

# MATHEMATICAL SPACE-TIME, NEURONAL SPACE-TIME AND TIMELESS QUANTUM SPACE

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## 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 frequency, velocity and numerical order of change. Experimental data confirms that changes and clocks do not run time; they run in quantum space only. Time is not a part of quantum space. Quantum space itself is timeless. Physical time that is clocks run is man created physical reality. Space-time is a math model merely. Fundamental arena of the universe is timeless quantum space. In the timeless quantum space into which massive bodies and elementary particles move there is no past and no future. Past and future belong to the inner neuronal space-time that is a result of neuronal activity of the brain.

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

## Introduction

Quantum gravity describes space as granular. Space is made out of quanta of space QS volume of Planck (1). Experimental data confirms that with clocks we measure a frequency  $\gamma(s^{-1})$ , velocity  $v(ms^{-1})$  and numerical order  $n...n+1...n+2...$  of material changes that occur in a quantum space.

We experience stream of changes in a linear concept of the inner neuronal time that is based in neuronal activity of the brain. Research done in 2003 introduces idea that part of the brain is creating linear time: "The brain is the "local" creator of time, space, and space-time as our special maps of the reality we "observe" and participate in." (2).

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 (3).

Physical time that is run of clocks ("tick" of clocks) is not a part of quantum space in which change occurs. The fundamental arena in which changes occur is the quantum space. With clocks we do not measure time as a fourth dimension of space. With clocks we measure frequency, velocity and numerical order of change in quantum space. Space-time is mathematical model merely were fourth coordinate  $X_4$  is a product of imaginary number  $i$ , light speed and number  $t$  that represents "tick" of clock:  $X_4 = i \times c \times t$ .

In physics numerical order of change is represented by a straight infinite line composed of real numbers. Transformation of the change  $n$  into  $n+1$ ,  $n+1$  into  $n+2$  is an unbroken continuous process that is represented by the continuum of real numbers. Number zero represents the present moment 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.

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### Perception, processing, experience

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 space and physical time as a run of clocks. He understood that changes exist “before” and “after” in a sense of a numerical order. Smallest unit of numerical order is “Planck time” and largest is “one year”.

#### INDIRECT EXPERIENCE

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

#### DIRECT EXPERIENCE

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

In today physics still stream of change is understood run in time as a physical reality although there is no experimental data for such interpretation. As we experience changes through linear concept of inner time we are not aware that changes run in the timeless quantum space only and not in time. Experimental data confirm that changes run in timeless space only and with clocks we measure their frequency, velocity and numerical order.

### Discussion

With discovery that physical time is run of clocks in timeless quantum space, a new interpretation of relativity emerges. 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.

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 (4).

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” (5).

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”(6).

Physical time that is run of clocks definitely does not play any role in the universe. There is no time as a physical reality in which change run. Space itself is timeless. The only linear time that exists is inner time that is based on neuronal dynamics of the brain.

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. Clocks are man-made inventions and linear time is an abstraction of the mind. In physical equations symbol "t" means "tick of clock". Clocks "tick" in space only, not in space-time.

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 (no run of clocks) 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).

What is meant here is that the timeless 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.

Understanding of time here confirms a vision of Einstein and Gödel who considered the universe to be a timeless phenomenon (12). "Back in time" and "forward in time" exists only as a numerical order of changes that run in timeless quantum space. Hypothetical "travelling in time" in spaceships is out of question; one can travel in timeless quantum space only. With clocks we measure velocity and numerical order of motion of a spaceship in quantum space.

## Conclusion

In today's physics the conviction still prevails that time is a part of space and so space-time a fundamental physical reality in which change occurs. There is no experimental data for this conviction. Experimental data confirms that physical time is run of clock. With clocks we measure frequency, velocity and numerical order of change that run in timeless quantum space. Space-time used in General Theory of Relativity is a mathematical model merely. Our sequent experiencing of change is based on the map of neuronal space-time.

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