Chapter 3. How to catch the passage of time?

> ... time does not move in space, but appears immediately in the whole Universe. Therefore, time is free from limiting the speed of the signal, and in time it will be possible to make instant communication with the farthest objects of the Cosmos.
>
> *N.A. Kozyrev. In the collection "N.A. Kozyrev. Selected Works" Leningrad, publishing house of the Leningrad University, 1991.*

Before setting up experiments that allow us to grasp the course of the inexorable flow of time into which we are all immersed, we need to mentally build a diagram of the world that includes the time, that is, the time itself. The most general principles that our world stands on should include, first of all, the phenomenon of rotation, which takes place at all levels (steps) of an infinite hierarchical ladder, extending from an electron rotating around the nucleus of an atom to the universe itself, where each of it structures - from planets to clusters and superclusters of galaxies — revolves around its center of attraction. Therefore, rotation at any level can be considered the Cause of subsequent events Consequences. Indeed, simple examples show the validity of this statement. The rotation of the Earth around the Sun is the reason for the change of day and night, the rotation of the planet around the Sun is the reason for seasonal changes, etc. Kozyrev considers the elementary transition of the cause to the effect at the atomic level to be a multiple of e^2/h and directly related to the speed of rotation of the electron around the nucleus. The value of e^2/h is a pseudoscalar, so its sign changes to the opposite when moving from the right coordinate system to the left.

The sign of the passage of time allows us to give an absolute (independent of the choice of reference frame) definition of the *right* and *left*. The fact is that in geometry these concepts are defined only from the point of view of an observer located in a certain reference frame, i.e. relatively. Each of the two observers isolated from each other can build their own geometry system, in which they will have their own concepts of right and left, but they will not be able to coordinate them until they engage in experiments that make it possible to experimentally determine the direction of the course of time. Then it remains only to agree on which sign c^2 — positive or negative — should be associated with a certain choice of the right or left coordinate system. "The course of time existing in the World establishes in space the objective difference between the right and the left" [7].

Indeed, in nature there are conspicuous objective differences between the right and the left, long known in the organic world. For example, the shells of most mollusks are twisted to the right. There are certain asymmetries in microbes that form spiral colonies. In the conducting vessels of plants, left spirals predominate. "In the middle of the last century, Louis Pasteur discovered the asymmetry of protoplasm and a number of remarkable studies showed that asymmetry is the main property of life. In an inorganic nature, stereoisomers form ... mixtures with the same number of right and left molecules. In protoplasm, a sharp inequality of the right and left forms is observed. ... levorotatory glucose is hardly absorbed by the body, left nicotine is more toxic than right nicotine, etc." [7, 10]. The solar system and the galaxy are right-handed systems, just like our planet, rotating around its axis in the same direction as around the sun.

In principle, two equivalent frames of reference are possible in which the concepts of right and left can be determined absolutely by experimentally establishing the direction of the flow of time, which in our minds flows from the past to the future. What is a world with a reverse passage of time, i.e., \ from the future to the past? To change the direction of the passage of time means to change the sign of the constant passage of time, but the principle of causality must be preserved: the cause must give rise to a consequence, and not vice versa. It follows that the mechanics of the world with the reverse course of time relative to our world should be the same as ours, and a change in the direction of the course of time is equivalent to the reflection of our world in the mirror. This is a mirror image of our world and will be a world with a reverse course of time - from the future to the past from the point of view of an observer from our world. Due to the fact that causality is preserved in the mirror world, it will be completely equivalent to our world, i.e., it will not be a film launched in the opposite direction, where the dead would get up from the graves and make the return journey to birth.

This is a mirror image of our world and will be a world with a reverse course of time - from the future to the past from the point of view of an observer from our world. Due to the fact that causality is preserved in the mirror world, it will be completely equivalent to our world, i.e., it will not be a film launched in the opposite direction, where the dead would get up from the graves and make the return journey to birth. So, a cause-effect pair can be represented as a pair of points rotating relative to each other in a certain direction,

which we perceive as a movement from the past to the future. And since everything in the world is only an endless chain of events, a pair of points rotating in a certain direction, connected by a gravitational field, electromagnetic forces, etc., can serve as an elementary link in the world. It follows that the course of time should primarily manifest itself in experiments with rotating bodies, where it is added to the usual linear rotation of bodies. The order of this addition should be $c^2/c = 1/137 > 10^{-5}$. In this case, the additives will be positive or negative, depending on which direction the body under study rotates — in the same direction where the passage of time is directed, or in the opposite direction. "The course of time of rotating bodies differs from the usual course of time in that the relative linear speed of these rotations is geometrically added to the usual course of time. ... Now it becomes clear that in order to clarify the properties of the passage of time, it is necessary to carry out experiments with rotating bodies — tops" [7].

An experimental verification of the basic theoretical principles of causal mechanics was started by Kozyrev in the winter of 1951–52. Later they were continued at the Pulkovo Observatory together with engineer V.V. Nasonov. We used gyroscopes of aviation automation with a rotation frequency of about 500 hertz (Hz) in a frame with both a vertical axis and a horizontal axis. They were weighed on a lever scale. It turned out that with a vertical axis of rotation and different frequencies, the weight of the gyro did not change with an accuracy determined to more than the 6th digit (one millionth). Kozyrev explained this fact by the fact that the gyroscope in this case is a strictly closed system, therefore, the law of conservation of momentum is fulfilled for it. But with the further development of experiments with gyroscopes, it turned out that during the transfer of vibrations from the gyroscope to the balance rack, changes in the balance readings may appear, depending on the direction and speed of rotation of the gyroscope (frequency). It turned out that for vertically located gyroscopes rotating counterclockwise, when viewed from above, a significant change (decrease) in weight was observed, while the weight of gyroscopes rotating clockwise under the same conditions remained unchanged. Moreover, a decrease in weight during counterclockwise rotation was observed, starting with a certain threshold vibrational force. The magnitude of the change is proportional to the gyroscope rotation speed and in order is approximately 10^{-5}. It is interesting to note that with an increase in the frequency of vibrations, jumps took place, as a result of which the weight reduction occurred in portions — quanta. Thus, the reduction in weight of a 620-gram gyro at a vibration frequency of about 22 Hz was 31 mg, which is about 10^{-5} of the initial weight, at a frequency of 25 Hz it instantly reached 62 mg, and at a frequency of 28 Hz — 93 mg. A further increase in the vibration frequency was impossible, since the accelerations caused by them approximated in order of magnitude the value of the acceleration due to gravity, and in this case, the balance beam began to beat against the support, which prevented proper weighing. At a frequency of 28 Hz, 93 mg. But near this critical value of the vibration frequency (approximately 30 Hz), it was possible to obtain 5- or even 10-fold values of weight reduction [11].

A step change in the weight of the gyroscope indicates the deep connections of quantum mechanics, which describes the movements of microbodies (elementary particles), and ordinary mechanics, dealing with macrobodies.In particular, a stepwise (quantum) change in the weight of a rotating gyroscope under the influence of vibrations can be compared with a stepwise change in the energy of an electron of a hydrogen-like atom under the influence of external effects on the atom — electromagnetic or radioactive radiation, impacts of elementary particles, etc. Let us consider for convenience the simplest of the atoms, the elementary brick of the structured material world — the hydrogen atom. It consists of a nucleus — a proton — and an electron rotating around it. Both particles have internal rotation (spin). Unlike planets, the rotation axis of which can have different angles of inclination with respect to the plane of motion around the central luminary, the electron spin is always oriented perpendicular to the plane of the orbit, but can be either positive or negative in magnitude, i.e., upward either down in relation to the orbit. The latter can be interpreted for simplicity as the internal right or left electron rotation.

It is interesting to note that the nucleus of a hydrogen atom (proton) also has a spin equal to, like the electron spin +1/2 ħ or –1/2 ħ. If the spins of the proton and electron have the same sign, i.e., \ are parallel, then hydrogen is in the ortho state and is called orthohydrogen. If the spins of the electron and proton have opposite signs, i.e., are \ antiparallel, then we are dealing with parahydrogen. The spins of particles add up geometrically, i.e., by the rule of addition of vectors. So, the total spin of parallel particles is 1 (in units of), and antiparallel — 0. Ortho- and parahydrogen can be considered as two modifications of one substance — hydrogen. This means that the mutual orientation of the right and left rotations of elementary particles that make up the structural unit — the atom of matter — affects its chemical properties.

The nucleus of a hydrogen atom (proton) can be considered as a Cause, and the electron rotating around it — as a Cause. In this case, both particles have spins, i.e., \ internal rotations, which in terms of causal mechanics can be expressed as follows: the spinning proton and electron are two points (2 gyroscopes, or gyroscopes) located in relative rotation. The axes of both gyroscopes are perpendicular to some plane, so

that they can be considered as 2 screws. In the ortho state, both screws are screwed in one direction, in the para state, in the opposite direction. In any case, a change in the electron velocity caused by various external factors changes the balance of forces that determine the translational motion of the screw. With a sufficient quantitative change, a qualitative change in the motion of the electron occurs — it jumps to another orbit.

This is also stated in Bohr's third postulate, or the frequency condition, which is formulated as follows: *an atom emits (absorbs) a quantum of electromagnetic energy when an electron passes from an orbit with a larger (smaller) n to an orbit with a smaller (large) n. The quantum energy is equal to the difference in electron energies in orbits before and after the transition:*

$$E = \hbar\, n_{mn} = E_m - E_n \text{.....(1)}$$

the transition frequency of a quantum (photon) arising or absorbed during the transition is:

$$n_{mn} = (E_m - E_n)/\hbar \text{.....(2)}$$

This (third) Bohr's postulate along with the second will help to understand the meaning of the relation $c_2/c = a = 1/137$. The fact is that the stability of the stationary orbits of electrons in an atom is due to the fact that the internal rotation of an electron, described by a characteristic called spin, is inextricably linked with its external rotation around the nucleus. If for simplicity we imagine an electron in the form of a rotating ball, then the number of periods of internal rotation (spin "frequency") should be related to its external rotation in such a way that the ratio of the number of periods of internal rotation (spin) to periods of external (orbital) rotation would be integer by number. External influences on an atom — electromagnetic or radioactive radiation, a meeting with another atom or nucleus, etc. — affect the speed of the electron in orbit, i.e., \ change the time of its revolution around the nucleus, and, therefore, its frequency. Thus, the ratio of the external and internal (spin) frequencies changes. Therefore, the electron is forced to leave orbit and rushes to the other - the one on which will correspond to its new energy state. If in the process of external action the electron slows down (loses energy), then it passes into an orbit located closer to the nucleus, where it can stay in a new state, and the energy lost by it is emitted in the form of a quantum (photon) of the corresponding frequency. If the electron gains energy, then it passes into a more distant orbit, absorbing the energy it acquired in the form of the corresponding quantum (photon). The delivered or absorbed electromagnetic energy propagates in the radial direction (to or from the nucleus) at the speed of light c, and the energy possessed by the orbital electron is transmitted along the orbit at a speed proportional to c_2. If the electron gains energy, then it passes into a more distant orbit, absorbing the energy it acquired in the form of the corresponding quantum (photon). The delivered or absorbed electromagnetic energy propagates in the radial direction (to or from the nucleus) at the speed of light c, and the energy possessed by the orbital electron is transmitted along the orbit at a speed proportional to c_2. The speed of rotation of the planet at the equator is approximately 500 m / s, at the latitude of Leningrad, where the weighing was carried out, it is 500 m/s×cos 60° = 250 m/s, where 60 ° is the latitude of Leningrad. The gyroscope rotation speeds in weighing experiments were tens of m / s, more precisely 26, 40 and 53 m/s [11]. When the gyroscope was rotated against the direction of the Earth's rotation, i.e., clockwise, the effect of weight change was not observed, while when rotated counterclockwise (in the direction of the planet's rotation), the gyroscope's own rotation speed ("spin"), added the speed of rotation of the planet (its "spin"), leads to the effects of a quantum change in the pressure force of a rotating gyroscope on the support area. So, in the case under consideration, the passage of time manifested itself in abrupt changes in the weight of a rotating gyroscope. It is interesting to note that during vibration, the force of influence of which was comparable with the weight of the gyroscope itself, a resonant state of the system occurred. This condition set a natural limit to further research efforts along the way. So, in the case under consideration, the passage of time manifested itself in abrupt changes in the weight of a rotating gyroscope. It is interesting to note that during vibration, the force of influence of which was comparable with the weight of the gyroscope itself, a resonant state of the system occurred.

In addition to the directional course (flow) of time studied in experiments with rotating bodies, Kozyrev was interested in such a characteristic of time as density. He believed that the processes in which the structure of a substance was destroyed radiated time into the surrounding space, thereby enhancing its density. On the contrary, the processes in which the substance was structured took time from the surrounding space, thereby reducing its density. For example, processes such as warming up the body, melting ice, evaporation of liquids, dissolution of various substances in water and even withering of vegetation should increase the density of time. And the oppositely directed processes of cooling bodies, freezing (crystallization) of water should absorb time, thereby reducing its density.

The density of time is a quantity that decreases with increasing distance from the process that generated it. Therefore, the measurement of time density should include 2 types of measurements: 11) the study of the process of changing the density at the same distance from the source; 2) the study of changes in the density of time at different distances from the source of the process. Type 1 studies relate to the scalar property of the density of time associated with its change depending on the dynamics of the process. Type 2 studies are related to the study of the spatial distribution of the time density created by the source, i.e. its gradient. An example of type 1 research was the measurement by Kozyrev of variations in the weight of a suspended load during a solar eclipse. The course of his reasoning was as follows: “If the Sun, due to the processes that occur in it, radiates time, then the Moon during eclipses should screen the action of the Sun through time to the Earth.A study of this kind should be carried out with partial eclipses in order to exclude the possibility of disturbance of the meteorological situation, which, as is known, remains unchanged during eclipses with a small phase” [11]. Observations of the change in the weight of the gyroscope in vibration mode were carried out in Pulkovo during 5 solar eclipses of 1961, 1966, 1971, 1975 and 1976. In all cases, a decrease in the forces caused by the passage of time was observed. “These observations make it possible, with good reason, to say that time density decreases during eclipses. Therefore, the Sun radiates not only light, but also time” [11].

Type 2 studies were carried out using a torsion balance. Using the test method, it was found that the best effect is achieved by a scale with a shoulder ratio of 1:10. The experiments performed with them showed that the long end of the rocker arm is repelled from the sources of processes that emit time, and is attracted to the sources of processes that absorb time. Type 2 studies were carried out using a torsion balance. Using the test method, it was found that the best effect is achieved by a scale with a shoulder ratio of 1:10. The experiments performed with them showed that the long end of the rocker arm is repelled from the sources of processes that emit time, and is attracted to the sources of processes that absorb time.

Moreover, it was experimentally established that in addition to the process of absorption of time, there is a process of its reflection, and the aluminum coating is an excellent reflector not only of light, but also of time.The existence of time reflection was proved as follows: a box with torsion scales was surrounded by a reliable protective screen with a vertical gap left in it. The time-radiating processes of evaporating the liquid or dissolving sugar in water were carried out far from the gap behind the protective screen, so that the source of the process did not affect the balance. If a mirror was placed in front of the slit reflecting the course of the process, then the repulsion of the arrow of the balance was observed. Moreover, the law known in optics turned out to be valid for the radiated time: *the angle of incidence is equal to the angle of reflection.* The processes that attract the arrow, i.e. absorbing time, the mirror is not reflected.

Then Kozyrev suggested that a concave aluminized mirror should collect and focus the time radiated by processes that increase entropy. But such mirrors are known to be used in astronomy as telescope lenses, therefore, it is possible to study the processes of time radiation from space objects. Such experiments were carried out in Pulkovo and at the Crimean Astrophysical Observatory. A torsion balance was placed in the focus of a telescope pointing at a space object. We studied stars, globular and open star clusters, galactic nebulae, the galactic center, other galaxies, the planets of the solar system, the moon. It turned out that among the stars, superdense objects emit the most time: white dwarfs and the alleged black hole - the source of X-1 in the constellation Cygnus. Of the planets, the Moon and Venus radiate most strongly, but irregularly [12]. Observations of radiation, called time by Kozyrev, showed that they can be produced both day and night, and even through light cloud cover. But clouds and dense clouds do not let this radiation through.

The astronomical observations considered here using torsion scales placed in the focus of the telescope serve as a bridge connecting experiments on the study of time radiation by substances in the laboratory and registration of radiation of the same nature from distant cosmic sources, which were discussed in Section 1 of this chapter and in particularly detail in Appendix A. Astronomical observations using a torsion pendulum served as a springboard for Kozyrev, taking off from which he was able to demonstrate to people what he was convinced: “Instant transmission of information is possible only through time, and only astronomical observations can prove this. ... In astronomy, it is possible to determine the direction and pace of evolution of cosmic bodies not by very dubious conclusions, but by a direct conclusion from the corresponding observations” [11].

The basis for such conclusions was Kozyrev’s striking intuition, and astronomical observations of the past, present and future of various objects of the Universe confirmed by other scientists confirm the correctness of the intuitive conclusions. “Time does not spread, therefore it does not tolerate momentum. In any coordinate system, time appears immediately in the entire Universe. ... It is not the image of the star that acts on the receiving system, but the place in the sky where the star is now, at the time of observation” [12]. Kozyrev believed that time is that living water of the Universe, which feeds everything that lives in it. “Time

does not let the stars go out, that is, \ come into balance with the surrounding space. Looking at the starry sky, we do not see the atomic furnaces where the destructive forces of Nature operate, but we see the manifestation of the vital creative forces that the current time brings to the World ” [11].