IOSR Journal Of Applied Physics (IOSR-JAP)
e-ISSN: 2278-4861.Volume 16, Issue 3 Ser. 2 (May. – June. 2024), PP 13-14
www.Iosrjournals.Org

Spacetime Conception Of The Universe

Hassan Ajami

Date of Submission: 20-06-2024 Date of Acceptance: 30-06-2024

According to the spacetime conception of the universe, spacetime, energy and mass form a continuum, such that st = mE. Given that st refers to spacetime, m stands for mass, and E is energy, the spacetime conception of the universe states that spacetime is equal to mass multiplied by energy. The law st = mE presents a holistic conception of the universe because it successfully accounts for the basic insights of both relativity theory and quantum mechanics, aiming to reconcile between classical physics and the weird behavior of the quantum world.

Spacetime, Energy And Mass

If we want to construct a spacetime, we need energy. This provides a justification for analyzing spacetime in terms of energy, as the spacetime conception of the universe does. But, according to what we know in physics, whenever there is energy, there is mass and/or the potentiality of the existence of mass. Now, given that spacetime requires the existence of energy (which is needed to construct spacetime), while whenever there is energy, there is mass or the potentiality of the existence of mass, it follows that spacetime should be defined in terms of energy and mass, such as defining spacetime as being equal to mass multiplied by energy, exactly as the spacetime conception of the universe does. All of this supports the plausibility of the law st = mE.

Gravity As Spacetime

According to Einstein's theory in physics, gravity is the curvature of spacetime [1]. But the law st = mE successfully accounts for defining gravity in terms of spacetime. Since spacetime is equal to mass multiplied by energy (i.e., since st = mE), it follows that mass and energy are reducible to spacetime. And therefore, energy could be accurately defined in terms of spacetime. Yet gravity is a form of energy. Therefore, gravity could be accurately defined in terms of spacetime, such as defining gravity as the curvature of spacetime, as Einstein said. This shows that the law st = mE is successful in accounting for a basic insight in modern physics, namely that gravity is accurately definable in terms of spacetime. And this success speaks for the plausibility of the law st = mE.

Subatomic Particles As Abstract

From the perspective of quantum mechanics, a subatomic particle could exist in different places at the same time [2]. Given that the law st = mE entails that mass and energy are reducible to spacetime, while spacetime is abstract, it follows that mass and energy are abstract. And therefore, the subatomic particles, which consist of mass and energy, are also abstract. But if the subatomic particles are abstract, then it is natural that a subatomic particle, such as an electron, could exist in different places at the same time (given that only concrete entities occupy definite and/or specific spacetimes). This shows that the law st = mE is successful in accounting for an essential insight in quantum mechanics, according to which, a subatomic particle could occupy different places at the same time.

Relative Time And Different Geometries

Other basic insights in modern physics are that time is relative and different geometries of spacetime lead to the construction of different universes [3]. The spacetime conception of the universe, according to which, st = mE, is also successful in accounting for those essential insights. Since spacetime is equal to mass multiplied by energy, as the law st = mE indicates, it follows that if we change the mass and energy of a certain system or object, its spacetime will change. And hence, space and time are relative to mass and energy. From the same perspective, since spacetime is equal to mass multiplied by energy, it follows that if we change the geometry of the space and time of the whole universe, then the mass and energy of the whole universe will change, and hence, we will be changing the universe. Therefore, different geometries of space and time lead to the existence of different universes. This shows that the law st = mE, which says that spacetime is equal to mass multiplied by energy, is also successful in accounting for a basic conception in modern physics, namely that different spacetime geometries lead to the emergence of different universes.

Mass-Energy Equivalence

According to the principle of mass-energy equivalence, mass can be converted into energy and vice versa [4]. But the law st = mE is successful in accounting for the fact that mass can be converted into energy and vice versa. Since spacetime is equal to mass multiplied by energy, as the law st = mE says, it follows that mass is equal to spacetime divided by energy, i.e., m = st ÷ E, and energy is equal to spacetime divided by mass, i.e., E = st ÷ m. And therefore, mass can be converted into energy and vice versa. This reveals that the law st = mE is successful in accounting for mass-energy equivalence. And this success is an additional virtue, supporting the plausibility of the law st = mE.

Particles As Particles And Waves

In quantum mechanics, particles behave as if they are particles and waves at the same time, although particles are the opposite of waves [5]. Now, the law st = mE is successful in accounting for the fact that particles behave as if they are particles and waves at the same time. Given that spacetime is equal to mass multiplied by energy, it follows that mass and energy are reducible to spacetime, and thus, particles, which consist of mass and energy, are reducible to spacetime. From this perspective, according to the law which holds that spacetime is equal to mass multiplied by energy, diverse particles are different spacetime configurations. But the same spacetime could have the configuration which corresponds to a particle and the configuration which corresponds to a wave, given that spacetime could have diverse instantiations due to the fact that spacetime is abstract. And this is why particles behave as if they are particles and waves at the same time, although particles are the opposite of waves. This indicates that the law st = mE is also successful in accounting for the weird behavior of particles in quantum mechanics.

A possible visualization of spacetime having a configuration corresponding to a particle and a configuration corresponding to a wave is the following: a spacetime has a configuration corresponding to a particle when the spacetime configuration is contracting, while a spacetime has a configuration corresponding to a wave when the spacetime configuration is expanding. This implies that particles are contracting and expanding at the same time, leading particles to behave as particles and waves at the same time. And thus, according to this visualization of spacetime having different configurations, the whole universe is also contracting and expanding at the same time due to the constant contraction and expansion of particles. If this prediction that the universe is constantly contracting and expanding is true, then the previous visualization of spacetime is plausible. Hence, the previous visualization of spacetime could be empirically tested, leading it to be scientific.

A Scientific Hypothesis

The law st = mE presents a spacetime conception of the universe because it reduces the universe, including all particles and energies, to diverse spacetime configurations due to the fact that it says that spacetime is equal to mass multiplied by energy. From this perspective, the law st = mE entails that mass and energy are reducible to spacetime. Therefore, according to the law st = mE, all of the different masses and energies, and hence, all of the diverse particles and forces, could be accurately defined and/or redefined as different configurations of spacetime. If this prediction were false, then the law st = mE would be false. Therefore, the law st = mE is falsifiable, i.e., it could be empirically tested. Hence, the law st = mE is scientific.

References

[1] Anthony Zee (Author): Einstein Gravity In A Nutshell. 2013. Princeton University Press.
[2] Eugen Merzbacher (Author): Quantum Mechanics. Third Edition. 1997. Wiley.
[3] Shing-Tung Yau (Author) And Steve Nadis (Author): The Shape Of Inner Space. 2010. Basic Books.
[4] Francisco Fernflores (Author): Einstein’s Mass-Energy Equation. 2017. Momentum Press.
[5] Leonard Susskind (Author) And Art Friedman (Author): Quantum Mechanics. 2015. Basic Books.