Energy Relativity and its Implications on the Energy Conservation Principle

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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 whole 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.

The above implies that Humans are not able to provide a proof for the Energy Conservation Principle, which means, that the Energy Conservation Principle is presented only as an axiom, even though, it is a corner stone of the nowadays Science of Physics.

Thus, in view of the above, this paper tries to examine the extent of the validity that Humans can attribute, to the Energy Conservation Principle.

Initially, this paper tries to explore, if the evaluation of the amount of Energy, only in certain specific Energy components, in the Universe, will result in the evaluations of the same Energy amounts, by any Human evaluator, or, if separate Human evaluators might arrive at different results, relating to the Total Energy Content, of these certain several specific Energy components, which they evaluated.

Thus, in view of the above, this paper provides significant arguments that two separate Humans, evaluating the Total Energy Content of certain 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 above implies that Energy evaluations by Humans is ***relative*** to the specific Human evaluating that Energy.

Moreover, this paper also provides significant arguments that Humans that evaluate the amount of Energy in specific Energy components, and then experience an 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 change their evaluations, as related to the amount of Energy embedded in the same above mentioned Energy components.

The above further supports the conclusion, presented above, that Energy evaluations by Humans is ***relative*** to the specific Human evaluating that Energy.

The paper then elaborates on the Implications of what was presented above, on the Energy Conservation Principle.

1. Arguments that the Energy evaluations by Humans might be relative to the Human which evaluated that Energy.

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, according to the Energy Conservation Principle, all Humans 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 Humans 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 Humans evaluate, relating ***only*** 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, this paper presents the following argument:

If two separate Humans, evaluate the Total amount of the Energy which is embedded ***only*** in two specific Energy components (for example, two specific massive bodies), these evaluations, of these two specific Humans, 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.

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 Human evaluating the amount of Mass in a specific Massive body which is moving at a constant velocity, v, relative to this Human, 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 Human, when this Massive body is at rest, relative to this Human, 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 Human, in the moving massive body, m_0 is the evaluated amount of Mass, by the Human, when the massive body is at rest relative to the Human, v is the velocity of the massive body relative to the Human, and c is the velocity of Light in vacuum.

Thus, let's examine how two Humans evaluate the Total amount of Energy in two specific massive bodies, when each Human 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 Human 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 Human.

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 Human 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 Human.

The amount of Mass (Energy) that the first Human 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 Human.

Thus, the Total amount of Mass (Energy) that the first Human 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 Human 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 Human.

The amount of Mass (Energy) that the second Human 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 Human.

Thus, the Total amount of Mass (Energy) that the second Human 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 Humans arrive at ***different values*** for the Total Mass (Energy) embedded in these two massive bodies, which implies that ***Energy evaluations might be relative*** to the Human 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 Humans also evaluated the amounts of Mass (Energy) in the above-mentioned massive bodies, during any process, that might have occurred, before these Humans ended up in two separate Inertial Frames of Reference, which move at a velocity v relative to each other.

However, even if the two Humans, 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 Humans being in two different Inertial Frames of Reference, these Humans, 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 Humans, being in two different Inertial Frames of Reference.

Because, if the first Human and the first massive body mentioned-above resided on a platform that initially resided in the Inertial Frame of Reference in which the second Human and the second massive body mentioned-above also resided, and that platform started to move, relative to the second Human mentioned-above, then, in order to end up with the two Humans 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 still evaluates the Mass (Energy) in the first massive body as m_{10}, because this massive body is

still at rest relative to this Human, and, at each specific moment, during that accelerating process of this platform, the first Human 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.

And, at each specific moment, during that accelerating process of this platform, the second Human still evaluates the Mass (Energy) in the second massive body as m_{20}, because this massive body is still at rest relative to this Human, and, at each specific moment, during that accelerating process of this platform, the second Human 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.

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

And, it is also ***reasonable to assume***, that the increase in the evaluated Mass, in this massive body, by this Human mentioned-above, will be also ***proportional*** to the amount of Mass evaluated, in this massive body, by this Human mentioned-above, when this massive body is at rest, relative to the Human 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 will evaluate the amount of Mass in both massive bodies mentioned-above as $m_{10} + m_{20} + \delta_1$, and the second Human 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 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 Humans ***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 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 Humans 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 Humans, maybe, sometime after they finished the above-described scenario.

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

The second Human might say, that this occurred, because he (the second Human) noticed that an ***external Force*** was the cause of the Acceleration of the platform on which the first Human 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) which evaluated the Mass (Energy) embedded in this massive body by him (the second Human), as $m_{10} / \sqrt{(1-v^2/c^2)}$, and not just as m_{10}, as the first Human evaluated it.

The first Human 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 Humans, 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 Humans, mentioned above, evaluated the Mass (Energy) embedded in the ***second massive body*** mentioned above.

Because, the first Human ***could not tell*** the second Human 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 resided started to move, while the second Human and the second massive body, mentioned above, ***did not move at all***.

The first Human 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, ***did not noticed*** any external Force or Energy exerted on the second massive body, the first Human, still evaluated the Mass (Energy) in the second massive body as $m_{20} / \sqrt{(1-v^2/c^2)}$, ***only because*** the first Human 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 ***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 provided, regarding why ***he*** (the second Human) 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 Humans ***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 Humans ***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 Human evaluating these 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, the above implies that 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.

Thus, the above further strongly supports the statement, that if these two separate specific Humans 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), and ***could not*** explain why that happened, then, this will ***necessarily also imply*** that these Humans, 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***, these two Humans 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, 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 Human evaluating these Energy amounts.

2. Implications to the conclusion that the evaluation of Energy amounts is also relative to the Human who did that evaluation.

A possible conclusion that can be derived from what was just presented above, that the Energy evaluations might be also relative to the Human evaluating that Energy, might be, that the Energy Conservation Principle might not be ***completely*** correct, because the above just demonstrated that

two separate Humans, 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 is estimated to be 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, 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 to the Human who evaluates this Energy.

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 can 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.

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 Human*** 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 to the Human who evaluates this Energy, is strongly supported by what was presented in this paper, especially, the conclusion that 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.

Thus, the above 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 Human who evaluates this Energy.

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 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 Humans, 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 Human, 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 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.

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 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 Human 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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