

About Arrow of Time

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Abstract

All laws of physics are time-invariant. Quantum mechanical experiments show time reversibility in micro-scale conditions. Everyday experience demonstrates that time flows only from past to future and never back. This conundrum of physics has not been solved until now. The article discloses an explanation of nature of time based on the statement that time itself does not exist. Time is one characteristic of movement as such.

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Introduction

The term “Arrow of time” was introduced in 1927 by the astronomer Arthur Eddington. The astronomer wanted to highlight the fact that time has only one direction from past to future. In contemporary physics there are many partially controversial interpretations of the arrow of time. The basics of them are:

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1. The causal arrow of time states that the cause precedes its effect. For example, birth precedes death and never *vice versa*.
2. The thermodynamic arrow of time. The Second Law of Thermodynamics states that entropy can only increase with time in an isolated system. Time reverse violates this law.
3. The cosmological arrow of time is based on the expansion of the Universe. The opposite direction can be only in the case of the shrinking of the Universe.
4. The radiative arrow of time characterises waves expanding from a source. This arrow can be reversible in the case of convergent waves. This statement has been proved by careful experiments.
5. The particle physics arrow of time is based on the universal law of charge, parity, and time (CPT) reversal symmetry.
6. The quantum arrow of time is governed by the Schrödinger equation, which is time-symmetric.
7. The psychological/perceptual arrow of time is based on human perception which is a continuous movement from the known (past) to the unknown (future).

Direction of time

The time *per se* does not exist. Only motion exists. Time is a parameter of motion. The absolute (cosmic) time is an expansion rate of the Universe [2]:

$$t^2 = (6\pi G\rho)^{-1} = H^2, \quad (1)$$

where: ρ – density of the Universe,
 H – Hubble's constant,
 G – gravity constant.

Time can be both positive or negative but the action of time t^2 is always positive, i.e., $t^2 = (-t)^2$. Therefore, in everyday life, time only goes from past to future and never back.

In the Antiverse time also flows from Past to Future, but this direction is opposite to time flow in the Universe (Fig. 1.).

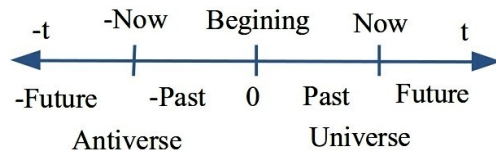


Fig. 1. Absolute time flow in Omniverse.

The time of Antiverse and the time of Universe are mutually opposite.

The time in the Antiverse as well as in the Universe flows from Past to Future. Looking from the point of view of the Universe it seems to be negative, but looking from the Antiverse the time flow of our Universe seems negative. The cause of opposite time flow in the Antiverse is an opposite sign of mass [3]. Negative mass is the cause of negative space and negative expansion of the Antiverse. Throughout the Omniverse entropy increases, the cause precedes its effect and our life goes from womb to tomb.

Let us look at particle-antiparticle pair generation (Fig.2.). The antiparticles have negative time in comparison with the time of ordinary particles. It is their local time.

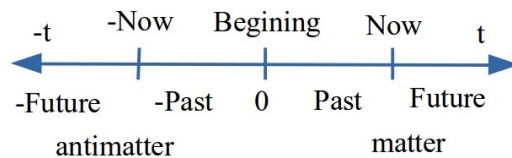


Fig. 1. Local time flow in the particle-antiparticle pair generation event (Beginning).

The local time of particle (matter) and the local time of antiparticle (antimatter) are mutually opposite.

In comparison with absolute time (Fig. 3.) the Past of antimatter seems to be shifted in the Future of Absolute time.

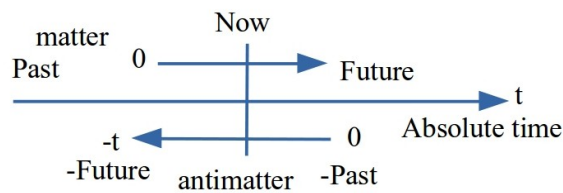


Fig. 2. Local time of particle-antiparticle pair in the coordinates of absolute time.

The moment of present (Now) is common to all events. As a result, the Past of antimatter is shifted to the Future of absolute time. “0” marks the moment of particle-antiparticle generation. Only present (Now) really exists. Thus the shift of antimatter Past to Future of absolute time is an illusion.

Conclusions

There is no contradiction between macroscopic time flow only in one direction and micro-scale bidirectional time. The latter is local time, which has two opposite components, i.e., positive and negative. The sum of the components is zero [4]. The local time does not affect the macroscopic time flow.

References

1. Eddington, A. The nature of the physical world. Cambridge university press, 1927.
2. Prūsis I. and P. Universe Self Inflation Without Dark Energy.
<https://ia601504.us.archive.org/6/items/UniverseSelfInflationWithoutDarkEnergy/Universe%20Self%20Inflation%20without%20Dark%20Energy.pdf>
3. Prūsis I. and P. New Concept of Mass.
<https://ia601508.us.archive.org/34/items/NewConceptOfMass/New%20Concept%20of%20Mass.pdf>.
4. Prūsis I. and P. Liar paradox and Completeness of Theory.
<https://ia601504.us.archive.org/2/items/LiarParadoxAndCompletenessOfTheory/Liar%20paradox%20and%20completeness%20of%20theory%20.pdf>

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