Energy May Be the Only Unique, Distinct, and Independent Entity in Nature

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Abstract

This paper is based on several additional papers, by the author of this paper, and as such, summarizes a broad theoretical research work. These papers intended initially to investigate the nature and the characteristics of the Entity of the *Electric Charge*. The first two parts of this research, dealing with *Electric Charge*, *Energy*, and *Space*, were published in two papers: "Energy Analysis of a Null Electromagnetic Wave" [1] and "The Nature of Space and Dark Energy, Based on Electric and Magnetic Fields' Behavior in Space in the Energy Pairs Theory Framework" [2]. The first paper, [1], 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 and perceptible matter in the universe is composed of only two Entities: Mass and Electric Charge, then, the first paper, [1], concluded that all the tangible and perceptible matter in the universe is just a form of Energy. The second paper, [2], provided a reasonable explanation for the mysterious Dark Energy and concluded that also *Space* might be a form (or facet) of*Energy*. A third paper, by the author of this paper, "A New Theory Expands Einstein's General Relativity Theory to Include Both Electric Charge and Mass Entities" [3], studied the origins of the Electrically Charged Bodies' Interactions. It provided an explanation for what *causes* the Attraction/Repulsion between Electric Charges, which is still a mystery, similarly to the explanation of Einstein's General Relativity Theory for what *causes* the Attraction between Massive Objects. As such, the third paper, [3], is an expansion of Einstein's General Relativity Theory to include in it not only Massive Objects but also

Electric Charges. Additional papers, by the author of this paper, which are also referenced in the body of this paper, focus on details and additional elements of this research, and this paper derives additional conclusions from all the previous papers mentioned above, 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 humans percept Nature, and, this paper concludes, that all these other Entities are either 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.

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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 [4][5], and the ancient Greeks idea that matter is composed of Atoms[6][7]. However, Physics today still uses many elements to explain Nature, such as *Energy, Mass, Electric Charge, Forces, Fields, Space, Time* etc.

This paper summarizes conclusions from previous theoretical research works done by the author of this paper. The bottom-line conclusion from these researches is that Nature might be composed of only one unique, distinct and independent Entity: *Energy*.

Actually, Energy and the Energy Conservation Principle might be the most important building blocks of the Physical Sciences.

Until the discovery, in the 20th century, that the Universe expands much faster than the expansion that can be justified by the amount of the Traceable Energy that the Science of Physics can detect 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 today are that the *Dark Energy* must be looked for in Gravitation using Einstein's General Relativity Theory.

However, several papers, by the author of this paper, present the prediction that the origin of *most* of the *Dark Energy* might be in *Electromagnetism*.

These papers are: "Dark Energy and Electromagnetism",[8] and "Electromagnetism Might Be the Source of Most of the Dark Energy", [9].

This paper summarizes the above-mentioned materials, and as already stated above, this paper provides arguments which support the prediction that Nature might be composed of only one unique, distinct, and independent Entity: *Energy*.

2. All the tangible and perceptible matter in the universe is forms of Energy

The basic building blocks, or elements, of all the tangible 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 and perceptible matter in the universe contains 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, which states 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 [10].

In addition to the above, the most significant conclusion derived from the first theoretical research work,[1], mentioned above, is that, *electric charge* is also a form of *energy*, similarly to *mass* being already recognized as a form of energy.

Thus, since the basic elements of all the tangible 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 and perceptible matter in the universe is just forms of *energy*.

In addition to the tangible 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 massive objects and these fields also interact with massive objects, causing massive objects' movements.

The science of Physics also recognizes that the Electric and Magnetic Fields are generated by Electric Charges. These Fields also interact with Electric Charges, causing movements of Electric Charges.

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 can exist and 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, Electromagnetic Waves, or Gravitational Waves, as their names indicate, are also assigned, by the science of Physics, as forms of *Energy*.

Thus, all the tangible 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 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 humans perceive it, might also be a form (or facet) of Energy

The first theoretical research work, [1], mentioned above, and an additional paper by the author of this paper, titled "A discussion relating to the feasibility of a Null Electromagnetic Wave", [11], provided a reasonable explanation for the mysterious *Dark Energy* that the science of Physics assumes is responsible for the extended rate of expansion of the Universe.

These papers, [1][11], provided this explanation by presenting a surprising scenario of two Electromagnetic Waves, from separate sources, which collide and consolidate.

The nowadays science of Physics concludes that such a scenario *cannot* occur.

An example of the fact that nowadays the Science of Physics concludes that such a scenario *cannot* occur is the paper titled: "Does Destructive Interference Destroy Energy?" [12].

That paper states, when referring to Electromagnetic Waves, the following: “A one-dimensional wave moving in one direction can have only one source, and there can be only one such wave at a given point”, which implies that Electromagnetic Waves, from separate sources, *cannot* consolidate.

The reason why the nowadays Science of Physics concludes that such a scenario *cannot* occur is because, if such a scenario does occur, it *seems* that it violates the Energy Conservation Principle, which is a cornerstone of Physics.

And indeed, the research [1], mentioned above, shows that if two Electromagnetic Waves, from separate sources,

consolidate, and following their consolidation, travel together in the same direction, then, if certain additional conditions also occur, some of the embedded Energy of the consolidating Electromagnetic Waves *seems* to disappear.

That research, [1] also shows that if additional certain specific conditions also occur,*all* their embedded Energy *seems* to disappear, and the Electromagnetic Waves become *undetectable*.

An additional paper, by the author of this paper, titled: "Consolidating Electromagnetic Waves Might Embed More Traceable Energy than the Sum of the Traceable Energies Embedded in the Waves before Consolidation", [13], shows that if *other* certain conditions occur, in scenarios of consolidating Electromagnetic Waves from separate sources, the complement of *seemingly* energy disappearance might occur, namely, *seemingly* the creation of energy out of nothing might occur.

That paper, [13], presents a scenario in which, if two electromagnetic waves from separate sources consolidate and, following their consolidation, travel together in the same direction, then, if *other* certain additional conditions occur, other than the conditions mentioned above that seem to create a loss of energy, the energy embedded in the consolidated electromagnetic wave is *bigger* as compared to the *combined energies* in the electromagnetic waves that created the consolidated wave, which implies that energy *seems* to be created out of nothing, which is also a clear violation of the energy conservation principle.

And that paper, [13] also shows that *in any scenario* of consolidations of electromagnetic waves from separate sources, the energy in the created consolidated electromagnetic wave is either *less* or *more* than the *combined energies* in the electromagnetic waves that created it, which is also a clear violation of the energy conservation principle.

However, despite the fact that consolidations of electromagnetic waves from separate sources might embed paradoxes that *seem* to violate the energy conservation principle, the paper[1] provides very sound arguments that imply that electromagnetic waves from separate sources can actually consolidate.

The paper [1] also proposes an experiment that describes how to generate consolidations of electromagnetic waves from separate sources.

Also, an additional paper by the author of this paper, titled "Consolidating Electromagnetic Waves from Separate Sources" [14], presents scenarios that anyone can experience every day, which indicate and imply that electromagnetic waves from separate sources do indeed continuously consolidate.

The research [1], mentioned above, also proposes an explanation for the above-mentioned paradoxes, which*seem* to violate the Energy Conservation Principle, by proposing a new theory, the Energy Pairs Theory, which is also presented in an additional paper by the author of this paper, titled: "The Energy Pairs Theory" [15].

That paper, [15], predicts that in the scenario in which the Energy*seemed* to disappear, it did not disappear; instead, it was converted into *Dark Energy* and stored as *Untraceable Energy* in the photons in *space*.

Also, that paper [15], predicts that in the scenarios in which the Energy*seemed* as if it was created from nothing, it was not

created from nothing; instead, *Dark Energy* embedded in photons in the consolidating electromagnetic waves from separate sources converted back into *Traceable Energy* embedded in the photons of the created consolidated electromagnetic wave.

Two additional papers by the author of this paper also present, in detail, what was just presented above. These papers are: "Dark Energy and Electromagnetism" [16], and "Electromagnetism Might Be the Source of Most of the Dark Energy" [17].

All these papers, mentioned above, also conclude that the media that stores the Traceable Energy, which *seems* to disappear in scenarios of consolidations of electromagnetic waves from separate sources, might be *space* itself.

And because *space* is not a tangible medium, that Energy, which *seems* to be disappearing, is stored in *space* as *Untraceable, or Dark Energy*.

Thus, from what was just presented, the research mentioned above deducts a reasonable explanation for the mysterious *Dark Energy*.

That explanation concludes that at least some of the *Dark Energy* is composed of Electromagnetic Waves which annihilated each other, and *seem* to disappear, and in certain conditions, this *Dark Energy* might convert back into *Traceable Energy*, appearing as Energy that *seems* as if it was created out of nothing and embedded in electromagnetic waves.

That explanation about the nature of *Dark Energy*, deduced by the research mentioned above, is significantly enhanced by the second theoretical research work mentioned above, titled: "The Nature of Space and Dark Energy, Based on Electric and Magnetic Fields' Behavior in Space in the Energy Pairs Theory Framework" [2].

That paper [2] shows that Electric and Magnetic Fields in *Space* always manifest a phenomenon: part of their embedded Energy *seems* to disappear, and this occurs at each point of *Space*, continuously, all the time.

That phenomenon is analogous to the *seemingly* disappearance of Energy presented above in certain scenarios of consolidating electromagnetic waves from separate sources.

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.

Since the Electromagnetic Waves traveling in *Space* might be a significant source of the *Energy* embedded in *Space*, and because the Energies embedded in the Electric and Magnetic Fields in *Space* are significantly more potent than the *Gravitational Energy in Space* (which is negligible compared to the Energy embedded in the Electric and Magnetic Fields), this significantly enhances the validity of the prediction that the *Dark Energy* might be *most* (about 68%) of the Energy embedded in the Universe, which is also in very good compliance with the estimated amount accepted by nowadays science of physics of the total amount of *Dark Energy* in the Universe, which is also estimated to be about 68% of all the Energy embedded in *Space*.

This also implies that *Space* cannot be a vacuum or a complete emptiness or nothingness.

Space must be a form of *Energy* because, as that research [2] shows, each point of *Space*, and continuously all the time, *Space* contains two types of energies: *detectable energies and undetectable energies (or dark energy)*[2].

Thus, that research, [2] shows that *most* of 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 Massive Bodies, and Bodies which are composed of Mass plus Electric Charges. 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 paper, the actual nature of *Space* will be further elaborated, relating also to the concept of the four-dimensional Interwoven Space/Time Entity introduced by Einstein's General Relativity Theory, which, as will be presented in the following sections of this paper, also cannot be a Vacuum or a Complete Emptiness, and, thus, must also be a form of Energy.

Since in the notion of the Interwoven Space/Time Entity, *Space and Time* are Interweaved into one four-dimensional Continuum, and *Space* and the Interwoven Space/Time Continuum are already presented to be forms of Energy, one might wonder what the implications of this are 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 paper.

4. What about the Time entity, is it also a form (or facet) 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.

For anything that undergoes changes, these changes are manifested by the parts of that thing that have 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 [18].

That four-dimensional Interwoven Space/Time Entity was used by Einstein's General Relativity Theory to explain the *origin* of the attraction between massive objects, attraction which generates motions (changes of locations) of massive objects in space, by concluding that the *distortion* of that Interwoven Space/Time Entity by any mass dictates to all other massive objects how to move, which results in the accelerated attraction between these massive objects.

Einstein also recognized that this four-dimensional Interwoven Space/Time Continuum Entity cannot be a vacuum or a complete emptiness or nothingness, because it must be composed of some "medium" in order to provide physical properties to it, enabling its *distortion.*

As such, space must be a form of energy, which further supports the conclusion derived in the second theoretical research work, [2], which also concludes that space is a form of energy, as already elaborated in the previous section of this paper.

Albert Einstein gave a speech at the University of Leiden on May 5th, 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 [19].

Thus, Einstein's four-dimensional Interwoven Space/Time concept succeeded in explaining the *origin* of massive bodies' attraction, but the *origin* of the attraction or repulsion between electric charges is still a mystery.

The third theoretical research work, mentioned above, by the author of this paper, titled: "A New Theory Expands Einstein's General Relativity Theory to Include Both Electric Charge and Mass Entities" [3], relates to that question.

As its name indicates, this work is an extension of Einstein's General Relativity Theory to include not only massive objects but also electric charges.

It provided an explanation for what *causes* the attraction/repulsion between electric charges, similarly to the explanation of Einstein's General Relativity Theory for what *causes* the attraction between massive 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.

Actually, the above was based on a prediction presented in the above-mentioned paper,[3], that the Electric Field should be also recognized as a form of Acceleration, similarly to the Gravitational Field, which is already recognized as a form of Acceleration.

The nowadays Science of Physics does not recognize the Electric Field as a form of Acceleration, possibly because such a recognition would result in very significant implications, which will be further presented in this paper.

The above-mentioned prediction, that the Electric Field should be also recognized as a form of Acceleration, is further supported by arguments presented in additional papers by the author of this paper.

These papers are: "The Electric Field as a Form of Acceleration, Moshe Segal"[20], "Implications if the Electric Field Will Be Recognized as a Form of Acceleration, Moshe Segal" [21], "Like Gravity, the Electric Field Should Be Also Recognized

as a Form of Acceleration, Moshe Segal" [22], and "For Electrically Charged Bodies, Attracted or Repelled under Coulomb's Law, F=ma Should Be Replaced with F=kqa, Moshe Segal" [23].

These papers provide very sound arguments, based on *structural identities* between Newton's Universal Gravitational Law and Coulomb's Law, that the Electric Field should be indeed also recognized as a form of Acceleration, similarly to the Gravitational Field, which is already recognized as a form of Acceleration.

And, as already mentioned above, this prediction, that the Electric Field should be also recognized as a form of Acceleration, results in significant implications, as presented in the above-mentioned papers, [20][21][22][23].

These papers also propose a relatively simple experiment that, if executed, might prove (or disprove) the prediction that the Electric Field should be also recognized as a form of Acceleration.

One significant implication, if the Electric Field is also recognized as a form of Acceleration, is that Newton's Second Law of Motion (F=ma) might not always be valid, and for Electrically Charged Bodies attracted or repelled under Coulomb's Law, this law should be replaced with a different law, as presented in the above-mentioned papers.

Another significant implication, if the Electric Field is also recognized as a form of Acceleration, is that the *Space and the Time* entities, as humans perceive these entities, might *not be entities that really exist*. These entities are embedded in specific Energy Fields (for example, Gravitational Field, or Electric and Magnetic Fields) and are just attributes or facets of these specific Energy Fields.

The above-mentioned prediction, that Space and Time might be just attributes or facets of specific Energy Fields, is also elaborated in an additional paper by the author of this paper titled: "A Discussion Related to The Existence of The Entities of Space and Time" [24].

The statement that Space and Time do not really exist sounds like an extraordinary, unbelievable, and out-of-line statement at first.

This is because, as already presented before in this paper, the notions of Space and Time are crucial notions, which Humans need to perceive, understand, and calculate Motions and Changes.

However, in view of the arguments presented before in this paper, if Space and Time cannot be considered any longer as independent entities, because, according to Einstein's Interwoven Space/Time concept, they are *always* interweaved into one four-dimensional construct, and if, according to Einstein's General Relativity Theory, Space and Time are just embedded in a form of Energy (the Gravitational Field), the statement that Space and Time might not really exist does not sound so detached anymore.

Moreover, the above actually indicates that what *does exist* are Energies which *Interact* with each other, and these *Interactions* cause what Humans perceive as Motions and Changes. For example, the attraction (Motions) between Massive Bodies is a result of the *Way* a form of Energy (the Gravitational Field) *Interacts* with another form of Energy (Massive Bodies), which leads Humans to attribute attributes (or facets) of Space and Time to the Gravitational Field

Energy, in order to be able to explain why this Attraction between Massive Bodies occurs, and also to be able to calculate the details embedded in that Attraction Motion.

In addition to the above, the following should also be noted:

Einstein assumed that the Universe embeds only *one, single* three-dimensional Space entity, and also only *one, single* one-dimensional Time entity, resulting in only *one, single* four-dimensional Interwoven Space/Time entity.

This implies that Einstein's Interwoven Space/Time entity, should be the *only* entity which dictates Accelerations, because the Acceleration is defined as the second derivate of Space in relation to Time, and if Space and Time are *always* interweaved in that Interwoven Space/Time entity, which implies that Einstein's Interwoven Space/Time entity is the *only* entity in the Universe which *embeds* the Space and the Time entities, it is, thus, also the *only* entity which is able to dictate the Accelerations in the Universe, especially Accelerations embedded in motions which are the result of activities originating by all Energy Fields in the Universe, for example, Gravity *and* Electric Fields.

Thus, if the Electric Field might be also recognized as a form of Acceleration, as this paper suggests, then, because the Electric Field might exist together with the Gravitational Field, in the same locations defined by Einstein's Interwoven Space/Time entity, then, the Acceleration embedded in that Electric Field, should be also dictated by the *one, single* Interwoven Space/Time entity, just described above.

However, as will be immediately presented in the following, if the Acceleration embedded in Electric Fields, must be also dictated by the *one single* Interwoven Space/Time entity just described above, this might pose a *severe difficulty*, relating to the concept of Einstein's Interwoven Space/Time concept, as is presented in the following paragraphs:

Einstein explained the *origin* of the attraction forces between Massive Bodies by assuming that Massive Bodies, which are the cause of Newton's Gravitational Field, are able to induce a deformation into Einstein's Interwoven Space/Time entity, which *causes* the attraction between Massive Bodies.

Thus, if the Electric Field might be also recognized as a form of Acceleration, as this paper suggests, then, also Electric Charges, which are the cause of the Electric Fields, *must also be able* to induce a deformation into Einstein's Interwoven Space/Time entity, in order to cause the Acceleration embedded in the Electric Fields, as this paper suggests, because, as just presented above, Einstein's Interwoven Space/Time entity, is the *only entity* which causes Accelerations, because it is the *only entity* which embeds the Space and the Time entities.

The assumption made by Einstein, that there is *only one, single* entity of Einstein's Interwoven Space/Time entity, *enabled* Einstein to develop his General Relativity theory, because it is possible to envision how a proper deformation into that *one, single* Einstein's Interwoven Space/Time entity can generate the required acceleration at each point of it to explain the *origin* of the attraction between massive bodies.

However, electric charges might attract *or* repel each other, and it seems *impossible* to envision a proper deformation induced into a *single* Einstein's Interwoven Space/Time entity, composed of only a *single* space entity and a *single* time entity, which will be able to generate the proper accelerations that will explain the *origin* of electric charges' attractions,

and, also to explain the *origin* of electric charges' repulsions.

Thus, if Einstein's Interwoven Space/Time entity is the *only entity* that can generate accelerations, because it is assumed that it is the *only entity* that embeds the space and the time entities, if electric fields might be also recognized as a form of acceleration, that acceleration seems to be *problematic*, because it cannot be related to Einstein's Interwoven Space/Time entity, as presented above, although, as also presented above, this acceleration *must* be related to Einstein's Interwoven Space/Time entity.

The resolution of the above-mentioned difficulty relies in the prediction presented before, in this paper, that the space and the time entities are not entities that really exist, and they are just attributes or facets of specific forms of energy.

Based on the above, this paper proposes the following:

This work, and the papers [3][20][21][22][23] predict that there are two *additional and separate* 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 and separate* four-dimensional Interwoven Space/Time Continuum Entities, and these *Distortions*, in these *additional and separate* four-dimensional Interwoven Space/Time Continuum Entities *cause* the Attraction/Repulsion between Electric Charges, similar to how Einstein's four-dimensional Interwoven Space/Time Continuum Entity *causes* the Attraction between Massive Objects via its *Distortion*.

In this model, these *additional and separate* 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 Massive Objects.

Thus, if these *additional and separate* four-dimensional Interwoven Space/Time Continuum Entities explain and monitor the movements of Electric Charges, the notions of Space and Time are redundant for monitoring motions between Electric Charges, as the notion of Space and Time is redundant for monitoring motions between Massive Bodies, following the introduction of Einstein's Interwoven Space/Time concept.

Thus, this paper 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 and separate*

Interwoven Space/Time Entities, presented in the third theoretical research work, mentioned above[3], and the papers [20][21][22][23], which results in the notions of Space and Time being redundant for monitoring motions between either Massive Objects or Electric Charges.

Thus, the *three independent* and *separate* Interwoven Space/Time Entities are just forms of Energy and they generate Movements and Changes just by *interacting* with other forms of Energies, such as Massive Objects or Electric Charges, and the Space and the 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 Humans to *perceive* 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, (by a successful execution of the proposed experiment, which was already mentioned above, in a previous chapter of this paper) 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 Humans *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 paper predicts.

As already presented before in this paper, the prediction that the entities of Space and Time are entities that do not really exist might seem out of line and not correct, even if the arguments presented above, which back up this prediction, might seem convincing and reasonable.

But it should also be recalled and emphasized that this prediction is based on the prediction that the Electric Field should be recognized as a form of Acceleration, and that prediction can be proved (or disproved) by executing the experiment, which is proposed in the paper [3] and papers [20][21][22][23], mentioned already in this paper.

Thus, if Mass *and* Electric Charges are just forms of Energy, as already presented above in this paper, and if Space and Time are notions that do not really exist, and these notions are also just attributes or facets of forms of Energy, then the Universe might be composed of only one distinct and independent entity: *Energy*.

5. A discussion about possible remarks related to what is presented in the paper

The prediction presented already above in this paper, that Energy might be the only unique, distinct, and independent entity in Nature, is indeed a revolutionary prediction.

As such, it is reasonable that such a prediction might stir remarks. The following presents a discussion about such possible remarks.

The first issue discussed is the issue of Dimensions. The dimension assigned to a specific entity is an important issue in

Physics.

Thus, one remark might be that the claim that Space-Time is a form of Energy is difficult to reconcile with the dimensions of Space-Time components, which are length and time, and not Energy.

However, the paper ***does not*** predict that what Humans perceive as Space-Time is Energy.

The paper predicts that the notions of Space-Time are notions that Humans invented and are not entities that really exist.

If this prediction will be found correct, by a successful implementation of the experiment proposed in the paper, then Humans should consider these notions to be just ***attributes***, or ***facets***, ***embedded*** in certain forms of Energy, ***and not the Energy itself***.

And, humans should do the above, ***only in order*** to be able to understand and explain motions and changes, and calculate values that humans use in connection to motions and changes, such as velocities or accelerations.

Because the notions of space and time are still crucial notions, which humans need in order to understand and explain motions and changes, and what humans perceive as relative locations between objects, which this paper predicts, are only the result of interactions between forms of energy.

Actually, the paper, and the additional papers referenced in the paper, presented that Einstein's interwoven space/time concept already established the first step in the prediction that the notions of space and time might be entities that do not really exist.

This paper presents that Einstein's interwoven space/time concept did that first step, mentioned above, by stating that space and time are not independent entities, as humans used to perceive these notions, because they are ***always*** interweaved into a four-dimensional interwoven space/time construct, and also, by stating that this four-dimensional interwoven space/time construct must be able to ***undergo deformations***, which implies that it must be a form of media, which might also imply that it might be a form of energy.

Actually, since this four-dimensional interwoven space/time construct actually replaces the traditional gravitational field, which is a form of energy, then Einstein's interwoven space/time concept also seems to be establishing the first step in the prediction that space and time are just attributes ***embedded*** in a form of energy, the gravitational field energy.

The paper took this one step further by adding another prediction, that the electric field might be also considered as a form of acceleration, and this paper also proposes an experiment that might prove or disprove this prediction.

And, as presented in detail in the paper, and the additional papers referenced in the paper, this additional prediction imposes significant difficulties on Einstein's interwoven space/time concept.

And, in order to resolve these difficulties, the prediction was provided that nature does not embed just one, single space entity, and just one, single time entity; instead, the paper provided the prediction that multiple, separate attributes of space, and multiple, separate attributes of time, might be assigned to certain forms of energy, which also implies that the

space and time notions, as humans perceive these notions, might not be entities that really exist.

Thus, although the Space-Time entities are considered to be fundamental components of the Universe, the paper predicts that the Space-Time entities (or notions) do not really exist and that these notions ***are not Energy***, and are not fundamental components of the Universe.

This paper suggests that these notions might be considered by humans only as***attributes***, or ***facets***, ***embedded*** in certain forms of Energy, but ***not the Energy itself***, and as such, humans can still assign to these multiple attributes of Space-Time notions dimensions of length and time, and not dimensions of Energy, because these multiple attributes of Space and Time, mentioned above, are only attributes ***embedded*** in forms of Energy, and ***not the Energy entities themselves***.

But in order to be completely accurate, such dimensions should be given additional markings (or subscripts) to specify to which Energy a specific Space dimension relates or a specific Time dimension relates.

For example, X_g, Y_g, or Z_g might be assigned to cartesian Length dimensions ***embedded*** in Einstein's Gravitational Interwoven Space/Time Energy (or, in other words, ***embedded*** in the Gravitational Field Energy), while X_{ep}, Y_{ep}, Z_{ep} might be assigned to cartesian Length dimensions ***embedded*** in the additional Interwoven Space/Time Energy related to the Positive Electric Charges, as presented in the paper, (or, in other words, ***embedded*** in the Electric Field Energy related to the Positive Electric Charges), and X_{en}, Y_{en}, Z_{en} might be assigned to cartesian Length dimensions ***embedded*** in the additional Interwoven Space/Time Energy related to the Negative Electric Charges, as presented in the paper, (or, in other words, ***embedded*** in the Electric Field Energy related to the Negative Electric Charges).

And, for example, Sec_g might be assigned as the seconds dimension ***embedded*** in Einstein's Gravitational Interwoven Space/Time Energy (or, in other words, ***embedded*** in the Gravitational Field Energy), and Sec_{ep} might be assigned as the seconds dimension ***embedded*** in the additional Interwoven Space/Time Energy related to the positive electric charges, as presented in the paper, and (or, in other words, ***embedded*** in the Electric Field Energy related to the positive electric charges), and Sec_{en} might be assigned as the seconds dimension ***embedded*** in the additional Interwoven Space/Time Energy related to the negative electric charges, as presented in the paper, (or, in other words, ***embedded*** in the Electric Field Energy related to the negative electric charges).

Thus, by using the above, humans might still use these various length and time dimensions, similarly to how humans used the single space and time dimensions, for explaining, understanding, and calculating motions, changes, and locations caused by interactions between various forms of energy.

It should also be added here, as is already presented in the paper, that if the electric field is also recognized as a form of acceleration, then this will result in significant implications.

And, as presented in the paper, one immediate implication would be that Newton's Second Law of Motion (F=ma) might not be applicable in scenarios of electrically charged bodies attracted or repelled under Coulomb's Law, and in such scenarios, Newton's Second Law of Motion (F=ma) should be replaced with a different law, as presented in the paper.

However, the more significant implication is the realization that space and time might not be entities that really exist, as mentioned already above, and this might lead to an explanation of what is the origin (or cause) of the attraction or repulsion between electric charges, an issue which is still a mystery today and which should be also viewed as an extension of Einstein's General Relativity to include electric charges as well as massive bodies.

An additional remark might ask how the understanding of matter as just forms of energy, presented in the paper, might reshape traditional concepts in physics.

Physics initially assumed that mass is not a form of energy. Thus, before the introduction of Einstein's Special Relativity Theory, which equated mass with energy, the Energy Conservation Principle did not contain mass in it. After the introduction of Einstein's Special Relativity Theory, which equated mass with energy, the Energy Conservation Principle was expanded to include mass as well.

Now, after the suggestion presented in the paper titled "Electromagnetism might be the source of most of the Dark Energy" [17], by the author of the paper, which predicts that the electric charge might be just a form of energy, the Energy Conservation Principle might need to be expanded again to include the electric charge entity.

And since all tangible matter in the Universe is composed of atoms, which are composed of elementary particles that embed either mass or mass plus electric charges, then, if the above might be found correct, it turns out that all the tangible matter in the Universe is just forms of energy.

But, while mass can be converted to regular traceable energy, the above-mentioned paper predicts that only an amount of positive electric charge equal exactly to the same amount of negative electric charge can be converted into dark energy, and these amounts must be exactly equal to comply with the Electric Charge Conservation Principle, which states that the amount of all the positive electric charge in the Universe must be always equal to the amount of all the negative electric charge in the Universe.

Also, while any amount of regular traceable energy can be converted into mass, only dark energy can be converted into electric charges, but only into a pair of positive and negative electric charges with exactly the same amounts of electric charge in each of this pair of electric charges, to comply again with the Electric Charge Conservation Principle.

An additional remark might require a discussion on the implications of the prediction, presented in the paper, that the Universe is composed of only energy, on various branches of Physics and potential avenues for further research and experimental validation.

It might be reasonable to assume that if the materials presented in the paper, including the prediction that the Universe might be composed of just one entity, energy, are found correct, this will have significant implications for various branches of Physics, because some significant implications were already presented in the paper and also discussed above.

But the most important avenues that must be taken, in order to proceed, are avenues that will try to prove the issues that were presented in the paper.

Since the paper, and the papers referenced in the paper, by the author of the paper, already proposed two experiments, the most important avenues would be the implementation of these experiments.

In order to provide validity to the prediction presented in the paper that electromagnetic waves from separate sources can indeed consolidate, the experiment presented, which might implement the above, should be executed.

This experiment might be very difficult to implement, even maybe virtually impossible, but, if implemented, and its results are successful, it might prove that electromagnetic waves from separate sources can indeed consolidate, it might prove that electric charges are just also a form of energy, and it might prove the predictions presented in the paper about dark energy.

However, a much simpler experiment is presented in the paper.

This experiment is the experiment which might prove or disprove the prediction presented in this paper that the electric field should also be recognized as a form of acceleration.

That experiment might be relatively simple to implement (but still might have complications, as presented in the additional papers referenced in the paper), but a successful implementation of this experiment might also prove that the space and time entities are not entities that really exist, might prove that Newton's Second Law of Motion (F=ma) might need modifications, as already presented above, might explain the origin of the attraction or repulsion between electric charges, and might also provide an explanation for the question: why does light velocity, measured by humans, always result in a constant value, which is also the maximum velocity that humans can measure, which can be found in the paper titled: "A discussion related to the uniqueness of the Velocity of Light" [25].

Finally, additional remarks might be presented, which state that the relationships and implications developed between various physical entities in the paper could be interpreted as metaphors rather than concrete physical theories, and that the concept that everything is energy is not new and has been used in various philosophical and mythological contexts.

The answer to the above would be a successful implementation of the experiments proposed in the paper and the additional papers referenced in the paper.

If these experiments are executed and their results are not successful, then this will disprove what is presented in the paper.

But, if these experiments are executed, and their results are successful, then this should provide validity to what is presented in the paper, not as metaphors, but as concrete physical theories, and then this might also provide validity to the various philosophical contexts mentioned above, but still, this has nothing to do with any theological beliefs, because the author of this paper is not at all a believer or a religious person.

6. Summary and Conclusions

This paper summarizes a broad theoretical research work. The conclusions derived from the first two research works, [1][2], of this broad research work, are that all the tangible and perceptible matter in the *universe* is forms of *energy*, and *space might* also be a form of *energy*. The third research work, [3] provides additional conclusions about *space and time.*

These additional conclusions about space and time, presented in the paper[3], are based on a prediction that the electric field should be recognized as a form of acceleration, similarly to the gravitational field, which is already recognized as a form of acceleration.

That prediction is based on arguments grounded in *structural identities* between Newton's Universal Gravitational Law and Coulomb's Law, which are also presented in additional papers by the author of this paper [20][21][22][23].

The papers [3][20][21][22][23] also propose a relatively simple experiment which if implemented, might prove (or disprove) the prediction that the Electric Field should be also recognized as a form of Acceleration.

These additional conclusions about Space and Time, presented above, *modify* the conclusion presented in the second research work, [2] that Space *might* be a form of Energy which *does exist*, by stating that the Energies that the second research works attributed to Space, is the Energies embedded in *three separate* Interwoven Space/Time Entities, which implies, that *Space* is *not* an entity that does exist, it is only an attribute or facet embedded in three forms of Energy.

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 presented above, are forms of Energies that explain the *origins* of the Attraction or the Repulsion between Electric Charges, similarly to the explanation provided by Einstein's General Relativity Theory to the *origins* of the Attraction between Massive Objects.

Thus, the introduction of these three Interwoven Space/Time Entities implies that the Space and the Time notions are *redundant,* and *does not really exist*, or are only Features or Attributes or facets, *embedded* in each of the three Interwoven Space/Time Entities.

This paper claims that Space and Time are features or attributes or facets, that Humans can apply to the above mentioned three Interwoven Space/Time Entities, in order to understand 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 paper turns out to be valid, it seems that Physics does not need the notions of Space and Time as independent entities (or entities), because they are just features or attributes or facets which are *embedded* in the three interwoven Space/Time entities presented in the research works mentioned in this paper, 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 humans *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 humans *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 energy occur, but, still, this paper concludes that all these notions are *not independent notions*. They are either features or attributes embedded in forms of energy which might enable *humans to perceive* the *result* (or the *outcome*) of *interactions* between forms of energy.

Thus, the Existence, or the Universe, is composed of only one independent notion or entity: *energy*. And this entity, energy, is always *conserved*, *nothing* of it can be annihilated or destroyed, it appears in various forms, which continuously interact with each other, and it might be possible to convert each form of energy into 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 paper [1][2], 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.

It should also be emphasized that the prediction that the entities of Space and Time are entities that do not really exist might seem out of line and not correct, even if the arguments presented, which back up this prediction, might seem convincing and reasonable.

But it should also be recalled and emphasized that this prediction is based on the prediction that the Electric Field should be recognized as a form of Acceleration, and that prediction can be proved (or disproved) by executing the experiment, which is proposed in the paper [3] and the papers [20][21][22][23].

To summarize: If all the Tangible Matter is just different forms of Energy, and what *causes* the Changes in the *Universe* is also just forms of Energy, then, also Space and Time do not really exist and are just attributes or facets of certain forms of Energy.

Thus, this paper concludes that the Universe contains only one independent and distinct Entity: *Energy*.

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