F=ma might not be correct for Electrically Charged Bodies

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Abstract:

The Nowadays Science of Physics states that when an external Force is exerted on ***any*** Massive Body it causes an Acceleration of this Massive Body according to Newton's Second Law of Motion, F=ma.

But, if that Massive Body Accelerates according to Newton's Second Law of Motion, F=ma, this also implies, as will be presented in this paper, that ***all the Work*** done by this external Force, which is also ***all the Energy*** exerted on this Massive Body, is ***already converted to*** the Kinetic Energy that that Massive Body acquires**,** or, in other words, is already ***manifested*** and ***embedded*** in the Kinetic Energy that that Massive Body acquires, because of the above-mentioned external Force which was exerted on it.

However, if an external Force is exerted on an Electrically Charged Massive Body, what was presented above might need modifications.

Because, if an Electrically Charged Massive Body ***does indeed*** Accelerates ***also*** according to Newton's Second Law of Motion, F=ma, and ***all the Work*** done by the external Force exerted on it, is ***already manifested*** and ***embedded*** in the Kinetic Energy embedded in this Electrically Charged Massive Body, then this ***cannot explain*** the ***origin*** of the ***Extra Energy*** that an Electrically Charged Massive Body acquires, which is manifested in the Electromagnetic Waves that it emits when it Accelerates, and the Magnetic Field that surrounds it when it moves.

If the above presented dilemma is further substantiated, then, the resolution to this dilemma should be only one of two possibilities: either the ***Extra Energy*** mentioned-above, is generated from nothing, which clearly violates the Energy Conservation Principle, or, as this paper predicts, that Newton's Second Law of Motion, F=ma might ***not be*** the proper equation which should be used to calculate the Acceleration that an Electrically Charged Body acquires, when an external Force is exerted on it.

Despite the fact that the proof provided to the prediction that F=ma might ***not be*** correct for Electrically Charged Bodies, is based on very simple but significant arguments, as can be also

concluded from what was already presented above, since that prediction does challenge a significant element of the nowadays Science of Physics (F=ma), which is accepted as a definitely correct element, then, an additional support for that prediction might be required, to further substantiate that prediction.

But because, the proof provided to that dilemma is based on very simple arguments, that additional support should not be provided from additional theoretical arguments, but rather, it should be provided by a proposal for a physical experiment, which if implemented, might provide validity to that prediction.

Thus, this paper does also propose such an experiment, which is based on measurements related to the Acceleration embedded in the Attraction between two Electrically Charged Bodies under Coulomb's Law Force, which is clearly a scenario of Forces exerted on Electrically Charged Bodies.

Based on the ***Identical Structures*** of Newton's Law of Universal Gravitation, $F = G\cdot(m_1\cdot m_2)/ r^2$, and Coulomb's Law, $F = Ke\cdot(q_1\cdot q_2)/r^2$, this paper predicts that the ***origin*** of the Acceleration embedded in the Attraction between two Electrically Charged Bodies under Coulomb's Law Force is the Electric Fields, which also implies, that the Electric Fields Strength are also forms of Acceleration, as the Gravitational Field Strength is already recognized as a form of Acceleration, which also implies, that the Acceleration embedded in the Attraction between two Electrically Charged Bodies under the Coulomb's Law Force cannot be calculated by the equation F=ma, as was also presented before above.

Thus, a measurement of the Time to collision between two Electrically Charged Bodies, in a scenario of the Attraction between two Electrically Charged Bodies under the Coulomb's Law Force, is a good indication for concluding, if the Acceleration in that scenario does indeed complies, or ***does not comply*** with the equation F=ma.

As already presented above, such an experiment is proposed, and described in this paper.

If that experiment will be implemented, and its results will be successful, this will provide the required additional substantiation, to the prediction that F=ma might ***not be*** correct for Electrically Charged Bodies.

However, the substantiation of the above-mentioned prediction, will have also additional significant implications.

Because, if the above-mentioned prediction will be validated, and also the Electric Fields Strength will be recognized as a form of Acceleration, then, this will have significant implications also on how the entities of Space and Time should be perceived.

The nowadays Science of Physics states, that there is only one, single, three-dimensional entity of Space, and just one, single, one-dimensional entity of Time, which together are Interweaved to form the real one, single, four-dimensional Interwoven Space/Time entity, presented in Einstein's General Relativity Theory.

However, if the Electric Field Strength will be recognized as a form of Acceleration, this paper presents that this will also imply that there must be multiple, separate, Interwoven Space/Time entities, each attributed to a separate form of Energy, and not just one single, four-dimensional Interwoven Space/Time entity, presented in Einstein's General Relativity Theory.

The analogy presented by Einstein's General Relativity of mass curving Space/Time works well for Gravity, where the curvature always leads to Attraction. However, it struggles to explain the bidirectional nature of Electromagnetic Forces (Attraction and repulsion). A simple "dent" in Space/Time cannot account for both pushing and pulling.

Thus, as also presented in this paper, the prediction of multiple, separate, Interwoven Space/Time entities might be the lead to start a Unification between Gravity and Electromagnetism, a significantly unresolved issue today, and explain the ***origin*** of the Attraction or the Repulsion between Electric Charges, an issue which is still a mystery today.

Thus, from the above follows, that the prediction, presented in this paper, that F=ma might not be correct for Electrically Charged Bodies, which as presented above can be proved with very simple but significant arguments, might be only the first step, of more significant implications, and thus, an implementation of the above-mentioned proposed experiment, might be an important endeavor.

1. The Acceleration and the Kinetic Energy that a moving Electrically Charged Massive Body acquires because of an External Force Exerted on it

Appendix A bellow presents a proof that ***all the Work*** done by an external Force, F, exerted on any Massive Body, is ***already manifested and embedded*** in the Kinetic Energy, $mv^2/2$, that that Massive Body acquired because of that Force, F, that was exerted on it, ***if*** the Massive Body ***indeed Accelerates*** according to Newton's Second Law of Motion, F=ma, when an external Force, F, is exerted on it.

But if an external Force, F, is exerted on an Electrically Charged Body, F=ma might not be correct for calculating the Acceleration that this Electrically Charged Body acquires.

Because, an Electrically Charged Body which Accelerates, also emits Electromagnetic Waves.

And also, because, an external spectator, which inspects a moving Electrically Charged Body, detects an additional Magnetic Field generated because of this Electrically Charged Body movement, ***in addition*** to the Electric Field that surrounded this Electrically Charged Body before its movement.

It should be also emphasized, that any Electrically Charged Body embeds both, Electric Charge and Mass.

And if the external Force exerted ***also*** on an Electrically Charged Body also causes that body to Accelerate according to Newton's Second Law of Motion, F=ma, as the nowadays Science of Physics ***does state***, then as already presented above, ***all the work*** done, by that external Force is ***already embedded*** in the Kinetic Energy that that Electrically Charged Body acquired, because of that Force exerted on it.

And since that external Force is the ***only cause*** which caused that Electrically Charged Body to acquire an Accelerated movement, and ***all the work*** done by that external Force, is ***already embedded*** in the Kinetic Energy that that Electrically Charged Body acquired, then, the following questions might arise:

What generates the ***Extra Energy*** embedded in the Magnetic Field that surrounds this Electrically Charged Body because of its movement, and ***what generates*** the ***Extra Energy*** embedded in the Electromagnetic Waves that that Electrically Charged Body emits because it now Accelerates?

It cannot be the Work done by the external Force which was exerted on that Electrically Charged Massive Body, because, if that Electrically Charged Body ***does Accelerate*** according to Newton's Second Law of Motion, F=ma, then as stated above, ***all the work*** done by that external Force, is ***already embedded*** in the Kinetic Energy that that Electrically Charged Body acquired.

If the above presented dilemma is further substantiated, then, the resolution to this dilemma should be only one of two possibilities: either the ***Extra Energy*** mentioned-above, is generated from nothing, which clearly violates the Energy Conservation Principle, or, as this paper predicts, that Newton's Second Law of Motion, F=ma might ***not be*** the proper equation which should be used to calculate the Acceleration that an Electrically Charged Body acquires, when an external Force is exerted on it.

In a following section of this paper a physical experiment is proposed which if implemented, and its results will be successful, can provide additional substantiation to the prediction presented above that F=ma might ***not be*** the proper equation which should be used to calculate the Acceleration that an Electrically Charged Body acquires, when an external Force is exerted on it.

2. The possibility that the Electric Field Strength will be also recognized as a form of Acceleration.

A preprint, by the author of this paper, titled: "Implications if the Electric Field will be recognized as a form of Acceleration" (1), presents the assumption that the Electric Field Strength should be also recognized as a form of Acceleration, similar to the Gravitational Field Strength which is already recognized as a form of Acceleration**.**

This assumption is based on significant arguments, which can be found in the above-mentioned preprint (1).

These arguments start with the notification, that the ***structures*** of Newton's Law of Universal Gravitation, $F = G\cdot(m_1\cdot m_2)/ r^2$, and Coulomb's Law, $F = Ke\cdot(q_1\cdot q_2)/r^2$ are ***identical***.

The following further summarizes the arguments presented in the above-mentioned preprint (1) relating to the possibility that the Electric Field Strength should be also recognized as a form of Acceleration:

These arguments first present that by analyzing ***only*** Newton's Law of Universal Gravitation, which, as already presented above, is presented by the equation $F = G\cdot(m_1\cdot m_2)/ r^2$, ***without*** referring ***at all*** to Newton's Second Law of Motion, F=ma, one can already conclude that the Gravitational Field Strength, g, is a form of Acceleration.

The nowadays Science of Physics states that the conclusion that the Gravitational Field Strength, g, is a form of Acceleration ***must rely*** also on the recognition of Newton's Second Law of Motion, F=ma, because the Gravitational Field Force exerted on a Mass, m, is presented by F=mg, and because any Force exerted on any Mass, m, also complies to F=ma, then, from the above follows that g=a, or, that the Gravitational Field Strength is a form of Acceleration.

But, the arguments presented in the above-mentioned preprint (1) state, that during the attraction process between two Massive Bodies the Force of attraction continuously increases, which ***must result*** in an increase of the bodies velocities, or, in other words, an Acceleration, exerted on these Massive Bodies, and because what causes this Force is the Gravitational Field, then, the Gravitational Field Strength must be recognized as the source of this Acceleration, even without referring ***at all*** to the equation F=ma.

Then, the arguments presented in the above-mentioned preprint (1) state, that since the ***structure*** of Newton's Law of Universal Gravitation, $F = G\cdot(m_1\cdot m_2)/ r^2$, and the ***structure*** of the Coulomb's Law, $F = Ke\cdot(q_1\cdot q_2)/r^2$, are ***identical***, then, the same arguments should also apply to the Electric Field Strength, as further explained below:

The arguments presented in the above-mentioned preprint (1) state, that during the process of the attraction (or the repulsion) between two Electrically Charged Bodies, the Force of the attraction (or the repulsion) between these Electrically Charged Bodies, continuously increases (or decreases, depending if the Electrically Charged Bodies attract or repel each other), which ***must also result*** in an Acceleration (or Deceleration) exerted on these Electrically Charged Bodies.

And because what causes this Force is the Electric Field, then, the Electrical Field Strength, ***must be*** also recognized as the source of this Acceleration (or Deceleration), and not the Mass magnitudes embedded on these Electrically Charged Bodies, which is not presented at all in the equation of the Coulomb's Law.

However, if the Electrical Field Strength will be recognized also as a form of Acceleration, as predicted in the preprint (1), and maybe validated by a successful implementation of a proposed experiment, then, if the Acceleration between two Electrically Charged Bodies is dictated by the Electric Field, as predicted in that preprint, and ***not by*** the amounts of the Mass that these bodies embed, because the Electric Field ***is the entity*** that ***causes*** that Acceleration, as also stated in that preprint, then, the Acceleration exerted on these Electrically Charged Bodies should ***not be*** calculated via the equation F=ma.

Instead, the following might apply:

Because the Coulomb's Force between these Electrically Charged Bodies, exerted on any of these Electrically Charged bodies, which embed an amount of Electric Charge of q is presented by: F=qE, where E is the Electric Field Strength, and if E is a form of Acceleration, then, it can be also presented as: E=ka, where a is the Acceleration, and k is a factor, which implies that the Coulomb's Law Force F can be presented as: F=kqa, instead of F=ma.

Thus, in view of the proof already presented in the previous chapter of this paper that F=ma might not be correct for Electrically Charged Bodies, the above might be understood and accepted.

Moreover, it should be also noted that the equation F=ma was initially presented as F=kma, and only after the dimensions of the entity of the Force were assigned as Newtons, k was set to 1 and that equation became F=ma.

This might also imply that Newton also arrived to the notion that F=ma, also by recognizing that the Gravitational Field Strength must be a form of Acceleration ***only*** by analyzing his Law of Universal Gravitation, $F = G\cdot(m_1\cdot m_2)/ r^2$, as already presented above in this paper, and presented also in the preprint (1).

Also, it might be that Newton presented his laws of motion because these laws explained the trajectories of the planets in the solar system, as is also presented in Ref (3), and an experiment, which establishes the Acceleration in a scenario of Electrically Charged Bodies moving under the Coulomb's Law Force was never yet implemented.

In the next chapter of this paper an experiment is proposed, based on the scenario of two Electrically Charged Bodies Attracted under the Coulomb's Law Force, which if implemented, and its results will be successful, will provide additional required substantiation to the prediction, presented in this paper, that F=ma might not be correct for Electrically Charged Bodies.

3. A proposed experiment for validating the statement that F=ma might not be correct for Electrically Charged Bodies.

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 $6.67\cdot10^{-11}$ (4) 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 $9\cdot10^{9}$ (5) 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 $1.35\cdot10^{20}$!

Thus, if Electric Fields Strength 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 Mass magnitudes of these bodies, as Newton's Second Law of Motion states.

Thus, this paper proposes a relatively simple experiment which might check if the Acceleration between Electrically Charged Bodies, attracted to, or repelled from each other, because of Coulomb's Law Force, ***does indeed comply*** to Newton's Second Law of Motion F=ma.

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, (and thus, the Coulomb's Force will be the same, and the Gravitational Force is negligible in comparison with Coulomb's Force), but the Mass magnitudes of the bodies are bigger in the second phase of the experiment, which will result in a smaller Acceleration, according to F=ma.

This paper, on the other hand, predicts that the time to collision in both phases of the experiment will not comply with the equation F=ma, 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 Mass magnitudes of these bodies, as Newton's Second Law of Motion (F=ma) states.

It should be also emphasized, that because any Electrically Charged Body embeds both, Electric Charge and Mass, it might ***also*** be, that the Acceleration between two Electrically Charged Bodies, moving under the Coulomb's Law Force might be dictated by ***both***, the Electrical Charge embedded on each of these Electrically Charged Bodies ***and*** the Mass embedded on each of these Electrically Charged Bodies.

But the above ***might still imply*** that F=ma might ***not be*** the equation that dictates the Acceleration in a scenario of two Electrically Charged Bodies, moving under the Coulomb's Law Force.

Instead, in such a scenario, the factor k in the above-proposed equation of F=kqa, might be dependent on the amount of the Mass embedded on the two Electrically Charged Bodies, moving under the Coulomb's Law Force.

And, even though, the Acceleration between two Electrically Charged Bodies, moving under the Coulomb's Law Force might be ***also*** dependent on the amount of Mass embedded in these Electrically Charged Bodies, F=kqa ***might still be*** the proper equation for evaluating the Acceleration between two Electrically Charged Bodies, moving under the Coulomb's Law Force, ***and not*** F=ma.

Because as already presented before in this paper, and the preprint (1), the Electric Field ***might be the entity*** that ***causes*** the Acceleration between two Electrically Charged Bodies, moving under the Coulomb's Law Force, and thus, as already presented above, in this paper, F=kqa ***might still be*** the proper equation for evaluating the Acceleration between two Electrically Charged Bodies, moving under the Coulomb's Law Force, ***and not*** F=ma.

Thus, in view of the above, in the proposed experiment mentioned-above, and in the preprint (1), that experiment might test ***not if*** the Acceleration between two Electrically Charged Bodies, moving under the Coulomb's Law Force ***is not*** dependent ***at all*** on the amount of the Mass that these Electrically Charged Bodies embed.

Instead, that experiment might need to evaluate ***if*** F=ma is ***not the valid*** equation, in evaluating the Acceleration between two Electrically Charged Bodies, moving under the Coulomb's Law Force, and this can be accomplished by, for example, doubling the amount of the Mass embedded in each of these Electrically Charged Bodies, and evaluating that the Acceleration ***is not halved***, which must be the case if F=ma does apply.

The experiment mentioned-above, and in the preprint (1), intends to evaluate the Acceleration in a scenario of two Electrically Charged Bodies, moving under the Coulomb's Law Force, which attract each other, by monitoring the Time to collision of these Electrically Charged Bodies, and from this Time to collision, the experiment intends to decide if the Acceleration, in that scenario, can be ***indeed*** evaluated via the equation F=ma, as the nowadays Science of Physics states.

It is already known, that the equation of motion follows the general property, that if the Acceleration a(x), is dependent on the position, x, as in the case of two Electrically Charged Bodies, moving under the Coulomb's Law Force, then, if this Acceleration, a(x), scales by a factor of α, then the Time travel scales by a factor of $\sqrt{1/\alpha}$.

The Appendix B presented below, provides an explanation, of what was just presented above, in more details.

Thus, if in a scenario of two Electrically Charged Bodies, moving under the Coulomb's Law Force, the Acceleration indeed complies completely with the equation F=ma, and the amount of the Mass embedded in the Electrically Charged Bodies is doubled, then, the Acceleration must be halved, and thus, from the above follows that the Time to collision should increase by a factor of $\sqrt{2}$.

Thus, if in the proposed experiment the Time to collision will ***not be*** increased by a factor of $\sqrt{2}$, if the amounts of the Mass embedded in the Electrically Charged Bodies will be doubled, this will imply that the Acceleration in this scenario ***cannot be*** determined via the equation F=ma, as predicted in this paper and in the preprint (1).

The above might also help in determining ***how the values of k***, in the equation of F=kqa, proposed in this paper and the preprint (1), might be depending on the amounts of the Mass that the above-mentioned Electrically Charged Bodies embed.

4. Implications imposed on the existence of the entities of Space and Time if the Electric Field Strength will be recognized as form of Acceleration

As already mentioned before, in this paper, the possibility that the Electric Field Strength will be also recognized as a form of Acceleration, will impose a significant challenge on the way Humans should refer to the entities of Space and Time**.**

This is already elaborated in more details in the preprint (1), and is also presented briefly, in this paper, below:

Humans need the entity of Space to perceive relative positions between objects. Humans also need the entities of Space and Time to calculate values that Humans attribute to Motions, such as Velocity or Acceleration.

Thus, the nowadays Science of Physics states that the entities of Space and Time are real entities, that do really exist, and there is only one, single, three-dimensional entity of Space, and just one, single, one-dimensional entity of Time, which together are Interweaved to form the real one, single, four-dimensional Interwoven Space/Time entity, presented in Einstein's General Relativity Theory.

Einstein's General Relativity Theory introduced the concept of the four-dimensional Interwoven Space/Time entity, for providing an explanation for the ***origin*** of the attraction between Massive Bodies, which was an unresolved issue before the introduction of Einstein's General Relativity Theory.

Newton's Universal Gravitational Law, $F = G\cdot(m_1\cdot m_2)/ r^2$, provided the amount and the direction of the Force of attraction between 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.

The understanding that the Gravitational Field Strength is actually a form of Acceleration helped Einstein in his endeavor of explaining the ***origin*** of the attraction between Massive Bodies, via his General Relativity Theory.

Einstein accomplished the above by stating, that any Massive Body induces a deformation into Einstein's four-dimensional Interwoven Space/Time entity, which causes any other Massive Body to be attracted to the Massive Body that causes this deformation, in an Accelerated movement, because this four-dimensional Interwoven Space/Time entity already embeds the Space and the Time entities in it, and thus, an Acceleration can be calculated at each point of such a deformed four-dimensional Interwoven Space/Time entity, the Acceleration that dictates the Acceleration in the attraction of these Massive Bodies.

But, if Einstein's four-dimensional Interwoven Space/Time entity can undergo the deformation presented above, it must be some form of media, and thus, some 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.

Actually, Einstein’s four-dimensional Interwoven Space/Time notion replaces the Newton’s Gravitational Field, which should be recognized as a form of Energy.

But, as already presented above, the nowadays Science of Physics, and for that matter, also Einstein's General Relativity Theory states, that there is only ***one, single***, three-dimensional

entity of Space, and just ***one, single***, one-dimensional entity of Time, which together are Interweaved to form the real ***one, single***, four-dimensional Interwoven Space/Time entity, presented in Einstein's General Relativity Theory, which is the ***only entity*** that can dictate Accelerations in the Universe, because it is the ***only entity*** that embeds the ***one, single*** Space entity and the ***one, single***, Time entity.

But if the Electric Field Strength will be also recognized as a form of Acceleration, as predicted by the preprint (1), then, also Electric Charges, which are the cause of the Electric Fields, must also be able to induce a deformation into Einstein's Interwoven Space/Time entity, in order to cause the Acceleration embedded in the Electric Fields, as the preprint (1) predicts, because, as just presented above, Einstein's Interwoven Space/Time entity, is the ***only entity*** which causes Accelerations, because it is the ***only entity*** which embeds the Space and the Time entities.

The following highlights difficulties which result from what was just presented above:

Because Physics assumes that the Electric Fields reside together with the Gravitational Field, in the ***same locations*** in this ***one single*** Space entity, then, ***how can it be*** that the Gravitational Field generates an Acceleration presented by F=ma, for the attraction between Massive Bodies, and the Electric Field generates a ***different*** Acceleration, F=kda, for the attraction or the repulsion between Electrically Charged Bodies, as predicted by the preprint (1), in that ***same single*** Space entity, which embeds both, the Electric and the Gravitational Fields, ***in the same locations***?

Moreover, the assumption made by Einstein, that there is only ***one***, ***single*** entity of Einstein's Interwoven Space/Time entity, enabled Einstein to develop his General Relativity theory, because it is possible to envision, how a proper deformation into that ***one, single*** Einstein's Interwoven Space/Time entity, can generate the required Acceleration, at each point of it, for explaining the ***origin***, of the Massive Bodies attractions.

However, Electric Charges might attract or repel each other, and it seems impossible to envision a proper deformation, induced into a ***single*** Einstein's Interwoven Space/Time entity, composed of only a ***single*** Space entity and a ***single*** Time entity, which will be able to generate the proper Accelerations which will be able to explain the ***origin*** of the Electric Charges attractions, and, also to explain the ***origin*** of the Electric Charges repulsions.

Thus, ***if*** Einstein's Interwoven Space/Time entity is the ***only entity*** that can generate Accelerations, because it is the ***only entity*** that embeds the Space and the Time entities, then, if Electric Fields Strength might be also recognized as a form of Acceleration, as predicted by the preprint (1), that Acceleration seems to be ***problematic***, because it ***cannot*** be related to Einstein's Interwoven Space/Time entity, as presented above, although, as also presented above, this Acceleration ***must*** be related to Einstein's Interwoven Space/Time entity, because it is the ***only*** entity that embeds the Space and the Time entities.

A resolution to the dilemma presented above might be the conclusion that the Space and the Time entities ***do not really exist*** and might be viewed only as ***facets, or attributes*** of certain forms of ***Energies***.

Thus, the above suggests that there might be ***multiple, separate and independent*** facets of Space and Time, each attributed to a ***different form of Energy***.

For example, the Gravitational Field might embed a facet, or attribute, which is presented by Einstein's Interwoven Space/Time concept, and this facet, or attribute, might be ***different, separate and independent*** from another facet, or attribute, of an Interwoven Space/Time attributed to the Electric Field.

The resolution presented above, also provides the possibility to provide explanations to additional unresolved issues, such as:

What is the ***origin***, of the attraction or the repulsion between Electrically Charged Bodies?

Einstein's General Relativity did provide an explanation for the ***origin*** of the attraction between Massive Bodies, but the ***origin*** of the attraction or the repulsion between Electrically Charged Bodies is still a mystery today.

The paper (7), by the author of this paper, proposes an explanation for the ***origin*** of the attraction or the repulsion between Electrically Charged Bodies, based on the prediction that there are ***multiple, separate and independent*** facets of Space and Time, each attributed to a ***different form of Energy***.

And, the preprint (8), by the author of this paper, proposes a simple unification between the Gravity and the Electromagnetism, based also on the prediction that there are ***multiple, separate and independent*** facets of Space and Time, each attributed to a ***different form of Energy***.

The nowadays Science of Physics tries to provide a Unification between the Gravity and the Electromagnetism by assuming additional dimensions, as for example in the Kaluza Klein Theory. But, since such theories cannot provide a physical experiment to validate their assumptions, and this paper does provide such an experiment, the Unification between the Gravity and the Electromagnetism provided in this paper is a viable candidate to cope with this issue. More on the above can be also found in the preprint, by the author of this paper: " Kaluza Klein Theory versus the possibility that the Electric Field Strength might be recognized as a form of Acceleration" (2).

Thus, a successful execution of the experiment proposed might provide validity to the recognition that the Electric Field Strength might be a form of Acceleration, but it will also impose challenges on how Humans should refer to the very existence of the entities of Space and Time, and, it might also provide, as presented above, additional significant insights.

And, then, the recognition that the Space and the Time entities might not be entities that really exist, might not seem so detached, also because, these entities are purely abstract notions, which Humans might never be able to touch or feel, contrary to the Energy notion, which does contain abstract appearances (such as the notions of Energy Fields) but also appearances that Humans can touch and feel such as Massive objects.

5. Summary and Conclusions.

The paper highlights a paradox resulting from the statement, presented by the nowadays Science of Physics, that when an external Force is exerted on ***any*** Massive Body it causes an Acceleration of this Massive Body according to Newton's Second Law of Motion, F=ma.

That paradox appears when the above statement is applied to an external Force exerted on an Electrically Charged Body.

Because, an Accelerating Electrically Charged Body also emits Electromagnetic Waves and has a Magnetic Field which surrounds it, in addition to the Electric Field, which surrounded it, before that Electrically Charged Body started its movement.

And, if that Electrically Charged Body ***indeed*** also Accelerates according to Newton's Second Law of Motion, F=ma, as the nowadays Science of Physics ***does state***, then, because, as presented in this paper, ***all the Work*** done by this external Force is ***already manifested and embedded*** in the ***Kinetic Energy*** that that Electrically Charged Body acquired, because of that external Force that was exerted on it, then this implies that, there is ***no additional Energy*** exerted on that Electrically Charged Body, which ***can explain*** the ***origin*** of the ***additional Energies*** that appear after that Electrically Charged Body started its movement, which are the Electromagnetic Waves that that Electrically Charged Body emits after it started its Acceleration, or the Magnetic Field which surrounds it after that Electrically Charged Body started its movement.

The paper presents the assumption that for an external Force exerted on an Electrically Charged Body, F=ma might ***not be*** the proper equation which should be used to calculate the Acceleration that an Electrically Charged Body acquires, when an external Force is exerted on it.

Thus, this paper might also provide extra support to what is already presented in additional papers, by the author of this paper, which also present the above possibility, that F=ma might ***not be*** the proper equation which should be used to calculate the Acceleration that an Electrically Charged Body acquires, when an external Force is exerted on it.

This paper and the above-mentioned additional papers also propose an experiment which might either discard the above-mentioned possibility, if the results of that experiment will turn out to be unsuccessful, or, alternatively, provide validity to the above-mentioned possibility, if the results of that experiment will turn out to be successful.

This paper and the above-mentioned additional papers also point out additional significant implications, if the predictions presented in this paper, will be validated. These significant implications might be a lead to start the Unification of Gravity and Electromagnetism.

Thus, what is presented in this paper might provide extra support to the statement that an implementation of the above-mentioned experiment, might be an important endeavor.

It should be also added, that if the above-mentioned experiment will turn out to be unsuccessful, this will ***indeed discard*** the above-presented assumption that for an external Force exerted on an Electrically Charged Body, F=ma might ***not be*** the proper equation which should be used to

calculate the Acceleration that an Electrically Charged Body acquires, when an external Force is exerted on it.

But in such a situation the paradox presented in this paper will still remain as an unresolved open question.

Appendix A:

A proof that if F=ma applies to a Force exerted on ***any*** Massive Body, then, ***all the Work*** done by that external Force is converted to the Kinetic Energy that that Massive Body acquires

The Nowadays Science of Physics states that when an external Force is exerted on ***any*** Massive Body it causes an Acceleration of this Massive Body according to Newton's Second Law of Motion, F=ma.

Thus, from the above follows that, the infinitesimal Work, dW, done by an external Force, F, exerted on an Uncharged Massive Body is:

$dW = Fdx = ma\,dx,$

where dx is the infinitesimal length of route covered by this external force F.

Since the Acceleration a is equal to:

$a = dv/dt = (dv/dx)\,(dx/dt),$

and since:

$dx/dt = v$

then $a = v(dv/dx)$.

Then, the infinitesimal Work, dW, is equal to:

$m\,v(dv/dx)dx = m\,v\,dv.$

Then, the ***Total Work***, W, done by that external Force, F = ma, is:

$W = m \int v\,dv = m\,v^2/2 + C.$

Assuming the Uncharged Massive Body starts moving from rest, then, when W=0 also v=0 which results in C=0.

Thus, the above presents that the ***Total Work*** (or, in other words, ***all the Work***), W, done by the above-mentioned external Force, F, exerted on the above-mentioned Uncharged Massive Body is also equal to:

$m\,v^2/2,$

which is also the known equation for the Newtonian Kinetic Energy that that Uncharged Massive Body acquired, because of that external Force, F, which was exerted on it, if indeed that Uncharged Massive Body, accelerates according to Newton's Second Law of Motion, F=ma.

The nowadays Science of Physics also states, that the above-mentioned Newtonian Kinetic Energy is only an approximation.

Because, the nowadays Science of Physics states, that the magnitude of the embedded Mass of an Uncharged Massive Body actually increases, when an external force, F, is exerted on that Massive Body, according to the equation:

$m=m_{0\,(}1-v^2/c^2)^{-1/2}$,

presented by Einstein's Special Relativity Theory.

And the nowadays Science of Physics states that the resulting embedded Energy, of that Uncharged Massive Body,

mc^2,

embeds in it the Rest Energy of this Uncharged Massive Body,

m_0c^2,

Plus, the additional Kinetic Energy that that Uncharged Massive Body acquired, because of the external Force, F, which was exerted on it.

But it can be presented, that also in the above-presented relativistic approach, the Kinetic Energy results in

$m\ v^2/2$

For velocities v which are significantly smaller than the velocity of Light in vacuum, c, as presented below:

The Kinetic Energy K is equal to:

$K= mc^2 – m_0c^2 = m_0\ c^2\ (1-v^2/c^2)^{-1/2} - m_0c^2$.

And since from the Binomial Theorem $(1+x)^{-1/2}$ is equal approximately to $1 – x/2$, for very small x values, then:

$K= m_0\ c^2\ (1+v^2/2c^2) - m_0\ c^2 = m_0\ c^2 + m_0\ v^2/2 - m_0\ c^2 = m_0\ v^2/2$.

Thus, the above also presented, that ***all the Work*** done by an external Force, F, exerted on a Massive Body, is ***already manifested and embedded*** in the Kinetic Energy, $m_0\ v^2/2$, that that Massive Body acquired because of that Force, F, that was exerted on it, ***if*** the Massive Body ***indeed Accelerates*** according to Newton's Second Law of Motion, F=ma, when an external Force, F, is exerted on it.

Appendix B:

How the Time travel is dependent on the Acceleration, if the Acceleration is a function of the position, x

The Acceleration a(x) is presented by d^2x/dt^2, and the Velocity v is presented by v = dx/dt, thus, the Acceleration a(x) is also presented by dv/dt.

Since a(x) = dv/dt = (dv/dx) (dx/dt), then also a(x) = v(dv/dx).

Separating variables results in v dv = a(x) dx, then integrating, $\int$ v dv = $\int$ a(x) dx which results in,

$v^2/2 = \int a(x)\,dx + C$, assuming the body starts from rest at $x = x_0$, then, $v=0$ at $x = x_0$, which implies:

$$0 = \int_{x_0}^{x_0} a(x)\,dx + C, \text{ which gives, } C=0.$$

Thus, $v^2/2 = \int_{x_0}^{x} a(x)\,dx$, which results in $v = dx/dt = \sqrt{2\int_{x_0}^{x} a(x)\,dx}$

or,

$$dt = \frac{dx}{\sqrt{2\int_{x_0}^{x} a(x)\,dx}}$$

Integrating both sides to find the Time of travel T results in:

$$T = \int_{x_0}^{x_f} \frac{dx}{\sqrt{2\int_{x_0}^{x} a(x)\,dx}}$$

Thus, if the Acceleration a(x) is scaled by a constant factor of α to become $a(x)_{new} = \alpha\, a(x)$, then the Time of travel T_{new} will become:

$$T_{new} = \int_{x_0}^{x_f} \frac{dx}{\sqrt{2\int_{x_0}^{x} \alpha\, a(x)\,dx}}$$

which is equal to:

$$T_{new} = \frac{1}{\sqrt{\alpha}} \int_{x_0}^{x_f} \frac{dx}{\sqrt{2\int_{x_0}^{x} a(x)\,dx}}$$

which is equal to $T_{new} = T \frac{1}{\sqrt{\alpha}}$

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