

The Flow of Time and Processes in the Universe

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Abstract

A new approach to explaining the accelerated expansion of the Universe is presented. An analysis of the question "How does time flow?" revealed that for time to flow, the rate of time must change. It is shown that the rate of time is accelerating. This results in the effect of accelerated expansion of the Universe and the need for "dark" matter. Acceleration increases the Doppler effect of the expansion of the Universe. Options for testing the theoretical conclusions are proposed.

Keywords: time, redshift, inflation.

1. INTRODACTION

Physical laws are based on regularities and constants. For constants to exist, a variable must exist (Noether's theorem). The common variable for all processes is the movement of time. Much has been written about time. Surprisingly, the question "How does time flow?" has not been analyzed. To answer this question, we use the postulate: The present (the moment "now") has a specific duration. Conversely, the infinite duration of the present allows matter (and living things) to move throughout the entire magnitude of the infinite present—to travel through time. There is no evidence of the possibility of time travel.

- the zero duration of the present (the moment "now") prohibits the flow of time = the sum of zeros is zero, or the present (now) does not exist, which is inconsistent with reality;

Movement is a change in the coordinate system. In time, the coordinate system is only time. Therefore, for time (the present) to move in time (create the duration of an event and the past), changes in the characteristics of the present or past are necessary. The past cannot be changed. The characteristics of the present are described by the "arrow" of time, showing the direction and speed of movement.

Therefore, for the moment "now" to move, the direction of time's movement, or its pace, must change. In Time, there is only one direction of movement—from the past to the future, i.e., the "arrow" of time remains an "arrow," regardless of the direction of movement. What remains is a change in the rate of time. The rate of time can change. For example, the rate of time is changed by gravity and the speed of matter in space.

There is sufficient information for analysis. We will begin the analysis with the most important thing for physicists: dimensionality.

2. THE MATHEMATICS OF TIME

Matter exists in the present. Being in the present, matter moves through time. If we accept that the present, the moment "now," has a specific dimension in seconds, then the speed of the present's movement within the duration of an event (in time), is a dimensionless quantity [sec/sec].

Dimensionlessness is described by a ratio (percentage). The ratio is abstract, but describes reality.

Example: Income growth indicates a real increase in the amount of money. But! Percentages are not real money. Percentages are an abstract indicator of a specific amount of money. Therefore, the dimensionlessness of the flow of time creates abstract-real time. The reality of time exists as the moment "now"—the present. The present allows us to observe processes within the duration of an event. The abstract nature of the flow of time prevents us from observing the movement of the present within time—for the observer, the present is motionless.

The direction and speed of movement do not affect the abstract ratio [sec/sec]. This explains why changes in the speed and direction of the flow of time do not affect the laws of physics.

Dimensionless movement exists when the ratio changes. The rate of passage of time is the tempo of time. Therefore, the movement of the present, within the duration of an event, is a change in the of time, over the event's duration. The tempo of time is the rate at which time moves. A change in velocity is created by acceleration. Therefore, for the movement of time, the rate of time accelerates or decelerates.

2.1 DOES THE RATE OF TIME ACCELERATE OR DECELERATE?

When in a moving frame of reference, by moving along the axis of motion, one accelerates or decelerates one's motion relative to an external observer. In nature, the rate of time slows down, regardless of the direction of matter's motion. This fact is explained if the rate of time accelerates. Result. In a photon, the flow of time is stopped—the rate of time is fixed at the moment the photon is created. Acceleration of the rate of time creates a frequency shift in photons created in the past relative to photons created in the present. A "redshift" occurs in the spectrum of atoms. Gravity slows the flow of time, creating a gravitational redshift.

2.2. HOW DOES TIME FLOW?

The flow of time is unobservable. But the past did exist! Question: "How does the present flow along the axis of time, creating the past?"

The present exists continuously. For the present to exist continuously, there must be a continuous passage of the present into the past and the arrival of the future. The past, present, and future are different forms of time. Preserving essence while changing form is called transformation. The past is immutable. Therefore, the flow of time is the transformation of the future into the past. Transformation determines the direction of the process—the "arrow" of time. The period of transformation exists as the duration of the present (the moment "now"). Consequently, the speed of transformation is determined by the rate of time in the Universe. The continuity of transformation creates the continuity of the present. The main point! There is only one period of transformation. You can abstractly summarize periods of transformation, describing the duration of an event, but it is impossible to create a real line from past moments of "now." Conclusion: Abstract time travel is possible. This process is explored by science fiction writers. Real travel from the present to the past/future (and vice versa) is impossible. Transformation creates change. Questions arise. What are the differences between the past and the future? What is a transformer?

To answer these questions, let's analyze the motion of matter in space. Deceleration, as matter moves through space, is accompanied by the release of energy and the acceleration of the rate of time in matter. The acceleration of time in the Universe creates a similar effect in matter. Therefore, matter, as it moves through time, radiates energy. Without matter, there is no energy emission. The release of energy by matter as it moves through time creates the irreversibility of time. Test. The nearest platform is the Moon. A two-week night will detect excess energy emission from the Moon's surface. Jupiter and Saturn are further away, and the Sun's influence is less.

The emission of energy by matter is an interconnected process, as is the acceleration of time. As a result, the absorption of energy by matter slows the rate of time. Stars continuously emit energy. Gravity slows the rate of time. Result: A mutual influence arises between the emission of energy and the gravitational effect. Test. With the Sun's mass remaining virtually unchanged, the effect on gravity will be recorded as a change in the gravitational constant. A correlation between changes in the gravitational constant and solar flares can be detected.

2.3. WHERE DOES THE ENERGY EMITTED BY MATTER COME FROM?

Transformation changes the energy of a system qualitatively and quantitatively.

Quantitatively. In an electrical transformer, energy is transformed along the following chain: electric current → magnetic field → electric current.

Qualitatively. The transition from a gas to a liquid to a solid (and vice versa) is accompanied by the release or absorption of energy.

What is the path of time transformation? All possible processes occur in Nature. The Past increases quantitatively and the Future decreases. For transformation, the Future must actually exist.

Attention!!!! In the essay, the Future is the possibility of continuing processes existing in the present. It is a possibility, not a duration, of an event ahead of the present. The question arises, "Where are the possibilities?"

Matter does not have excess energy for continuous radiation. Energy emission results from the transformation of the Future into the Past, or the Future possesses energy. The transformation occurs on matter. What transforms matter, emitting energy? This could be "dark" energy. "Dark" energy condenses into matter, emitting energy. A continuous and accelerating increase in the amount of matter

occurs in the Universe. The increase in matter accelerates the transformation, accelerating the pace of time in the Universe.

The transformation of "dark" energy into matter has three states:

- future = "dark" energy;
- present = the period of transformation of "dark" energy into matter;
- past = "dark" energy that has radiated its energy and become matter.

For matter to emit energy, moving through time, the dimension of dark "energy" must be $[J \times sec]$. h , Planck's constant, has a similar dimension. Why hasn't this type of energy been detected? "Dark" energy has the mathematical form iE , i.e., it is located normal to existing forms of energy. This type of energy is similar to potential energy—energy exists, but manifests itself only when transformed into kinetic energy. "Dark" energy is transformed into electromagnetic energy $E=h\nu$.

2.4. THE "ARROW" OF TIME

In the present, an observer does not see the movement of time. Let us assess the situation as an external observer. Observing the succession of events leads to the conclusion that time is moving and the duration of the past is increasing, transforming the future into the past. Transformation implies a constancy of the sum of the components. Otherwise, the components would disappear or grow to the size of infinite characteristics. For the past, future, and present, the constancy of the sum of the components is described by the equation $\sum Ti = const$. The const of time, as the sum of the past, present, and future, is a specific and limited value. Consequently, as time moves, there is a moment of complete consumption of the future. Having exhausted the future, time will stop moving. This cessation of time places the external observer in the position of an internal observer—the movement of time is not recorded. The stopped process of time's flow, for the next external observer, №2, continues in time. In this way, the process can be described infinitely. To avoid multiplying the number of external observers, it is sufficient to reverse the movement of the "arrow" of time. There is no prohibition on the reverse movement of the "arrow" of time—the laws of physics are equivalent for any direction of time's movement.

3. CONDITIONS OF TRANSFORMATION

For the process of transformation to occur, the ability to change its characteristics is necessary. A single system changes its characteristics by accepting or giving up part. For a single transformation to occur, characteristics must arise and disappear from "nothing" or have the ability to exchange characteristics with similar systems. The emergence of the Universe from a single system creates the following options:

- "It arose from nothing, because it arose from nothing";
- "It arose in nothing, because there are many Universes around it."

These answers are a shift in the answer into the distance. This is how the origin of life on Earth is explained, through its transfer from other places.

The ability to transform arises in a min two-component unified system. Transformation is analogous to the dependence of volume on gas pressure: $PV = const$. This option makes the present unnecessary. The future will transform into the past, with the ability to transform back, depending on changes in external conditions. The movement of time will exist only with continuous change in external conditions. This option leads to equilibrium. A break in equilibrium requires the existence of subsequent changing external worlds.

The situation is solvable if the transformation process occurs between two binary unified systems. Each system is an external world for the other. The transformation of one system into the other creates dynamics (in our case, the flow of time). Having reached a critical point, the process reverses.

Pendulums and self-oscillations are well known.

A binary unified system is geometrically a plane. Two binary systems exist mutually and independently in at least three-dimensional Nature. The normal arrangement of the planes creates conditions under which all four components exist according to the general rules of a three-dimensional world. The axis of contact between the planes creates the possibility of the transformation of one binary system into the other. The size of the axis determines the limit of the amount of transformed entity and the duration of the transformation.

4. CONCLUSIONS

The rate of time has changed over the period from the Big Bang to the present. A change in the rate of time creates a shift in the emission spectrum of atoms, similar to the Doppler effect. The rate of expansion of the Universe must be adjusted.

The flow of time is created by the transformation of "dark" energy into matter. The increase in the amount of matter accelerates a number of processes in the Universe.

"Dark" energy has the dimension $[J \times sec]$.

Data Availability Statement

The data underlying this article are available in the article.