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.

This, might also imply, as will be elaborated in the paper, that the evaluated amount of an Energy should not be relative to a specific spectator, which performs the evaluation of this amount of this Energy, and all spectators, evaluating the Total Energy Content of several specific Energy components, in the Universe, should conclude, that these specific Energy components, contain the same Total amount of Energy, as each of the spectators evaluated.

However, this paper provides significant arguments that the Energy might be also relative to the spectator, and that two separate spectators, 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.

The paper also elaborates on the Implications of the conclusion that the Energy might be also relative.

1. Arguments that the Energy might be also relative

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 although Humans cannot arrive at an exact value of the Total amount of the Energy which is embedded in the whole Universe, Humans can still check if all Human spectators are indeed able, ***or are not able***, to arrive at the same constant value of the Total amount of the Energy which is embedded in the whole Universe, ***without actually*** devising means or experiments which actually evaluate exactly the Total amount of the Energy which is embedded in the whole Universe.

This can be done by ***only*** checking what two specific Human spectators evaluate, relating to two specific Energy components, in the Universe.

Because, although Humans cannot calculate exactly the Total amount of the Energy which is embedded in the whole Universe, the conclusion that the Total amount of the Energy, which is embedded in the whole Universe, must be a constant value, also implies, that if two separate spectators, evaluate the Total amount of the Energy which is embedded ***only*** in two specific Energy components (for example, two massive bodies), these evaluations, of these two specific spectators, should arrive to the same evaluated amount of the Total Energy, in these two specific Energy components, if all Humans are ***indeed*** able to ***conclude*** with ***complete validity***, that the Total amount of the Energy embedded in the whole Universe, must be a constant value.

Because, if these two separate specific spectators arrive at ***different values*** as related to the Total amount of Energy ***only*** in these two specific Energy components (for example, these two massive bodies), then, this will necessarily also result in these two spectators ending up with two ***different values*** of the Total amount of the Energy embedded in the whole Universe, ***unless*** these two spectators would be able to devise means which provide an exact value of the Total amount of Energy in the ***whole Universe***, based on the evaluations that each of these two spectators execute, because only by devising means which provide an exact value of the Total amount of the Energy embedded in the ***whole Universe***, the discrepancies in the ***different values*** as related to the Total amount of Energy ***only*** in the above-mentioned two specific Energy components, can be, ***maybe***, explained, and that explanation will be necessary, ***only*** if ***all*** the Energy, embedded in the whole Universe is ***indeed fully conserved***, and can be ***indeed*** represented by a constant value, as the Energy Conservation Principle implies.

But since Humans cannot devise means which provide an exact value of the Total amount of the Energy in the whole Universe, then, the discrepancies in the ***different values*** as related to the Total

amount of Energy ***only*** in the above-mentioned two specific Energy components, should indicate, that Humans are indeed ***not able***, to arrive at the same constant value of the Total amount of the Energy which is embedded in the whole Universe.

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.

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.

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 spectator 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.

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, these Human spectators ***could not*** arrive at a ***satisfactory conclusion*** why they evaluated differently the Mass (Energy) embedded in the second massive body.

Thus, the above demonstrated, that the two Human spectators ***could not*** explain the ***discrepancies*** in their evaluations, of the Mass (Energy) embedded in the two massive bodies mentioned above, ***even after*** they try to do that by a discussion between them.

Thus, the above still implies that ***Energy evaluations might be indeed relative*** to the spectator evaluating these Energy amounts.

And the above also further supports the statement, presented earlier in this chapter of this paper, that if these two separate specific spectators arrive at ***different values*** as related to the Total amount of the Energy ***only*** in these two specific Energy components (for example, these two massive bodies), then, this will ***necessarily also imply*** that these Human spectators, will ***not be able*** to conclude, with ***complete validity***, that all the Energy embedded in the whole Universe, can be ***indeed*** represented by a constant value, ***unless***, as already stated before in this chapter of this paper, these two Human spectators would be able to evaluate exactly the amount of Energy in the ***whole Universe***, because only by devising means which provide an exact value of the Total amount of the Energy embedded in the ***whole Universe***, the discrepancies in the ***different values*** as related to the Total amount of Energy ***only*** in the above-mentioned two specific Energy components, can be, ***maybe***, explained.

But, since as also presented before, in this paper, Humans are not able to devise means to evaluate exactly the amount of the Energy embedded in the whole Universe, then, what was presented above only further supports the statement, that Humans can only conclude, that ***Energy evaluations might be indeed relative*** to the spectator evaluating these Energy amounts.

2. Implications to the conclusion that the Energy is also relative.

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 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), which implies, that Humans cannot prove that the Total amount of the Energy, in the whole Universe, is a constant value, which 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), 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, 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 Energy evaluations might be also relative.

That additional conclusion can state that although separate spectators might arrive at different evaluations as related to the Total amount of the Energy embedded in specific Energy components in the Universe, each such spectator can still detect Energy Conservation in his specific

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

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

Thus, although the additional conclusion presented above, that each spectator can still detect Energy Conservation in his 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, should point out a significant limitation that Humans might have.

Because, Humans cannot provide a complete proof to the Energy Conservation principle, which is a very significant corner stone of the Science of Physics, because Humans cannot devise means or experiments which arrive at an exact value of the Total amount of the Energy in the whole Universe, and also, because all Humans might not be able to arrive at a unique constant value of the Total amount of the Energy in the whole Universe, as presented in this paper, because the Energy evaluations seems to be relative to the sectator , and thus, all this should indicate that Humans do have significant limitations 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 vale, 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 paper then elaborates on the Implication of the Energy relativity demonstrated in the paper, on whether this might render the Energy Conservation Principle to be completely not 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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