

A Three-Layered Space Might Explain the Coulomb's Law

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Abstract

Albert Einstein's General Relativity Theory provided an explanation for *Newton's Universal Gravitation Law* that defines how two *Masses* attract each other, by stating that the distortion of the *interwoven Space/Time* entity caused by *Mass* dictates to all other *Masses* how to move and as such *causes* the attraction between *Masses*. However, *Coulomb's Law*, that defines the attraction/repulsion between two *Electric Charges*, has an identical structure to the structure of *Newton's Universal Gravitation Law*. Thus, it is reasonable to wonder, what causes the attraction/repulsion between *Electric Charges*. This study presents a new model of *Space*, which suggests an answer to that question. That model describes *Space* as being composed of three entities or *Layers*, a *Mass Space Layer* for *Masses*, a *Positive Electric Charge Space Layer* for *Positive Electric Charges* and a *Negative Electric Charge Space Layer* for *Negative Electric Charges*. That model also assumes that *Masses* affect the *Mass Space Layer*, and is affected by this layer, according to what the *General Relativity Theory* claims. In addition, that model describes how *Electric Charges* affect the additional *Space Layers*, the two *Electric Charges Space Layers*, and are affected by these layers, such that the *Coulomb's Law* is explained, analogous to the explanation of the *Universal Gravitation Law* by the *General Relativity Theory*. This article expands the *General Relativity Theory* to include *Electric Charges*. As such, it predicts that the *acceleration* between two *Charged Objects* is a function of the *Electric Charges* magnitude and not a function of the *Masses* of the *Charged Objects*. This article also provides a proposal how to check that prediction, and if this prediction turns to be successful it will provide validity to the theory presented in this article.

Keys: Newton's Universal Gravitation Law, Coulomb's Law, Space, Electric Charges, Energy.

1. Introduction

Newton's Universal Gravitation Law, which defines how *Masses* attract each other, was presented by the formula: [1]

$$F = G * (m_1 * m_2) / r^2$$
 where F is the gravitational force acting between two objects, m_1 and m_2 are the *Masses* of the objects, r is the distance between the centers of the masses and G is the Gravitational Constant and is equal to $6.674 \times 10^{-11} \text{ m}^3 \cdot \text{kg}^{-1} \cdot \text{s}^{-2}$.

Although the *Universal Gravitation Law* complied with the experimental results regarding to how two *Masses* attract each other, no explanation why such attraction obeys that formula was provided. *Albert Einstein's General Relativity Theory* provided such an explanation.

It stated that a *Mass* causes the distortion of the *interwoven Space/Time* entity around that *Mass*, and that distorted *interwoven Space/Time* indicates to any other *Mass* how to move, because *Einstein's interwoven Space/Time* is just a form of *acceleration*, and as such it can dictate to any other mass how to move.

However, *Coulomb's Law*, which defines how *Electric Charges* attract or repel each other, has *the same structure* as the *Universal Gravitation Law*. *Coulomb's Law* was presented by the formula: [2]

$F = K_e * (q_1 * q_2) / r^2$ where F is the attraction/repulsion force acting between two *Electric Charges*, q_1 and q_2 are the charge magnitude in each of these *Electric Charges*, r is the distance between the *Electric Charges* and K_e is the Coulomb's Constant and is equal to $8.99 \times 10^9 \text{ N} \cdot \text{m}^2 \cdot \text{C}^{-2}$.

Although *Coulomb's Law* also complied with the experimental results regarding to how two *Electric Charges* attract/repel each other, no explanation was also provided to why such an attraction/repulsion obeys the formula that was provided in that case.

Since both formulae, the *Universal Gravitation Law* and *Coulomb's Law* clearly have identical structures, it is reasonable to ask if there is also an explanation to why *Coulomb's Law* complies with the above formula which defines it. This article proposes such an explanation.

It presents a new model of *Space*. In this model *Space* contains three entities or *Layers*, a *Mass Space Layer* for *Masses*, a *Positive Electric Charge Space Layer* for *Positive Electric Charges* and a *Negative Electric Charge Space Layer* for *Negative Electric Charges*.

That model also assumes that *Masses* affect the *Mass Space Layer*, according to what the *General Relativity Theory* claims, and *Masses* are also affected by the *Mass Space Layer* also as the *General Relativity Theory* claims.

In addition, that model describes how *Electric Charges* affect the two additional *Space Layers*, the *Electric Charges Space Layers*, and how *Electric Charges* are affected by the two *Electric Charges Space Layers*, such that the *Coulomb's Law* might be explained, analogous to the explanation of the *Universal Gravitation Law* by the *General Relativity Theory*.

This article actually expands the *General Relativity Theory* to include *Electric Charges*. As such this article also predicts that the *acceleration* of two *Electric Charges* attracted or repelled by the *Coulomb's Law*, should be a function of the *Electric Charge Magnitude* of these two *Electric Charges* and not a function of the magnitudes of the *Masses* which carry these *Electric Charges*. This article also provides a proposal how to check that prediction, and if this prediction turns to be successful it will provide validity to the theory presented in this article.

2. Space, Masses, Electric Charges and Energy

As stated above, this article presents a new model of *Space*. In this model *Space* contains three entities or *Layers*, a *Mass Space Layer* for *Masses*, a *Positive Electric Charge Space Layer* for *Positive Electric Charges* and a *Negative Electric Charge Space Layer* for *Negative Electric Charges*.

The first layer mentioned above, the *Mass Space Layer*, coincides with the *Space* as it is assumed today, and it is also the same *Space* entity that is also used to describe how *Masses* affect the *Space/Time* entity and how *Masses* are affected by the *Space/Time* entity as described in the *General Relativity Theory*.

In order to modify the *Space* entity, and present it as being composed of three *Layers*, this article assumes that *Space* is not composed of *Nothing* or *Complete Emptiness*. This article adopts the assumption that the *Space* entity itself is a form of *Energy*. This complies with the *General Relativity Theory* requirement to assume that *Space* is composed of some sort of medium (such as Aether) to provide physical properties to its *Space/Time* entity. *Albert Einstein's* speech in the University of Leiden in May 5th, 1920, explained that his *General Relativity Theory* require *Space* to be some sort of medium. [3].

This also makes sense if we assign to *Space* some sort of fabric, as is visualized in Figures 1 and 2 presented in a following section of this article, in order to enable its distortion.

This also complies with two articles by the author of this article, which present the claim that the universe is composed of only one entity, *Energy*. The title of the first of these two articles is: "Energy Analysis of a Null Electromagnetic Wave" [4]. That article provided the claim that *Electric Charges* are equated with *Energy* analogous to *Mass* being equated with *Energy* by *Albert Einstein's Special Relativity Theory*.

The title of the second of these two articles is: "Space, Aether and the Dark Energy in the Energy Pairs Theory Framework" [5]. That article provided the claim that *Space* is not composed out of *Nothing* or *Complete Emptiness* and that the *Space* entity itself is equated with *Energy*, which also contains *untraceable Energy* at each point of it, these *untraceable* energies are stored into a new construct named *Energy Pairs*.

Thus, if *Space* is also *Energy*, it can be assumed that it contains *Layers*, and each layer contains the energies embedded in the entity that it is related to. Thus, the *Mass Space Layer* embeds the energies embedded in the *gravitational field*. The *Positive Electric Charge Space Layer* embeds the *traceable* energies embedded in the *electric and magnetic fields* generated by *Positive Electric Charges*, and half of the *untraceable* energies embedded in *Energy Pairs* [5] the half that is *untraceable* and originated from *Positive Electric Charges*. And the *Negative Electric Charge Space Layer* embeds the *traceable* energies embedded in the *electric and magnetic fields* generated by *Negative Electric Charges*, and half of the *untraceable* energies embedded in *Energy Pairs* [5] the half that is *untraceable* and originated from *Negative Electric Charges*.

This article presents the claim that *Electric Charges* cause the distortion of the *interwoven* of the additional two *Electric Charges Space/Time Layers*, as is described in a next section of this article. This article also presents the claim that the movement of *Electric Charges* is dictated by these additional two *Electric Charges Space/Time Layers*.

It should be added that the use of the term "*Layers*" in this article might be somewhat misleading. *Layers* are expected to be separate things with each *Layer* occupying a different *location*. This is not what is meant by *Layers* in this article. This article assumes that each *point* in *Space* might contain portions of each of the three *Layers* described in the article. Thus, it might be that using the term "*Entities*" might be more accurate, and the description of *Space* as being composed of three *Entities* might be more suitable as compared to describing *Space* as composed of three *Layers*. However, since each *Space Layer*, described in this article is interwoven differently, using still the term "*Layers*" might provide better visualization to what this article describes, as long as it is understood that each point in *Space* might contain simultaneously portions of all these *Layers* or *Entities*. Thus this article will continue to use the term "*Layers*" despite the fact that it might be somewhat misleading.

3. Explaining Attraction/Repulsion by Interwoven Space/Time.

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]. That image might be used to provide a visualization of how the *General Relativity Theory* uses *interwoven Space/Time* caused by *Mass* to explain the attraction between *Masses*. In that image the Earth *Mass* creates a *Pit* in the fabric of *Space/Time*. That *Pit* dictates to all other *Masses* how to move, which results in an attraction of all other *Masses* towards Earth.

Figure 2 is the same as Figure 1 only rotated by 180 degrees. That image can provide a visualization of how repulsion can be also explained by *interwoven Space/Time*.

If instead of a *Pit* in the *Space/Time* the Earth *Mass* would create a *Hill* (or a small *Mountain*) in the fabric of the *Space/Time* that *Hill* would dictate to all other *Masses* how to move, which would result in a repulsion of all other *Masses* away from Earth. That distortion in the fabric of the *interwoven Space/Time* can be also viewed as a mirror image of the distortion of the fabric of the *interwoven Space/Time* presented in Figure 1.

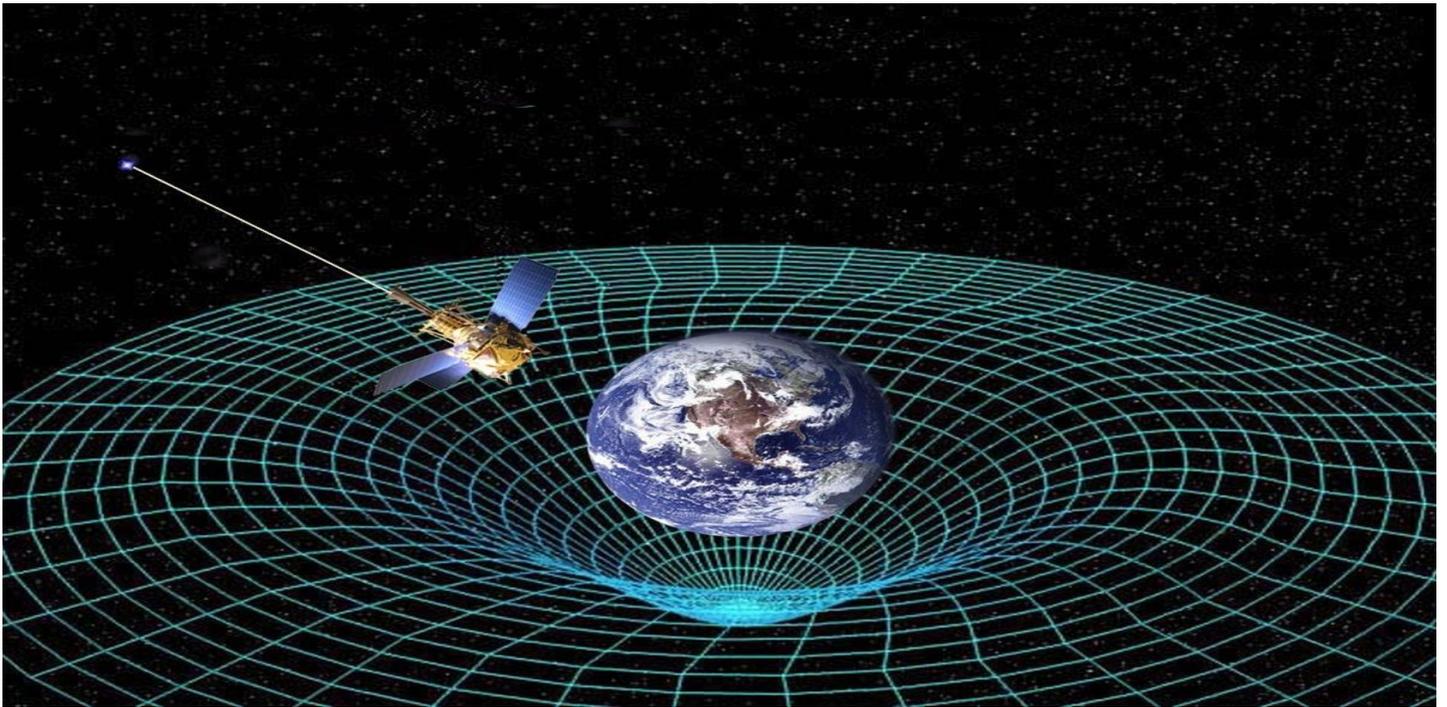


Fig 1 | Visualization of how *interwoven Space/Time* distortion can explain attraction. (Image: © NASA)

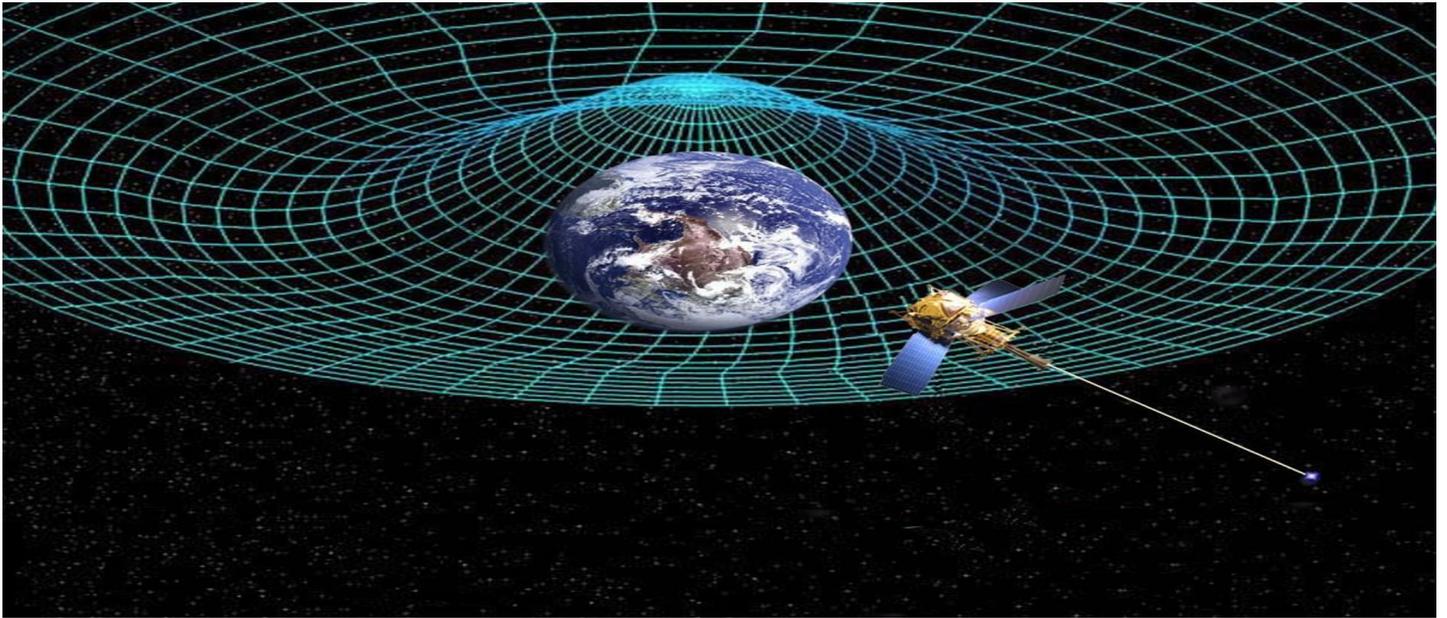


Fig 2 | Visualization of how *interwoven Space/Time* distortion can explain repulsion. (Image: rotated © NASA image)

What actually happens when *Masses* distort the fabric of the *interwoven Space/Time* is what is described in Figure 1 and not what is described in Figure 2, but it is presented here only to show how distortion of the fabric of the *interwoven Space/Time* can also explain repulsion.

4. Interwoven Electric Charges Space/Time Layers

As already stated above, this article suggests a new model of *Space* that is composed of three entities or *Layers*, a *Mass Space Layer* for *Masses*, a *Positive Electric Charge Space Layer* for *Positive Electric Charges* and a *Negative Electric Charge Space Layer* for *Negative Electric Charges*.

That model also assumes that *Masses* affect the *Mass Space/Time Layer*, according to what the *General Relativity Theory* claims, and *Masses* are also affected by the *Mass Space/Time Layer* also as the *General Relativity Theory* claims. That model also assumes that *Electric Charges* do not alter (or distort) the *Mass Space/Time Layer*, and are not affected by the *Mass Space/Time Layer*, and also that *Masses* do not alter (or distort) any of the *Electric Charges Space/Time Layers* and *Masses* are not affected by any of the *Electric Charges Space/Time Layers*, which complies with experience that *Masses* and *Electric Charges* do not interact with each other.

On the other hand, this article assumes that *Electric Charges* alter (or distort) the other two additional *Space Layers*, the two *Electric Charges Space/Time Layers*, and are affected by these two *Electric Charges Space/Time Layers* in the following manner:

Each *Electric Charge* moves according to what *its Electric Charge Space/Time Layer* dictates. This means that the *Positive Electric Charge Space/Time Layer* dictates to *Positive Electric Charges* how to move, and the *Negative Electric Charge Space/Time Layer* dictates to *Negative Electric Charges* how to move.

In addition, each *Electric Charge* distorts *its Electric Space/Time Layer* by creating a *Hill* in it as can be visualized by Figure 2 above. And, each *Electric Charge* distorts the *Electric Charge Space/Time Layer* not related to its *polarity* (related to the polarity of the other type of *Electric Charges*) by creating a *Pit* in it, analogous to the way a *Mass* would create a *Pit* in the *Mass Space/Time Layer*.

This means that whenever a *Pit* is created in an *Electric Charge Space/Time Layer*, the *Electric Charges* that are affected by that layer will be attracted to the *Electric Charge* that created that *Pit*. And because that *Pit* is analogous to the *Pit* created by *Masses* in the *Space/Time layer*, that attraction will comply with *Coulomb's Law*, because *Coulomb's Law* has the same *structure* as the *Universal Gravitation Law*.

This also means that whenever a *Hill* is created in an *Electric Charge Space/Time Layer*, the *Electric Charges* that are affected by that layer will be repelled away from the *Electric Charge* that created that *Hill*. That *Hill* is analogous to the mirror image of a *Pit* created by *Masses* in the *Space/Time Layer*. Thus, that repulsion will comply with *Coulomb's Law*, because *Coulomb's Law* has the same *structure* as the *Universal Gravitation Law*.

The fact that each *Electric Charge* distorts differently each of the two *Electric Charges Space/Time Layers* is reasonable, because, as assumed in a previous section of this article, each of these two *Electric Charges Space/Time Layers* contains different *Energy*.

What was described above is explained in more details as follows:

The *Positive Electric Charges* distort the *Negative Electric Charge Space/Time Layer* by creating a *Pit* in it. And, *Positive Electric Charges* distort the *Positive Electric Charge Space/Time Layer* by creating a *Hill* in it.

Also, *Negative Electric Charges* distort the *Positive Electric Charge Space/Time Layer* by creating a *Pit* in it. And, *Negative Electric Charges* distort the *Negative Electric Charge Space/Time Layer* by creating a *Hill* in it.

Such distortions might result in explaining the attraction/repulsion between *Electric Charges*, as is explained in more details as follows:

Since a *Positive Electric Charge* creates a *Pit* in the *Negative Electric Charge Space/Time Layer*, all the *Negative Electric Charges* are affected by that distortion which results in them being attracted to that *Positive Electric Charge* according to what *Coulomb's Law* dictates.

And, since a *Negative Electric Charge* creates a *Pit* in the *Positive Electric Charge Space/Time Layer*, all the *Positive Electric Charges* are affected by that distortion which results in them being attracted to that *Negative Electric Charge* according to what *Coulomb's Law* dictates.

Also, since a *Positive Electric Charge* creates a *Hill* in the *Positive Electric Charge Space/Time Layer*, all the *Positive Electric Charges* are affected by that distortion which results in them being repelled away from that *Positive Electric Charge* according to what *Coulomb's Law* dictates.

And, since a *Negative Electric Charge* creates a *Hill* in the *Negative Electric Charge Space/Time Layer*, all the *Negative Electric Charges* are affected by that distortion which results in them being repelled away from that *Negative Electric Charge* according to what *Coulomb's Law* dictates.

5. A Three-Layered Space Might Explain the Coulomb's Law

The claim that what was described above explains *fully* the *Coulomb's Law* need some more clarification and a proposal of how to provide validity to the theory presented. The following provides that by presenting a prediction which can be checked, and if found true, that prediction provides validity to the theory presented in this article. The following also presents a description of a lab experiment for checking that prediction.

The need for additional clarification relies on the fact that the theory presented might raise some questions.

The first question raised relates to the fact that the *Coulomb's Law* defines a Force F , and there is not yet an equivalent equation to $F = m * a$ for *Electric Charges*. Also, when the *General Relativity Theory* explains the *Universal Gravitation Law* it does not use the concept of a Force F . There is not real analogy to *Newton's 2nd Law* ($F = m * a$) in the *General Relativity Theory*, because the *General Relativity Theory* framework is different from *Newton's Mechanics*.

The *General Relativity Theory* uses the distortion of the *interwoven Space/Time* to describe how this distortion affects the *motion* of *Masses* because *Einstein's interwoven Space/Time* is just a form of *acceleration*, and as such it can *dictate* to any other *Mass* how to move.

Thus, the answer to the above question is as follows: what this article claims is that the *interwoven Electric Charges Space/Time Layers* are also just a form of *acceleration*, as *Einstein's interwoven Space/Time* is just a form of *acceleration*, and as such, it can also *dictate* to any other *Electric Charge* how to move, and still explain the *Coulomb's Law* without the need to involve forces in it.

The next question that might be raised is related to the fact that there is no *Electric Charge* that is not attached to a *Mass*. Each *Electric Charge* is carried by a body which contains also some *Mass*. Thus, according to the theory presented in this article, each *Charged Body* is affected by two *Space/Time Layers*. The *Mass Space/Time Layer* that dictates to the *Charged Body Mass* how to move, and an *Electric Charge Space/Time Layer*, which dictates to the *Charged Body Electric Charge* how to move.

However, the effect of the *Electric Charge Space/Time Layer* on the *Charged Body* is bigger by many orders of magnitudes as compared to the effect of the *Mass Space/Time Layer* on the *Charged Body*. This can be seen from the following:

The *gravitational force* between two 1-kg masses that are 1 meter apart is 0.0000000000667 newtons, while the force of attraction or repulsion between two 1 coulomb charges held 1 meter apart is 9 billion newtons. Thus, the *Coulomb's Law* effect on a *Charged Body* is more effective by a factor of more than 10^{20} as compared to the effect of the *Universal Gravitation Law* effect on that *Charged Body*. This means that the *Universal Gravitation Law* effect on a *Charged Body* is negligible in comparison to the *Coulomb's Law* effect on that *Charged Body*.

The following uses the fact that the *Universal Gravitation Law* effect on a *Charged Body* is negligible in comparison to the *Coulomb's Law* effect on that *Charged Body*, and additional argumentations, to provide an answer to the question how the theory presented copes with the fact that there is no *Electric Charge* that is not attached to a *Mass*. The result is a prediction about the acceleration existing in the movement of *Charged Bodies* which differs from the current state of knowledge. That prediction, if found true, provides validity to the theory presented in that article.

The argumentation described above starts as follows:

The gravitational field g is expressed by the expression $g = G * (m_1) / r^2$ [7]. Thus, the *Universal Gravitation Law*, $F = G * (m_1 * m_2) / r^2$ can be rewritten as $F = m_2 * g$. However, g is also the gravitational *acceleration*. This implies that the *Mass* m_1 dictates the *acceleration* which will exist in the motion of any other *Mass* m_2 that will be attracted to it under the *Universal Gravitation Law*. This might be an interpretation of the claim that *Einstein's distorted interwoven Space/Time* is a form of *acceleration*. This is not exactly what is claimed by the *General Relativity Theory*, but it can be a presentation of a simplified approximation of it.

Then, if the *Electric Charges Space/Time Layers* are also just a form of *acceleration*, this also implies that there is an analog equation to $F = m * a$ for *Electric Charges*, which might be an equation of the form $F = q * a$.

Because, also in the *Electric Charges* case, the electric field E is expressed by the formula $E = K_e * q_1 / r^2$ [8], and the *Coulomb's Law* $F = K_e * (q_1 * q_2) / r^2$, can be rewritten as $F = q_2 * E$, which is a well-known formula. But, if the electric field E and the *Electric Charges Space/Time Layers* are also just a form of *acceleration* which can be denoted as a , the *Coulomb's Law* $F = K_e * (q_1 * q_2) / r^2$, can be also rewritten as $F = q_2 * a$. This is analogous to the gravitational field and *Einstein's distorted interwoven Space/Time* being a form of *acceleration*.

This implies that the *Electric Charge* q_1 dictates the *acceleration* which will exist in the motion of any other *Electric Charge* q_2 that will be attracted or repelled to or by it under the *Coulomb's Law*.

This also complies with the fact that *Electric Charges* is equated with *Energy*, as claimed by the article titled: "Energy Analysis of a Null Electromagnetic Wave" [4], mentioned in a previous section of this article, as *Mass* is equated with *Energy* by *Albert Einstein's Special Relativity Theory*.

Thus, the *Electric Charge* q in $F = q * a$, is *Energy*, as the *Mass* m in $F = m * a$, is *Energy*.

The current state of knowledge is as follows: The dominant force exerted on a *Charged Body* is the *Coulomb's Law* force because the *Universal Gravitation Law* force exerted on a *Charged Body* is negligible and insignificant as compared to the *Coulomb's Law* force exerted on that *Charged Body*. But the *acceleration* resulting from that force is a function of the *Mass* of the *Charged Body*, according to the equation $F = m * a$, and that *acceleration* is equal to the division of the *Coulomb's Law* force exerted on the *Charged Body* by the *Charged Body Mass*.

However, this article predicts something else which can be described as follows:

If the *Electric Charges Space/Time Layers* are also just a form of *acceleration*, which also implies that the equation $F = q * a$ should also hold, then the *acceleration* of two *Charged Bodies* attracted or repelled under the *Coulomb's Law*, should be a function of the *Charge Magnitude* of these two *Charged Bodies* and not a function of the magnitudes of the *Masses* of these two *Charged Bodies*, because the effect on the *acceleration* resulted from the *Universal Gravitation Law* on these two *Charged Bodies* is negligible compared to the effect on the *acceleration* resulted from the *Coulomb's Law* on these two *Charged Bodies*.

An experiment that checks that claim might be used to establish if the theory presented in this article might be valid. Such an experiment uses the fact, mentioned above, that the attraction between *Electric Charges* is *stronger* by a factor of many orders of magnitude as compared to the attraction between *Masses*. Thus, such an experiment might be:

Two opposite polarity *Electric Charges*, each residing on a body of *Mass* of magnitude M , attract each other according to the *Coulomb's Law*. The two *Charged Bodies* should be placed on a surface with as little friction as possible, such that they are initially at a distant L apart from each other, and the two *Charged Bodies* are let free to be attracted to each other and *accelerate* one towards each other, until they meet. The travel time to that meeting point should be recorded, because this data item implies what is the *acceleration* that existed in that movement. Then, another set of *Charged Bodies* are used, each containing the same amount of *Electric Charges* as the first set contained, but each *Charged Body* has *half* the *Mass* that the first set contained. The same procedure is repeated with that second set of *Charged Bodies*. If the travel time to the meeting point remains the same as in the first phase of this experiment, this

implies that the *acceleration* of the *Electrically Charged Bodies* is a function of the magnitude of the *Electric Charges* that these *Charged Bodies* contain and *not* their *Masses*, as this article predicts.

If such an experiment turns out to prove what this article predicts, then, the three-layered *Space* proposed by this article and the *interwoven Electric Charges Space/Time Layers* might explain the *Coulomb's Law* analogous to the explanation of the *Universal Gravitation Law* by the *General Relativity Theory*.

6. Summary and Conclusions

This article raises the following question: since *Newton's Universal Gravitation Law* has identical structure to the *Coulomb's Law*, why the cause of attraction between *Masses* is explained by *Albert Einstein's General Relativity Theory* and there is not an analog explanation to the attraction/repulsion between *Electric Charges*.

This article provides a suggestion for an explanation for that question.

This is done by presenting a new model of *Space*. That model describes *Space* as being composed of three entities or *Layers*, a *Mass Space Layer* for *Masses*, a *Positive Electric Charge Space Layer* for *Positive Electric Charges* and a *Negative Electric Charge Space Layer* for *Negative Electric Charges*. That model also assumes that *Masses* affect (and are affected by) the *Mass Space Layer*, according to what the *General Relativity Theory* claims. In addition, that model describes how *Electric Charges* affect (and are affected by) the two *Electric Charges Space Layers*, such that the *Coulomb's Law* is explained, analogous to the explanation of the *Universal Gravitation Law* by the *General Relativity Theory*.

This article expands the *General Relativity Theory* to include *Electric Charges*. As such, it predicts that the *acceleration* between two *Charged Objects* is a function of the *Electric Charges* magnitude and not a function of the *Masses* of the *Charged Objects*. This article also provides a proposal how to check that prediction, and if this prediction turns to be proved it will provide validity to the theory presented in this article..

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Please also note that the article referenced in reference [4] whose title is: "Energy Analysis of a Null Electromagnetic Wave" was also written by Moshe Segal and was also inserted in the open e-Print archive viXra.org.

That article was also published by Physics Tomorrow Letters (PTL) in the Theoretical Physics Journal. The link to that publication is:

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