

# TIME IS INFORMATION

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“Time - the time that we know through clocks and calendars - was invented”.

Albert Einstein

<http://www.britannica.com/clockworks/article.html>

## Abstract

The universe is in a continuous change. A change  $n$  gets transformed into a change  $n+1$ , the change  $n+1$  into a change  $n+2$  and so on. Clocks measure a numerical order of change. The time obtained by clocks is information about changes. Changes do not occur in time, changes occur in space only. Time is not a part of space, space itself is timeless. For some changes time is zero, they are immediate. In the timeless space there is no past and no future. The only existing physical reality is in the present moment. Past and future belong to the inner time that is a result of neuronal activity of the brain.

**Key words:** change, time, inner time, space, space-time, space, time dilatation, information, observer

## Introduction

When the change  $n+1$  enters into existence, the change  $n$  does not exist any more. When the change  $n+2$  enters existence, the change  $n+1$  does not exist any more. Clocks measure a numerical order of change that occurs in a timeless space. We experience the change  $x$  before the change  $x+1$  and the change  $x+2$  after the change  $x+1$  because we experience a stream of change in a linear concept of the inner time that is based in neuronal activity of the brain. Research done in 2005 shows that consequent experience of changes in a “past-present-future” perspective is a result of neuronal dynamics in certain areas of the brain (1).

The time obtained by clocks is information produced by the man about change in the universe. The universe is timeless in a sense that time is not a part of space in which change occurs. The fundamental arena in which changes occur is the timeless space.

A growing number of modern researchers are challenging the view that space-time is the fundamental arena of the universe. They point out that the mathematical model of space-time does not correspond to the physical reality, and propose a “timeless space” as the arena instead. One recent paper on the subject is: “A New Geometric Framework for the Foundations of Quantum Theory and the Role Played by Gravity: Since quantum theory is inherently blind to the existence of such state-space geometries, the analysis here suggests that attempts to formulate unified theories of physics within a conventional quantum-theoretic framework are misguided, and that a successful quantum theory of gravity should unify the causal non-Euclidean geometry of space time with the atemporal fractal geometry of state space (2).

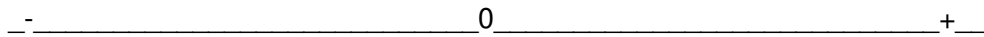
Another recent paper says: “We illustrate our proposal using a toy model where we show how the Lorentzian signature and Nordstroem gravity (a diffeomorphisms invariant scalar gravity theory) can emerge from a timeless non-dynamical space” (3).

Julian Barbour says in *The Nature of Time*: “I will not claim that time can be definitely banished from physics; the universe might be infinite, and black holes present some problems for the time picture. Nevertheless, I think it is entirely possible, indeed likely, that time as such plays no role in the universe”(4).

What is meant here is that the time obtained by clocks is information about change in the universe. Time definitely does not play any role in the universe. Time is a scientific tool for measuring numerical order of change.

Ernst Mach said: “It is utterly beyond our power to measure the changes of things by time. Quite the contrary, time is an abstraction, at which we arrive by means of the changes of things”. Mach is right. Time and clocks are man-made inventions. Time is information of measurement, a useful tool that permits us to build mental and mathematical models for our daily lives as well as for our physics and cosmology.

In physics numerical order of change is represented by a straight infinite line composed of real numbers. Since the real numbers are a continuum also changes are a continuum. Transformation of the change  $n$  into  $n+1$ ,  $n+1$  into  $n+2$  is an unbroken continuous process. Number zero represents the present moment, i.e. a timeless space in which we measure changes. Changes that have happened are represented by the real numbers to the left from zero and changes that will happen are represented by real numbers to the right from zero.



As we experience changes through linear concept of inner time we are not aware that changes run in the timeless space only and not in time. Time is merely information about numerical order of changes measured by clocks.

changes occurring in the timeless space - perception – processing of the inner time -  
experience

### Materials and Methods

We perceive changes that occur in the universe through our eyes. Then the information about the changes is processed by the brain into the inner time, and finally becomes our experience. Between the perception and the experience there is processing through the inner time that creates a distortion of perception. However, once we become aware of the inner time, we can experience changes directly as they occur. This direct experience gives a scientist an objective view of the timeless nature of the physical world.

This direct experience is essential for the further development of physics. The direct experience can be achieved by observing a pendulum. For the first few minutes you will experience the pendulum moving in space and time. After closing your eyes to envisage an image of the pendulum moving in your mind's eye, you become aware of the inner time in which you experience pendulum motion. You experience the change directly as it occurs in space.

An observer is a constituent part of a scientific experiment. In the indirect (temporal) experience the observer is captured within the inner time. In the direct (atemporal) experience the observer is fully aware of the inner time and experiences changes directly as they occur in a timeless space (5, 6).

#### INDIRECT TEMPORAL EXPERIENCE

change – perception - processing through the inner time - temporal experience of the observer

#### DIRECT ATEMPORAL EXPERIENCE

change - perception (eyes) - atemporal experience of the observer

### Discussion

With distinguishing between time obtained by clocks and the inner time, a new interpretation of relativity emerges. The universe is a timeless phenomenon where changes exist “before” and “after” only in a sense of a numerical order. Experimental physics confirms that changes occur in the present moment in the timeless space only and not in space-time that is only a mathematical model. In a faster inertial system that moves in the timeless space the speed of change is slower than in a slower inertial system. With stronger gravity the speed of change is slower than with weaker gravity. The so-called “time-dilatation” means that the speed of change slows down, including the speed of clocks.

Recent research indicates that some change happens in zero time. Timeless quantum communication is a real phenomenon: *“We show how continuous-variable systems can allow the direct communication of messages with an acceptable degree of privacy. This is possible by combining a suitable phase-space encoding of the plain message with real-time checks of the quantum communication channel. The resulting protocol works properly when a small amount of noise affects the quantum channel. If this noise is non-tolerable, the protocol stops leaving a limited amount of information to a potential eavesdropper”* (7). What is meant here is that information does not move through space-time, but through the timeless space, an immediate medium for identifiable quanta.

The Einstein-Podolsky-Rosen (EPR) experiment similarly reminds us that physical space is a timeless environment. There is no discernible signal in the form of a photon travelling between A and B. The time of information transfer between A and B is essentially zero. We might infer that A and B are extended entities. The timeless space represents an immediate communication medium between the quanta A and B (8).

The timeless physical space as an “immediate information medium” resolves the causality problem of the Fermi two-atom system: *“Let A and B be two atoms or, more generally, a ‘source’ and a ‘detector’ separated by some distance R. At  $t=0$  A is in an excited state, B in its ground state, and no photons are present. A theorem is proved that in contrast to Einstein causality and finite signal velocity, the excitation probability of B is non-zero immediately after  $t=0$ . Implications are discussed”* (9). The excitation probability of B is non-zero because the space in which atoms exist is an “immediate medium of excitation”.

It can be said that certain physical phenomena are timeless, since no measurable time elapses for them to happen. For example in the article entitled *Attosecond Ionization and Tunneling Delay Time Measurements in Helium* by Eckle et al, a conclusion is drawn that *“an electron can tunnel through the potential barrier of a He atom in practically no time”* (10).

In similar vein, a recent arxiv paper depicts a system of diagrams to represent various elements of a quantum circuit, in a form which makes no reference to time (11).

Quantum gravity describes space as granular. Space is made out of quanta of space volume of Planck (12).

What is meant here is that the quantum space is an immediate medium for information (I) and energy (E) transfer. At Planck size (IE), transfers are immediate; at photon size, they move at the light speed; at larger scales they move at the speed lower than the light speed.

Gravity is not an energy transfer from an object A to an object B, gravity is a result of dynamics between mass and quantum space. Existence of certain mass in a given volume of space changes the quantum structure of space and this generates gravity. In the General Theory of Relativity structural change of quantum space is described by curvature of space. Quantum space itself is timeless. Gravity is immediate.

### Conclusion

In today's physics the conviction still prevails that time is a part of space and so a fundamental physical reality in which change occurs. Most physicists are still experiencing changes through the linear inner time. They "project" the inner time into the timeless physical reality and so their experience is temporal. Temporal experience is an obstacle for deeper understanding of immediate quantum phenomena for which time is zero. Physicists who know only the temporal experience are convinced that no change can happen in time zero.

Once a physicist is aware of the inner time he experiences changes directly as they occur in space. This atemporal experience confirms that time is not a part of physical world; time obtained by clocks is merely information on changes that occur in the timeless space. Atemporal experience will ensure development of new scientific models that will be closer to the real nature of the universe. It confirms a vision of Einstein and Gödel who considered the universe to be a timeless phenomenon.

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