

## Is the Total Energy of the Universe Zero?

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### ABSTRACT

If the universe has a beginning, it is immaterial as to whether it has originated from something or from nothing, because in both the cases it will start with zero energy. Now, we have already shown previously in this journal that the initial something was without space and time and there cannot be any energy without space and time. So the initial something cannot have any energy. However, we cannot claim that space, time, matter and energy have actually originated from nothing, because in that case there would not have grown the binding in between them that has been empirically tested and verified many, many times. Rather, we should say that all these four concepts have originated from some common source, from some common substance which may be called God.

**Key Words:** Universe, nothing, substance, space, time, energy, matter, gravity, God.

It can be shown in some indirect way that the net energy of the universe is zero. For this, we will have to first determine as to whether the universe has a beginning in the past, or whether it has an eternal past. I think that there is a consensus among scientists that the universe is not past-eternal, but that it originated from a big bang 13.8 billion years ago. So we can say now that the universe has a beginning. Now there are only two options that can be taken into consideration while discussing the beginning of the universe. We can ask: 1) did it originate from nothing? Or, 2) did it originate from something?

If it had originated from nothing, then obviously the net total energy of the universe will be zero, because in this case the universe started with zero energy. If the universe had originated from something, then also with the help of special and general theory of relativity it can be shown that the total energy of that something will be zero. We say that the universe had originated from something. That means before the origin of the universe there was nothing else other than that something - no space, no time, no matter and no energy. Space, time, matter and energy came into being only after the origin of the universe from that something.

Now Einstein's general theory of relativity has shown that space, time and matter are so interlinked that there cannot be any space and time without matter. Similarly there cannot be any matter without space and time. Again from Einstein's special theory of relativity we come to know that matter and energy are equivalent. So instead of saying that there cannot be any matter without space and time, we can also say that there cannot be any energy without space and time. We have already shown previously in this journal that the initial something was without space and time. But we have also shown that there cannot be any energy without space and time. So the initial something cannot have any energy.

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So, if the universe has a beginning, then it is immaterial as to whether it has originated from something or from nothing, because in both the cases it will start with zero energy. Therefore if the universe is not past-eternal, then its net energy will always be zero.

There is one more reason as to why universe as a whole cannot have any energy. It is due to its definition itself. Universe is defined in this way: it is that which contains everything that is there. So by definition there cannot be anything outside the universe, because whatever will be there will be within the universe. So by definition universe will always be spaceless and timeless, because as per definition nothing will be there outside it. Universe being neither in space nor in time cannot have any energy at all, because GTR has already shown that there cannot be any energy without space and time.

From Einstein's special theory of relativity we come to know that matter and energy are equivalent. Matter is concentrated energy and energy is diluted matter. Again from GTR we come to know that space, time and matter are so interlinked that there cannot be any space and time without matter. Similarly there cannot be any matter without space and time. So we see that all these four are interlinked; we cannot think of any one of these four entities singularly, isolatedly. Whenever we will think of energy, we will have to think of matter. Whenever we will think of matter, we will have to think of space and time.

But what is the reason that these four entities are so interlinked? If they have all originated from nothing, then what was there in nothing that could have helped establish this link, this binding in between them? The answer is: Nothing. In nothing there was nothing that could have been the cause of it. So we cannot claim that space, time, matter and energy have actually originated from nothing, because in that case there would not have grown the binding in between them that has been empirically tested and verified many, many times. Rather we should say that all these four have originated from some common source, from some common substance. Metaphorically we can say here that they have some common ancestor. Due to this common ancestry, all these four are actually kith and kin (also a metaphor, not to be taken literally). Due to their common ancestry, they are all naturally related to each other.

This common substance has expressed itself in four different forms, e.g. space, time, matter and energy, but basically at their root all these four are one. Scientists have so far been able to show that only matter and energy are one. We hope that in future a day will definitely come when they will be able to show that space, time, matter and energy – all these four are one.