

ON THE CONCEPT OF ENERGY-INFORMATION EQUIVALENCE

PRINCIPLE ©

INTRODUCTION

Mass-energy equivalence confirms that anything that has mass, has an equivalent amount of energy and vice versa. These fundamental quantities directly relate to one another by Albert Einstein's formula : $E = mc^2$

Information has slowly scaled up from an insignificant area of discussion to the most fundamental concepts in physics. Information has been explaining subject matters in quantum mechanics, is an important mechanism in quantum computing, and is predictive to play an important role in unifying two fundamental and time-honored theories of twentieth century physics, general relativity and quantum mechanics.

Thus, mass-energy-information loop emerges as essential element in quantum mechanics.

CONTENTION : “INFORMATION IN TERMS OF ENERGY”

The concept of information is the inception that describes a physical reality. It is the basic currency of physical existence, so theorist Paul Davies terms it as “*ontological basis*” of reality.^[1]

“**INFORMATION**” in simple terms can be described as collection of facts, knowledge or data. It is derived from the Latin word *informare* which means to give form to mind.

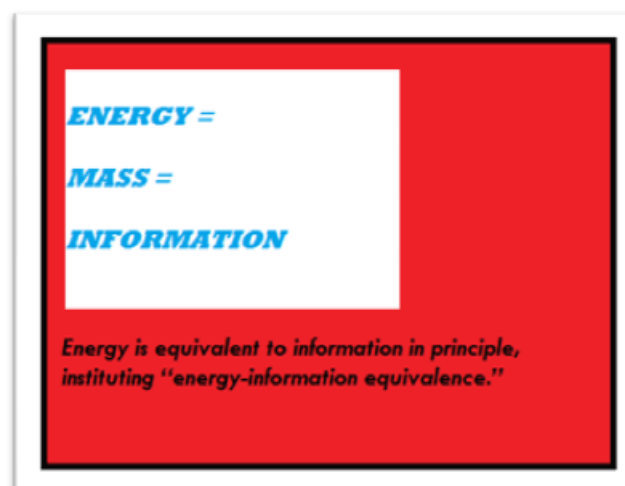
Information is an inert expression and abstract concept and cannot be measured.

In basic scientific precepts, ***complete information about a physical system at one point in time should determine its state at any other time.***^[2] For this ideology to be true, *any physical system in existence necessitates holding some*

information. Without information, the description and existence of the physical system is not possible. Convincingly, it is an unreserved inference that *every physical system registers distinctive information*. The assemblage and organization of this information materializes into the same physical system, every time.

This connotes that matter is equivalent to information in principle, introducing **“mass-information equivalence.”**

In a most remarkable explanation, Albert Einstein correctly described the equivalence of mass and energy. According to Einstein's famous equation $E = mc^2$, the energy E of a physical system is numerically equal to the product of its mass m and the speed of light c squared. This result lies at the core of modern physics. It is customary to refer to this result as the equivalence of mass and energy, or simply **“mass-energy equivalence,”** because one can choose units in which $c = 1$, and hence $E = m$.^[3]



*On evaluation of the above discussion, we know that matter is equivalent to energy and matter is abbreviated in terms of information. Therefore, energy and information have to be analogous to each other. As follows, energy is equivalent to information in principle, instituting **“energy-information equivalence.”***

Conclusively, all information is expression of energy.

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The equivalence principle of energy and information also cohere because of their comparative features.

The first law of thermodynamics states that energy cannot be destroyed.

The same feature stands true for information, when quantum mechanics distinguishes that information cannot in principle be lost.^[4]

Sources:

[1] <http://www.pbs.org/wgbh/nova/blogs/physics/2014/04/is-information-fundamental/>

[2] <https://arxiv.org/pdf/1412.7234.pdf>

[3] Fernflores, Francisco, "*The Equivalence of Mass and Energy*", *The Stanford Encyclopedia of Philosophy (Spring 2012 Edition)*, Edward N. Zalta (ed.)

[4] <http://van.physics.illinois.edu/qa/listing.php?id=24045>