the four-dimensional Interwoven Space/Time Continuum Entity related to Positive Electric Charges comes from the Energy embedded in the Electric and Magnetic Fields generated by Positive Electric Charges, and the Energy embedded in the four-dimensional Interwoven Space/Time Continuum Entity related to Negative Electric Charges comes from the Energy embedded in the Electric and Magnetic Fields generated by Negative Electric Charges. This model also assumes that the Energy embedded in Einstein's four-dimensional Interwoven Space/Time Continuum Entity comes from the Energy embedded in the Gravitational Field caused by Mass Objects.

Thus, if these **additional** four-dimensional Interwoven Space/Time Continuum Entities explain and monitor movements of Electric Charges, the Notions of Space and Time are **also** redundant for monitoring motions between Electric Charges.

Thus, this article concludes that what **causes** the Motions of all Tangible Matter in the *Universe*, Mass or Electric Charge, are only forms of Energies. In these cases these Energies are Einstein's Interwoven Space/Time Entity, and the two **additional** Interwoven Space/Time Entities, presented in the third theoretical research work, mentioned above [10], and presented by the author of this article, which results in the Notions of Space and Time being redundant for monitoring motions.

The above statement, that Space and Time might be redundant is also supported by the following argumentation: The New Model of three Interwoven Space/Time Entities mentioned above [10], implies that the conclusion derived in the second phase of the research mentioned above, and in the second published article [7], is not complete and should be updated. In this second published article [7], *Space* was presented as being a form of *Energy*, because each

point of it and continuously all the *Time* it contains a mixture of Traceable and Untraceable Energies. The Traceable Energies are the Gravitational Energy generated by Mass Objects, and **parts** of the Electric and Magnetic Energies generated by Electric Charges, and the Untraceable Energy is provided by **another part** of the Electrical and Magnetic Energy generated by Electric Charges. But the New Model of three Interwoven Space/Time Entities assigns these Energies to these three Interwoven Space/Time Entities. It states that Einstein's Interwoven Space/Time Entity is Energy, and that Energy is the Gravitational Energy generated by Mass Objects. It also states that the **additional** two Interwoven Space/Time Entities mentioned above are also Energies, and these Energies are the Energies embedded in the Electric and Magnetic Fields generated by Electric Charges. All that implies that although **each** Space Entity in any of the three Interwoven Space/Time Entities presented above, is Energy, its true nature should be updated from what was presented in the second article presented above [7], because there are **three independent** such Space Entities. And since in each of the three Interwoven Space/Time Entities, *Space* and *Time* appear as Interweaved Elements, this must have important implications also on the Nature of the *Time* Entity, as is further elaborated in the following:

The science of Physics uses just **one** *Space* and just **one** *Time* Entity. However, as already mentioned above, the third theoretical research work, mentioned above, and done by the author of this article [10], 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.

Thus, the updating of the Nature of Space and the implications on the Nature of Time should be as follows:

The third theoretical research work, mentioned above, and done by the author of this article [10], implies that these **three independent** and **separate** Interwoven Space/Time Entities are just forms of Energy, and do not really contain Space and Time Entities. Space and Time might be **precepted** by us as the **result** of the **activities** manifested by these three Interwoven Space/Time Entities with other forms of Energy: Mass Objects or Electric Charges. Thus, the **three independent** and **separate** Space/Time Entities are just forms of Energy and they generate Movements and Changes just by **interacting** with other forms of Energies, such as Mass Objects or Electric Charges, and Space and Time Notions are not really required in addition to the statement that these **interactions** between forms of Energies dictate and **create** the Changes and the Movements that occur. **Artificial** attributes of Space and Time can be related to every one of these **three independent** and **separate** Interwoven Space/Time Entities only in helping us to **percept** the **details** of these Changes and Movements, and to be able to perform **detailed** calculations about these Changes and Movements. But if the theories presented in these research works turn to be valid, then, this **artificially** added attributes of Space and Time to each of the three Interwoven Space/Time Entities must be recognized just as they are, **artificial**, *and not really existing*, or Features or Attributes, embedded in each of the three Interwoven Space/Time Entities, or Notions that the Science of Physics must **use** only to help us **perceive**, and be able to monitor and **calculate** the details of Motions, which are actually only the results of **interactions** between forms of Energies, as this article predicts.

## 5. Summary and Conclusions

This article is the last of four articles that summarize a broad theoretical research work. The conclusions derived from the first two research works are that all the Tangible, Concrete and Perceptible Matter in the *Universe* are forms of *Energy*, and *Space* **might** be also a form of *Energy*. The third research work provides additional conclusions about *Space* and *Time*. It **modifies** the conclusion presented in the second research work that *Space* **might** be a form of *Energy*, by stating that the *Energies* that the second research works attributed to *Space* is the *Energies* embedded in **three separate** Interwoven Space/Time Entities. The first of these three Interwoven Space/Time Entities is the Interwoven Space/Time Entity presented by Einstein's General Relativity Theory, and the **additional** two Interwoven Space/Time Entities, suggested by the third research work mentioned in this article, are forms of *Energies* that explain the **origins** of the Attraction/Repulsion between Electric Charges, similarly to the explanation provided by Einstein's General Relativity Theory to **origins** of the Attraction between Mass Objects. Another outcome from the introduction of these three Interwoven Space/Time Entities presented in the third research work, mentioned in this article, is that the *Space* and the *Time* Notions are **redundant**, and does not really exist, or are only Features or Attributes, **embedded** in each of the three Interwoven Space/Time Entities.

This article claims that *Space* and *Time* are the **outcome** of **interactions** between forms of *Energies*. Actions which all the Tangible Matter (which are also forms of *Energies*) **impose** on the three Interwoven Space/Time Entities, (which are also just forms of *Energies*), and actions which the three Interwoven Space/Time Entities **impose** on all the Tangible Matter.

Thus, if the theory presented in the research works mentioned in this article turns to be found valid, it seems that Physics does not need at all the Notions of *Space* and *Time* as independent Notions (or Entities), because they are just Features or Attributes which are **embedded** in the three Interwoven Space/Time Entities presented in the research works mentioned in this article, and each such Interwoven Space/Time Entity embeds **its own** *Space* **attribute** and **its own** *Time* **attribute** which is **separate and different** from the *Space* and the *Time* embedded in another Interwoven Space/Time Entity, although all these **separate and different** *Space* attributes might turn to occupy, in certain cases, the same location, in what we **perceive** as a single *Space* Entity, and although all these **separate and different** *Time* attributes might turn to exist, in certain cases, in the same moment, in what we **perceive** as a single *Time* Entity.

*Space* and *Time* (and also 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, this article concludes, that all these Notions are **not independent Notions**. They are either Features or Attributes embedded in forms of *Energies* or are what **we perceive** as the **result** (or the **outcome**) of **interactions** between forms of *Energies*.



Thus, the Existence, or the Universe, is composed of only one independent Notion or 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 between Energies and the interactions between Energies create all the Activities in the Existence, or the *Universe*.

Also, **parts** of this Entity, the Energy, can be Traceable, and **parts** of it might be Untraceable as stated in the previous studies presented in this article [6], [7], and Untraceable forms of Energies can convert back to Traceable forms of Energies, and Traceable forms of Energies can convert to Untraceable forms of Energies, as it is also presented in these previous studies [6], [7].

To summarize: If all the Tangible Matter are just different forms of Energy, and what **causes** the Changes in the *Universe* are also just forms of Energy, this article concludes that the Universe contains only one Entity: *Energy*. That Energy is manifested in all the Tangible Matter (Mass Objects and Electric Charges) which are just forms of Energies, and the three Interwoven Space/Time Entities (which are also forms of Energies). And the Notions of Space and Time are **not** independent Notions (or Entities) because they are only what we **perceive** as the **result** (or outcome) of interactions between also forms of Energies, the three Interwoven Space/Time Entities presented in the research mentioned in this article.

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