

A Simple Unification of Gravitation and Electricity

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Abstract: Einstein devoted many years for finding a Classical Unification of Gravity and Electricity. These attempts did not result in conclusive successful results.

This study proposes a lead for a simple unification of Gravity and Electricity by predicting that Electric Fields are also forms of Accelerations, as Gravity is already recognized as a form of Acceleration.

There are other proposals for unifications of Gravity and Electricity, but neither also propose a simple test how to validate the proposed unification.

This study, on the other hand, does also propose a relatively simple physical experiment, which if implemented might prove, or disprove, the prediction that Electric Fields are also forms of Acceleration, which will also provide validity to the proposed lead for a unification of Gravity and Electricity, or disprove it.

One-Sentence Summary: A proof that Electric Fields are forms of Acceleration will also provide a lead for a simple unification of Gravitation and Electricity.

Main Text: After the publication of the General Relativity Theory, Einstein devoted many years and significant efforts, together with various numerous colleagues, to unify Gravitation and Electricity, in what is known as the quest for finding a Classical Unified Field Theory.

Among Einstein's endeavors were also endeavors to employ additional dimensions such as his work with five-dimensional classical Kaluza–Klein theory (13) .

However, these Einstein's endeavors did not result in conclusive successful results, as the following quotes from References (14) and (15) indicate: "Einstein, in the latter part of his career, wanted to unify the theories of general relativity and electromagnetic field into one unified theory. He wasn't able to achieve any significant success in this goal though", and "With the death of Einstein, the search for a unified theory of gravitation and electro-magnetism has apparently faded into the background". Also, a basic corner stone of electricity is Coulomb's Law, and as Ref (16) states: "Coulomb's law is not compatible with the unified theory".

Unifications in Physics are significant steps forward because they provide deeper understanding, new insights, and new predictions.

This study proposes the prediction that Electric Fields are also forms of Acceleration, as Gravitation is already known to be also a form of Acceleration. Based on this prediction, this study proposes a lead for a simple unification between Gravitation and Electricity.

There are other proposals for unifications of Gravity and Electricity, but neither also propose a simple test how to validate the proposed unification.

This study, on the other hand, does also propose a relatively simple physical experiment, which if implemented might prove, or disprove, the prediction that Electric Fields are also forms of Accelerations, which will also provide validity to the proposed lead for a simple unification of Gravity and Electricity, or disprove it.

1. Einstein's Space/Time concept explains the *Origin* of the Attraction between Masses

The issue of Massive Bodies attraction was initially investigated by Galileo as well as Kepler, but Newton discovered the inverse-square dependence of the Gravity Force on the Distance.

Newton's measurements concluded that two spherical symmetric Massive Bodies attract each other according to the Universal Gravitational Law, which is formulated as (1):

$$F = G \cdot (m_1 \cdot m_2) / r^2$$

Where G is the Gravitational Constant and is equal to $6.674 \times 10^{-11} \text{ m}^3 \cdot \text{kg}^{-1} \cdot \text{s}^{-2}$, m_1 is the Mass magnitude of the first Massive Body, m_2 is the Mass magnitude of the second Massive Body and r is the distant between the center of Masses of the two Massive Bodies.

The Universal Gravitational Law presented above provides the amount and the direction of the Force that attracts these two Massive Bodies.

However, Newton could not provide a complete explanation relating to what causes this force, or what is exactly the *origin* of the attraction between Massive Bodies.

Attempts to explain the *origin* of the attraction force between Massive Bodies introduced the concept of the Gravitational Field.

The Gravitational Field concept stated that a Massive Body creates a Gravitational Field around it, which generates the force presented in the Universal Gravitational Law.

However, the concept of the Gravitational Field could not explain how any Field, including the Gravitational Field, can cause the attraction forces between bodies.

The Gravitational Field strength, which is defined as the Gravitational Force, of the Gravitational Field, in Newtons, that acts on a Mass of one Kg, is presented by the following equation (2):

$$g = G \cdot m_g / r^2$$

Where g is the Gravitational Field strength magnitude, G is the Gravitational Constant, which was already presented above in the Universal Gravitational Law, m_g is the Mass magnitude of the Massive Body which creates this Gravitational Field strength g and r is the distance between the center of Mass of this Massive Body, m_g , and the point in Space, where this Gravitational Field strength g is measured.

Thus, from Newton's Universal Gravitation Law, presented above, the attraction Force between a Massive Body of Gravitational Mass magnitude m_g , which generates its Gravitational Field strength g , at a distant point r in Space, from its center of Mass, and another Massive Body of Inertial Mass Magnitude m_i , at this distant point r in Space, from the center of Mass of the Massive Body m_g , is presented by:

$$F = G \cdot (m_g \cdot m_i) / r^2$$

Thus, the Universal Gravitational Law can be reformulated as:

$$F = m_i \cdot g$$

Where m_i is the Inertial Mass magnitude of the Massive Body on which the Gravitational Field strength g exerts the force F .

However, as already stated above, the notion of a Field, does not provide a complete answer to the question: how can a Field generate the Forces that it is assumed to create?

Thus, the question:

what is the **origin** of the force presented by the Universal Gravitational Law? remained an unanswered question, until the introduction of Einstein's General Relativity Theory (3).

Einstein succeeded to explain the **origin** of the attraction forces between Massive Bodies by introducing the concept, that Gravitational Forces are related to the Space and the Time entities, which can be also presented as a curved Interwoven Space/Time construct, if Mass can be assumed to induce a curve into that Interwoven Space/Time construct.

It might be also added, that, because an Interwoven Space/Time construct, embeds both the Space and the Time entities in it, which implies that at each point of this curved Interwoven Space/Time construct, an Acceleration can be calculated, the understanding that the Gravitational Field is also a form of Acceleration, helped Einstein to develop this concept, of a curved Interwoven Space/Time construct, which succeeded to explain the **origin** of the attraction between Massive Bodies.

The fact that the Gravitational Field is also a form of Acceleration, was already a well-known fact when Einstein developed his Interwoven Space/Time concept, because it can be derived directly from Newton's work.

Newton's Second Law of Motion (4) states, that a force F exerted on a Massive Body of Inertial Mass magnitude m_i obeys the following equation:

$$F = m_i \cdot a$$

Where a is the Acceleration that this Massive Body of Inertial Mass magnitude m_i acquires because of the force F exerted on it.

However, the above already presented, that a Gravitational Field strength g exerted on a Massive Body of Inertial Mass magnitude m_i also results in a force F exerted on this Massive Body:

$$F = m_i \cdot g$$

Thus, from the above follows that: $g = a$

Thus, the Gravitational Field must also be a form of Acceleration.

From the above, Einstein concluded that this could provide an explanation to the question: how a Gravitational Field can generate the force F expressed by Newton's Universal Gravitational Law? or, in other words, what is really the *origin* of the attraction force between Massive Bodies?

Einstein's General Relativity Theory explains the *origin* of the attraction force between Massive Bodies using the following argumentation:

Acceleration is the second derivative of Space as related to Time:

$$a = d^2s/dt^2$$

Where s is the Space point at which the Acceleration a is measured, and t is the Time moment at which the Acceleration a is measured.

Space is a three-dimensional entity, while Time is a one-dimensional entity.

From the above Einstein concluded that if it can be assumed, that Space and Time are not independent entities, and they are always *interweaved* into a four-dimensional construct, which replaces the three-dimensional Space entity, then, this four-dimensional Interwoven Space/Time entity already embeds an Acceleration at each point of it, because the second derivative of Space in relation to Time can be calculated at each point of it, because this four-dimensional Interwoven Space/Time entity already embeds the Space *and* the Time entities at each point of it.

Thus, Einstein concluded, that if a form of this four-dimensional Interwoven Space/Time entity can be assumed to be Newton's Gravitational Field, then, this Interwoven Space/Time entity, will exert an Acceleration, on any Massive Body, residing in it, which is the Acceleration embedded in the point of this Interwoven Space/Time entity, where this Massive Body resides.

2. Arguments which imply that the Electric Field should be also recognized as a form of Acceleration

As already presented above, the fact that the Gravitational Field is already recognized as a form of Acceleration, can be derived directly from a version of Newton's Universal Gravitational Law, $F = m_1 \cdot g$, and Newton's Second Law of Motion, $F = m_1 \cdot a$.

But this conclusion might be also obvious from analyzing *only* Newton's Universal Gravitational Law, $F = G \cdot (m_1 \cdot m_2) / r^2$, without using Newton's Second Law of Motion, $F = ma$.

During the attraction process between the Massive Bodies the Force F in $F = G \cdot (m_1 \cdot m_2) / r^2$ is dependent only on the distance r between these Massive Bodies, since G is a constant and the Mass magnitudes of the Massive Bodies also do not change, assuming that the velocities in the attraction process are negligible in comparison to the velocity of Light, implying that the Mass increase with velocity, implied from Einstein's Special Relativity Theory, is also negligible.

Thus, during the attraction process, the force F continuously increases, as the distance r between the bodies continuously decreases.

Since this Force F is what causes the attraction between the Massive Bodies, the fact that during this attraction process the Force F continuously increases, this should imply, that during the attraction process, the velocities of the attracting Massive Bodies also continuously increase, which implies that during the attraction process, the Massive Bodies are also Accelerating towards each other.

Since the Gravitational Field is what causes the Force F , and thus, is actually the cause of the attraction between the Massive Bodies which, as concluded above, are Accelerating towards each other, it should be concluded that the Gravitational Field is a form of Acceleration.

And this conclusion is the result from an analysis done *only* on Newton's Universal Gravitational Law, $F = G \cdot (m_1 \cdot m_2) / r^2$, without using Newton's Second Law of Motion, $F = ma$, as presented above.

However, the analysis done only on Newton's Universal Gravitational Law, $F = G \cdot (m_1 \cdot m_2) / r^2$, without using Newton's Second Law of Motion, $F = ma$, reveals more than what was presented above.

Since the Gravitational Field strength itself, presented by the equation: $g = G \cdot m / r^2$, also continuously increases during the attraction process, as the distance r between the bodies continuously decreases, then, the Gravitational Field strength, which is the cause of the attraction between the Massive Bodies, is not only a form of Acceleration, it is a form of Acceleration which increases continuously, during the attraction process between the Massive Bodies.

The nowadays Science of Physics, does not recognize (yet) the Electric Fields as being also a form of Acceleration, as the Gravitational Field is already recognized as a form of Acceleration.

But, similar to what was presented, that Newton's Gravitational Field is a form of Acceleration, which can be derived **only** from analyzing Newton's Universal Gravitational Law, $F = G \cdot (m_1 \cdot m_2) / r^2$, without using Newton's Second Law of Motion, $F = ma$, similar arguments might apply also to the claim, that Electric Fields might also be concluded to be forms of Acceleration, only by analyzing the Coulomb's Law.

Analogous to Newton's Universal Gravitational Law, which provides the Force of attraction between Massive Bodies, Coulomb's Law provides the Force of the attraction or the repulsion between Electric Charges.

Coulomb's Law is presented by the following formula (5) :

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

Where K_e represents the Coulomb's Constant and is equal to $8.99 \times 10^9 \text{ N} \cdot \text{m}^2 \cdot \text{C}^{-2}$, q_1 is the amount of Electric Charge in the first Electric Charge, q_2 is the amount of Electric Charge in the second Electric Charge and r is the distance between the center of Mass of the bodies that carry these two Electric Charges, assuming that the Electric Charges embedded in the Electrically Charged Bodies used in a Coulomb's Law experiment, are spread uniformly on these Electrically Charged Bodies.

It should be noticed that the **structure** of the Newton's Universal Gravitational Law and the **structure** of the Coulomb's Law are **identical**.

Thus, as already stated above, similarly to the arguments presented above, that Gravity can be recognized as a form of Acceleration **only** by analyzing Newton's Universal Gravitational Law, without using also Newton's Second Law of Motion, similar arguments apply, which imply, that the Electric Field should be also recognized as a form of Acceleration, only from analyzing Coulomb's Law.

These arguments are:

During the attraction or the repulsion process between the Electrically Charged Bodies the Force F in $F = K_e \cdot (q_1 \cdot q_2) / r^2$ is dependent only on the distance r between these Electrically Charged Bodies, since K_e is a constant and the Electric Charges magnitudes embedded in the Electrically Charged Bodies also do not change.

Thus, during the attraction or the repulsion process, the force F continuously increases or decreases, as the distance r between the Electric Charges continuously decreases or increases (depending if the Electric Charges attract or repel each other).

Since this Force F , presented by Coulomb's Law, is what causes the attraction or the repulsion between the Electrically Charged Bodies, the fact that during this attraction or repulsion process the Force F continuously increases or decreases, (depending if the Electric Charges attract or repel each other), this should imply, that during the attraction or the repulsion process, the velocities of the attracting or repelling Electrically Charged Bodies also continuously increase or

decrease, which implies that during the attraction or the repulsion process, the Electrically Charged Bodies are also Accelerating towards each other, or Decelerating from each other.

Since the Electric Fields involved in the above-described process are the cause of the force F and thus, also the cause of the attraction or the repulsion between the Electrically Charged Bodies which, as concluded above, are accelerating towards each other, or decelerating from each other, it should be concluded that these Electric Fields are also forms of Accelerations or Decelerations (depending if the Electrically Charged Bodies attract or repel each other).

And this conclusion is the result from an analysis done *only* on Coulomb's Law, $F = Ke \cdot (q_1 \cdot q_2) / r^2$, as presented above.

However, the analyzing done only on Coulomb's Law, $F = Ke \cdot (q_1 \cdot q_2) / r^2$, reveals more than what was presented above.

Since the Electric Fields strength involved, presented by the equation: $e = Ke \cdot q / r^2$, also continuously increase or decrease during the attraction or the repulsion process, as the distance r between the Electrically Charged Bodies continuously decreases or increases, then, the Electric Fields strength, which are the cause of the attraction or the repulsion between the Electrically Charged Bodies, are not only forms of acceleration or deceleration, these Electric Fields strength are forms of acceleration or deceleration which increases continuously, during the attraction or the repulsion process between the Electrically Charged Bodies.

But since Coulomb's Law *does not* contain any Mass component in its equation, it is reasonable to conclude that the above-described Acceleration or Deceleration property, derived from analyzing *only* the Coulomb's Law, is caused *only* by the Electric Fields created by Electric Charges embedded in the Electrically Charged Bodies presented in the Coulomb's Laws, which implies that Electric Fields are also forms of Acceleration.

3. A simpler presentation that the Electric Field should be also recognized as a form of Acceleration

In the previous chapter of this paper, detailed arguments were provided, which result in the conclusion that the Electric Field should be also recognized as a form of Acceleration.

This presentation was provided in order to point out all the details which are required to arrive at the conclusion that the Electric Field should be also recognized as a form of Acceleration.

But the *obvious structural identities* between Newton's Universal Gravitational Law, $F = G \cdot (m_1 \cdot m_2) / r^2$ and Coulomb's Law, $F = Ke \cdot (q_1 \cdot q_2) / r^2$ can be used to provide a somewhat simpler presentation of the claim that the Electric Field should be also recognized as a form of Acceleration.

Because the Gravitational Field, is already recognized, by the nowadays Science of Physics as a form of Acceleration, and because this Gravitation Field, presented in Newton's Universal

Gravitational Law, is the cause of the attraction between the Massive Bodies, then, the following can be concluded:

Because the *structure* of the Coulomb's Law is *identical* to the *structure* of Newton's Universal Gravitational Law, and the Electric Field is the cause of the attraction or the repulsion of the Electrically Charged Bodies presented in the Coulomb's Law, then, it should be concluded, that like the Gravitational Field in Newton's Universal Gravitational Law, which is already recognized by the nowadays Science of Physics as a form of Acceleration, also the Electric Field, in Coulomb's Law, should be also concluded to be a form of Acceleration.

Because the discussion in this paper relies heavily on Coulomb's Law, the following should be also added:

Coulomb's law relates to Electrical Charges at rest.

Coulomb's law is indeed considered completely correct only for Electrically Charged Bodies at rest, mainly because moving Electric Charges manifest additional phenomena, such as Magnetic Fields, when the Electrically Charged Bodies move without Acceleration, and also emission of Electromagnetic Waves, when the Electrically Charged Bodies accelerate.

However, the discussion in this paper refers to Electric Charges which are not at rest, and thus, the use of Coulomb's Law, in the discussion presented in this paper, might imply that the conclusions derived, in this paper, are completely wrong.

But additional phenomena occur also in Gravity

Also, the Mass magnitudes of Massive Bodies, monitored by a spectator external to the moving Massive Bodies, is measured as an increase in the Mass magnitudes of these moving Massive Bodies, and Accelerating Massive Bodies also emit Gravitational Waves, and there are also the GEM phenomena (Gravitational Electromagnetism).

And, all these phenomena, which do occur also in Gravity, do not cancel the recognition that attracting Massive Bodies accelerate.

What these additional phenomena implies is that attracting Massive Bodies, because of Gravity, seem to be a complex process, which might also be, that it is still, not fully understood.

Similarly, the Magnetic Fields, and the Electromagnetic emissions, in scenarios of attracting Electrically Charged Bodies, does not necessarily imply that the component presented by Coulomb's Force (which is indeed completely correct only for rest bodies), might not be still a significant factor in this attraction movement between Electrically Charged Bodies.

What the above does imply, is that also the process of attracting (or repelling) Electrically Charged Bodies, seem to be a complex process, which might be also not fully understood.

But the above-mentioned additional phenomena existing in scenarios of attracting Electrically Charged Bodies, does not necessarily render the conclusions of this paper to be completely unjustified, and does not completely cancel the possibility, presented in this paper, that Electric

Fields might also be a form of Acceleration, as the additional phenomena presented above, regarding to Gravity, does not cancel the recognition that the Gravitational Field is a form of Acceleration.

This makes the execution of the experiment presented in a next chapter of this paper, which might prove (or disprove) the conclusions presented in this paper, that the Electric Field might be also a form of Acceleration, an important endeavor.

Despite the fact that Coulomb's law is completely correct only for rest bodies, this paper states, that there is a possibility, that the experiment presented in my paper, might bring about new findings, as presented in this paper.

4. Additional Implications as related to Einstein's Space/Time notion

Einstein's four-dimensional *Interwoven Space/Time* notion does succeed to explain the **origin** of the attraction between Massive Bodies, as presented in the previous chapter, above. However, that notion embeds also an important additional implication.

By stating that the Space and the Time notions are *always* interweaved into one four-dimensional entity, this also implies that the Space and the Time notions, are not independent notions, as Humans perceive such notions.

Moreover, because Einstein's four-dimensional Interwoven Space/Time notion replaces the Newton's Gravitational Field, which should be recognized as a form of Energy, then, the Space and the Time notion, are not only not independent notions, but they are also just attributes (or facets) of a form of Energy.

In a speech, in the University of Leiden on May 5th, 1920, (6), Einstein claimed that the ether should exist to provide physical properties to his Space/Time entity, which implies, that Einstein also agreed that his Space/Time Entity is a form of Energy.

Thus, Einstein's four-dimensional Interwoven Space/Time notion also implies that the Space and the Time notions are not independent notions, are just attributes (or facets) of a form of Energy, which also implies that the Space and the Time notions, as Humans perceive such notions, do not really exist.

The statement that Space and Time do not really exist sounds as an extraordinary, unbelievable, and out of line statement, at first. This is because the notions of Space and Time are crucial notions, which Humans need them, to perceive, understand and calculate Motions and Changes. However, in view of the arguments above, if Space and Time cannot be considered any longer as independent entities, and if Space and Time are just embedded in a form of Energy (the Gravitational Field), the statement that Space and Time might not really exist does not sound so detached any more.

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

leads Humans to attribute attributes (or facets) of Space and Time to the Gravitational Field Energy.

The understanding that Space and Time might not really exist, and what causes Motions and Changes are the *Ways* interactions of Energies interact with each other, is used to explain the attraction or repulsion between Electric Charges, in the next chapter of this paper, which also results in a proposal for a lead for a simple unification of Gravitation and Electricity.

5. An explanation for the Attraction or Repulsion between Electric Charges

Analogous to Newton's Universal Gravitational Law, which provides the force of attraction between Massive Bodies, Coulomb's Law provides the force of the attraction or the repulsion between Electric Charges.

Coulomb's Law is presented by the following formula (5) :

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

Where K_e represents the Coulomb's Constant and is equal to $8.99 \times 10^9 \text{ N} \cdot \text{m}^2 \cdot \text{C}^{-2}$, q_1 is the amount of Electric Charge in the first Electric Charge, q_2 is the amount of Electric Charge in the second Electric Charge and r is the distance between the center of Masses of the bodies that carry these two Electric Charges, assuming that the Electric Charges embedded in the Electrically Charged Bodies used in a Coulomb's Law experiment, are spread uniformly on these Electrically Charged Bodies.

As in the case related to the attraction between Massive Bodies, the *origin*, or the cause of Coulomb's Law is attributed to an Electric Field that each Electric Charge generates, which, as explained already, in relation to the attraction between Massive Bodies, this cannot provide a complete explanation to the question: why Electric Charges attract or repel each other? It should be noticed that the *structure* of the Newton's Universal Gravitational Law and the *structure* of the Coulomb's Law are identical.

Thus, the following question might be asked:

Since the *structure* of the Newton's Universal Gravitational Law and the *structure* of the Coulomb's Law are identical, why the *origin* of the attraction between Massive Bodies was resolved via Einstein's General Relativity Theory, and its concept of a four-dimensional Interwoven Space/Time entity, and the *origin* of the attraction or the repulsion forces between Electric Charges, is still a mystery?

As already presented in previous chapters of this paper, the Electric Fields should be also considered as forms of Accelerations, as Newton's Gravitational Field is already recognized as a form of Acceleration.

Based on the prediction that the Electric Fields should be also considered as forms of Accelerations, as Newton's Gravitational Field is already recognized as a form of Acceleration, the author of this paper published an additional paper (7) which explains the *origin* of the attraction or the repulsion between Electrically Charged bodies like Einstein's General Relativity explains the *origin* of the attraction between Massive Bodies.

That explanation is based on the understanding, presented above, that Space and Time do not really exist.

This enabled the prediction that there are two additional *separate* four-dimensional Interwoven Space/Time entities, in addition to Einstein's four-dimensional Interwoven Space/Time entity.

One of these additional four-dimensional Interwoven Space/Time entity replaces the Electric (or Magnetic) Fields generated by the Positive Electric Charges.

The second of these additional four-dimensional Interwoven Space/Time entity replaces the Electric (or Magnetic) Fields generated by the Negative Electric Charges.

And thus, these three separate four-dimensional Interwoven Space/Time entities are all forms of Energies, and each of these three separate four-dimensional Interwoven Space/Time entities embeds its own separate Space and Time attributes (or facets).

The paper (7) provides detailed explanations of the above, which also results in a lead for a simple unification of Gravity and Electricity, because, if the materials presented in the paper (7) will be found valid, then, Gravity and Electricity operations is governed by similar processes.

6. A tentative modification to Newton's Second Law of Motion

The prediction presented above, that Electric (or Magnetic) Fields are also forms of Accelerations also implies that the acceleration between Electrically Charged bodies, attracted to, or repelled from each other, because of Coulomb's Law, is dependent mainly on the amount of the Electric Charge that these bodies carry and not on the Masses of these bodies, as Newton's Second Law of motion ($F=ma$) states.

Electrically Charged bodies always embed Electric Charge *and* Mass. However, the Coulomb's Force is much more potent than the Gravitational Force. This can be demonstrated by the following:

The Gravitational Force between two 1-kg Mass Objects that are 1 meter apart is $6.67 \cdot 10^{-11}$ (8) Newtons, while the Attraction or the Repulsion Force caused by the Coulomb's Law, between two 1 Coulomb Electrically Charged Bodies, held 1 meter apart, is $9 \cdot 10^9$ (9) Newtons.

The above clearly indicates that the Coulomb's Force might be more *potent*, as compared to the Gravitational Force, by a magnitude factor of $1.35 \cdot 10^{20}$!

Thus, if Electric (or Magnetic) Fields are also forms of Accelerations, the acceleration between Electrically Charged bodies, attracted to, or repelled from each other, because of Coulomb's Law, should be dependent mainly on the amount of the Electric Charge that these bodies carry and not on the Masses of these bodies, as Newton's Second Law of motion states, which also implies that Newton's Second Law of motion should undergo a suitable modification, as is described in the paper (7) .

7. An Experiment for Validating or Disproving the proposed Unification

The paper (7) also suggest a physical experiment that might prove or disprove the prediction that the acceleration between Electrically Charged bodies, attracted to, or repelled from each other, because of Coulomb's Law, is dependent mainly on the amount of the Electric Charge that these bodies carry and not on the Masses of these bodies, as Newton's Second Law of motion ($F=ma$) states.

That experiment suggests letting two Electrically Charged bodies, at a specific distant L apart, being attracted to each other under Coulomb's Law.

In the first phase of the experiment the bodies should be of equal Mass magnitudes, embedding equal amounts of Electric Charges, each of a different polarity, to enable the attraction between the bodies under the Coulomb's Force. The experiment should measure the time it takes for these bodies to collide.

Then, the experiment is repeated with two additional Electrically Charged bodies with the same amount of Electric Charge but with a much bigger Mass magnitude (for example, twice the Mass magnitude that the Electrically Charged bodies had in the first phase of the experiment).

Newton's Second Law of motion predicts that the time to collision, in that second phase of the experiment, would be different (bigger), because the Forces exerted on the bodies will be the same, as in the first phase of the experiment, because the Electric Charges are the same in both phases of the experiment, but the Masses of the bodies are bigger in the second phase of the experiment, which will result in a smaller acceleration.

This paper, on the other hand, predicts that the time to collision in both phases of the experiment would be virtually the same, because the acceleration between Electrically Charged bodies, attracted to, or repelled from each other under the Coulomb's Law, is dependent mainly on the amount of the Electric Charge that these bodies carry and not on the Masses of these bodies, as Newton's Second Law of motion ($F=ma$) states.

If the experiment will prove that the time to collision will be virtually the same, in both phases of the experiment, this will provide validity to what is presented in this paper.

8. Summary and Conclusions

This paper assumes that Newton's Second Law of motion was never checked to see if it complies with the acceleration in scenarios of attraction or repulsion between Electrically Charged bodies, attracting or repelling under Coulomb's Law.

Instead, this paper assumes that Newton developed his Second Law of motion based on the trajectories existing in the Solar System (10) , (11) , (12) .

Newton used these trajectories to prove that his laws are valid, by showing that his laws of motion forecasted these trajectories.

Thus, this paper predicts that Newton's Second Law of motion is valid only for very Massive Bodies (such as planets) or Electrically Uncharged bodies, or Forces exerted on Electrically Charged Bodies which are not Forces related to Coulomb's Law, and for Electrically Charged Bodies attracting or repelling under Coulomb's Law Newton's Second Law of motion should undergo a suitable modification.

That prediction is based on another prediction that Electric (or Magnetic) Fields are also forms of Acceleration, as the Newton's Gravitational Field is already recognized as a form of Acceleration.

The prediction that Electric (or Magnetic) Fields are also forms of Acceleration, was used by the author of this paper, to explain the *origin* of the attraction or the repulsion between Electrically Charged bodies (which is still a mystery today) like Einstein's General Relativity explains the *origin* of the attraction between Massive Bodies.

This also provides a lead for a simple unification of Gravity and Electricity.

However, the prediction that Electric (or Magnetic) Fields are also forms of Acceleration also implies that the acceleration between Electrically Charged bodies, attracted to, or repelled from each other, because of Coulomb's Law, is dependent mainly on the amount of the Electric Charge that these bodies carry and not on the Masses of these bodies, as Newton's Second Law of motion ($F=ma$) states.

This paper also proposes a physical experiment to validate (or disprove) the prediction that the acceleration between Electrically Charged bodies, attracted to, or repelled from each other, because of Coulomb's Law, is dependent mainly on the amount of Electric Charge that these bodies carry and not on the Masses of these bodies.

This experiment is relatively simple to implement, but still requires means and funds which are beyond the reach of the author of this paper, thus, the author of this paper hopes, that this paper will bring about the execution of this experiment, and, hopefully, the validation of what is presented in this paper.

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