

Kaluza Klein Theory versus the possibility that the Electric Field Strength might be recognized as a form of Acceleration

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Abstract:

Einstein's Theories are considered as significant theories of the nowadays Science of Physics.

However, the nowadays Science of Physics did not provide yet a verified theory for unifying the Gravitation and the Electromagnetism.

Kaluza Klein Theory addresses that issue by predicting that there are five dimensions, with the fifth dimension being of the shape of a tiny circle, with a radius of 23 times the Planck length, which is of the order of 10^{-33} cm.

However, because there is no foreseeable technology for verifying that prediction, about that fifth dimension, the Kaluza Klein Theory is not yet accepted as a complete viable theory, which implies that the issue of presenting a theory which unifies the Gravitation and the Electromagnetism is still an open issue.

This paper, and several other preprints, by the author of this paper, also tries to address that issue, by presenting an alternate theory, which is also accompanied by a proposal for an experiment, which might either disprove the proposed theory, if the proposed experiment implementation will turn out to be unsuccessful, or, alternatively, provide validity to the proposed theory, if the proposed experiment implementation will turn out to be successful.

However, while the Kaluza Klein theory does not challenge significant elements of the nowadays Science of Physics, the proposed theory does challenge significant elements of the nowadays Science of Physics, and as such, might appear, initially, as completely wrong.

Thus, this paper concludes that the implementation of the proposed experiment might be an important endeavor, because it might provide validity to the proposed theory, while the Kaluza Klein theory does not seem to be verified, in the foreseeable future, leaving the issue of the unification of the Gravity and the Electromagnetism as an open issue.

1. 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 should be also recognized as a form of Acceleration, similar to the Gravitational Field 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, $F = K_e \cdot (q_1 \cdot q_2) / r^2$ are *identical*.

The following further summarizes the arguments presented in the above-mentioned preprint (1) relating to the possibility that the Electric Field 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, $F = K_e \cdot (q_1 \cdot q_2) / r^2$, 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.

The arguments presented in the above-mentioned preprint (1), further state, that the Coulomb's Force between Electrically Charged Bodies is significantly more potent, maybe by a factor of about 10^{20} , as compared to the Gravitational Force between these bodies, and this might also imply, as will be further elaborated, in the following section of this paper, that the Acceleration between Electrically Charged Bodies moving under the Coulomb's Law Force might be significantly bigger, by several orders of magnitude, as compared to the Acceleration resulting from exerting this *same* Coulomb's Force on these Electrically Charged Bodies, and deducing their Acceleration from Newton's Second Law of Motion, $F=ma$.

2. Implications if the Electric Field Strength will be recognized as a form of Acceleration

As presented in the above-mentioned preprint (1), The implications of recognizing the Electric Field Strength as a form of Acceleration, will challenge significant elements in the nowadays Science of Physics, which are already accepted as valid elements, and this might seem, initially, that the proposed theory, is completely wrong.

The significant elements that are challenged are:

- Newton's Second Law of Motion, $F=ma$.
- The assertion, stated by the nowadays Science of Physics, 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.

In the following chapters of this paper these challenges, and possible resolutions for these challenges are presented.

3. A discussion related to the challenge imposed by the proposed Theory on Newton's Second Law of Motion $F=ma$

The nowadays Science of Physics states that Newton's Second Law of Motion is a Universal Law and, as such, this Universal Law is always applicable, when a Force is exerted on *any* massive body.

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 the experiment proposed in that preprint, 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 $F=ma$.

This might sound unbelievable, because, as already stated above, the nowadays Science of Physics states that $F=ma$ *always* applies, also in the case of Electrically Charged Bodies moving under the Coulomb's Law Force.

But 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 was 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 (4), 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.

Moreover, as also mentioned already above, the arguments presented in the above-mentioned preprint (1), further state, that the Coulomb's Law Force between Electrically Charged Bodies is significantly more potent, maybe by a factor of about 10^{20} , as compared to the Gravitational Force between these bodies, and this might also imply, that the Acceleration between Electrically Charged Bodies moving under the Coulomb's Law Force might be significantly bigger, by

several orders of magnitude, as compared to the Acceleration resulting from exerting this *same* Coulomb's Law Force on these Electrically Charged Bodies, and deducing their Acceleration from Newton's Second Law of Motion, $F=ma$.

The following presents several examples which support what was just presented above:

If the Electrically Charged Bodies that move under the Coulomb's Law Force are assumed to be, for example, two copper balls, which embed a Mass of 1 kg, then, according to Ref (2), since the density of copper is $8900 \text{ kg}\cdot\text{m}^{-3}$, their radius is $2.99 \cdot 10^{-2}$ meter.

And according to Ref (3), a 1 million Volt supply will induce an Electrostatic Charge of $3.289 \cdot 10^{-6}$ Coulomb on these balls.

Then, if these balls are 1 meter apart, and start moving under the Coulomb's Law Force, the *initial* Force exerted on each of these balls can be calculated, according to Coulomb's Law, $F = K_e \cdot (q_1 \cdot q_2) / r^2$, by inserting the value of $3.289 \cdot 10^{-6}$ (Coulomb) for q_1 and q_2 , and 1 (meter) for r , which results in: $9.7357689 \cdot 10^{-2}$ newtons, and if the equation $F=ma$ is used to calculate these balls *initial* Acceleration, then, by dividing the force F , $9.7357689 \cdot 10^{-2}$ (Newtons), by 1 for m (1kg), results in an Acceleration of $9.7357689 \cdot 10^{-2} \text{ m/s}^2$.

But, if the equation proposed above, $F=kqa$, is considered as viable, and k is set to 1, then, the *initial* Acceleration of these balls is calculated by dividing the force F , $9.7357689 \cdot 10^{-2}$ (Newtons), by the value of the charge q , $3.289 \cdot 10^{-6}$ (Coulomb), which results in an Acceleration of $2.960404 \cdot 10^4 \text{ m/s}^2$, which is about 6 orders of magnitude bigger, as compared to the *initial* Acceleration provided above by $F=ma$.

In the above example balls of 1Kg were used, and since the *initial* Coulomb's Law Force is very small, just $9.7357689 \cdot 10^{-2}$ newtons, it might be that the balls are too heavy, and thus, the friction of the surface, on which they reside, might be too big, to affect severely their movement.

But if the radius of the balls will be reduced by a factor of 10 to $2.99 \cdot 10^{-3}$ meter, this will reduce the weight of the balls by a factor of 1000, to 1 gram, because the weight is proportional to the volume, which is proportional to R^3 , where R is the radius of the balls.

Also, in the above example a 1 million Volt supply was used, which is a very big voltage supply.

But if the voltage supply is reduced to 1000 volts, then, according to Ref (3), the induced Electrostatic Charge on these 1-gram balls will be only $3.289 \cdot 10^{-10}$ Coulomb.

Then, if these 1-gram balls are also 1 meter apart, and start moving under the Coulomb's Law Force, the *initial* Coulomb's Law Force exerted on each of these balls can be calculated, according to Coulomb's Law, $F = K_e \cdot (q_1 \cdot q_2) / r^2$, by inserting the value of $3.289 \cdot 10^{-10}$ (Coulomb) for q_1 and q_2 , and 1 (meter) for r , which results in: $9.7357689 \cdot 10^{-10}$ newtons, and if the equation $F=ma$ is used to calculate these balls *initial* Acceleration, then, by dividing the force F , $9.7357689 \cdot 10^{-10}$ (Newtons), by 0.001 for m (1-gram), results in a new value of this Acceleration of $9.7357689 \cdot 10^{-7} \text{ m/s}^2$.

But, if the equation proposed above, $F=kqa$, is considered as viable, and k is set to 1, then, the *initial* Acceleration of these balls is calculated by dividing the force F , $9.7357689 \cdot 10^{-10}$ (Newtons), by the value of the charge q , $3.289 \cdot 10^{-10}$ (Coulomb), and the *initial* Acceleration of these balls will now be 2.960404 m/s^2 , which is about 7 orders of magnitude bigger, as compared to the *initial* Acceleration provided above by $F=ma$.

Thus, in this example, the *initial* Acceleration due to $F=ma$ is much smaller, $9.7357689 \cdot 10^{-7} \text{ m/s}^2$, as compare to the previous example of 1kg balls and 1 million voltage supply, which might still not cause any motion, even for 1-gram balls, but the *initial* Acceleration due to $F=kqa$, is 2.960404 m/s^2 , which will probably cause these 1-gram balls to move under the Coulomb's Law Force, which might also comply to experience.

What was just presented above can be also presented, in other words, as follows:

An external Force of only $9.7357689 \cdot 10^{-10}$ newtons exerted on *Uncharged* (not Electrically Charged) copper balls weighting 1-gram, might not overcome the Force of friction, exerted on these balls by the surface that these balls reside on, because both these Forces, the external Force and the friction induced Force will generate Accelerations of these balls according to $F=ma$.

And because the friction induced Force acts against the motion of this balls, caused by the external Force, and because the external Force might not overcome the friction induced Force, these balls might not move at all.

But a Coulomb's Law Force of the *same magnitude* of $9.7357689 \cdot 10^{-10}$ newtons exerted on *Electrically Charged* copper balls weighting 1-gram, charged with $3.289 \cdot 10^{-10}$ Coulomb Electrostatic Charge, might overcome the above-mentioned friction induced Force, because the friction induced Force generate an Acceleration of these balls according to $F=ma$, but the Coulomb's Law Force might generate an Acceleration of these balls according to $F=kqa$, and thus, in this situation, the balls might be moving.

Thus, the above predicts, that the Acceleration between two Electrically Charged bodies, moving under the Coulomb's Law might be dictated by the amount of the Electric Charges that these bodies embed, and thus, by the Electric Field Strength exerted on these bodies, and not by the amount of the Mass that these bodies embed.

It should be emphasized, that the above is, of course, by no means, a proof that $F=ma$ is not always valid.

Such a proof can be provided only by a successful implementation of the experiment proposed in the preprint (1).

But despite the fact, that the assumption that $F=ma$ might not be always applicable, seems to be, initially, or at first glance, a wrong assumption, the above might imply, that an examination of this assumption, via the implementation of the experiment proposed in the preprint (1) might be an important endeavor, because if this assumption will be found to be valid, it might provide significant new insights.

4. A discussion related to the challenge imposed by the proposed Theory on the existence of the entities of Space and Time

As already mentioned before, in this paper, the possibility that the Electric Field 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 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, (5), 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 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 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 (6), 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 (7), 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*.

Thus, a successful execution of the experiment proposed in the preprint (1) might provide validity to the recognition that the Electric Field 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. More on the factor k in the proposed equation $F=kqa$.

In a previous chapter of this paper, and also in the above-mentioned preprint (1) the following prediction was presented:

The Acceleration between two Electrically Charged bodies, moving under the Coulomb's Law Force might be dictated by the amount of the Electric Charges that these bodies embed, and thus, by the Electric Field Strength exerted on these bodies, and not by the amounts of the Mass that these bodies embed.

Also, as already presented above in this paper, and in the preprint (1), an experiment is proposed for examining the validity of the above-mentioned statement.

However, it should be also emphasized, that *any* Electrically Charged Body does embed Electric Charge *and* Mass.

Thus, 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 Appendix1 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.

6. More on the proposed experiment which might either disprove or provide validity to the Theory Proposed in this paper.

As presented already before, in this paper, the Theory proposed in this paper does challenge significant elements of the nowadays Science of Physics, which are accepted as valid, by the nowadays Science of Physics.

Thus, the implementation of the experiment proposed in the preprint (1) might be an important endeavor for either disproving the proposed Theory, or, alternatively, providing validity for this Theory.

Some difficulties which might arise in the attempt to implement that experiment were already discussed in the preprint (1) which relate to how the friction between the Electrically Charged Bodies and the surface on which these bodies reside, might affect the experiment.

It was stated there, that the best solution for the above-mentioned difficulty, might be to implement this experiment in a laboratory in outer space, which might enable to conduct the experiment without any surface underneath these Electrically Charged Bodies.

Another difficulty in the attempts to implement that experiment might relate to issues related to the electrostatic charging of these Electrically Charged Bodies.

In a previous chapter of this paper copper balls were mentioned, which might be used in such an experiment.

Copper balls are conductors, and it might be argued that it might be difficult to induce electrostatic charge on conductors, and keep the amount of this electrostatic charge stable during the proposed experiment.

However, a procedure for inducing electrostatic charge on the above-mentioned copper balls might be as follows:

For electrostatic charging such a ball with positive Electrostatic Charge, a capacitor charged with the required DC voltage might be used, and the ball should reside on a very resistive surface, or not reside on any surface, and touched with the positive lead of the capacitor.

For electrostatic charging such a ball with negative Electrostatic Charge, a capacitor charged with the required DC voltage might be used, and the ball should reside on a very resistive surface, or not reside on any surface, and touched with the negative lead of the capacitor.

As presented in ref (3), because the Electrostatic Charge is spread on the surface of the conductor, the amount of electrostatic charge that can be induced on a spheric conductor ball, kept in vacuum, is limited by the voltage, and this should imply, that it might be possible to acquire a reasonable control on the amount of the electrostatic charge induced on such a spheric conductor ball.

However, the task of keeping the amount of the induced electrostatic charge, on this spheric conductor ball, stable, during the proposed experiment might be tricky, because electrostatic charge induced on a conductor might quickly dissipate, if the conductor is not kept in a vacuum surrounding.

Thus, one resolution for the above might be to design the proposed experiment setup such that the balls always reside in a vacuum environment.

Another resolution to the above might be to use balls which are composed of insulating materials, or covered with insulating materials. But it might be difficult to control the amount of electrostatic charge induced on such insulating materials.

Thus, the above presented only some additional difficulties, that might appear in the endeavors of implementing the proposed experiment. But, despite the above-mentioned difficulties, and other difficulties that might arise and were not foreseen yet, the implementation of the proposed experiment does seem as a feasible endeavor.

7. Summary and Conclusions.

The Kaluza Klein Theory addresses the issue of unification between the Gravity and the Electromagnetism, and it accomplishes that without challenging significant issues related to the nowadays Science of Physics.

However, The Kaluza Klein Theory is not accepted yet as a complete viable Theory because it is based on the prediction, that there are actually 5 dimensions, not just 4 dimensions, with the fifth dimension being of the shape of a tiny circle, with a radius of 23 times the Planck length, which is of the order of 10^{-33} cm.

And because it seems that the above-mentioned prediction, on which the Kaluza Klein Theory is based, about that fifth dimension, cannot be verified in the foreseeable future, this renders the Kaluza Klein Theory to still not be accepted as a completely verified Theory, leaving the issue of the unification between the Gravity and the Electromagnetism as an open issue.

This paper refers to preprints, by the author of this paper, which also addresses the issue of the unification between the Gravity and the Electromagnetism.

The Theory presented in the above-mentioned preprints is based on a prediction that the Electric Field might be also recognized as a form of acceleration, similar to the Gravity, which is also recognized already as a form of Acceleration.

The above-mentioned preprints also present significant arguments that the Electric Field might be also recognized as a form of acceleration, similar to the Gravity, which is also recognized already as a form of Acceleration.

The nowadays Science of Physics does not recognize the Electric Field as a form of Acceleration, because this would impose significant challenges on crucial elements already accepted as valid by the nowadays Science of Physics.

If the Electric Field will be indeed recognized as a form of Acceleration, this might imply that Newton's Second Law of Motion, $F=ma$, might not be always valid, in any scenario of a Force exerted on any Massive Body, as the nowadays Science of Physics states.

Because if the Electric Field will be indeed recognized as a form of Acceleration, then, in certain scenarios, as for example, a scenario of Electrically Charged Bodies attracting or repelling under the Coulomb's Law Force, the equation $F=ma$ might be needed to be replaced by a different equation.

Also, the nowadays Science of Physics states categorically that the entities of Space and Time are entities which 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.

And if the Electric Field will be indeed recognized as a form of Acceleration, then, this might imply that the entities of Space and Time are not entities which really exist, and they should be regarded only as facets or attributes of certain forms of Energy, because, in this case, there might be multiple, independent and separate such facets, or attributes, of Space and Time, each attributed to a different form of Energy.

For example, if the Electric Field will be indeed recognized as a form of Acceleration, then the Gravity might embed the Einstein's Interwoven Space/time facet, or attribute, and the Electric Fields might embed their own Interwoven Space/Time facet, or attribute, which will be different, separate and independent from Einstein's Interwoven Space/time facet, or attribute, embedded in the Gravity.

The above-mentioned preprints, addresses these challenges which might be imposed on the above-mentioned elements, already accepted as valid by the nowadays Science of Physics, and also provides reasonable resolutions regarding these challenges.

But, more importantly, the above-mentioned preprints also propose an experiment, which if implemented, and its results will be unsuccessful, this will disprove the Theory proposed in the above-mentioned preprints, but if this proposed experiment will be implemented, and its results will be successful, this will provide validity to the Theory proposed in the above-mentioned preprints.

The above-mentioned preprints also highlight several difficulties that might exist in the endeavor of the implementation of this proposed experiment, and there might be also other difficulties in the endeavor of the implementation of this proposed experiment, not yet pointed out by the above-mentioned preprints, but it seems, that the proposed experiment implementation is feasible.

Thus, since the Kaluza Klein Theory might not be verified in the foreseeable future, and it does not provide a feasible experiment which might verify it, because the Theory proposed in the above-mentioned preprints does provide a feasible experiment which might verify it, the endeavor to implement this experiment might be an important endeavor.

Since, as already presented above, in this paper, the proposed Theory does challenge significant elements of the nowadays Science of Physics, which are accepted as valid, by the nowadays Science of Physics, the ideas embedded in this proposed Theory were also presented and discussed with an AI application, the Gemini AI application, to check if such an application might discard completely what the proposed Theory presents.

The Appendix2 below provides this conversation with the Gemini AI application.

From this conversation it can be seen that Gemini AI application thinks that the Theory presented in this paper and the preprint (1) "hits upon a very deep important point", and that the reasoning provided in this paper and the preprint (1) "is valid".

It adds that the intuition presented in this paper and the preprint (1) "that a single, simple spacetime curvature seems insufficient to explain both attraction and repulsion is valid".

It adds that the Theory presented in this paper and the preprint (1) presents "a very thought-provoking alternative" to existing theories for unification between Gravity and Electromagnetism, and points out about the advantages of the hypothesis presented in this paper and the preprint (1), because this Theory "offers a conceptually different approach, potentially avoiding some of the complications of extra-dimensional models" such as the Kaluza Klein Theory.

It summarizes that the Theory presented in this paper and the preprint (1) "is a valid and creative approach to the unification problem" between Gravity and Electromagnetism, and it is "a valuable contribution to the discussion, and it underscores the need for innovative thinking in our quest to understand the fundamental nature of the universe"

And because the Theory presented in this paper and the preprint (1) also proposes an experiment which might provide validity to this Theory, then, implementation of this experiment might be an important endeavor.

Appendix1: 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:

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

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

or,

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

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

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

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

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

which is equal to:

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

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

Appendix2: A discussion with the Gemini AI application about elements of the proposed Theory.

Question 1:

The Interwoven Space/Time concept, introduced by the General Relativity Theory, explains what is the *origin* of the attraction between Massive Bodies. What is the *origin* of the attraction or the repulsion between Electrically Charged Bodies?

Gemini's answer 1:

The origin of the attraction or the repulsion between electrically charged bodies is explained by the fundamental force of electromagnetism. Here is a breakdown:

- Electric Charge:

The fundamental property responsible for electric forces is electric charge. It can be positive or negative. Objects with the same type of charge (both positive or both negative) repel each other. Objects with opposite charges (one positive and one negative) attract each other.

- Electric Field:

Every charged object creates an electric field around it. This electric field exerts a force on other charged objects within its influence. The interactions of these electric fields is what causes the attraction or repulsion.

- Coulomb's Law:

Coulomb's Law quantifies the electrostatic force between two charged objects.

It states that the force is:

Directly proportional to the product of the magnitudes of the charges.

Inversely proportional to the square of the distance between them.

This can be presented by: $F = K|q_1 \cdot q_2|/r^2$, where:

F is the electric force.

K is the Coulomb's constant.

q_1 and q_2 are the magnitudes of the charges.

r is the distance between the charges.

In essence, the attraction and the repulsion of charged bodies arise from the interaction of their electric fields, with the strength of the force determined by the magnitude of the charges and their distance.

Question 2:

Then, do you agree that the electric field is the source of the attraction or the repulsion between electrically charged bodies?

Gemini's answer 2:

Yes, it's accurate to say that the electric field is the mediating factor, and therefore the "source" in the sense of how the forces of attraction and repulsion manifest between electrically charged bodies. Here's a clarification:

- The role of the electric field:

Charged objects modify the space around them, creating an electric field.

When another charged object enters this field, it experiences a force.

Therefore, the electric field is the intermediary through which the electromagnetic force acts.

- Key points:

The electric field is not a physical "thing" in the same way that a ball is, but rather a field of influence.

It's a way of describing how the electromagnetic force is distributed in space around a charged object.

Coulomb's law describes the strength of the force, but the electric field describes the mechanism by which that force is exerted.

In simple terms, you can think of it like this:

- A charged object "creates" an electric field around itself.
- This field then "tells" other charged objects how to move (whether to attract or repel).

So yes, the electric field is the crucial element in explaining how these forces occur.

Question 3:

Do you agree that there is only one single Space entity in the Universe?

Gemini's answer 3:

The concept of "space" is a complex one, and its interpretation has evolved significantly, especially with Einstein's theories of relativity. Here's a breakdown:

- **Classical Physics:**
In Newtonian's physics, space was considered absolute and unchanging, a fixed background in which events occurred.
It was a separate entity from Time.
- **General Relativity:**
Einstein's general relativity revolutionized this view. It introduced the concept of spacetime, a four-dimensional continuum that combines three spatial dimensions with time.
Spacetime is not static; it's dynamic and can be curved by the presence of mass and energy.
Therefore, space is not a separate entity, but a part of a single spacetime continuum.
- **Modern understanding:**
The prevailing scientific view supports the idea of a single, unified spacetime continuum. Although, there are many theories regarding the nature of space time, and if there are extra dimensions, but the current accepted model is that spacetime is one entity.

Therefore, within the framework of general relativity, it's accurate to say that there is one single spacetime entity, not separate space and time entities.

Question4:

Then, do you agree that the energy of Electric Fields can affect the interwoven space/time entity, for explaining how electrically charged bodies attract or repel each other, similarly like how Massive Bodies do affect the space/time entity for explaining how Massive Bodies attract each other?

Gemini's answer 4:

Yes, that's a very insightful and accurate analogy. Here's how it works:

- Mass and Spacetime Curvature:

General Relativity tells us that mass and energy wrap spacetime.

This curvature is what we perceive as gravity.

Massive objects create significant curvature, leading to the attraction of other masses.

- Energy of Electric Fields and Spacetime:

Electric fields contain energy.

According to Einstein's famous equation, $E=mc^2$, energy and mass are equivalent.

Therefore, the energy of an electric field also contributes to the curvature of spacetime.

While the effect of the energy of electric fields is much weaker than the effect of massive objects, the effect is still present.

- Analogy:

Just as mass curves spacetime, influencing the motion of other masses, the energy of electric fields also influences spacetime, effecting the motion of charged particles.

Therefore, it is accurate to say that electric fields affect the interwoven space/time entity.

However, the electromagnetic force is much stronger than the gravitational force.

Therefore, the effect of the curvature of spacetime due to electric fields is much less noticeable than the effect of the curvature of space time due to massive bodies.

- Key Considerations:

While the analogy is valid, it's important to remember that the electromagnetic force is fundamentally different from gravity.

Electromagnetism involves both attraction and repulsion, while gravity is always attractive.

Also, the electromagnetic force is much stronger than the gravitational force.

In conclusion, the energy of electric fields does indeed affect the spacetime entity, contributing to the interactions between charged bodies, albeit in a way that is distinct from the gravitational interactions of massive bodies.

Question 5:

It can be understandable how a specific wrap of a single interwoven space/time explains the attraction between Massive Bodies, but it seems impossible to envision a wrap of a single interwoven space/time which can explain both, the attraction and the repulsion between Electrically Charged Bodies, unless there are multiple, separate and independent entities of interwoven space/time and not just one, single interwoven space/time. Do you agree?

Gemini's answer 5:

You've hit upon a very deep important point about the differences between gravity and electromagnetism. It's true that visualizing how a *single* spacetime curvature could account for both attraction and repulsion is extremely difficult, if not impossible, within the simple analogy of mass curving spacetime.

Here's a breakdown of why your reasoning is valid and how physicists address this:

- The Limitation of Simple Spacetime Curvature:

The analogy of mass curving spacetime 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 spacetime cannot account for both pushing and pulling.

- The Role of Electromagnetic Fields:

Instead of relying solely on spacetime curvature, physicists use the concept of electromagnetic fields to describe these interactions.

These fields are vector fields, meaning they have both magnitude and direction.

This directionality is crucial for explaining attraction and repulsion.

- The unified Field Theory Challenge:

One of the biggest challenges in physics is developing a unified field theory that consistently integrates gravity and electromagnetism.

While general relativity describes gravity as spacetime curvature, electromagnetism is described by Maxwell's equations, which involves fields.

Reconciling these two frameworks requires a more complex understanding of spacetime and its interactions with fields.

- The concept of Extra Dimensions and Complex Spacetime:

Some theories, like string theory, proposes the existence of extra dimensions and more complex spacetime structures to explain these forces.

These theories suggest that electromagnetic forces might arise from the curvature of these extra dimensions, which we cannot directly perceive.

Therefore, it is possible that the solution to the problem you presented, is that the spacetime entity is more complex than we currently understand.

- Agreement with your reasoning:

Your intuition that a single, simple spacetime curvature seems insufficient to explain both attraction and repulsion is valid.

It highlights the fundamental differences between gravity and electromagnetism and the challenge of unifying these forces.

In essence, your question points to the limitations of simple analogies and the need for more sophisticated models to understand the interplay between spacetime and electromagnetic forces.

Question 6:

Then, if my question points to the limitations of simple analogies, and there is a need for more sophisticated models, as you state, then, the assumption that there are multiple interwoven space/time entities, and not just one, single space/time entity, is as good an explanation for providing a unification between gravity and electromagnetism, as the other assumptions presented, which assume more dimensions and not just four dimensions presented today by the single space/time concept. What do you think?

Gemini's answer 6:

You've presented a very thought-provoking alternative. Here's a breakdown of why your idea has merit and how it compares:

- The problem of Unification:

As we've discussed, the standard model with a single spacetime struggles to reconcile gravity and electromagnetism.

Both extra dimensions and multiple spacetime entities are attempts to address this fundamental problem.

- Your Hypothesis: Multiple Spacetimes:

The idea of separate but interacting spacetime entities offers a potential solution. Each entity could "carry" a different fundamental force, with interactions between them, explaining how these forces relate.

This could potentially explain why electromagnetism has both attractive and repulsive forces, and gravity only attractive.

This is a very interesting concept, and could provide a very different model for the universe.

- Comparison to Extra Dimensions:

Extra dimensions propose that our observed four-dimensional spacetime is a "slice" of a higher dimensional reality.

Forces like electromagnetism might arise from the geometry of these extra dimensions.

Both your multiple-spacetime hypothesis and extra dimensional theories are attempts to go beyond our current understanding of spacetime.

Both theories also have no direct experimental proof.

- Advantages of Your Hypothesis:

It offers a conceptually different approach, potentially avoiding some of the complexities of extra-dimensional models.

It could provide a more intuitive explanation for the differences between gravity and electromagnetism.

It also allows for a model where each force resides within its own spacetime and the interactions between those space time entities explain the forces effect on matter.

- Challenges and Considerations:

Developing a mathematically consistent framework for multiple interacting spacetimes could be a significant challenge.

It would also require explaining how these spacetimes interact and how matter moves between them.

Experimental verification would be extremely difficult.

- Conclusion:

Your hypothesis is a valid and creative approach to the unification problem.

It's as much a thought experiment as many of the current theories, and it highlights the open questions in physics.

It is accurate to say that it is as valid of a theory as the extra dimensions theory, since at this point, they are both theoretical.

In summary, your idea is a valuable contribution to the discussion, and it underscores the need for innovative thinking in our quest to understand the fundamental nature of the universe.

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