

A discussion related to the Energy Relativity and its Implications

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Abstract:

A corner stone of Physics is the Energy Conservation principle which states that the Energy is always conserved and that the Energy, embedded in the Universe, cannot disappear or be created from nothing.

This should imply that the Total amount of the Energy, which is embedded in the whole Universe, must be a constant value.

However, Humans *are not able* to devise means or experiments which will provide the exact amount of the Energy embedded in the *whole Universe*, which implies that Humans *are not able* to devise means or experiments which will conclude, *with complete validity*, that the amount of the Energy embedded in the whole Universe, can be *indeed* represented by a *constant value*.

In addition to the above, this paper provides significant arguments that evaluations of amounts of Energy might be also *relative* to the Human evaluating these Energy amounts, and that two separate Humans, evaluating the Total Energy Content of several specific Energy components, in the Universe, might arrive at *different results*, relating to this Total Energy Content, of these several specific Energy components, which they evaluated.

Moreover, this paper also provides *significant arguments* that Humans that evaluate the amount of Energy in specific Energy components, and then experience a change of velocity (Acceleration), and following this Acceleration end up in an Inertial Frame of Reference which is moving at a *different velocity*, as compared to the velocity that existed in the Inertial Frame of Reference, in which these Humans resided, before they experienced the above mentioned Acceleration, will either *change their evaluations*, as related to the amount of Energy embedded in the *same* above mentioned Energy components, or will *not detect changes* in the Energies that should be attributed to the *same* above mentioned Energy components.

From the above, this paper presents *significant arguments* which imply that *all* Humans are bound to be in situations in which they will evaluate *wrongfully* the Kinetic Energies attributed to *all* massive bodies in the Universe.

The paper also elaborates on the Implications of the conclusion that the evaluations of Energy amounts might be also *relative* to the Human who evaluated these Energy amounts.

1. Arguments that evaluations of Energy amounts might be also relative to the Human who evaluated these Energy amounts

A corner stone of Physics is the Energy Conservation principle which states that any amount of the Energy which is embedded in the whole Universe, cannot disappear or be created from nothing.

This should imply that the Total amount of the Energy, embedded in the whole Universe, must be a constant value, because no amount of Energy, in the Universe, can disappear or be created from nothing.

Because, as already stated above, the Total amount of the Energy, which is embedded in the whole Universe, must be constant, all Human spectators should arrive at the same value of the Total amount of the Energy which is embedded in the whole Universe.

However, Humans cannot devise means or experiments which end up in providing an exact value of the Total amount of the Energy which is embedded in the whole Universe.

Thus, it seems that Humans did not provide yet a complete validity, or a complete proof, to the Energy Conservation Principle, despite the fact that this principle is considered to be a very significant corner stone of the nowadays Science of Physics.

Thus, this paper tries to elaborate on this very issue.

This paper states, that in addition to the fact that Humans *cannot* arrive at an exact value of the Total amount of the Energy which is embedded in the whole Universe, different and separate Humans might also arrive at *different values* for the amounts of Energy embedded in the **same** several Energy components in the Universe, which implies that at least *some* of these Humans might arrive at *wrong results* as related to these evaluations, of these *same* several Energy components in the Universe, and that Humans evaluations of the amounts of Energy might be *relative* to the Human who executed these evaluations.

Einstein's Special Relativity Theory brought about the recognition that the Mass is equated with Energy via his famous equation (1):

$$E = mc^2.$$

Where E is Energy, m is the amount of Mass and c is the velocity of Light in vacuum.

Einstein's Special Relativity Theory also brought about the recognition that a spectator evaluating the amount of Mass in a specific Massive body which is moving at a constant velocity, v, relative to this spectator, sees an increase of the amount of Mass in this Massive body, relative to the

amount of Mass evaluated in this Massive body, by this spectator, when this Massive body is at rest, relative to this spectator, according to the following equation (2):

$$m = m_0 / \sqrt{(1-v^2/c^2)}.$$

Where m is the evaluated amount of Mass, by the spectator, in the moving massive body, m_0 is the evaluated amount of Mass, by the spectator, when the massive body is at rest relative to the spectator, v is the velocity of the massive body relative to the spectator, and c is the velocity of Light in vacuum.

It should be also stated, that the increase in the evaluation of the amount of Mass, that any Human detects in a Mass which is moving relative to this Human, as presented in Einstein's Special Relativity Theory, and was also presented above, is attributed to the ***Kinetic Energy*** that this Human detects relating to this moving Mass, which implies, that any Human will ***indeed*** detect an ***additional Energy*** embedded in any moving Mass, the ***Kinetic Energy*** attributed to that moving Mass.

Thus, let's examine how two spectators evaluate the Total amount of Energy in two specific massive bodies, when each spectator resides in a ***separate*** Inertial Frame of Reference, and the ***relative velocity*** between these two Inertial Frames of Reference is v .

In these evaluations each spectator evaluates the amount of Mass, m_1 , in a specific massive body residing in his Inertial Frame of Reference, and also the amount of Mass, m_2 , in a specific massive body residing in the Inertial Frame of Reference related to the other spectator.

Also, the rest Mass values of the above-mentioned massive bodies are not the same, or, m_{10} is different from m_{20} .

The amount of Mass (Energy) that the first spectator evaluates, related to the massive body residing in his Inertial Frame of Reference is m_{10} , because this massive body is at rest, relative to that spectator.

The amount of Mass (Energy) that the first spectator evaluates, related to the massive body residing in the other Inertial Frame of Reference is $m_2 = m_{20} / \sqrt{(1-v^2/c^2)}$, because this massive body is moving at a velocity v relative to that spectator.

Thus, the Total amount of Mass (Energy) that the first spectator evaluates related to the two massive bodies is:

$$m_{10} + m_{20} / \sqrt{(1-v^2/c^2)}$$

The amount of Mass (Energy) that the second spectator evaluates, related to the massive body residing in his Inertial Frame of Reference is m_{20} , because this massive body is at rest, relative to that spectator.

The amount of Mass (Energy) that the second spectator evaluates, related to the massive body residing in the other Inertial Frame of Reference is $m_1 = m_{10} / \sqrt{(1-v^2/c^2)}$, because this massive body is moving at a velocity v relative to that spectator.

Thus, the Total amount of Mass (Energy) that the second spectator evaluates related to the two massive bodies is:

$$m_{20} + m_{10} / \sqrt{(1-v^2/c^2)}$$

And since $m_{10} + m_{20} / \sqrt{(1-v^2/c^2)}$ **is not equal** to $m_{20} + m_{10} / \sqrt{(1-v^2/c^2)}$ then, the two spectators arrive at **different values** for the Total Mass (Energy) embedded in these two massive bodies, which implies that **Energy evaluations might be indeed relative** to the spectator evaluating these Energy amounts, and this also implies, that at least one of the above mentioned Humans, arrived at a **wrong evaluation** as related to the Energy amount evaluated in these two specific massive bodies.

It might be argued, that what was just presented above is not accurate, because it did not take into consideration, how the above-mentioned Human spectators also evaluated the amounts of Mass (Energy) in the above-mentioned massive bodies, during any process, that might have occurred, before these Human spectators ended up in two separate Inertial Frames of Reference, which move at a velocity v relative to each other.

However, even if the two Human spectators, mentioned-above, started in being in the **same** Inertial Frame of Reference, then, it is reasonable to assume, similarly to what was just presented above, that in any process, which might have occurred, which ended up in these Human spectators being in two different Inertial Frames of Reference, these Human spectators, still **evaluated differently**, the amounts of Mass (Energy) in the above-mentioned massive bodies, during any such process, which would have ended up, in these Human spectators, being in two different Inertial Frames of Reference.

Because, if the first Human spectator and the first massive body mentioned-above reside on a platform that initially resided in the Inertial Frame of Reference in which the second Human spectator and the second massive body mentioned-above also resided, and that platform started to move, relative to the second Human spectator mentioned-above, then, in order to end up with the two Human spectators residing in two separate Inertial Frames of Reference, which move with a relative velocity v , that platform must first accelerate and then stop when it reaches the velocity v .

But, at each specific moment, during that accelerating process of this platform, the first Human spectator still evaluates the Mass (Energy) in the first massive body as m_{10} , because this massive body is at rest relative to this Human spectator, and, at each specific moment, during that accelerating process of this platform, the first Human spectator still evaluates the Mass (Energy) in the second massive body as **greater** than m_{20} , or as $m_{20} + \delta_1$, because this second massive body is moving relative to this first Human spectator.

And, at each specific moment, during that accelerating process of this platform, the second Human spectator still evaluates the Mass (Energy) in the second massive body as m_{20} , because this massive body is at rest relative to this Human spectator, and, at each specific moment, during that accelerating process of this platform, the second Human spectator still evaluates the Mass (Energy) in the first massive body as **greater** than m_{10} , or as $m_{10} + \delta_2$, because this first massive body is moving relative to this second Human spectator.

The equation $m = m_0 / \sqrt{(1-v^2/c^2)}$ presented by Einstein's Special Relativity Theory, relates to massive bodies that reside in Inertial Frames of Reference, and thus, move at constant velocities.

But it is *reasonable to assume*, that the evaluation of the amount of Mass in a massive body that is *accelerating* relative to a Human spectator, by this Human spectator, will be also *greater*, as compared to the amount of Mass in this massive body, that this Human spectator will evaluate, if this massive body will be at rest, relative to this Human spectator, even though, this massive body is *accelerating*, and not moving at a constant velocity, relative to this Human spectator.

And, it is also *reasonable to assume*, that the increase in the evaluated Mass, in this massive body, by this Human spectator mentioned-above, will be also *proportional* to the amount of Mass evaluated, in this massive body, by this Human spectator mentioned-above, when this massive body is at rest, relative to the Human spectator that evaluates the amount of Mass in this *accelerating* massive body.

Thus, in the above description, since m_{10} is not equal to m_{20} , then, also δ_1 is not equal to δ_2 .

Thus, at each specific moment, during that accelerating process of the platform in the above description, the first Human evaluator will evaluate the amount of Mass in both massive bodies mentioned-above as $m_{10} + m_{20} + \delta_1$, and the second Human evaluator will evaluate the amount of Mass in both massive bodies mentioned-above as $m_{20} + m_{10} + \delta_2$, which are *different evaluations*.

Thus, the above still implies that these two Humans spectators will *still evaluate differently* the Mass (Energy) embedded in these two massive bodies, also at each specific moment, during the accelerating process of the platform mentioned-above.

Also, the above demonstrated that, even though both Human spectators *started* on the *same* Inertial Frame of Reference, when they *did agree* on the amount of Mass (Energy) in the above mentioned two massive bodies, after the platform on which the first Human spectator resided started moving, they started to arrive at evaluating *different values* of the amount of Mass (Energy) embedded in the above mentioned two massive bodies.

Let's try and evaluate now if the above-mentioned Human spectators can explain why this happened.

One possibility which might provide such an explanation, might be a discussion on what happened, in the scenario described above, between these two Human spectators, maybe, sometime after they finished the above-described scenario.

In such a discussion the second Human spectator might tell the first Human spectator, that he can explain why the first Human spectator evaluated the Mass (Energy) embedded in the first massive body as m_{10} , while he (the second Human spectator) evaluated it as $m_{10} / \sqrt{(1-v^2/c^2)}$.

The second Human spectator might say, that this occurred, because he (the second Human spectator) noticed that an external Force was the cause of the Acceleration of the platform on which the first Human spectator resided, and the Work done by this Force caused also the Acceleration of the first massive body, which resulted in a Kinetic Energy added to the first massive body, which caused the increase in the Mass (Energy) evaluation of this massive body by him (the second

Human spectator) which evaluated the Mass (Energy) embedded in this massive body by him (the second Human spectator), as $m_{10} / \sqrt{(1-v^2/c^2)}$, and not just as m_{10} , as the first Human spectator evaluated it.

The first Human spectator might agree and might also mention, that he did suspect that an external Force might have been involved.

Thus, the above implies that the second Human, mentioned above, did evaluated correctly the amount of Energy embedded in the first massive body mentioned above, but the first Human was **wrong** in his evaluation as related to the amount of Energy embedded in the first massive body mentioned above, because he could not detect the **Kinetic Energy** added to this moving massive body.

However, the above provides only a **partial explanation** to the **discrepancies** presented above in how the two Human spectators, mentioned above, evaluated the Mass (Energy) embedded in the **two massive bodies**, mentioned above, because this **does not explain** yet the **discrepancy** in how the two Human spectators, mentioned above, evaluated the Mass (Energy) embedded in the **second massive body** mentioned above.

Because, the first Human spectator **could not tell** the second Human spectator that he also noticed that an external Force was exerted on the **second massive body**, mentioned above, because, in the scenario described above, only the platform on which the first Human spectator resided started to move, while the second Human Spectator and the second massive body, mentioned above, **did not move at all**.

The first Human spectator did indeed notice that the second massive body moved relative to him, **but only** because he moved, **and not because** an external Force or an Energy was exerted on the second massive body.

Thus, even though, the first Human spectator, **did not noticed** any external Force or Energy exerted on the second massive body, the first Human spectator, still evaluated the Mass (Energy) in the second massive body as $m_{20} / \sqrt{(1-v^2/c^2)}$, **only because** the first Human spectator did detect the **second massive body** as moving, and **not because** he detected any external Force or Energy exerted on the second massive body.

And thus, the first Human spectator **could not provide** a satisfactory explanation why he evaluated the Mass (Energy) embedded in the second massive body as $m_{20} / \sqrt{(1-v^2/c^2)}$, which would explain this by a Force or an Energy exerted on the second massive body, as the second Human spectator provided, regarding why **he** (the second Human spectator) evaluated the first massive body as $m_{10} / \sqrt{(1-v^2/c^2)}$, which did provide a cause of an external Force or Energy exerted on the first massive body.

Thus, the above implies again that, the second Human evaluated, again, correctly the amount of Energy, in this case, in the second massive body, mentioned above, and the first Human, mentioned above, arrived, again, at a **wrong** evaluation of the Energy, in this case, in the second massive body, mentioned above, because he attributed to this massive body a **Kinetic Energy** which **did not exist**.

Thus, the above still implies that **Energy evaluations might be indeed relative** to the spectator evaluating these Energy amounts, and some of the Humans (in this case, the first Human mentioned above), might arrive at **wrong results** in their evaluations of Energy amounts.

Moreover, it should be emphasized, that the first Human mentioned above, **changed his evaluation** as related to the amount of Mass (Energy) embedded in second massive body mentioned above, from m_{20} to $m_{20} / \sqrt{(1-v^2/c^2)}$, after he underwent the acceleration mentioned above and ended in a new Inertial Frame of Reference.

And this change of evaluation occurred **only** because this Human detected this second massive body mentioned above as moving relative to him, **only** because this Human was **himself** moving, and **not because** he could point out that an external Force or Energy was exerted on this second massive body mentioned above.

Thus, in view of the scenario described above, the following important conclusions should be emphasized:

If **any Human** undergoes an Acceleration, and after that Acceleration, ends up in an Inertial Frame of Reference which moves with a different velocity, as related to the velocity of the Inertial Frame of Reference on which this Human resided before he underwent that Acceleration, this Human will **evaluate differently** the amount of Mass (Energy) embedded in **all** the massive bodies which are **external** to his current Inertial Frame of Reference, as related to how this Human evaluated these same amounts of Mass (Energy), before he underwent this Acceleration.

Because this Human will evaluate differently the **Kinetic Energy** attributed to **all** the massive bodies which are **external** to his current Inertial Frame of Reference, as the first Human, in the scenario described above, evaluated **wrongfully**, the Mass embedded in the second massive body, described above, by attributing to it a **Kinetic Energy** which did not exist, because this massive body did not move.

Moreover, if **any Human** undergoes an Acceleration, and after that Acceleration, ends up in an Inertial Frame of Reference which moves with a different velocity, as related to the velocity of the Inertial Frame of Reference on which this Human resided before he underwent that Acceleration, this Human will **not detect the change** that have occurred in the amount of the **Kinetic Energy** attributed to **all** the massive bodies which are **in his** current Inertial Frame of Reference, as the first Human, in the scenario described above, **did not detect the change**, that occurred in the amount of the **Kinetic Energy** that was added to the first massive body, described above, which did move because it resided in the platform on which the first Human, described above, also resided.

Thus, the above implies, that **any Human**, who undergoes a change of velocity (Acceleration), is bound to evaluate **wrongfully** the Energies, embedded (or attributed) to **all** the massive bodies in the Universe, because that Human will either **not detect** the changes in the Kinetic Energies attributed to all the massive bodies residing **in his** Inertial Frame of Reference, or detect **wrongfully** the changes in the Kinetic Energies attributed to all the massive bodies **external to his** Inertial Frame of Reference.

And because all Humans undergo a change of velocity (Acceleration) some time, then, all Humans are bound to be in situations in which they will evaluate *wrongfully* the Kinetic Energies attributed to all massive bodies in the Universe.

The above strongly supports the conclusion, presented already before in this paper, that evaluations of Energy amounts by Humans might be *indeed relative* to the Human evaluating these Energy amounts.

2. Implications to the conclusion that evaluations of Energy amounts by Humans might be also relative to the Human who executed these evaluations.

On one hand, a possible conclusion that can be derived from what was just presented above, that the Energy evaluations might be also relative, might be that the Energy Conservation Principle might not be *completely* correct, because the above just demonstrated that two separate Human spectators, arrive at different evaluations for the Total Mass (Energy) embedded in two specific Energy components in the Universe (the two specific massive bodies presented above), and because, as also presented in this paper, Humans cannot prove that the Total amount of the Energy, in the whole Universe, is a constant value, and also because *all* Humans are bound to be in situations in which they will evaluate *wrongfully* the Energy embedded (or attributed) to *all* the massive bodies in the Universe, as presented in this paper, and all the above might imply that the Energy might not be *completely* conserved, as the Energy Conservation Principle states.

This conclusion might be also supported by the fact, that the nowadays Science of Physics does agree that in addition to the Detectable Energy, the Universe embeds a very large amount of undetectable, or Dark Energy, (about 70% of the estimated Total Energy which is estimated to be embedded in the whole Universe is attributed to the Dark Energy), which might further imply, that Humans cannot evaluate the actual amount of the Total Energy embedded in the Universe, which might further support the assumption, that Humans cannot prove, that all the Energy embedded in the Universe, is indeed conserved.

However, on the other hand, the paper does highlight problematic issues in Human evaluations of amounts of Energy, but it should be emphasized, that this paper did not present a conclusive result which implies definitely, that the Energy Conservation Principle is definitely a false principle.

And, since the Energy Conservation Principle is a very significant corner stone of the Science of Physics, an additional possible conclusion can be also derived from what was just presented above, that the evaluations of Energy amounts might be also *relative* to the Human evaluating these Energy amounts.

The Science of Physics states that the laws of Physics are the same in all Inertial Frames of Reference.

Thus, that additional conclusion can state that although *separate* Humans might arrive at *different evaluations* as related to the Total amount of the Energy embedded in specific Energy components in the Universe, *each* such Human, residing in an Inertial Frame of Reference (which means that this Human moves at a constant velocity), might still detect *Energy Conservation* in *his* specific

evaluations, especially if the evaluations related to each Human are *limited* to what this Human can evaluate, and not to the Energy embedded in the whole Universe.

But, as also presented in this paper, even though *each single* Human might detect Energy Conservation only in *his own* Energy amounts evaluations, these evaluations *might be also wrong*.

Thus, although the additional conclusion presented above, that *each Human* might still detect Energy Conservation in *his own evaluations*, does comply with the statement that the laws of Physics are the same in all Inertial Frames of Reference, still, what was presented in this paper, that the Energy evaluations might be also *relative* to the Human who evaluates this Energy, is strongly supported by what was presented in this paper, especially, the conclusion that *all* Humans are bound to be in situations in which they will evaluate *wrongfully* the Kinetic Energies attributed to *all* massive bodies in the Universe.

And, even though, Humans might be able to provide validity to the Energy Conservation Principle as related only to the evaluations of Energy amount related only to *any single Human* evaluator, this paper points out, that Humans *cannot attribute complete validity* to the Energy Conservation Principle as related to evaluations of Energy amount by *separate, different Human evaluators*.

Thus, the conclusion presented above, in this paper, that evaluations of Energy amounts by Humans might be *indeed relative* to the Human evaluating these Energy amounts, should point out a *significant limitation* that Humans might have in Humans endeavors to achieve a deep and comprehensive *understanding of the Universe or the Existence*.

The author of this paper published a paper: " Energy Might be the Only Unique, Distinct and Independent Entity in Nature." (3).

This paper presents the possibility that the Universe is composed of only one distinct and independent entity, Energy. This implies that also Humans are composed of only this distinct and independent entity, Energy.

And thus, since it is impossible to figure out completely an issue *just by using* this *same* issue, Human minds, being just an aggregate of forms of Energy, might not be able to figure out completely what is Energy, and what are all the details for understanding all the elements involved in all the interactions between Energy forms, and this might provide some explanation to the Humans limitation presented above.

3. Summary and Conclusions

The paper states that the Energy Conservation principle, which is considered a corner stone of the Science of Physics, actually implies that the Total amount of the Energy, which is embedded in the whole Universe, must be a constant value, because otherwise, this would imply that Energy can either disappear or be created from nothing, contrary to what is implied by the Energy Conservation principle.

The paper also points out that Humans cannot provide a complete proof to the Energy Conservation principle, because Humans cannot devise means or experiments which would provide an exact value of the Total amount of the Energy, embedded in the whole Universe.

On the other hand, the paper provides arguments, that two specific Human spectators, each evaluating the Total amount of Energy, in two specific Energy components in the Universe, (two specific massive bodies), might *not arrive* at the same results, which would imply that the evaluations of Energy amounts might be also *relative* to the spectator, evaluating these Energy amounts.

The conclusion presented in the paper, that the evaluations of Energy amounts might be also *relative* to the Human, evaluating these Energy amounts, is also strongly supported by the conclusion presented in this paper, that *all* Humans are bound to be in situations in which they will evaluate *wrongfully* the Kinetic Energies attributed to *all* massive bodies in the Universe.

The paper then elaborates on the Implication of the Energy relativity demonstrated in the paper, on whether this might render the Energy Conservation Principle to *not be completely* correct, or whether each Human spectator still can decide that the Energy Conservation principle is valid as related to his own evaluations, because the Science of Physics states that the laws of Physics are the same in all Inertial Frames of Reference.

But still, what is presented in this paper, that the Energy evaluations might be also relative to the spectator executing these evaluations, might also point out a significant limitation that Humans might have in Humans endeavors to achieve a deep and comprehensive understanding of the Universe or the Existence, if Humans cannot provide a complete proof to a very significant building block, or corner stone, of the Science of Physics, the Energy Conservation principle.

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