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 Gravitation and 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 issues of presenting a theory which unifies the Gravitation and 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 Gravity and 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 mention 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 should be also recognized as a form of Acceleration:

These arguments first present that by analyzing ***only*** Newton's Law of Universal Gravitation, ***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 ***structures*** of Newton's Law of Universal Gravitation, and Coulomb's Law, 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 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, and this might seem, initially, that the proposed theory, is completely wrong.

The significant elements that are challenged are:

- Newton 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, three-dimensional entity of Space, and just one, one-dimensional entity of Time, which together are Interweaved to form the real one 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 is always applicable, when a Force is exerted on ***any*** massive body.

However, if the Electrical Field Strength will be recognized also a form of Acceleration, as assumed 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 and not by the Masses that these bodies embed, as

assumed in that preprint, because the Electric Field ***is the entity*** that ***causes*** that Acceleration, as also assumed 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 magnitudes of the entity of the Force was assigned as Newtons, k was set to 1 and that equation became F=ma.

This might imply that Newton 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, as 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 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 supports 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 $kg \cdot m^{-3}$, their radius is 2.99 10^{-2} meter.

And according to Ref (3), a 1 million Volt supply will induce an Electrostatic Charge of 3.289 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 will be, according to Coulomb's Law, 9.7357689 10^{-2} newtons, and if the equation F=ma is used to calculate these balls ***initial*** Acceleration, then, this Acceleration will be 9.7357689 10^{-2} 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 will be 2.960404 10^4 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 10^{-2} newtons, it might be that the balls are too heavy, and thus, the friction on the surface 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 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 supple.

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 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 will be 9.7357689 10^{-10} newtons, and if the equation F=ma is used to calculate these balls ***initial*** Acceleration, then, this Acceleration will be 9.7357689 10^{-7} 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 will 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 10^{-7} 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, 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 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 10^{-10} newtons exerted on ***Electrically Charged*** copper balls weighting 1-gram, charged with 3.289 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 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 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, three-dimensional entity of Space, and just one, one-dimensional entity of Time, which together are Interweaved to form the real one 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, 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 suggested 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) suggests, 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 Massive Bodies attraction.

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 fact, 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 Gravity and 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 insights.

And, then, the recognition that the Space and the Time entities might not be entities that really exist, might not seem so undetached, 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 notion of Energy Field) but also appearances that Humans can touch and feel such as Massive objects.

5. Summary and Conclusions.

The Kaluza Klein Theory addresses the issue of unification between 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 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 Gravity and 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 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 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 assumes.

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, three-dimensional entity of Space, and just one, one-dimensional entity of Time, which together are Interweaved to form the real one 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 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.

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