

A New Theory Expands Einstein's General Relativity Theory to Include Both Electric Charge and Mass Entities

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Abstract

Einstein's General Relativity Theory provides an explanation to the question of **why** two *Mass Objects Attract* each other according to *Newton's Universal Gravitation Law*: $\mathbf{F} = \mathbf{G} \cdot (\mathbf{m}_1 \cdot \mathbf{m}_2) / \mathbf{r}^2$. The *General Relativity Theory*, based on mathematical elaboration, concluded that a *Distortion of the Interwoven Space/Time Entity*, caused by one *Mass Object*, guides all other *Mass Objects* how to move in an *Accelerated Attraction* towards it. Interestingly, *Coulomb's Law*: $\mathbf{F} = \mathbf{K}_e \cdot (\mathbf{q}_1 \cdot \mathbf{q}_2) / \mathbf{r}^2$, that defines the *Attraction/Repulsion Force* between two *Electrically Charged Bodies*, has an identical structure to that of *Newton's Gravitation Law's*. So, it is reasonable to wonder whether the **origins** of the *Attraction/Repulsion Force* between two *Electrically Charged Bodies* are also similar. This question is this study's focus. *The New Model* presented in this article is based on *Einstein's General Relativity Theory*, and it proposes an answer to this question. *That New Model* describes **three** *Interwoven Space/Time Entities*, separated of each other:

1. A *Mass Interwoven Space/Time Entity* that guides the *Accelerated Attraction Forces* of *Mass Objects*, towards each other. This part of the model complies completely with *Einstein's General Relativity Theory*.
2. A *Positive Electric Charge Interwoven Space/Time Entity* that guides *Positive Electrically Charged Bodies* how to *Repel* from any other *Positive Electrically Charged Body*, and how to *Attract* to any *Negative Electrically Charged Body* in an *Accelerated* movement.
3. A *Negative Electric Charge Interwoven Space/Time Entity* that guides *Negative Electrically Charged Bodies* how to *Repel* from any other *Negative Electrically Charged Body*, and how to *Attract* to any *Positive Electrically Charged Body* in an *Accelerated* movement.

According to *That New Model*, in both *Mass Bodies' Attraction*, and *Electrically Charged Bodies' Attraction or Repulsion*, the **origins** of the *Attraction or Repulsion Acceleration Forces*, is rooted in the ***Distortion*** of one of the *Interwoven Space/Time Entities*. So, this theory explains the **origins** of the *Coulomb's Force* analogously to the explanation of the *Universal Gravitation Force's origins* by the *General Relativity Theory*. As such, *That New Model* predicts that the *Acceleration* between two *Electrically Charged Bodies Attracted-to, or Repelled-from* each other, is usually dependent on the *Electric Charge Bodies'* magnitude, and not on their *Mass* magnitude. Based on this idea, the present study provides a detailed proposal for an experimental process, intending to validate the new theory.

Key Words: Space, Electric Charge, Mass, Energy, General Relativity Theory, Gravitational Law, Coulomb's Law.

1. Introduction

Mass and *Electric Charge* are fundamental entities of the natural matter. The nature of the entity of *Mass Bodies* and their interactions, was studied extensively by *Newton's Theories* and by *Einstein's Relativity Theories*, while the nature and characteristics of the *Electric Charge Entity* was limited to the study of *Electric Fields* and *Electromagnetism*, which was studied prominently by Maxwell [23], and fundamental questions such as “what is basically the nature of the *Electric Charges?*”, or “how and why do *Electric Charges* interact the way they do?”, was not yet answered.

This article is a third of three articles that summarize a broad research work intended to investigate and study these questions, and provide answers to the above questions, and specifically, 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 [4], [5]. The present article provides a summation of the third part of the research that studies the **origins** of the *Electrically Charged Bodies'* interactions.

The *Mass Entity* was thoroughly studied, prominently by *Newton* and *Einstein*. So, the basic scientific knowledge relating to the question: “*Why and How do Mass Objects Attract* each other?” is answered through *Newton's Universal Gravitation Law*, and especially by *Albert Einstein's General Relativity Theory*. However, the same question related to the *Electric Charge Entity*: “*Why and How do Electrically Charged Bodies Attract or Repel* each other?” was not answered yet. We do have knowledge about the force magnitude of *Attraction* or *Repulsion* of *Electrically Charged Bodies* by the *Coulomb's Law*, but we still do not have any explanation to the question of: “*Why and How do Electrically Charged Bodies* impose such a force on each other?” Or in other words: “*What is the origin of the Electric Coulomb Force?*” This study's aim is to investigate these questions.

Newton's Universal Gravitation Law that defines the force by which *Mass Objects Attract* each other, was presented by the formula: [1]

$$\mathbf{F} = \mathbf{G} \cdot (\mathbf{m}_1 \cdot \mathbf{m}_2) / \mathbf{r}^2.$$

In this formula \mathbf{F} represents the *Gravitational Attraction Force* acting between two *Mass Bodies*; \mathbf{m}_1 and \mathbf{m}_2 represent the bodies' *respectable Mass*; \mathbf{r} represents the distance between the centers of the *Mass Bodies*, and \mathbf{G} represents the *Gravitational Constant* which is equal to $6.674 \times 10^{-11} \text{ m}^3 \cdot \text{kg}^{-1} \cdot \text{s}^{-2}$.

Although the *Universal Gravitation Law* complies with the experimental observations related to the force by which two *Mass Objects Attract* each other, no explanation was provided by *Newton's law* to the question of why such *Attraction* occurs, and why its magnitude is according to that formula. *Albert Einstein's General Relativity Theory* [6], [10], [11] provides such an explanation.

Coulomb's Law which defines the force by which *Electrically Charged Bodies Attract* or *Repel* each other was presented by the formula: $\mathbf{F} = \mathbf{K}_e \cdot (\mathbf{q}_1 \cdot \mathbf{q}_2) / \mathbf{r}^2$ [2].

in which \mathbf{F} represents the *Attraction/Repulsion* force between two *Electrically Charged Bodies*; \mathbf{q}_1 and \mathbf{q}_2 represent the *Electric Charge* magnitude of each of these *Electrically Charged Bodies*; \mathbf{r} represents the distance between the *Electrically Charged Bodies*, and \mathbf{K}_e represents the *Coulomb's Constant* which is equal to $8.99 \times 10^9 \text{ N} \cdot \text{m}^2 \cdot \text{C}^{-2}$.

Although *Coulomb's Law* complies with the experimental observations related to the force by which two *Electrically Charged Bodies Attract* or *Repel* each other, similar to the way the *Universal Gravitation Law* complies with the experimental observations related to the force by which two *Mass Bodies Attract* each other, no explanation was ever provided to the question of why such an *Attraction or Repulsion* occurs, and why it obeys the formula that was provided by *Coulomb*.

Since both formulae, the *Universal Gravitation Law* and *Coulomb's Law* have clearly identical structure relating the *Mass Bodies'* or *Electric Charge's* magnitude, and the distance between two *Mass Bodies* or *Electrically Charged Bodies*, it is reasonable to wonder whether there are any other similarities or identities between the *Gravitational Force* and the *Coulomb's Force*, relating especially to the origins of these two forces. A reasonable hypothesis at this point might be that these two different kinds of forces are also initiated or caused by similar sources. Since the way *Mass Objects Attract* each other and the origin of this *Attraction*, was studied extensively and resolved by *Einstein's General Relativity Theory* that was first published in 1915, it seems reasonable to examine this theory from a new point of view, trying to find answers to the question: "*Why and How do Electric Charges Attract or Repel each other and why the Attraction/Repulsion force formula has a similar structure as the Gravitational Force?*". These are the central questions that the present study is dealing with.

This study provides a theoretical expansion of *Einstein's General Relativity Theory* to include the *Entity* of the *Electric Charge*, in an attempt, to answer the questions that this study is investigating. A *New Model of Einstein's Interwoven Space/Time Entity* is presented in this study, which is based on both *Einstein's Interwoven Space/Time model* [6], [10], [11], and previous theoretical models related to *Electric Charge*, *Energy*, and *Space* characteristics, developed by the author of this article [4], [5].

In the first part of the article the principles of *Einstein's General Relativity Theory* are provided. Then, a presentation of a *New Model of the Interwoven Space/Time Entity*, which relates to both, *Mass* and *Electric Charge Entities*, will be provided.

Then, a detailed explanation to the question: "*Why and How do Electric Charges Attract/Repel each other?*" based on the new *Interwoven Space/Time Entity Theory*, will be presented.

Finally, this study provides a discussion which leads to a revolutionary conclusion regarding the *Acceleration* magnitude existing in any scenario which involves *Electrically Charged Bodies* that are *Attracted-to* or *Repelled-from* each other, and suggests a lab experimental tool, designed to validate the new *Interwoven Space/Time Entity Theory* offered in this study.

2. Brief Introduction to Einstein's General Relativity Theory Principles

Before *Einstein's General Relativity Theory* was developed, the base of knowledge about *Gravity* was built on *Newton's Gravitational Law* related to moving *Mass Bodies*. The question of why *Mass Bodies Attract* each other, at the first place, was answered by *Newton* by introducing the *Gravitational Field* – \mathbf{g} , which was formulated as:

$$\mathbf{g} = \mathbf{G} \cdot (\mathbf{m}_1) / r^2 \quad [7].$$

Thus, according to *Newton's Theory*, a *Mass Body* \mathbf{m}_1 imposes a force on another *Mass Body* \mathbf{m}_2 because the entity of *Mass* creates a *Gravitational Field* around it. As already shown before, the force that is imposed on one *Mass Body* by another *Mass*, is given by *Newton's Universal Gravitation Law*:

$$\mathbf{F} = \mathbf{G} \cdot (\mathbf{m}_1 \cdot \mathbf{m}_2) / r^2 \quad [1].$$

Thus, the *Universal Gravitation Law*, $\mathbf{F} = \mathbf{G} \cdot (\mathbf{m}_1 \cdot \mathbf{m}_2) / r^2$, can be rewritten as $\mathbf{F} = \mathbf{m}_2 \cdot \mathbf{g}$.

In addition, *Newton's Second Law* relating to moving *Mass Bodies* states that the *Acceleration* - \mathbf{a} of any *Mass Body* \mathbf{m}_2 , which is a result of a force \mathbf{F} exerted on that *Mass*, would comply to the equation: $\mathbf{F} = \mathbf{m}_2 \cdot \mathbf{a}$ [9]. Thus, \mathbf{g} can also be denoted as a *Gravitational Acceleration*.

This implies that the *Mass Body* \mathbf{m}_1 dictates or “guides” the *Acceleration* in which any other *Mass Body* \mathbf{m}_2 , which is *Attracted* to it, will move. Or, in other words, a *Gravitational Field* created by one *Mass Body*, dictates or “guides” the *Acceleration* of any other *Mass Body's* movement in that *Gravitation Field*.

A simple conclusion of this discussion is that: *"A Gravitation Field g is equated with Acceleration"*.

The fact that the *Gravitational field is a form of Acceleration* is the foundation of *Einstein's General Relativity Theory*. Because both a *Mass Body* \mathbf{m}_1 that creates the *Gravitational* field, and a *Mass Body* \mathbf{m}_2 that is forced to accelerate towards it, reside in *Space* in different locations, sometimes quite far away from each other, one can still argue how one *Mass Body* can generate *Acceleration* on any other *Mass Body*, at a remote point in *Space*. *Einstein's General Relativity Theory* resolves this question.

The basic assumption of *Einstein's General Relativity Theory* was that because both, the *Mass Bodies*, and the *Gravitational Fields*, exist in *Space*, and the *Gravitational Attraction* between *Mass Bodies* takes place in *Space*, *Space* itself must play an important role in how *Attraction Forces* between *Mass Bodies* takes place. During his long-lasting work (about 10 years) to develop the *General Relativity Theory*, *Einstein* used advanced mathematical tools, in an effort, to include **Acceleration** into the mathematical equations related to *Mass Bodies' Attraction*. While both *Velocity* and *Acceleration* are *Time* dependent, he decided to interweave *Space and Time* into one continuum entity, which he named: **Interwoven Space/Time**. This entity is 4-dimensional – (4D) *Entity*, which is a key factor in the understanding of how all *Massive Bodies Attract* each other. Using this *Interwoven Space/Time Entity* in his calculations, considering **Time (T)** as one dimension in addition to the other three dimensions of *Space (X, Y, and Z)*, he concluded that each *Massive Body*, causes a **Distortion** in the *Interwoven Space/Time Entity*. His mathematical workout showed that the **Distortion** of the *Interwoven Space/Time Entity* by one *Mass Body*, causes the **Accelerated Attraction** of any other *Mass Body* in the *Interwoven Space/Time Entity*, to it [6], [10], [11].

It should be noted that *Einstein's General Relativity Theory* does not need the notions of *Fields* or *Forces* and does not root the **origin** of the *Attraction* between *Mass Bodies* using notions of *Fields* or *Forces*. In *Einstein's General Relativity Theory*, the **origin** of the *Attraction* between *Mass Bodies* is **only** the **embedded** *Acceleration* in the **Distorted** *Interwoven Space/Time Entity*. This understanding will be also **very significant** in the implementation of *The New Model*, presented in this article, which expands *Einstein's General Relativity Theory* to include the *Electric Charge Entity* in it, as will be explained in a following section of this article.

To summarize this brief introduction to ***Einstein's General Relativity Theory***, two important principles that will be used later in the present study, aiming to extend this theory to include the *Electric Charge Entity*, may be drawn:

1. Each *Mass Body* causes a **Distortion** of the *Interwoven Space/Time Entity*.
2. The **Distorted** *Interwoven Space/Time* created by one *Mass*, dictates or “guides” any other *Mass Body*, to *Attract* to the *Mass* that created that *Distortion* in the *Interwoven Space/Time Entity*, in an *Accelerated* movement. In this view, *Einstein's Interwoven Space/Time Entity* is seen as a “*Guide of Acceleration*”. In other words, the **Distortion in the Interwoven Space/Time Entity** by each *Mass Body*, guides any other *Mass Body* **how to move**, which contains the direction of that movement, or *Attraction* towards the first *Mass Body*, and the magnitude of the *Acceleration* in that movement [6], [10], [11].

Understanding *Einstein's Interwoven Space/Time Entity*, requires a *Space Entity* that is not composed of *Nothingness* or *Vacuum* or *Complete Emptiness*, as was thought about the nature of *Space* in the past. Rather, *Einstein's General Relativity Theory* requires to conclude that *Space* is composed of some sort of medium (such as *Aether* [12]), that can be used to describe the “matter” or the “something” of which *Space* is made from, in order to provide physical

properties to the *Interwoven Space/Time Entity*, and enable its ***Distortion***. *Albert Einstein's* speech in the University of Leiden on May 5th, 1920, explained that his *General Relativity Theory* requires *Space* to be some sort of medium, to enable its *Distortion* [3], [13].

To explain, **by visualization**, how *Distortion* of the *Interwoven Space/Time Entity* takes place and how it causes *Attraction* of *Mass Bodies* to each other, *Space* should be some sort of "fabric", as is visualized in Figure 1.

Figure 1 is a NASA image that is also presented in Space.com site in an article titled: "Einstein's Theory of General Relativity" [6]. This image provides a visualization of how the *General Relativity Theory* presents the ***Distortion*** of the *Interwoven Space/Time Entity*, caused by one *Mass Body*, to explain the *Attraction* of any other *Mass Body* towards it. At this point, it is important to note that tools to illustrate a 4D-*Interwoven Space/Time Entity* are limited related to humans' inability to percept more than 3-Dimension Entities. Therefore, a 3D slice illustration, of the 4D construct, is usually used to explain both the ***Distortion*** of the *Interwoven Space/Time Entity*, and the *Attraction* of *Mass Bodies* to each other. This kind of illustration is used in Figure 1. Such 3D illustrations aiming to exemplify the 4D *Interwoven Space/Time Entity* should always include the Time-Dimension, which is important regarding the *Acceleration* calculations in an *Accelerated Attraction* of *Mass Bodies*. Therefore, the illustration in Figure 1 includes only two dimensions of *Space*, like: X and Y; or Y and Z; etc., in addition to the *Time* - T dimension. Later, in the third part of this article, the connection between the ***shape*** of the *Distorted Interwoven Space/Time Entity*, and the *Acceleration* of the *Attracted* body, will be discussed in detail.

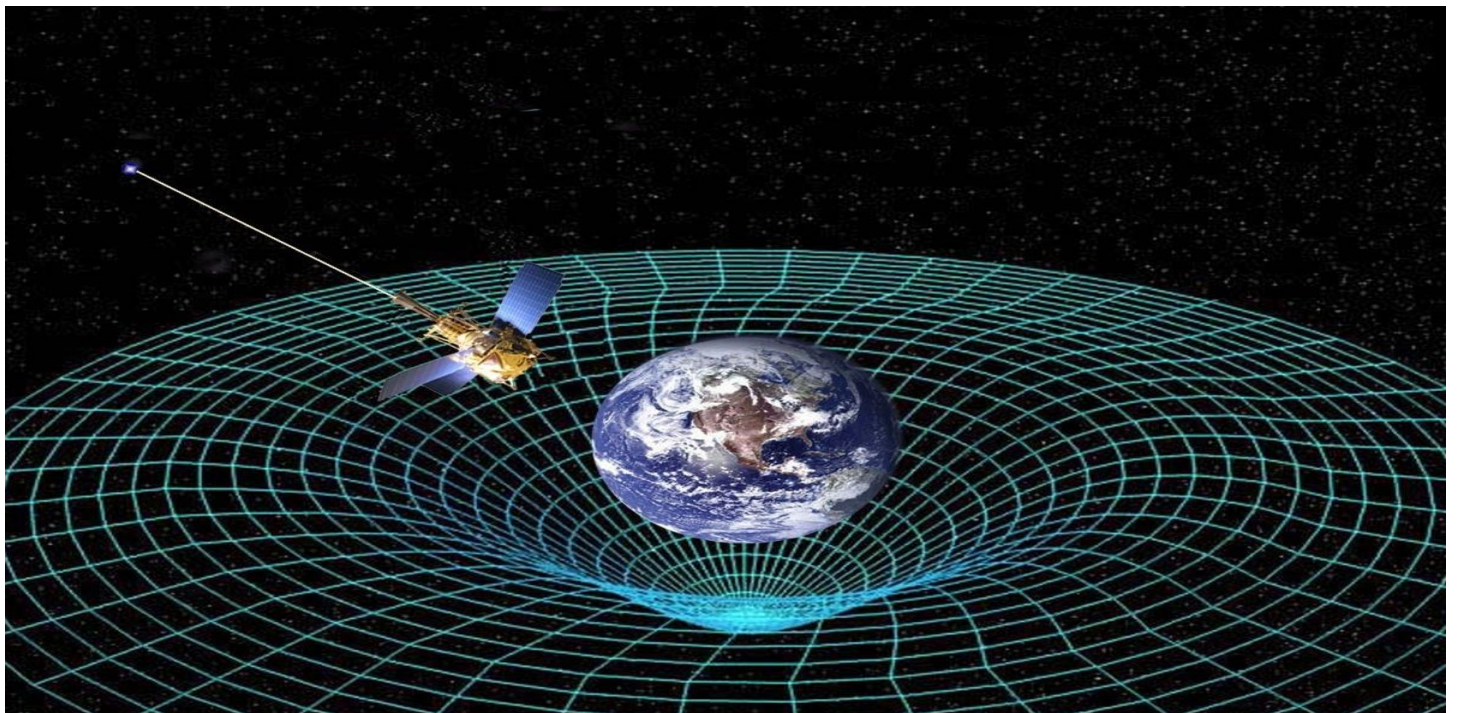


Fig 1 | Visualization of how *Interwoven Space/Time Distortion* explains *Attraction* between *Mass Objects*. (Image: © NASA)

In Figure 1 the *Earth Mass* creates a *Distortion* in the illustrated 3D slice, of the 4D construct, of the "fabric" of the *Interwoven Space/Time* that looks like a ***Dimple***. The second *Mass Object*, seen in the image, is a Spaceship that is *Attracted* by that ***Dimple*** towards the Earth. In other words, the *Distortion* of the *Interwoven Space/Time* (*the Dimple*) created by the *Earth Mass* in the *Space/Time* "fabric", dictates or "guides" the Spaceship's *Accelerated Attraction* towards *Earth*. Obviously, it is not only that Spaceship; all other *Mass Bodies* residing in the *Interwoven Space/Time Entity* are also *Attracted* towards *Earth* in the same way. It can be concluded then, that according to the *General Relativity Theory*, a *Distortion* of the *Interwoven Space/Time Entity* by one *Mass-Object*, dictates or guides the *Accelerated Attraction* of all other *Mass-Objects* residing in that *Interwoven Space/Time Entity*, towards it.

3. A New Model Expands Einstein's General Relativity Theory to Include the Electric Charge

The initial goal of this study was to investigate the origins of the *Attraction* and the *Repulsion Forces* between *Electric Charges*. Because the formulated *Newton's Gravitational Force* has identical structure as the *Coulomb's* formulated *Attraction/Repulsion Forces* between *Electric Charges*, the basic assumption in developing *The New Model* was that the origins of the *Electric Attraction/Repulsion Forces*, resemble the *Gravitational Attraction Forces' origins*, that were already explained by *Einstein's General Relativity Theory*. Therefore, the development of this *New Model* to include the *Electric Charge Entity* is based on *Einstein's General Relativity Theory*.

As shown in the previous section, the *Gravitational Attraction's origins* between *Mass Objects* were explained by *Einstein's General Relativity Theory* as follows:

1. Each *Mass Object* causes a ***Distortion*** of the *Interwoven Space/Time Entity* by creating a shape of a ***Dimple*** in it.
2. The ***Distorted Interwoven Space/Time Entity*** "dictates" or "guides" any other *Mass Object*, both its direction of movement, in this case, *Attraction*, and its *Acceleration* magnitude. In this view, *Einstein's Interwoven Space/Time Entity* functions as a "*Guide of Acceleration*"; In other words, the ***Distortion*** of the *Interwoven Space/Time Entity* by any *Mass Object* "dictates" or "guides" any other *Mass Object* how to move, or its *Accelerated Attraction* towards the *Mass Object* that *Distorted* the *Interwoven Space/Time Entity*. [6], [10], [11].
3. *Mass Objects* always *Attract* each other, which mean that every *Mass Object* can create only a shape of a ***Dimple*** in the *Interwoven Space/Time Entity*, like the *Dimple* shown in Figure 1.

Thus, according to *Einstein's General Relativity Theory*, the origins of the *Gravitational Accelerated Attraction Forces* are rooted in the ***Distortion*** of the *Interwoven Space/Time Entity* by any *Mass Object*. This ***Distortion*** "guides" any other *Mass Object* how to move towards or be *Attracted* to the *Mass Object* that created the ***Distortion***.

However, *Einstein's General Relativity Theory* does not consider the origin of the *Attraction* between *Mass Bodies* as being rooted in any *Forces* or *Fields*. In *Einstein's General Relativity Theory*, the root of the *Attraction* between *Mass Bodies* is only the embedded *Acceleration* in the ***Distorted Interwoven Space/Time Entity***.

If the *Interwoven Space/Time's Distortion* is a "guide" to any *Mass Object* how to move, then a reasonable assumption, at this point, would be that there should be more such "guides" that are responsible "to dictate" or "to guide" the *Accelerated Attraction* or *Repulsion Forces* between *Electric Charges*.

Because *Electrically Charged Bodies* are of two basic kinds: *Positive* and *Negative*, there should reasonably be, two additional and different kinds of *Interwoven Space/Time Entities* (in addition to the *Distorted Interwoven Space/Time Entity* that guides the movement of *Mass Bodies*) to "guide" the *Accelerated* movement of *Electrically Charged Bodies*; One, to guide the *Positive Electrically Charged Bodies* how to move (direction and magnitude of *Acceleration*), and the other to guide the *Negative Electrically Charged Bodies* how to move. This is the basic idea upon which *The New Model of three Interwoven Space/Time Entities* was developed.

The proposed *New Mode of three Interwoven Space/Time Entities* central idea is that there are **three** separate *Interwoven Space/Time Entities*:

1. *A Mass Interwoven Space/Time Entity* that "guides" the *Attraction Accelerated Forces* of *Mass Objects* to each other, and their related *Acceleration*. This part of the model complies completely with *Einstein's General Relativity Theory* that its basic principles were presented above. This *Entity of Interwoven Space/Time* will be assigned in the following discussion, as: **Mass-Guide-Interwoven-Space-Time** or: **MA-G-IST**.
2. *A Positive Electric Charge Interwoven Space/Time Entity* that "guides" the *Positive Electric Charges* how to *Repel* from any other *Positive Electric Charge*, and how to *Attract* to any *Negative Electric Charge*, in an *Accelerated* movement. This *Entity of Interwoven Space/Time* will be assigned in the following discussion, as: **Positive-Charge-Guide-Interwoven-Space-Time** or **PC-G-IST**.
3. *A Negative Electric Charge Interwoven Space/Time Entity* that "guides" the *Negative Electric Charges* how to *Repel* from any other *Negative Electric Charge*, and how to *Attract* to any *Positive Electric Charge*, in an *Accelerated* movement. This *Entity of Interwoven Space/Time* will be assigned in the following discussion, as: **Negative-Charge-Guide-Interwoven-Space-Time** or **NC-G-IST**.

Before going into a detailed presentation of *The New Model of the three Interwoven Space/Time Entities*, it is important to emphasize that this model is based upon two fundamental assumptions:

1. *Electrically Charged Bodies* May *Distort* the *Mass Interwoven Space/Time Entity* exactly as *Uncharged Mass Objects* *Distort* the *Mass Interwoven Space/Time Entity*. In other word, The *Distortion* that *Electrically Charged*

Bodies impose on the *Mass Interwoven Space/Time Entity*, is imposed only by the *Mass* that carry these *Electrically Charged Bodies*.

2. *Uncharged Mass Objects* do not *Distort* any of the *Electric Charge Interwoven Space/Time Entities* and are not affected by them. This assumption complies with the experimental knowledge that *Uncharged Mass Objects*, and *Electric Charges* do not interact with each other [14].
3. To modify *Einstein's Interwoven Space/Time Entity* and present it as part of the **three Interwoven Space/Time Entities**, each **Space Entity**, in any of the three *Interwoven Space/Time Entities*, should be composed of "something", not *Vacuum*, not *Nothingness* nor *Complete Emptiness*. Each such *Space Entity* should be some "sort of fabric" to be suitable of enabling its *Distortion* in order to generate the *Acceleration* of *Mass Objects* or *Electrically Charged Objects* in it. This complies with *Einstein's General Relativity Theory* requirement to assume that *Space* is composed of some sort of "medium" that provides physical properties to its *Space/Time Entity* and enable its *Distortion*. In his speech in the University of Leiden on May 5th, 1920, *Albert Einstein* himself explained that his *General Relativity Theory* requires *Space* to be some sort of a medium [3], [13].

Concerning the second assumption above, that each *Space Entity* in the three *Interwoven Space/Time Entities*, should be composed of something, a trivial question might be asked: "What is this "medium", that each such *Space Entity* is made of?"; "What should each of the *Space Entities* be built of in order to enable the *Distortion* of that *Interwoven Space/Time Entity*?" The answer of the present work to this question, is based on results and conclusions of a previous study, conducted by the author of the present article, and published in an article named: "*The Nature of Space and Dark Energy, Based on Electric and Magnetic Fields' Behavior in Space in the Energy Pairs Theory Framework*" [5].

The central idea presented and concluded in that study, was that the **Space Entity is equated with Energy**. In other words, *Space* is "made out" of *Energy*. So, according to this novel idea, the "medium" that can be *Distorted* in any of the *Space/Time Entities* is *Energy*. Thus, if *Space* is *Energy*, it can be assumed that the "fabric" or "medium" of each of the *Space Entities* existing in the suggested **three Interwoven Space/Time Entities**, consists of the **Energy** embedded in that specific *Entity*: The *Mass Interwoven Space/Time Entity* - **MA-G-IST**, embeds the *Energies* of the *Gravitational Fields*; The *Positive Electric Charge Interwoven Space/Time Entity* - **PC-G-IST**, embeds the *Energies* of the *Electric and Magnetic Fields* generated by *Positive Electric Charges* [5]; And the *Negative Electric Charge Interwoven Space/Time Entity* - **NC-G-IST** embeds the *Energies* of the *Electric and Magnetic Fields* generated by *Negative Electric Charges* [5].

Thus, to summarize what was presented above: *The New Model* presents three *Entities* of *Interwoven Space/Time*: A *Mass Interwoven Space/Time Entity* **MA-G-IST** that "guides" the *Accelerated Attraction* movement of *Mass Objects*; A *Positive Electric Charge Interwoven Space/Time Entity* **PC-G-IST** that "guides" the *Accelerated Attraction or Repulsion* of *Positive Electric Charges*, and a *Negative Electric Charge Interwoven Space/Time Entity* **NC-G-IST** that "guides" the *Accelerated Attraction or Repulsion* of *Negative Electric Charges*. As noticed before, it is important to remember that each of the **three Interwoven Space/Time Entities** is separate.

Electric Charges do not *Distort* the **Mass Interwoven Space/Time Entity MA-G-IST** and are not affected by it, but because each *Electric Charge* is attached to some *Mass*, *Electrically Charged Bodies* May *Distort* the *Mass Interwoven Space/Time Entity* exactly as *Uncharged Mass Objects* *Distort* the *Mass Interwoven Space/Time Entity*. In other word, The *Distortion* that *Electrically Charged Bodies* impose on the *Mass Interwoven Space/Time Entity*, is imposed only by the *Mass* that carry these *Electrically Charged Bodies*.

In addition, *Uncharged Mass Bodies* do not *Distort* any of the **two Electric Charge Interwoven Space/Time Entities** and are not affected by them. However, *Electric Charges*, both *Positive* and *Negative*, can alter, or *Distort* any of the two additional *Electric Charges Interwoven Space/Time Entities*; **PC-G-IST** and **NC-G-IST**, and can be affected by them.

Unlike *Mass Objects* that exhibit only *Accelerated Attraction* interactions, *Electrically Charged Bodies*, *Positive* or *Negative*, exhibit both *Attraction* and *Repulsion*. According to *Einstein's General Relativity Theory*, *Accelerated Attraction* between two *Mass Objects* is guided by a **Distortion** of the **MA-G-IST** by one *Mass Object* and the creation of a shape of a **Dimple** in it. This **Dimple** "guides" all other *Mass Objects* how to move. A **Dimple** shape is concluded from the mathematical workout related to *Einstein's General Relativity Theory*. If a shape of a **Dimple** in the **MA-G-IST Interwoven Space/Time Entity** causes *Accelerated Attraction* between *Mass Bodies* (Fig. 1), it can be assumed that, similarly, *Accelerated Attraction* between *Positive* and *Negative Electric Charges* are "guided" by the creation of a **Dimple** in one of the two *Electric Charges Interwoven Space/Time Entities* as follows:

A Positive Electrically Charged Body *Distorts* the *Negative Electric Charge Interwoven Space/Time Entity* - **NC-G-IST** by creating a **Dimple** in it (Figure 3); and because the **NC-G-IST** guides all *Negative Electric Charges* movements, this means that all *Negative Electric Charges* are *Attracted* towards the *Positive Electric Charge* that created the **Dimple** in the **NC-G-IST**, in an *Accelerated* movement "guided" by that **Dimple**.

A Negative Electrically Charged Body *Distorts* the *Positive Electric Charge Interwoven Space/Time Entity* - **PC-G-IST** by creating a **Dimple** in it (Figure 3); and because the **PC-G-IST** guides all *Positive Electric Charges* movements, this means that all *Positive Electric Charges* are *Attracted* towards the *Negative Electric Charge* that created the **Dimple** in the **PC-G-IST**, in an *Accelerated* movement "guided" by that **Dimple**.

However, to exhibit a **Repulsive Accelerated movement** of same polarity *Electrically Charged Bodies*, any of the *Distorted Electric Charge Interwoven Space/Time Entity* should exhibit a different shape of the *Distortion* imposed on that *Interwoven Space/Time Entity*. The question of what this shape looks like, and how it can cause a *Repulsive Acceleration* movement, might be answered by extending *Einstein's General Relativity Theory* to include *Repulsive* interactions, and to explain *Repulsion* between *Electrically Charged Bodies* of the same polarity. This new idea will be further explained in detail.

Possibility of Repulsion Between Objects in the Framework of Einstein's Interwoven Space/Time Model

Figure 1 above, provides a visualization of how *Einstein's General Relativity Theory* uses ***Distorted Interwoven Space/Time Entity*** caused by one *Mass Object* (in this case – Earth) to explain the *Attraction* between *Mass Objects*. This image shows how the Earth *Mass* creates a **Dimple** in the "fabric" of the *Interwoven Space/Time Entity*. This **Dimple** dictates or "guides" all other *Mass Objects* how to move (in what *Acceleration* magnitude and in what direction) towards the *Earth Mass*, which results in an *Accelerated Attraction* of all *Mass Objects* towards Earth. It is important to pay attention to the fact that the "fabric" of the slice of the *Interwoven Space/Time Entity* shown in Figure 1, is a 2-dimensional plane, which is one plane out of the infinite planes existing in the 4-dimensional construct of *Einstein's Interwoven Space/Time Entity*. In addition, the ***Distortion*** presented in this specific plane, the **Dimple**, embeds *Acceleration* of any other *Mass Object* whose direction is **towards** the *Earth Mass*, which implies that the **shape** of a **Dimple**, causes an *Accelerated Attraction* towards Earth. This explanation of *Accelerated Attraction* between *Mass Objects* according to *Einstein's General Relativity Theory*, is based on a complex, long-lasting mathematical workout [6], [10], [11], which a very simplified version of it can be presented, as elaborated in the following paragraph:

The *Interwoven Space/Time Entity* is a 4D construct that embeds the three dimensions of *Space*: X, Y, Z, and the dimension of *Time* T. Since it is a 4D construct it cannot be visualized or be precepted by human beings; Figure 1 provides a possibly precepted 3D illustration in which a *Distorted* plane is shown. This *Distorted* plane embeds two *Space* dimensions (X and Y; or Y and Z; or X and Z etc.) and the *Time* T dimension as a third dimension. This is a 3D illustration, in which it is possible to calculate both *the Velocity* and *the Acceleration* of *Mass Objects*.

Velocity in any axis of *Space*, for example the X-axis, is defined as the first derivative of that axis in respect to *Time* T - dx/dt . *Acceleration* in any axis of *Space*, for example the X-axis, is defined as the first derivative of the *Velocity* in respect to *Time* T - dv/dt , or the second derivative of the X-axis in respect to *Time* T - d^2x/dt^2 .

Both *Velocity* and *Acceleration* are vectors, which are defined by magnitude and direction. At any point of a ***Distorted Interwoven Space/Time Entity*** the second derivative of any axis of *Space* in respect to *Time* can be calculated, because this ***Distorted Interwoven Space/Time Entity*** is composed of three dimensions of *Space*: (X, Y, Z) and the *Time* (T) as the fourth dimension.

As such, the **shape** of the ***Distorted Interwoven Space/Time Entity*** **already** embeds the "guided" *Acceleration* in each point of it, including both, direction and magnitude.

If a **Dimple** in the *Interwoven Space/Time Entity*, similar to the Dimple shown in Figure 1, has been shown mathematically by *Einstein's General Relativity Theory* to represent a source of **Attraction** [6], [10], [11], then according to the same mathematical workout, a *Distorted* shape that would be able to cause the opposed-direction movement, a

Repulsion, or a *Repulsive Acceleration*, would be a **mirror image of a Dimple**, which is a **Hill** (or a **Hump**) in the *Interwoven Space/Time Entity*. In this view, expanding *Einstein's General Relativity Theory* can explain **Repulsive Forces** in an *Interwoven Space/Time Entity* as well as **Attraction**.

However, *Repulsive Forces* are exhibited only by *Same Polarity Electric Charges*. Therefore, formation of a **Hill** in the "fabric" of one of the *Electric Charge Interwoven Space/Time Entities*, either **PC-G-IST** or **NC-G-IST**, by an *Electrically Charged Body*, would cause a **Repulsive Acceleration** of all other *Electrically Charged Bodies* having the *Same Polarity* as the *Polarity* of the *Electrically Charged Body* that created this **Hill Distortion**, from it. This idea is further explained in the following section by more visualization images.

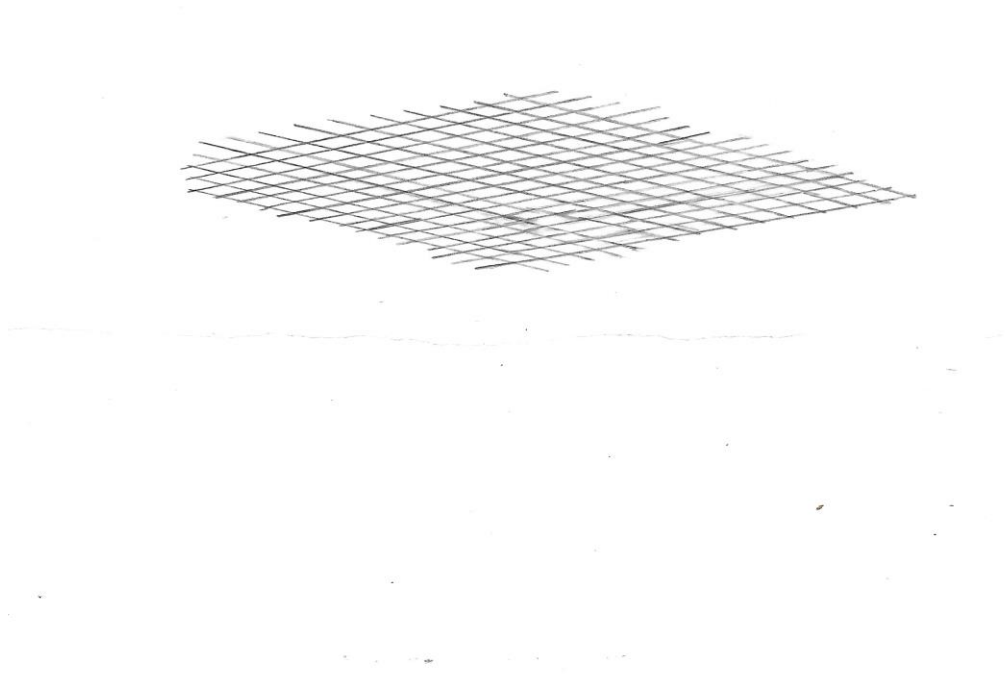


Fig 2 | Visualization of a "fabric" of a "flat" *Interwoven Space/Time Entity*.

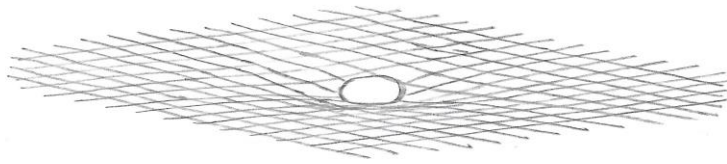


Fig 3 | Visualization of a ***Dimple Distortion*** created by a *Mass Object* or an *Electrically Charged Body* in an *Interwoven Space/Time Entity*

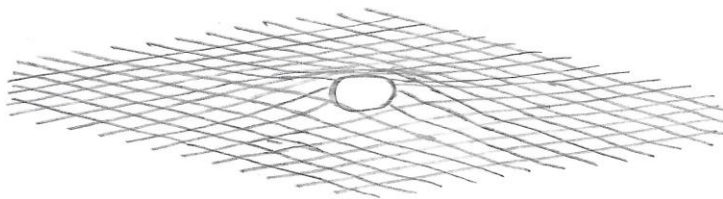


Fig 4 | Visualization of a ***Hill Distortion*** created by an *Electrically Charged Body* in an *Interwoven Space/Time Entity*

Figure 2 is a visualization of a theoretical 2-dimensional plane "fabric" of a "flat" *Interwoven Space/Time Entity*. In such an **Undistorted** *Interwoven Space/Time Entity*, the *Acceleration* embedded in each point of it is zero or: $d^2x/dt^2=0$. There are no *Mass Objects Attracted* to it, nor *Electrically Charged Objects Attracted* to it or *Repelled* from it. Such an *Interwoven Space/Time Entity*, that cannot exist, lacks a "guide" of *Acceleration*. Such a "guide", according to the new model of *three Interwoven Space/Time Entities* suggested in this study, should be a *Mass object* or an *Electrically Charged Body*, either *Positive* or *Negative* that creates a *Distortion* in the *Interwoven Space/Time* entity.

Figures 3 is a visualization of a 2-dimensional plane of a "fabric" of a **Distorted** *Interwoven Space/Time Entity*, which embeds a **Dimple**, similarly to the *Distorted Interwoven Space/Time Entity* presented in Figure 1. According to the *New Model of three Interwoven Space/Time Entities* suggested in this study, an object that can create such a **Dimple**, is either a *Mass Object* or an *Electrically Charged Body*, *Positive* or *Negative*. The *Acceleration* embedded in each point of the **Dimple** is directed towards the bottom of the **Dimple**, which implies **Attraction**.

Figures 4 is a visualization of a 2-dimensional plane of a "fabric" of a **Distorted** *Interwoven Space/Time Entity*, which embeds a **Hill** (or a **Hump**). According to the *New Model of three Interwoven Space/Time Entities* suggested in this study, an object that can create such a **Hill**, is only an *Electrically Charged Body*. It cannot be a *Mass Object* because *Mass Objects* exhibit only *Attraction Accelerated Forces* by creating a **Dimple**. The *Acceleration* embedded in each point of the **Hill** is directed outwards, from the top of the **Hill**, which implies **Repulsion**.

Thus, to exhibit a *Repulsive Accelerated* movement of same polarity *Electrically Charged Bodies*, the *Distorted Electric Charge Interwoven Space/Time Entity* should exhibit a 'mirror image' of a **Dimple**, which is a **Hill** (or a **Hump**), as shown in Figure 4. A **Hill** shape *Distortion* in the *Electric Charge Interwoven Space/Time Entity* would cause a *Repulsive Acceleration* movement of same polarity *Electrically Charged Bodies*, from each other. This idea complies with the mathematical workout related to *Einstein's General Relativity Theory* and enables to expand *Einstein's General Relativity Theory* to include *Repulsive* interactions, and to explain *Repulsive Forces* between *Electrically Charged Bodies* of the same polarity.

Attraction and Repulsion of Electrically Charged Bodies in the Framework of The Proposed New Model

A *Dimple Shape Distortion* in an *Electric Charge Interwoven Space/Time Entity* resembles a *Dimple Distortion* created by *Mass Objects* in the **MA-G-IST**, which guides **Attraction Forces** between *Mass Objects*. In the same way, whenever a *Dimple Distortion* is created in any of the two *Electric Charge Interwoven Space/Time Entities*, the *Electrically Charged Bodies* that are guided by this specific *Dimple Distortion* will be **Attracted** to the *Electrically Charged Body* that created the *Dimple*. It is important to remember that the *Attraction Force* between *Electrically Charged Bodies*, complies with *Coulomb's Law*, which has the same formulation structure as the *Universal Gravitation Law*.

A *Hill Shape Distortion* in an *Electric Charge Interwoven Space/Time Entity* resembles a 'Mirror Image' of a *Dimple Shaped Distortion* created by *Mass Objects* in the **MA-G-IST**, and therefore guides a **Repulsion Force**. So, whenever a *Hill Distortion* is created in any of the two *Electric Charge Interwoven Space/Time Entities*, the *Electrically Charged Bodies* that are guided by this specific *Hill Distortion*, will be **Repelled** from the *Electrically Charged Body* that created the *Hill*. The *Repulsion Force* guided by a *Hill Distortion*, complies with *Coulomb's Law*, which has the same formulation structure as the *Universal Gravitation Law*.

Each *Electrically Charged* body moves according to what *its Electric Charge Interwoven Space/Time Entity* "guides". The **Positive Electric Charge Interwoven Space/Time Entity - PC-G-IST** guides *Positive Electric Charges* how to move (*Acceleration* magnitude and direction); and the **Negative Electric Charge Interwoven Space/Time Entity - NC-G-IST** guides *Negative Electric Charges* how to move. Each *Electrically Charged Body* Can *Distort* each of the *Interwoven Space/Time Entities: PC-G-IST* and *NC-G-IST*, differently:

1. Positive Electric Charges *Distort* the **PC-G-IST** by creating a **Hill** in it, as can be visualized by Figure 4; *Positive Electric Charges* can also *Distort* the **NC-G-IST** by creating a **Dimple** in it, similarly to the way a *Mass Object* creates a **Dimple** in the *Mass Interwoven Space/Time Entity* (Fig. 3). These two different *Distortions* imply that a *Positive Electrically Charged Body* Always *Repels* all other *Positive Electrically Charged Bodies*, and Always *Attracts* all *Negative Electrically Charged Bodies*.
2. Negative Electric Charges *Distort* the **NC-G-IST** by creating a **Hill** in it, as can be visualized by Figure 4; *Negative Electric Charges* can also *Distort* the **PC-G-IST** by creating a **Dimple** in it, resembling the way a *Mass Body* creates a **Dimple** in the *Mass Interwoven Space/Time Entity* (Fig.3). These two different *Distortions* imply that a *Negative Electrically Charged Body* Always *Repels* all other *Negative Electrically Charged Bodies*, and Always *Attracts* all *Positive Electrically Charged Bodies*.

The fact that each *Electrically Charged Body*, *Positively* or *Negatively Charged*, *Distorts* each of the two *Electric Charge Interwoven Space/Time Entities* differently, complies with the idea that *Space is equated with Energy* [5]; Each of the two *Electric Charge Interwoven Space/Time Entities*, **PC-G-IST** and **NC-G-IST**, embeds different *Energy*; **PC-G-IST** embeds the *Energy* generated by the *Positive Electrically Charged Bodies*, and **NC-G-IST** embeds the *Energy* generated by the *Negative Electrically Charged Bodies*.

Following is a summary of the above discussion related to the *Attraction/Repulsion Forces* between *Electrically Charged Bodies*, according to the New Model of three *Interwoven Space/Time Entities* proposed by this study:

1. *Positive Electrically Charged Bodies* Distort the *Negative Electric Charge Interwoven Space/Time Entity - NC-G-IST* by creating a **Dimple** in it, which "guides" an *Accelerated Attraction* of all *Negative Electrically Charged Bodies* towards this Dimple, or towards the *Positive Electrically Charged Body* that created that Dimple.
2. *Positive Electrically Charged Bodies* Distort the *Positive Electric Charge Interwoven Space/Time Entity - PC-G-IST* by creating a **Hill** in it, which "guides" an *Accelerated Repulsion* of all other *Positive Electrically Charged Bodies* outwards from the top of this Hill, or outwards from the *Positive Electrically Charged Body* that created that Hill.
3. *Negative Electrically Charged Bodies* Distort the *Positive Electric Charge Interwoven Space/Time Entity - PC-G-IST* by creating a **Dimple** in it which "guides" an *Accelerated Attraction* of all *Positive Electrically Charged Bodies* towards this **Dimple**, or towards the *Negative Electrically Charged Body* that created that Dimple.
4. *Negative Electrically Charged Bodies* Distort the *Negative Electric Charge Interwoven Space/Time Entity - NC-G-IST* by creating a **Hill** in it, which "guides" an *Accelerated Repulsion* of all other *Negative Electrically Charged Bodies* outwards from the top of this **Hill**, or outwards from the *Negative Electrically Charged Body* that created that Hill.

4. Discussion

Initially, developing a *New Model of three Interwoven Space/Time Entities* was intended to provide a theoretical framework for explaining the **origins** of the *Electric Attraction or Repulsion Forces* between *Electrically Charged Bodies*. *The New Model of three Interwoven Space/Time Entities* indeed provides such an explanation by introducing **three Interwoven Space/Time Entities** that can "guide" either *Mass Objects* or *Positively* or *Negatively Electrically Charged Bodies* **how to move** or determine the *Acceleration* magnitude and the direction of movement. As in *Einstein's General Relativity Theory*, where a *Mass Object* Distorts the **MA-G-IST**, and the *Distortion* determines how any other *Mass Objects* are *Attracted* to it in an *Accelerated* movement, in *The New Model of three Interwoven Space/Time Entities*, in addition, a *Positively* or a *Negatively Electrically Charged Body* Distorts each of the **PC-G-IST** and **NC-G-IST** and the *Distortion* determines how (direction and *Acceleration* magnitude) other *Electrically Charged Bodies* are *Attracted-to*, or are *Repelled-from* it. So, the *New Model of three Interwoven Space/Time Entities* provides an appropriate framework for explaining *Electrically Charged Bodies Attraction or Repulsion origins*, in compliance with the explanation given by *Einstein's General Relativity Theory* to *Mass Objects Attraction*. In both cases the **origins** of the *Attraction or Repulsion Acceleration Force*, is rooted in the **Distortion** of the appropriate *Interwoven Space/Time Entity* which determines the direction and the *Acceleration* magnitude of the movement.

In this section another revolutionary conclusion will be derived, relating to the connection between the *Acceleration* existing in the *Attraction* or *Repulsion* between *Electrically Charged Bodies* and the *Mass Magnitudes* of the *Bodies* that carry these *Electric Charges*, which follows from *the New Model of three Interwoven Space/Time Entities* developed in this study.

Einstein's General Relativity Theory was initially based on *Newton's* idea that a Gravitational Field is a form of Acceleration. According to *Newton's Gravitational Theory*, a *Mass Body* m_1 dictates or guides the *Acceleration* in which any other *Mass Body* m_2 is *Attracted* to it through the *Gravitational Field*. In other words, a *Gravitational Field* created by one *Mass Object*, dictates, or guides the *Acceleration* of any other *Mass Object's* movement in that *Gravitation Field*.

Einstein's General Relativity Theory has not changed this basic idea; it has only changed the terminology in compliance with his *General Relativity Theory*: The term: "*Gravitational Field*" in the basic classic *Newton's Theory* was replaced by the term: "*Distortion of the Interwoven Space/Time*" in the *General Relativity Theory*, so that each of these two terminologies can be considered as a "Guide of Acceleration". In *Einstein's General Relativity Theory*, *Mass Objects' Accelerated Attraction* origins come from the *Distortion of the Interwoven Space/Time* entity, but, as noted above, this *Interwoven Space/Time Entity* is identical to the *Newton's Gravitational Field*. Therefore, both the *Distortion of Einstein's Interwoven Space/Time Entity* **and** the *Gravitational Field*, can be considered a form of Acceleration.

Analogously, in *The New Model of three Interwoven Space/Time Entities* whenever an *Electrically Charged Body* q_1 *Distorts* the **PC-G-IST** or the **NC-G-IST**, the *Distortion* functions as a guide of the *Accelerated* movement of any other *Electrically Charged Body* q_2 , that can be either *Attracted*-to it or *Repelled*-from it, but, both **the PC-G-IST** and the **NC-G-IST** are **also** considered as *Energy* embedded in the *Electric Field*, as was already stated in a previous section of this article, and therefore, **both** the **PC-G-IST** and/or the **NC-G-IST** **and** the *Electric Field*, can be considered a form of Acceleration. Therefore, the same as a *Gravitational Field is a form of Acceleration*, *Electric Fields* can also be considered as a form of Acceleration.

Although this idea, that the *Electric Fields* can also be considered as a form of Acceleration, **is** new, it could have been derived long time ago by a simple mathematical elaboration of *Coulomb's Law*, which provides the *Electric Force* F of *Attraction*, or *Repulsion* between two *Electrically Charged Bodies*:

$$F = K_e \cdot (q_1 \cdot q_2) / r^2.$$

The *Electric Field* – E , induced by an *Electrically Charge Body* that has been shown by the present study, to be a form of Acceleration, is expressed by the formula:

$$E = K_e \cdot q_1 / r^2 [8].$$

Coulomb's Law can be rewritten, then, as: $F = q_2 \cdot E$, which is fully analogous to the formula:

$$F = m_2 \cdot g \quad \text{in } \textit{Newton's Gravitational Theory}, \text{ where } g \text{ represents the } \textit{Gravitational Acceleration}.$$

The similarity between these two formulae might imply that an ***Electric Field - E is also a form of Acceleration***, exactly as a *Gravitational Field - g*, is a form of *Acceleration* as related to *Newton's Gravitational Theory*.

The fact that the *Electric Field* is a form of *Acceleration* can be also derived directly from the *Coulomb's Law Force*. Because the *Coulomb's Force* between two *Electrically Charged Bodies Attracted-to or Repelled-from* each other, changes continuously, the velocity in the movement, of these two *Electrically Charged Bodies*, also changes continuously, which implies Acceleration. And since the *Coulomb's Force* is caused by the *Electric Field*, that *Electric Field* is a form of *Acceleration*. All that, is again, in complete analogy to the *Gravitational Force*, which also changes continuously, such that the velocity in the movement, of two *Mass Bodies Attracted* under this *Gravitational Force*, also changes continuously, which implies Acceleration. And since the *Gravitational Force* is caused by the *Gravitational Field*, that *Gravitational Field* is a form of *Acceleration*.

Obviously, this idea, that an ***Electric Field - E is also a form of Acceleration***, could have been derived before developing *Einstein's General Gravitational Theory* and the present *New Model of three Interwoven Space/Time Entities*, as it might be implied from *Coulomb's and Newton's Theories*, but the idea that an *Electric Field - E - might be also a form of Acceleration*, was not given the appropriate attention. Now, after developing *The New Model of three Interwoven Space/Time Entities*, the idea that an *Electric Field - E - is a form of Acceleration*, may have **surprising implications** and conclusions as further discussed in the following paragraphs of this article.

Before elaborating on the above mentioned surprising implications, it should be also noted that the *Distortion* in each of the ***Electric Charge Interwoven Space/Time Entities*** will also create the situation in which the movement between the *Electrically Charged Bodies* will comply **completely** with *Coulomb's Law*: $\mathbf{F} = \mathbf{K}_e \cdot (\mathbf{q}_1 \cdot \mathbf{q}_2) / \mathbf{r}^2$ [2], if the *Acceleration* embedded in that ***Distorted Interwoven Space/Time Entity***, will be equal to $\mathbf{K}_e \cdot \mathbf{q}_1 / \mathbf{r}^2$, because of the following argumentation:

It was already stated above that this ***Distorted Electric Charge Interwoven Space/Time Entity***, **which is a form of Acceleration**, also embeds the *Energy* of the *Electric Field - E*, induced by the *Electrically Charged Body q₁* that imposed that *Distortion*.

However, as stated above, the *Electric Field - E*, induced by an *Electrically Charge Body q₁* is expressed by the formula:

$$\mathbf{E} = \mathbf{K}_e \cdot \mathbf{q}_1 / \mathbf{r}^2 \text{ [8]}.$$

Thus, *Coulomb's Law* $\mathbf{F} = \mathbf{K}_e \cdot (\mathbf{q}_1 \cdot \mathbf{q}_2) / \mathbf{r}^2$ [2], can be rewritten as: $\mathbf{F} = \mathbf{q}_2 \cdot \mathbf{E}$.

Then, if the **embedded** *Acceleration* in the above mentioned ***Distorted Electric Charge Interwoven Space/Time Entity***, is equal to the *Electric Field E magnitude which is* $\mathbf{K}_e \cdot \mathbf{q}_1 / \mathbf{r}^2$, as stated above, and that *Electric Field - E*, is also the

Energy embedded in that ***Distorted Electric Charge Interwoven Space/Time Entity***, then, from the equation $\mathbf{F} = \mathbf{q}_2 \cdot \mathbf{E}$ follows that any *Electrically Charged Body* \mathbf{q}_2 , residing in that ***Distorted Electric Charge Interwoven Space/Time Entity***, and, thus, also residing in that *Electric Field* – \mathbf{E} , will be attracted-to or Repelled-from the *Electrically Charged Body* \mathbf{q}_1 that imposed that *Distortion*, **as if** a *Force* \mathbf{F} which fully complies with the *Coulomb's Law* $\mathbf{F} = \mathbf{K}_e \cdot (\mathbf{q}_1 \cdot \mathbf{q}_2) / \mathbf{r}^2$, was exerted on it.

It is worthwhile to pay attention to why in the previous section the situation was presented only **as if** a *Force* complying to *Coulomb's Force* was exerted. Because, as was already mentioned before, the *New Theory*, presented in this article, **like** *Einstein's General Relativity Theory*, states, that what really occurred, is that the *Accelerated* motion which occurred between the *Electrically Charged Bodies* was **not** controlled by any *Force* or by any *Field*. This **Accelerated** motion was only a result of the **Acceleration already embedded** in the above mentioned ***Distorted Electric Charge Interwoven Space/Time Entity***. And that **embedded** *Acceleration* **forced** any *Electrically Charged Body* which is “guided” by the above mentioned ***Distorted Electric Charge Interwoven Space/Time Entity***, to *Accelerated* with that *Acceleration*. And the *New Model*, presented in this article, does not assume, that there were any *Forces* or *Fields* involved in the generation of this motion. But, as explained above, if the *Acceleration* embedded in that ***Distorted Interwoven Space/Time Entity***, will be equal to $\mathbf{K}_e \cdot \mathbf{q}_1 / \mathbf{r}^2$, this motion will **seem as if** a *Force* complying fully with *Coulomb's Law* is exerted on the *Electrically Charged Bodies* that are **forced** to move because of the **embedded** *Acceleration* in that ***Distorted Interwoven Space/Time Entity***.

Thus, one surprising implication related to the statement that the *Electric Field* is a form of *Acceleration*, is the conclusion derived above, that the *Coulomb's Force* acting between *Electrically Charged Bodies*, as the *Classic Electromagnetism* claims, might not be existing at all. Because, what is stated above, is that the *Attractions* and/or *Repulsions* between *Electrically Charged Bodies* is not rooted in the *Coulomb's Force*. What was claimed above is that these *Attractions* and/or *Repulsions* are rooted **only** in the **embedded** *Acceleration* in the ***Distorted Electric Charge Interwoven Space/Time Entities***. Although this conclusion might not seem surprising if the *New Model* presented in this article is accepted as reasonable and viable, still, arriving at the conclusion that the notion of *Coulomb's Law*, which is a major corner stone in *Classic Electromagnetism*, is just a fiction and does not really exist, is a surprising conclusion. However, this article will continue to use the term *Coulomb's Law Force* because it is a common term.

However, the relation between the *Acceleration* in the *Attractions* or *Repulsions* between *Electrically Charged Bodies*, and the *Mass Magnitudes* of the *Bodies* that carry these *Electric Charges*, as will be elaborated in the next paragraph of this article, and which is also a conclusion derived from the *New Model* and the statement that *Electric Fields* are a form of *Acceleration*, might seem even more surprising.

Because this *New Theory* like *Einstein's General Relativity Theory*, does **not assume** any *Forces* or *Fields* the above also implies, that for any *Electrically Charged Body*, which is “guided” or dictated to move with an **embedded** *Acceleration* in

a ***Distorted Electric Charge Interwoven Space/Time Entity***, the *Mass* that is contained in that *Electrically Charged Body* will also be **forced** to move with that *Acceleration*, **regardless** of the actual *Mass* magnitude of that *Mass*, because this motion is **forced** or dictated by the *Acceleration* and not by any *Force*. This means, on one hand, that the *Mass* that is contained in that *Electrically Charged Body* **never violates** *Newton's Second Law*, $F = m \cdot a$, because no *Forces* are assumed in that movement. But, on the other hand, this means that *Newton's Second Law* might be **not** applicable, and it might be that it cannot be used in scenarios that contain *Attractions* or *Repulsions* between *Electrically Charged Bodies*!!! And, in addition to that, if the *Acceleration* embedded in that ***Distorted Interwoven Space/Time Entity***, will be $K_e \cdot q_1 / r^2$, the above movement will also comply completely to a situation in which the *Coulomb's Law* is also obeyed, **as if** such a *Force* was exerted on the *Electrically Charged Bodies*!!!

However, it should be emphasized, that the statement presented above, that the *Mass* that is contained in that *Electrically Charged Body* will also be **forced** to move with the *Acceleration* embedded in the ***Distorted Electric Charge Interwoven Space/Time Entity***, which also implies that *Newton's Second Law* might be **not** applicable, can be stated only in scenarios where the *Gravitational Law* effect on the *Electrically Charged Bodies* is negligible, as compared to the *Coulomb's Law* effect on these *Electrically Charged Bodies*, which it the usual scenarios in all cases of *Electrically Charged Bodies* which are not of the size of *Astronomical Bodies*, such as *Planets*. This will be further elaborated in the next section of this article, that proposes a lab experiment which might provide a way to validate the *New Model* described in this article.

So far it is clear that if the *New Model*, presented in this article will be found reasonable and viable, this implies that there exists a full analogy between *Mass Objects'* interactions, and *Electrically Charged Bodies'* interactions, and their resulted movement related to both the basic *Newton's* and *Einstein's Theories* and *The New Model of three Interwoven Space/Time Entities* developed in this study. The **origins** of these interactions are similar as related to *The New Model of three Interwoven Space/Time Entities*, and so are the significance of the *Fields*, either the *Gravitational Field* or the *Electric Field*, which are both **not only Fields** but also **a form of Acceleration** as related to *Newton's* and *Coulomb's Theories*. A further step into this interesting analogy may further clarify the significant meaning of *Acceleration* in the movement rules of *Electrically Charged Bodies*.

The meaning of what was stated above is revolutionary and significant, because this implies that the **Acceleration** of two *Electric Charges Attracted-to*, or *Repelled-from* each other, should be a function of the *Electric Charge Magnitude* of these two *Electric Charges*, **and** not a function of the *Mass* magnitudes of the *Bodies* on which these two *Electric Charges* reside, **in contrast** to the conclusion of *Newton's Theory* that this *Acceleration* always complies to the equation $F = m \cdot a$. This enables the validation of the novel theory offered by the current work, by a lab experiment designed to examine this idea, as will be further elaborated in the next section of this article.

5. Suggestion of a Lab-Experiment to Validate the New Model of Three Interwoven Space/Time Entities

The *New Model of three Interwoven Space/Time Entities* suggests that each *Electric Charge* - q_1 "guides" the *Acceleration* in which any other *Electric Charge* - q_2 is *Attracted-to* or *Repelled-from* it by *Distorting* the *Electric Charge Interwoven Space/Time Entities*, proposed in this article, and that imposes an **embedded** *Acceleration* in each of the *Distorted Electric Charge Interwoven Space/Time Entities*. As a result, the *Acceleration* of two *Electric Charges Attracted-to*, or *Repelled-from* each other should be a function of the *Electric Charge Magnitude* of each of these two *Electric Charges* and **not** of the *Mass Magnitude* of the *Bodies* that carry these *Electric Charges*. This idea establishes the basis of a lab-experiment to enable experimental validation of the new theory suggested by this study.

Before going into the implementation details of the experiment, it is important to note that **all**-natural objects possess both *Mass* and *Electric Charge Entities*. Therefore, *Electrically Charged Bodies* are always carried by *Mass*, while *Neutrally Charged Bodies* exhibit *Mass* only. In other words, while many *Uncharged Mass Bodies* exist in the natural world, there is no *Electric Charge* that is not attached to some *Mass*. So, *Electrically Charged Bodies* always exhibit both *Electric Charge* and *Mass Entities*.

The everyday usual experience implies that if two *Uncharged Mass Bodies* are placed on a *Horizontal* surface, they will not move one towards the other. This happens even though a *Horizontal Gravitational Attraction Force* tries to *Attract* them one towards the other. That happens because this *Gravitational Attraction Force* is very small and cannot overcome other forces operating on these *Uncharged Bodies*, such as the friction between these bodies and the surface they are placed on. However, if these bodies are charged with a reasonable amount of *Electric Charge*, they will be *Attracted/Repelled* to/from each other, because the *Coulomb's Force* is bigger as compared to the *Gravitational Force* mentioned above, and that *Coulomb's Force* can overcome all other forces that inhibit these bodies motion.

According to the theory presented in this article, each natural *Electrically Charged Body* movement should be "guided" by **three** *Interwoven Space/Time Entities*: *Einstein's Mass Interwoven Space/Time Entity* should "guide" the body's **Mass** how to move, and an *Electric Charge Interwoven Space/Time Entity*, **PC-G-IST**, or **NC-G-IST** should "guide" its **Electric Charge** how to move. So, an obvious question arises: "Who guides *Electrically Charged Body's* movement and *Acceleration*?"

Looking into some basic calculated data relating to the *Gravitational Force* and the *Coulomb's Force*, may provide an answer to this question: The *Gravitational Force* between two 1-kg *Mass Objects* that are 1 meter apart is $6.67 \cdot 10^{-11}$ Newtons [16], while the *Attraction or Repulsion Coulomb's Force* between two 1 *Coulomb Electrically Charged Bodies*, held 1 meter apart, is $9 \cdot 10^9$ Newtons [17]. And, the *Gravitational Force* between the two 1-kg *Mass Bodies* will

generate an *Acceleration* of $6.67 \cdot 10^{-11} \text{ m} \cdot \text{s}^{-2}$ according to *Newton's* second law ($F=m \cdot a$), while the *Acceleration* between the *Electrically Charged Bodies*, predicted by this article will be $9 \cdot 10^9 \text{ m} \cdot \text{s}^{-2}$, because this *Acceleration* is a function of the *Charge Magnitude* of each of these two *Electric Charges* and not of the *Mass Magnitude* of the *Bodies* that carry these *Electric Charges* and that *Acceleration* magnitude is equal to the magnitude of the *Electric Field* - $E=K \cdot q/r^2$. This calculated data indicates that *Coulomb's Force* exerted on an *Electrically Charged Body* is usually much more effective than the *Gravitation Force* exerted on that *Electrically Charged Body*, by a magnitude factor of $1.35 \cdot 10^{20}$! This implies that the *Gravitational Force* effect on an *Electrically Charged Body* is usually negligible in comparison to the *Coulomb's Force* effect on that same *Electrically Charged Body*. So, the *Acceleration* resulted from the *Gravitation Force* exerted on two *Electrically Charged Bodies* is usually negligible as compared to the *Acceleration* resulted from the *Coulomb's Force* exerted on these two same *Electrically Charged Bodies*. Therefore, and according to the new model of the three *Interwoven Space/Time Entities*, the *Acceleration* of two *Electrically Charged Bodies*, *Attracted* to or *Repelled* from, each other should be usually a function of the *Electric Charge* magnitude of these two *Electrically Charged Bodies* and not a function of the *Mass* magnitude of these two *Electrically Charged Bodies*.

However, 1 Coulomb *Electric Charges* are rare and *Electric Charges* are usually in the range of 10^{-3} or 10^{-6} or 10^{-9} , or even 10^{-12} Coulombs. Thus, if the 1 Coulomb *Electric Charges*, mentioned above, will be changed to 10^{-9} Coulomb *Electric Charges*, the *Coulomb Force* between the *Electric Charges* will be now $9 \cdot 10^{-9}$ Newtons and the *Acceleration* between the *Electrically Charged Bodies*, that this article predicts will be now $9 \text{ m} \cdot \text{s}^{-2}$, still many orders of magnitude greater, about $1.35 \cdot 10^{11}$ greater, than the *Acceleration* between the *Mass Bodies* created by the *Gravitation Force* between the 1-kg *Mass Bodies* mentioned above.

Only if the two 1 Coulomb *Electric Charges*, mentioned above, will be changed to 10^{-12} Coulomb *Electric Charges*, the *Coulomb Force* between the *Electric Charges* will now be $9 \cdot 10^{-15}$ Newtons, which is smaller than the *Gravitational Attraction Force* between these two 1-kg *Mass Bodies*. However, in this case, these *Electrically Charged Bodies* will not move, because now, also the *Coulomb's Force* is too small to overcome all other forces (such as friction) which inhibit the movement of these bodies. But, if these bodies will be in outer space, and no other forces, apart from the *Coulomb's Force* and the *Gravitational Attraction* between the bodies, will exist between them, this article predicts, that these bodies will now move and the *Acceleration* because of $F= m \cdot a$ will still be $6.67 \cdot 10^{-11} \text{ m} \cdot \text{s}^{-2}$, and the *Acceleration* between the *Electrically Charged Bodies*, that this article predicts will be $9 \cdot 10^{-3} \text{ m} \cdot \text{s}^{-2}$, still about $1.35 \cdot 10^8$ greater, than the *Acceleration* between the *Mass Bodies* created by the *Gravitation Force* between the two 1-kg *Mass Bodies* mentioned above.

Only if the two 1 – kg *Mass Bodies*, mentioned above, will be changed to 10^9 kg, and these *Mass Bodies* will be in outer space with no other forces applied on them, they will move with an *Acceleration* according to $F=m \cdot a$, because now that *Acceleration* will be $6.67 \cdot 10^{-2} \text{ m} \cdot \text{s}^{-2}$, bigger by a factor of about 7.4, as compared to the *Acceleration* that *Eclectically*

Charged Bodies, each charged by 10^{-12} Coulombs, can generate, which, as shown above, will be $9 \cdot 10^{-3} \text{ m} \cdot \text{s}^{-2}$, as this article predicts.

This implies that $\mathbf{F}=\mathbf{m} \cdot \mathbf{a}$ should be used **only in cases** of **Uncharged** (or *Neutrally Charged*) *Bodies* or very *Massive Bodies*. Because *Planets* are *Uncharged Bodies*, or *Electrically Neutral Bodies*, and very *Massive Objects*, (*Earth Mass*, for example, is $5.9722 \cdot 10^{24} \text{ kg}$) the *Acceleration* between *Planets* movements obeys Newton's second law, $\mathbf{F}=\mathbf{m} \cdot \mathbf{a}$, as is known from experience.

Thus, although situations can be created were the effect of the *Universal Gravitation Law* effect on an *Electrically Charged Body* is **not** negligible in comparison to the *Coulomb's Law* effect on that *Electrically Charged Body*, usually, it is well established that the dominant force exerted on *Electrically Charged Bodies*, residing in an Earth lab, is usually *Coulomb's Force* and not the *Gravitational Force*, because the *Gravitation Force* exerted between these *Electrically Charged Bodies* is usually negligible and insignificant as compared to the *Coulomb's Force* exerted between these *Electrically Charged Bodies*. However, the acceptable notion among many professionals in the field, is that the *Acceleration* resulting from the *Coulomb's Force* exerted on *Electrically Charged Bodies* is determined by the *Mass* magnitude of the *Electrically Charged Bodies*, and can simply be calculated according to *Newton's Second Law*: $\mathbf{F}=\mathbf{m} \cdot \mathbf{a}$ [18],[19]. According to this approach, the *Acceleration* of a moving *Electrically Charged Body*, that moves under the *Coulomb's Force*, is usually simply calculated by dividing the *Coulomb's Force* exerted on the *Electrically Charged Body* by the *Electrically Charged Body Mass*. This, of course, is an application of *Newton's Second Law*, which states that any *Force* (including *Coulomb's Force*) that is exerted on a *Mass Object*, or on an *Electrically charged Body* that carries *Mass*, *Accelerates* according to the *Newton's Second Law*: $\mathbf{F}=\mathbf{m} \cdot \mathbf{a}$, and the *Acceleration* magnitude is calculated by it.

However, in the framework of *The New Model of three Interwoven Space/Time Entities* this approach is wrong. *The New Model of three Interwoven Space/Time Entities* predicts that the *Electric Charge Interwoven Space/Time Entities*, **PC-G-IST**, and **NC-G-IST**, which contain the *Energy* embedded in the *Electric Field* $\mathbf{E} = \mathbf{K}_e \cdot \mathbf{q}/\mathbf{r}^2$, are a form of *Acceleration*, and it depends **only** on the *Electric Charge* q and not on any *Mass*; Therefore, the *Acceleration* of each of two *Electrically Charged Bodies Attracted-to* or *Repelled-from* each other should be usually dependent on the *Electric Charge Magnitude* of each of these two *Electrically Charged Bodies*, and **not** on their *Mass Magnitude*.

A lab-experiment that examines the above conclusion, derived from the new theory presented in the present study, might be also used to establish an experimental validation of *The New Model of three Interwoven Space/Time Entities* presented in this article. Thus, the experiment's goal should be to confirm that the *Acceleration* of each of two *Electrically Charged Bodies Attracted-to*, or *Repelled-from* each other, should be usually a function of their *Electric Charge Magnitude* only, and **not** a function of their *Mass* magnitude.

Implementation of the Suggested Lab-Experiment

Phase 1

Two small balls with equal *Mass* (for example: two small metal balls, 10 grams each) are placed on a *Horizontal* smooth surface with a remarkable small coefficient of friction, at any distance – r – apart. These two *Mass balls* should *Attract* each other according to *Newton's and Einstein's Gravitational Theories*. However, as shown before, this *Gravitational Attraction Force*, in the case of regular *Uncharged Mass Bodies* (as opposed to *Astronomical* bodies, such as *Planets*, that clearly exhibit *Gravitational Forces*), is so small that the *Gravitational Attraction Force* between the balls cannot overcome the other forces exerted on these balls, such as friction. As a result, these two equal *Mass* balls, that are placed on a very smooth surface, in a lab, would not move at all, and it would be impossible to record any movement or *Acceleration* between them.

Phase 2

However, if these two equal *Mass* balls are *Electrically Charged* with equal magnitude *Electric Charges* but *Opposite Polarity*, such as *Electric Charges*, $q+$ and $q-$, and the distance between them is still kept – r , as in the first phase of the experiment, and the two *Electrically Charged* balls are let free to be *Attracted* to each other according to *Coulomb's Law*, then they will *Accelerate* one towards the other until they meet. The *Mass Bodies* and the *Electric Charges* magnitudes should be such as to create the usual situation described above in which the *Universal Gravitation Law* effect on the *Electrically Charged balls* will be negligible in comparison to the *Coulomb's Law* effect on these *Electrically Charged balls*. For example, the *Mass Bodies* will be 10-grams and the *Electric Charges* 10^{-3} Coulomb. Since the *Attraction Coulomb's Force* between these two *Electric Charges* changes all the time from the beginning of their movement until they meet, a proper measurement that can provide an indication about the *Acceleration* magnitude during this experiment, is the *Time* from the beginning of their movement until they meet. This *Time T* is recorded.

Phase 3

Another set of two equal *Mass* and *Electrically Charged balls* are used, each ball *Charged* with the same amount of *Electric Charge* as the previous set: $q+$ and $q-$, but, this time, each *Electrically Charged ball* carries a **different Mass** magnitude than in the previous phase. The two balls should possess an equal *Mass* magnitude, but it should be significantly **different** from the *Mass* magnitude used in the previous phase, for example: 20 or 30 or 50 or 100 gram each; or 0.1 or 0.2 or 0.3 or 0.5 or 1 gram each. The distance between the balls should be also kept the same as in the previous phase - r . The same procedure is repeated with this second set of the equal (but different) *Mass* and *Electrically Charged balls*, the two *Electrically Charged balls* are let free to *Attract* each other according to *Coulomb's Law*; They will *Accelerate* one towards the other until they meet, and the **travel Time T** of the two balls from the beginning of their movement to the meeting point is recorded.

According to *The New Model of three Interwoven Space/Time Entities*, the *Acceleration* magnitude of the two balls in the present phase should be equal to the *Acceleration* magnitude in the previous phase, so that the recorded **travel Time - T** to the meeting point should be **the same** as in the previous phase of the experiment, because according to *The New Model of three Interwoven Space/Time Entities* what determines the *Acceleration* magnitude of each ball is its *Electric Charge* magnitude and **not** its *Mass* magnitude. If the *Electric Charge* magnitude in both phases is kept the same, even though the *Mass* magnitude has been changed, the *Acceleration* magnitude should remain the same, and thus, if the **travel Time - T** to the meeting point in the present phase indeed remains the same as in the previous phase of the experiment, it explicitly implies that the *Acceleration* of the *Electrically Charged balls* is dependent only on the magnitude of the *Electric Charge* that each of these *Electrically Charged balls* are carrying, and **not** on their *Mass* magnitude, in compliance with the theory provided by this study, which also implies that in this scenario **Newton's second law cannot be used** to calculate the *Acceleration* that occurred in this scenario.

Phase-3 of the experiment can, and should, be repeated several times, were **q+**, **q-**, and **r**, are kept the same all the times, and only the *Mass* magnitude of the two **equal Mass** and **equally Electrically Charged** balls, is changed. In every repeated experiment following the conditions explained above, the **Time travel - T** should be the same if indeed the *Acceleration* of the *Electrically Charged balls* is dependent only on the magnitude of their *Electric Charge*, and **not** on their *Mass magnitude*.

Additional Comments Related to the Proposed Lab-Experiment

First, it is important to pay attention to the fact that on each of the two, equal-Mass, equally-Electrically Charged balls, in each phase of the experiment, both **Vertical** and **Horizontal** forces are exerted. The experiment's aim is to prove that in the **Horizontal axis** the *Acceleration* of these two *Attracted Electrically Charged balls*, is affected only by their *Electric Charge* magnitude, and **not** by their *Mass* magnitude.

The **Horizontal Attraction** forces acting between the two *Electrically Charged balls* are two different forces that are rooted in two different sources of *Acceleration*: The *Attraction Forces* caused by the *Gravitational Attraction Force* between the two *Electrically Charged balls' Mass*, as one source of *Horizontal Forces* between the two balls; And the second source of the *Horizontal Forces* acting between the two balls is the *Coulomb's Force of Attraction* between the two *Electrically Charged balls' Electric Charge*, which, according to the theory developed in this study, will be the only dominant force that will eventually determine the *Acceleration* of the *Attraction* movement of these two balls. The *Gravitational Force* acting between these two *Electrically Charged balls*, as noted above is negligible in relation to the *Coulomb's Electrical Attraction Force*, because the *Mass* magnitude of the two balls is small (not of astronomic magnitude, such as planets).

In addition to the **Horizontal Forces** mentioned above, which are the focus of this study, an additional **Gravitation Vertical Force** is exerted on each of the two balls' *Mass*, Attracting it towards the center of the *Earth Mass*. This, of course, is the *Gravitational Force* acting between each of the *balls' Mass* and the *Earth Mass*. The *Earth Mass*, being of astronomic magnitude exerts an effective *Gravitational Force* in the **Vertical** direction, on each of the balls' *Mass*. Since this experiment intends to examine only what happens in the **Horizontal** direction, this force is not affecting the experimental observations related to the **Horizontal Attractions** between the two balls mentioned above. However, another **Horizontal Force** that might have a significant influence on the experiment's results is *Friction*, which is affected by the balls' *Mass* and the *Friction Coefficient* of the **Horizontal** surface, upon which the two *Electrically Charged balls* reside. This is the reason why the *Mass* of each of the balls, in each phase of the experiment, should be kept as small as possible, and the **Horizontal** surface upon which the two *Electric Charged balls* reside, should have a remarkably small *Friction Coefficient*. These two demands of the experiment ensure that the *Friction Force* acting in the **Horizontal** axis would be as small as possible.

Second, In the experimental process described above, both the *Mass* and the *Electric Charge* of each of the two *Electrically Charge balls*, move together as one unit with one noticeable *Acceleration*. This might be confusing; One may argue that the *Coulomb's Forces* is exerted on each of the balls' *Mass* and therefore, the balls' *Acceleration* should obey *Newton's Second Law: $F = m \cdot a$* . According to the new Model presented in this article this is not correct! It is worthwhile to emphasize again that according to the theory developed in this study, the *Attraction* between the two *Electrically Charged balls* in this experiment, is not rooted in a *Force* or a *Field*, the **origin** of this *Attraction* is the **embedded** *Acceleration* of the *Distorted Electric Charges Interwoven Space/Time Entities*, and even though these two *Electrically Charged balls* are carried by *Mass*, this *Acceleration* is **not** dependent on the magnitude of this *Mass*. After all, this was what was meant to be proved in this experiment. Following the *New Model of three Interwoven Space/Time Entities*, the *Acceleration* of the two *Electrically Charged balls* cannot be "guided" by the *Mass Interwoven Space/Time -MA-G-IST*; It should be "guided" **only** by the *Distortion of the Electric Charges' Interwoven Space/Time Entities PC-G-IST* and/or *NC-G-IST*, according to the *Distortion* of each of these *Entities* by the appropriate *Electric Charge*. Therefore, the balls' *Acceleration* that is measured indirectly, by recording the travel *Time* of the two balls – **T**, as described above, is "guided" only by the *Distortion of the Electric Charges' Interwoven Space/Time Entity*, and as this *Distortion* is a form of Acceleration, and that *Acceleration* is dependent only on the *Electric Charge* of each of the balls, and not on their *Mass* magnitude. As noted above, this is the actual idea upon which this experimental validation of the new theory, is based on. This also implies that in a scenario of two *Electrically Charged Bodies*, in order to calculate the *Acceleration* in the *Attraction/Repulsion* that occurs between these *Bodies*, **Newton's second law ($F = m \cdot a$) cannot always be used**.

In relation to the previous statement, that *Newton's second law* cannot always be used, the following should be also stated: *Newton's Second law* of motion, $F = m \cdot a$, was **not** developed and validated by looking into the details of motions and *Accelerations* between *Electrically Charged Bodies*. It was developed based on the knowledge that existed before *Newton*, provided by *Kepler* [20], [21], [22], about the trajectories existing in the *Solar System*. *Newton* used

this data when developing his *Gravitation* theory, and his laws of motion, as a proof that his laws are valid, because they forecasted what were already found by *Kepler*. As such, *Newton's* second law is based on *Gravitation*, which is also acknowledged by the study presented in this article. However, this article predicts that by investigating the *Acceleration* between *Electrically Charged Bodies*, it might turn out, that *Newton's second law* cannot always be used in such scenarios.

6. Summary and Conclusions

This work was mainly centered around an attempt to find the **origins** of the *Forces* between *Electrically Charged Bodies*, by studying the **analogies** which exist between *Mass* and *Electric Charge Entities*. One such well known **analogy** can be clearly identified in *Newton's Universal Gravitation Law* which defines the *Attraction Force* between *Mass Objects*, having an identical formulation structure as the *Coulomb's Law* which defines the *Attraction/Repulsion Force* between *Electrically Charged Bodies*. These two formulations are classified as *Classic Physics* and raise the question if any other possible **analogies** between the two *Entities* of *Mass* and *Electric Charge*, might be found. For example, while the **origins** of the *Accelerated Attraction* interactions between *Mass Objects* was studied and explained explicitly by *Albert Einstein's General Relativity Theory*, no explanation to the *Accelerated Attraction/Repulsion* interactions' **origins** of *Electrically Charged Bodies* was ever proposed. The current study was initially intended to examine this question, or to understand what initiates and evolves the *Attraction* or *Repulsion* defined by the *Coulomb's Force* between *Electrically Charged Bodies*, or the **origins** of their interactions. As *Einstein's General Relativity Theory* answered a similar or an **analog** question related to *Mass Objects*, it seemed reasonable to look for answers into his theory. Accordingly, this study's approach was to expand the *General Relativity Theory* to include *Electrically Charged Bodies*, trying to find solutions to the question of the **origins** of the *Coulomb's Electric Force*. This approach produced reasonable and surprising answers.

The New Model, developed in this study and based on the *General Relativity Theory*, describes **three Interwoven Space/Time Entities**.

Because *Electrically Charged Bodies* are of two basic polarity types: *Positive* and *Negative*, and the force acting between two *Electrically Charged Bodies* can be either *Attraction* or *Repulsion* depending on their polarity, describing their movement by expanding *Einstein's General Relativity Theory*, demanded two different possible modes of **Distortion** of *The Interwoven Space/Time Entity*. So, in addition to *Einstein's Dimple-shaped Distortion* that presents *Attraction Accelerated* movement, the new model, based on *Einstein's* mathematical elaboration, also suggests a **Hill-shaped Distortion** that implies *Repulsive Accelerated* movement. In such a framework, the two polarity types of *Electrically Charged Bodies*, the *Positive* and the *Negative*, are both capable of *Distorting* each of the **two additional Electric Charge**

Interwoven Space/Time Entities, proposed by the new model, by creating the appropriate *Distortion* in it, a **Dimple**, **or** a **Hill**, to produce *Attraction or Repulsion* movements. This novel idea in the framework of *Einstein's General Relativity Theory*, enabled understanding both the **origins** of the *Coulomb's Electric Force* and the rules of movement of *Electrically Charged Bodies*.

As already stated above, *The New Model*, developed in this study and based on the *General Relativity Theory*, describes **three** *Interwoven Space/Time Entities*:

One, in full compliance with the original *Einstein's Interwoven Space/Time Entity*, that its **Dimple** shaped *Distortion*, formed by a *Mass Object*, guides the *Accelerated Attraction* movement of any other *Mass Object*. This *Entity* guides *Mass Objects* how to move or how to *Attract and Accelerate* towards any other *Mass Object*.

The second, is a *Positive Electric Charge Interwoven Space/Time Entity* that its **Dimple or Hill** shaped *Distortion*, formed by an *Electrically Charged Body*, *Positively or Negatively* charged, guides *Positive Electrically Charged Bodies* how to move, or how to *Attract and Accelerate* towards any *Negative Electrically Charged Body* and how to *Repel* from any other *Positive Electrically Charged Body*.

The third, is a *Negative Electric Charge Interwoven Space/Time Entity* that its **Dimple or Hill** shaped *Distortion*, formed by an *Electrically Charged Body*, *Positively or Negatively* charged, guides *Negative Electrically Charged Bodies* how to move, or how to *Attract and Accelerate* towards any *Positive Electrically Charged Body* and how to *Repel* from any other *Negative Electrically Charged Body*.

Thus, these **three** *Interwoven Space/Time Entities*, described in this study, determine the direction and the *Acceleration* magnitude of the *Attraction/Repulsion* movement of any *Mass Object* or *Electrically Charged Body*, according to the *Distortion* of that *Interwoven Space/Time Entity*, by any other *Mass Objects* or *Electrically Charged Body*. Therefore, the *Distortion* of any of these *Interwoven Space/Time Entities* is described in this work as "A Guide of *Acceleration*", or "A form of *Acceleration*". This terminology exists also in *Newton's Gravitational Theory* stating that the *Gravitational Field* is "A Form of *Acceleration*". Thus, the terminology "A form of *Acceleration*" is related **analogically to** both concepts: "*Field*" in *Classic Physics*, which related, in that case, to the *Gravitational Field*, and the "*Distortion of an Interwoven Space/Time*" *Entity*, in the *General Relativity Theory*, or *Relativistic Physics*. This identity, according to this study, encompasses another **analogy** between "*Fields*" and "*Distortion of an Interwoven Space/Time*" *Entity*, which, in this case "*Field*" is **not only** the *Gravitational Field*, but **also** the *Electric Fields*, and implies that either the *Gravitational Field* **and** the *Electric Fields* are **all** manifestation of *Acceleration*. This insight and conclusion of the present study is one of the **linking analogies** between *Classic Physics* (*Newton's Gravitational Theory*), and *Relativistic Physics* (*Einstein's General Relativity Theory*). More such **analogies** concluded by the present study, will be further discussed.

The New Model, presented in detail in this article, explains explicitly the **origins** of the *Electrically Charged Bodies Attraction/Repulsion Coulomb's Force*, which was the central goal of this study, by using the terminology: "*Distortion of an Electric Charge Interwoven Space/Time Entity*", in complete **analogy** to the explanation of the **origins** of *Mass Objects*

Accelerated Attraction in Einstein's General Relativity Theory. In this case, the **analogy** between the origins of either *Gravitational or Electrical Force*, and the *Accelerated* movement of either *Mass Objects* or *Electrically Charged Bodies*, builds an analogy between Classic Physics and Relativistic Physics.

It is interesting to pay attention to the fact that although *Einstein's General Relativity Theory* relates to astronomic magnitude *Mass Objects*, the same theoretical framework and rules may determine the direction and *Acceleration* magnitude of moving smaller *Entities* such as *Electrically Charged Bodies*.

The New Theory, presented in this article, concludes that because the origins of the *Accelerated* movement of *Electrically Charged Bodies*, is the *Distortion* of an *Interwoven Space/Time Entity*, what determines the *Acceleration* magnitude of *Attracted/Repelled Electrically Charged Bodies* is usually their *Electric Charge* magnitude and not their *Mass* magnitude as might be predicted by *Newton's Second Law*. In other words, the *Acceleration* of the *Attracted/Repelled* movement of two *Electrically Charged Bodies* is dependent usually on their *Electric Charge* magnitude and **not** on their *Mass* magnitude. This conclusion establishes the basis of an experimental validation of *The New Model* which is described in detail in the article.

Thus, the present research work described in this article can be viewed as a connecting link between two categories of *Physics*, *Classic Physics* and *Relativistic Physics*. Categorizing the **analogies** found and studied in this work, may emphasize the novelty of *The New Model* and its efficacy in understanding the basic building stones of the natural world.

1. The first **analogy** mentioned in the beginning of the current work, between *Newton's Gravitational Law* and *Coulomb's Law* formulation structure, can be clearly categorized as *Classic Physics*. This **analogy** raised the question upon which the present research study was built around.
2. The **analogy** between the origins of the *Accelerated Attraction Force* between *Mass Objects*, and the origins of the *Accelerated Attraction/Repulsion Force* between *Electrically Charged Bodies*, can be clearly categorized as *Relativistic Physics*.
3. The **analogy** between: *Gravitational Field* being "A Form or a Guide of *Acceleration*" and being also a *Distortion of Einstein's Mass Interwoven Space/Time Entity*, on one hand, and on the other hand, the *Electric Field* being "A Form or a Guide of *Acceleration*" and being also a *Distortion of the Electric Charge Interwoven Space/Time Entity*, is a central idea developed in this study, and may be regarded as a **linking analogy** between *Classic Physics* and *Relativistic Physics*. Such **linking analogies** are essential for better understanding the nature of both *Mass* and *Electric Charge Entities*.

The development of *The New Model*, which used *Relativistic Physics* principles and provided conclusions that might change the view of *Classic Physics* principles, gave a broader approach in studying and understanding the nature of the most fundamental building stones of the natural world: *Mass Objects* and *Electrically Charged Bodies*. However,

expanding *Einstein's General Relativity Theory*, which seem to be achieved successfully, was supported also by conclusions drawn in the previous two parts of this comprehensive research work [4], [5]. This article is the third of three articles that summarize a comprehensive research work investigating the characteristics and the nature of the *Electric Charge Entity*.

The first part of the research was intended to study the *Energy* embedded in *Electromagnetic Waves* and is summarized in an article named: "*Energy Analysis of a Null Electromagnetic Wave*" [4]. The basic conclusion of this part of the study that "*Electric Charge is Equated with Energy*", is **analogous** to *Einstein's Special Relativity Theory's* conclusion that the entity of "*Mass is Equated with Energy*" [15]. This revolutionary **analogy** between the *Mass* and *Electric Charge Entities* in which both *Entities* exhibit a manifestation of *Energy*, was a significant support in implementing the idea of expanding *Einstein's General Relativity Theory*, which relates to *Mass Objects* only, to include *Electrically Charged Bodies* in it. The idea that both the *Mass* and the *Electric Charge Entities* are manifestation of *Energy*, indicated that they may have also other characteristics and features in common, which turned to be complimentary with the results presented in that third part of this study, that revealed a full **analogy** between these two *Entities'* movements **origins**, and their movement rules, in both *Classic* and *Relativistic Physics* approaches.

The second part of the research work investigated *Electric and Magnetic Fields' Energies* induced by *Electrically Charged Bodies* and concluded that "*Space is Equated with Energy*" [5]. In other words, *Space* itself was found to be a manifestation of *Energy*. This revolutionary conclusion has far-reaching consequences that were discussed in the second article [5], but it also formed a foundation of the ideas developed in the present third part of the study.

The conclusion that each of the **three** *Interwoven Space/Time Entities* can undergo a **Distortion**, is a key idea in both *Einstein's General Relativity Theory* and in the current suggested expansion of this theory. The fact that *Space* is equated with *Energy* is an important element in the understanding of how such *Distortions* can occur [5], because this enables to attribute to *Einstein's Interwoven Space/Time Entity* physical properties which enables its *Distortion*, and also to provide such physical properties for each of the **three** *Interwoven Space/Time Entities* to also enable its *Distortion*.

However, as the *Interwoven Space/Time Entity* might also be recognized as a manifestation of *Energy*, each of the **three** *Interwoven Space/Time Entities*, described in *The New Model* should embed different *Energies*: The *Mass Interwoven Space/Time Entity*, embeds the *Energies* of the *Gravitational Fields*; The *Positive Electric Charge Interwoven Space/Time Entity*, embeds the *Energies* of the *Electric and Magnetic Fields* generated by *Positive Electrically Charged Bodies* [5]; and the *Negative Electric Charge Interwoven Space/Time Entity* embeds the *Energies* of the *Electric and Magnetic Fields* generated by *Negative Electrically Charged Bodies* [5].

Thus, implementing conclusions and ideas developed in the first two parts of the study, in the development of the present third part of this wide-scale research work, provided a comprehensive picture of both *Electric Charge* and *Mass*

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