TIME AS NUMERICAL ORDER OF MATERIAL CHANGE

Essay
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Abstract

Einstein and Gödel speculated that time does not run in the universe as humans experience it. Their preposition seems to be right. Time as a physical entity in which material change runs can not be observed in the universe. One can observe time only as a numerical order of material change. Time is what one measures with a clock. With a clock one measures the numerical order of material change that happens in the universe: material change X1 transforms into X2, X2 transforms into X3 and so on. X3 exists "after" X2, X1 exists "before" X2 as numerical order only. Space-time does not exist as a physical reality, it exists only as a mathematical model, in which we describe the irreversible stream of material change in the universe.

What is measured with a clock?

Palle Yourgrau's book »A World without Time: The Forgotten Legacy of Gödel and Einstein« opens new perspectives regarding scientific definition and experience of time. Both giants of science have been discussing in the second part of the last century a possibility that there is no time in the universe as science experiences it. Their scientific vision of "World without time" has not been fully examined yet. In this essay we will discuss some evidences that support this idea of Gödel and Einstein.

Let's start with a question: "What is measured with a clock?" On the basis of elementary perception (sight) one can answer: "With a clock, the numerical order of material change is measured. The smallest material change that can be observed in the universe is the motion of a photon through Planck distance. The unit of time (of numerical order) that indicates this motion is called "Planck time".

With clocks we measure the numerical order of an irreversible stream of material change. With the eyes we can perceive material change in the universe only, space-time in which this material change should happen, is not perceivable. Space-time exists as a mathematical model in which one experiences universe. Time does not run in the universe as an independent fourth dimension of space-time, it runs only as numerical order of material change.

Physical time and Mind time

Einstein and Gödel were right: time as we experience it does not exist in the universe; it exists only as a mind concept through which we experience material change in the universe. Let's see the process of experiencing material change: material change is first perceived by senses (sight) then elaborated into time as a mind concept and finally experienced. Linear time is a "mind prism" through which we

experience material change that runs in the universe. Past, present and future are elements of time as a mind prism. In the universe there is no past, present and future.

One should distinguish between physical time (numerical order of material change) and mind time (time as a mind concept). One should be aware that material change has no duration on its own; we give it a sense of duration by measuring it. Motion of a clock has no duration on its own. We have defined duration of motion of clocks in regard to the movements of stellar objects, we are not aware that stellar objects move in the universe only and not in time. We "measure" with clocks the duration of all other motion that runs in the universe. Universe does not run in time, time runs in universe as numerical order of events.

Length is a physical quantity to measure lengths of objects and distances between them. Man has invented "units" of lengths: Planck distance, meter, mile, kilometer.. In the same way, time as numerical order of material change is a physical quantity. To measure the numerical order of material change, man has invented "units" of time: Planck time, second, day, year.

For example a photon is moving from the point A to the point B. Distance between point A and B is 100 Planck distances. A movement of a photon from A to B is described by the numerical order of 100 units of Planck time. The photon does not move in time, it moves in space only. Time is the numerical order of this movement.

Because of that, in Special Theory of Relativity, the forth coordinate of space-time X4 is imaginary: X4 = c x i x t. C is the light speed, i is an imaginary number (i squared is minus 1) and t is a number that indicates the numerical order of photon motion. The fourth imaginary coordinate describes the numerical order of photon motion in three dimensional space.

Numerical order of change has no arrow

Material change in the universe does not run in a linear way in a sense: the second material change is after the first material change and before the third material change and so on. What happens is that the first material change transforms into a second material change, the second into a third and so on in the universe, where "before" and "after" exists only in a sense of numerical order. Numerical order of change (time) has no an arrow. The "arrow of time" exists as a mind concept only.

Experiencing material change as a "linear stream" is a result of experiencing it inside a linear concept of time as a mind concept. That mother is born "before" the son and "after" grandmother belongs to the experience of life through "linear mind time". With clocks we only measure the numerical order of these three events: grandma has number 1, mother number 2 and grandson number 3.

In the universe, material change runs in what Einstein called NOW. Past, present and future belong to the mind. This NOW can be understood also as Eternity. We are born into Eternity, living in Eternity, dying in Eternity. As we experience Eternity through mind time, we experience it as "infinitely back into past and infinitely into future". Eternity is not linear, Eternity is NOW.

Temporal and Eternal experience in science

Current scientific experience is temporal. Science experiences universe in a linear concept of mind time. One first perceives information of a given experiment with the senses, then the mind elaborates this information into mind time and finally experience occurs.

perception – elaboration into mind time – experience

With awareness that mind time is a "prism" between perception and experience, future science will also develop eternal experience. In eternal experience there will be no mind elaboration, no gap between perception and experience. Eternal experience requires activation of consciousness. Mind creates thoughts, consciousness watches them (witnesses them). By watching the process of temporal experience, one becomes aware of how the mind's elaboration of events into time as a mind model influences experience. Consciousness as a research tool has an important role in future science: it will give awareness of the difference between models of the universe and the universe itself. Eternal experience will bridge physics, transpersonal psychology, shamanism, spirituality and religion.

Time as numerical order and General Theory of Relativity

The concept of space-time is here developed into a concept of space where physical time is the numerical order of material change that runs in space. In General Theory of Relativity, gravitational force is the result of curvature of space-time. Here the idea arises that the force of gravity is a result of curvature of space. The physical basis of curvature of space is its quantum structure.

"Loop Quantum Gravity" introduces a granular structure of space. Space is made out of "quanta of space" that have a volume of Planck. According to the thesis here, space is a "pool of free energy" made out of unstructured quanta of space (QS), - basic quanta of energy. QS are flexible, in areas where there is no stellar object, the density of space Ωs is high, the size of QS is of Planck volume. In areas where density of space Ωs is low, near stellar objects and inside of them, the size of QS is bigger than of Planck volume. Space is a dynamic energy system, where fluctuation of quanta of space follows motion of stellar objects and elementary particles. With movement of a material object or mass particles into a space diminishes the density of space around the material object or mass particles.

Density of space Ωs increases with distance from massive objects. Inside of massive objects the density of space Ωs depends on density of mass Ωm. The higher the density of mass Ωm, the lower is the density of space Ωs. The lower the density of space Ωs; the smaller is the number of quanta of space in a given volume of space. Where density of space Ωs is lower, quanta of space are more "stretched" and have a stronger tendency to "shrink". This "shrinking" force is the gravitational force that works between quanta of space. Gravitational force keeps space together and by that keeps together also objects that exist in space. For example: between earth and moon, gravity force exists between "low-density-space clouds" (LDSC) of earth and of moon. It does not act directly between material objects; it exists in the space where an object exists.

earth – LDSC of earth – gravity force – LDSC of moon – moon

The smaller the density Ωs of LDSC, the bigger is its curvature. Light is bent by passing massive stellar objects because of different density of space Ωs through which it moves. Space in which stellar objects exist can not be curved on its own. The physical basis of curvature of space is variable quantum density of space Ωs.

In General Theory of Relativity, curvature of space is a measure for density of space Ωs. Space is the "gravity medium" between stellar objects. In a similar way space is the "direct information medium" between two elementary particles in an "Einstein-Podolski-Rosen" experiment. Information does not travel between particle A and B, information is present in the space where both particles exist. Space somehow "knows", it is conscious of particle spin. When we measure spin of particle A and it is "left", then spin of particle B will be always "right". It might be that space carries not only gravitational force but also consciousness itself. Quanta of space (QS) change their electrical charge from positive to negative in a unit of Planck time $\left(5.39 \cdot 10^{-44} s\right)$. They "vibrate" at the "basic frequency" $\gamma = 0.19 \cdot 10^{-44} s^{-1}$. This "basic frequency" of space is consciousness itself. According to Penrose, consciousness is a result of quantum gravity acting on brain neurons.

Evolution of life is a continuous process of matter developing into more complex organisms that develop towards consciousness. Space plays an active role in the evolution of life.

Vector of gravity force

In areas where density Ωs changes, the vector of gravity force is directed towards the area of decreasing density Ωs. Material objects and elementary particles move in the direction of decreasing density Ωs of space. A mass particle creates a small LDSC around it; mass-less particles does not create a LDSC.

In space where there is no change of density Ωs there is no change of rate of curvature. Gravity force as a shrinking force of space is still there, but gravity on a given object there is zero. Such areas are for example at a Lagrange point between earth and moon, where density of space is stable. Objects there will not move but gravity force as a shrinking force between quanta of space exists. Such an area is also in the centre of stellar objects where density of space Ωs is stable, there is no change of rate of curvature, but gravity as a shrinking force of space is there.

Density of space inside black holes and neutron stars

Inside black holes and binary neutron stars, density of space Ωs is so low that space has an enormous force of shrinking. This shrinking force disintegrates all subatomic particles back into quanta of space. Beyond the Schwartzschild radius, mass transforms back into quanta of space QS. A black hole "sucks" matter from outer space and transforms it into quanta of space. The transformation "mass - quanta of space" continuously increases density of space Ωs in the centre of the black hole that spreads with light speed into outer space as a "gravitational waves".

Astronomical observations of diminishing of speed of rotation (orbit time) of binary neutron stars PSR1913+16 is explained by transformation of the mass of stars into "gravitational radiation". According to the understanding here, "gravitational radiation" is a result of the transformation of the mass of stars into quanta of space in the centre of binary stars (similar as in the centre of black holes). The transformation "mass - quanta of space" increases density of space Ωs in the centre of stars that spreads with the light speed into outer space as a "gravitational waves".

Existence of gravitational waves that are emission of mass and are absorbed by mass in a similar way as electromagnetic waves might be a wrong preposition. Research of Prof. Loinger from Milan excludes the existence of gravitational waves that travel from stellar object A to stellar object B in order to keep them together.

Astronomical observations show that the Active Galactic Nucleus (AGN) of our galaxy "eats" nearby stars and galaxies and from time to time throws out huge amounts of fresh gas. The AGN transforms matter into quanta of space QS. This process increases density Ωs of space in the AGN. As with black stars and neutron binary stars, "gravitational waves" are spreading into outer space also from an AGN. When a huge amount of matter is entering the AGN, density of space Ωs reaches a certain maximum in a very short time. Such a sudden increase of Ωs causes a big explosion where quanta of space transform into elementary particles. All elementary particles are different structures of quanta of space, we could also say they are quanta of space with different "vortex" properties. Quanta of space QS have a "basic energy" that is given by the relation: $Eqs = h \cdot \gamma$. ($h = 6.626069 \cdot 10^{-34} J \cdot s$) where h is the Planck constant and γ is the "basic frequency of quanta of space".

After density Ωs returns below the maximum value, the explosion stops. AGNs are "refreshing" the fabric of the universe, they transform "old" matter into "fresh" matter and keep the entropy of the universe constant.

In the universe there is a permanent fluctuation of energy "energy – matter – space – energy – matter – space". The sum of the densities of electromagnetic energy Ωe, matter Ωm and space Ωs in a given volume of universe tends to be in equilibrium: $\Omega e + \Omega m + \Omega s = 1$. When there is an excess of density of matter Ωm it will turn into energy Ωe, where there is an excess of density of space Ωs it will turn into matter and so on. The universe is a system in permanent dynamic equilibrium, there is no beginning and no end of the universe.

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