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LOGIC OF CAUSAL MECHANICS: OBSERVATIONS-THEORY-EXPERIMENTS

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Results of N.A.Kozyrev's experiments, which form basic subject-matter of causal mechanics are described in Levich's review in detail. However causal mechanics is not just an empirical construction. It has been called forth by necessity of interpretation of the astrophysical observations. It appeared, that many of the difficult astrophysical problems might be solved by the common way, if we assume the existence of the active properties of time. But it was found extremely difficult to obtain those properties by solving the inverse problems. And so construction of foundation of the theory by usual deductive way become the second stage of N.A.Kozyrev's work. Having put into operation some axioms motivated by results of the first, observation stage, he has obtained as theorems some consequences, which one could verify experimentally. It was important that those consequences (the most important of them was arising of the principal new forces acting along the axis of giro) were absolutely unexpected. Moreover important were their experimental verification. At the same time the first experiments, besides verification of theoretical conclusions, have shown number of features, which have been qualitatively explained and this explanation have been verified by other experiments. Further that chain: an experiment — a quality explanation — an experiment — have been extended by N.A.Kozyrev till very far going conclusions.

Since quantitative theory has remained only at the beginning of the chain, it is quite clearly prolonged non-acceptance of N.A.Kozyrev's views by the physical establishment. The most important aspect in favour of principal correctness of Kozyrev's conception is its predicting force: one can as much as one wants call in question its correctness, but it allows predicting results of the concrete experiments.

This section aims to depict a logical scheme of causal mechanics and to point out place of the experiments similarly described in Levich's review.

1. Reasons of arising of the causal mechanics

Any naturalist, not limiting himself artificially by bounds of his peculiar tasks and thus not passing over the difficult universal physical problems, must fall to thinking on concordance of time reversibility in the fundamental physical theories (classical and quantum mechanics, relativity) and visible, one can say, flagrant time irreversibility of the real Universe. Any solution of this problem gets into one of the two classes, namely: (1) irreversibility is the property of the systems; (2) irreversibility is the property of time. The solutions from the former class are inevitable particular at variance with universality of the

really observed irreversibility. However the most custom modern views are such exactly: the irreversibility arises owing to incomplete description, i.e. property of the system including the observer. The solution from the latter class on the strengths of Noetner's theorems lead automatically to breach of the law of conservation of energy. If we interpret this breach as expanding of the law bounds, then an energy of time arises, i.e. time from the relational concept becomes the substantional one. Such change of views is too strong to win an acknowledgement without the direct and faultless experimental facts.

N.A.Kozyrev's construction of time was based on its fundamental irreversibility. However not only general logic of naturalist has led him to consider the properties of time is necessity, but also reflections on the concrete astrophysical problems. The most important problem of such kind is the question on the energy sources of the stars (Kozyrev 1951). Having computed by independent parameters (mass, radiant emittance, radius) with the help of condition of balance the parameters characterised state of star's interior (temperature, density, energy emission), N.A.Kozyrev has shown statistically reliably that stars in the coordinates of state were on the free cooling surface. It means that there are no other mechanisms of energy emission independent of heatrelinquishing. In particular (this question has especially been considered) the thermonuclear reactions cannot be a source of energy. The Kelvin-Gelmgolts's mechanism turns has proved to be useful, but it is not acceptable because of too short scale of time. Kozyrev's conclusion is in full contradiction with the conventional theory of thermonuclear mechanism of stars fire, but, as far as is known, has nowhere refuted constructively. Recently evidences of the absence of the thermonuclear reaction in the Sun have been shown independently (deficit of the neutrino flow and low temperature of the interior computed by the oscillations of the Sun's figure). It has also been shown by N.A.Kozyrev that planetary energy source, at least of the planet-giants, probably, is analogical to that of the star.

Absence of the special energy sources in the following way leads N.A.Kozyrev to investigate in necessity the nature of time (Kozyrev 1968, p.114): "There is received that a problem of stars fire is a particular case of the general problem —why are the equiponderant states in the Universe absent? If there is a general principle of inaccessibility of the equiponderant states, which always means that under any circumstances there is a distinction between the future and the past. If this distinction is real and the course of time is the objective physical property of time it has to peep by the influence upon material systems. This influence will prevent the equiponderant states from realising, under which there are no distinctions between the future and the past, i.e. there is no course of time. Preventing stars to come in the equiponderant state, the course of time will be the source of their energy".

Other group of the facts are the connection of the processes on the remote heavenly bodies which do not come from the gravity and electromagnetic influence. For example, it has been uncovered (Kozyrev 1968) that in the double stars a satellite have parameters (spectral class, radius, radiant emittance) bonded with the main star. Also connection of tectonics activity of the Earth and the Moon has been uncovered which is not from tidal interaction. In addition one can make reference to a great number of statistical reliable solar-terrestrial connections, for which (except ionosphere-magnetosphere evi-

dences) it is miscarried to find so reliable physical mechanism in spite of several years' standing efforts of number of investigators. N.A.Kozyrev (1968, p.114) evaluated the facts of this kind from such position: "Time cannot be considered distractly from substance. All processes occurring in the Universe are sources, feeding a general flow of time. Therefore it should expect an existence of relations between the systems and a possibility of influence one system upon another one through time". Certainly one can bring up question on the substantial properties of time without any connection with those concrete problems. However for general assessment of Kozyrev's theory it seems important to bear in mind, that it reveals a possibility of their solution. In addition this theory has suffered unexpectedly in explaining number of geophysical facts hardexplained with conventional positions: asymmetry of figure, geological structure circulation of the atmosphere and distribution of physical fields of the Earth and other planets. Value of this group of the facts was consisted exactly in their unexpected accordance of the theory upon which they did not influence inductively.

2. Theoretical base of causal or nonsymmetrical mechanics

Due to the general nature of the problem it is considered the simplest mechanical system close to the system of material points. Causal-consequential relationships affect in this system.

The first difficulty consists in the absence in physical literature a strict formulation of the causal principle in spite of its extensive exploiting. N.A. Kozyrev has given the following definition (1963, p.97): "If by reproducing a phenomenon A while keeping the same circumstances a phenomenon B always takes place, then A is cause, and B is the consequence. Inversely, by the appearance B not without fail, A must realise, for the consequence B may be provoked not only the phenomenon A, but other causes". From our view, this definition is true, but not fully correct. Really, in the words "not without" safe gamma of transitions is contained. I.e. the asymmetry of dependence A and B must has a quantify expression which is not figuring in the definition. But recently it has been succeeded to give formal definition causality and to use that in applications (Korotaev 1992, 1993).

N.A.Kozyrev (1958, 1963, 1971, 1977) has input the following three basic axioms:

(1) Time has a specific property, that distinguishes causes from consequences and that might be called direction or motion. This property the defines distinction between the past and future.

(2) Cause and consequence always have separated in space. Thus, there is as much small, but not equal zero distance δx between them.

(3) Cause and consequence always has separated in time. Thus there is as much small, but not equal zero difference δt between them.

Discussing those axioms, N.A.Kozyrev notes that axiom (2) in fact included in Newton's law III-only external forces can become the cause of alteration of the impulse; on the contrary in atom mechanics due to principle of superposition $\delta x = 0$. We would note that axiom (2) is true for fermions. Concerning the axiom (3) N.A.Kozyrev has written

that $\delta t = 0$ in Newton's mechanics due to full reversibility of time and $\delta t \neq 0$ in atom mechanics due to irreversibly connected with effect of microscopical bodies. It seems more correct to say that $\delta t = 0$ in Newton's mechanics because of the assumption of immediate interaction. As to quantum mechanics, the irreversibly is peculiar to mixed states.

Then believing that δx and δt are of the same order of infinitesimal N.A.Kozyrev has input a fundamental conception of motion of time c_2:

$$c_2 = \delta x/\delta t. \qquad (1)$$

In the classical limit $\delta t \to 0 \Leftrightarrow |c_2| \to \infty$.

Constant c_2 has sent the velocity of converting the cause into the consequence. As the elementary causal-consequential link is considered, δx and δt determinate an "empty" interval between the material points. Therefore c_2 is connected with the properties of space-time, but not the properties of bodies and so is an universal constant. According to the axiom (1) since the causes are converting exactly into the consequences but not inversely, c_2 must have a certain sign. The latter in our opinion, is a more substantial assertion. The sign must really be certain; the certainty of value is more difficult to assert because of the connection of the properties of the vacuum with material properties of the bodies.

Thus the sign of c_2 is certain, the sign of δt is also certain by the usual condition of positive direction of time axis to consequence, the sign of δx is uncertain as isotropy of space. Invariant agreement of the signs is possible only under the condition that δt has sense of turning in the plane perpendicular to the cause-consequence direction, i.e. the axis x. Designate the unit vector of this direction $\vec{i}$. Then certain sign of δt orientates the plane yz and gives c_2 a certain sign. It means that c_2 is pseudoscalar and $\vec{i}c_2$ is axial vector. The axial with dimension of velocity has sense of the linear velocity of rotation. Thus motion of time has a certain sign, its inversion is equivalent to the inversion of the type of coordinate system (x, y, z, t).

It is easy to argue that $\vec{i}c_2$ has opposite signs at the cause and at the consequence. In fact, at the points "cause" and "consequence" δt counts off with opposite signs. It means inversion of directions of the axes y, z by the fixed direction of $\vec{i}$. The type of coordinate system changes, therefore the sign of $\vec{i}c_2$ changes. If $\vec{i}$ changes direction by transfer from the cause to the consequence, then c_2 conserves the sign, $\vec{i}c_2$ changes that.

Therefore pair $\pm\vec{i}c_2$ is always connected with elementary causal consequential link. The sign of c_2 at a fixed type of coordinate system must determine an experiment.

The previous two paragraphs reproduce Kozyrev's argument. As axial nature of $\vec{i}c_2$ (or simpler $\vec{c}_2$) has principal significance, consider this question from the positions of modern theory of symmetry (Zheludev 1987). Replace for generality δx on arbitrary choice i-component δr_i of $\delta\vec{r}$. Two vectors $\delta\vec{r}$ and $\vec{c}_2$ are coupled through tensor and therefore (1) can be rewritten as

$$\delta r_i = \delta t_{ij}\, c_{2j}\,, \qquad (2)$$

$$\begin{array}{cccc} & \delta r & \delta t & c_2 \\ R & \left\{\begin{array}{l} - \\ + \end{array}\right. & \begin{array}{c} - \\ - \end{array} & \begin{array}{c} + \\ - \end{array} \\ T & - & - & +\,, \end{array}$$

where $\delta\vec{r}$ is usual polar vector, $\vec{c}_2$ by the assumption of axial. Then δt is axial tensor. In agreement with the generalised Onsager's principle (Zheludev 1987), tensor $\delta\vec{r}$ is symmetrical:

$$\delta t_{ij} = \delta t_{ji}\,,$$

that takes place if by operation of time reversion R one of the vectors changes its sign, another one does not (that is shown symbolically under equation (2)). Therefore it can maintain that axial nature of c_2 is dictated by claim of R-invariance. It can motivate that and as N.A.Kozyrev: by essential positive δt_{ij} changing of sign of c_{2j} is coupled only with changing of sign of δr_i, i.e. with changing of sign of enantiomorphism of coordinate system. Therefore $\vec{c}_2$ is axial the vector.

The second line of signs of operation R points out on the correctness of Kozyrev's theorem on changing the sign of $\vec{c}_2$ in the cause and consequence (by conservation of sign of enantiomorphism of coordinate system).

The situation becomes clearer on the use of the terms of full symmetry (Zheludev 1987). Instead of invariance verification of operating of time reversion, invariance verification of operation time inversion $T=\bar{1}$ is used here. Result is shown under equation (2) too. Conservation of sign of c_{2j} indicates its axial nature.

If space is isotropic, the symmetrical axial tensor δt_{ij} is pseudoscalar

$$\delta t = \begin{pmatrix} \delta t_{11} & 0 & 0 \\ 0 & \delta t_{11} & 0 \\ 0 & 0 & \delta t_{11} \end{pmatrix}.$$

Its group of symmetry is $\infty/\infty 2$. In the group 2-fold symmetry axis mutual rotation of the cause and consequence on the angle multiple of π is avaliable as mentioned below and also by N.A.Kozyrev (1977).

It is interesting to note that in unisotropic space the tensor δt conserves diagonal canonical form, but with unequal components δt_{ij}. In particular, if 2-fold symmetry axes coincide with axes x and y, while $\bar{4}$-fold inversional axis coincides with axis z (the group of symmetry is $\bar{4}2m$), then the tensor δt is:

$$\delta t = \begin{pmatrix} \delta t_{11} & 0 & 0 \\ 0 & -\delta t_{11} & 0 \\ 0 & 0 & 0 \end{pmatrix}.$$

It means normal motion of time along axis x, reversal (i.e. reversal causality) along axis y and infinite (absence of causality) —along axis z. Physical interpretation of this quite fo r-mally admissible case is completely obscure, but it must be!

Considering c_2 as a fundamental constant, N.A.Kozyrev has connected it with another fundamental constants from dimensional analysis (that is possible only one way due to pseudoscalarity of c_2):

$$c_2 = ae^2/h \approx a \cdot 350\text{km/s}, \qquad (3)$$

where e is electron charge, *h* is Planck's constant, a is dimensionless coefficient. Hence it is clear that causal mechanics effects might be considered at nonrelativistic approximation. Here it is properly to note that (3) coincides with the expression of the electron velocity on Bohr's orbit. If this coincidence has some sense, then in excited states the motion of time is less than that in basic, decreasing by law 1/n (n = 1,2,3,...).

It is followed from (3) that at classical limit $c_2 \to \infty$, that coincided with the result of direct analysis of (1).

Proceeding from the fact that c_2 represents mutual rotation of the cause and the consequence, the following step is natural: consideration of an ideal gyro (i.e. a rotating material point), excited by causal-consequential interaction with a fulcrum (an immovable material point).

Let a point X (cause) moving under applied force $\vec{F}_X$ affects a point Y (consequence). The unelastic force $\vec{F}_Y$ of the cause affecting the consequence can be represented by

$$\vec{F}_Y = \vec{F}_X - \delta\vec{P}_X / \delta t = \delta\vec{P}_Y / \delta t,$$

where $\vec{P}$ is impulse. For the point X D'Alamber's loss of the force is

$$\delta\vec{P}_X / \delta t = \vec{F}_X - \delta\vec{P}_Y / \delta t.$$

According to these expressions over time interval δt the point X releases its impulse δP_X, that passes to the point Y. Designate the unit vector of $\vec{F}_Y$ as $\vec{i}$. Then

$$\vec{F}_Y = \vec{i}\left|\vec{F}_Y\right| = \vec{i}\left|\delta\vec{P}_Y\right| / \delta t = \vec{i}\left|\delta\vec{P}_Y / \delta x\right|\left|\delta\vec{x}\right| / \delta t.$$

Further, substituting $\left|\delta\vec{x} / \delta t\right|$ on c_2 we obtain the representation

$$\vec{F}_Y = \vec{i}\, c_2\left|\delta\vec{P}_Y / \delta x\right|, \qquad (4)$$

where $\left|\delta\vec{P}_Y / \delta x\right|$ is invariant as value independent with the motion of time.

As it has been proved above, at X and Y $\vec{i}\,c_2$ has opposite sign. It means that reaction $\vec{R}$ at the point X is expressed:

$$\vec{R}_X = -\vec{i}\,c_2\left|\delta\vec{P}_Y/\delta t\right|. \qquad (5)$$

In this sense Newton's third law is a direct consequence of the causality properties and the motion of time.

In the system rotating with velocity u about an axis $\vec{j}$ (considering $\vec{i}\,c_2$ as the quantum axial vector, while $\vec{j}\,u$ is the classical one):

$$\vec{F}'_Y = (\vec{i}\,c_2 - \vec{j}\,u\cos\theta)\left|\delta\vec{P}_Y/\delta x\right|, \qquad (6)$$

$$\vec{R}'_Y = -(\vec{i}\,c_2 - \vec{j}\,u\cos\theta)\left|\delta\vec{P}_Y/\delta x\right|, \qquad (7)$$

where $\theta = \vec{i}\overset{\wedge}{,}\vec{j}$.

Excluding $\left|\delta\vec{P}_Y/\delta x\right|$ from (4) – (7) we obtain the expression of the additional force, called by N.A.Kozyrev the force of causality:

$$\Delta\vec{F}_Y = -\vec{j}\frac{u}{c_2}\left|\vec{F}_Y\right|\cos\theta, \qquad (8)$$

$$\Delta\vec{R}_X = \vec{j}\frac{u}{c_2}\left|\vec{F}_Y\right|\cos\theta = -\Delta\vec{F}_Y. \qquad (9)$$

So the forces $\mp\Delta\vec{F}$ are connected with the causal-consequential link. Therefore impulse of the system does not change, but potential energy of the system changes. If there is a chain of causal-consequential links having an arm relatively of $\vec{j}$, a moment of the pair $\mp\Delta\vec{F}$ appears. Here direct consequence of two Noether's theorem is manifested resulted from the conditions of axiom (1) and the definition (1).

It should be noted that expression (6), (7) and respectively (8), (9) some differ from that obtained by N.A.Kozyrev (1958, 1963, 1971, 1977). In Kozyrev's work there is no difference between quantum and classical nature of $\vec{i}\,c_2$ and $\vec{j}\,u$ evidently. Definition of the sign of $\Delta\vec{F}$ corresponds to (Kozyrev 1977). In addition to (Kozyrev 1977) it takes into account that turn of the axes y, z from the cause to consequence must occur on the angle multiple of π, as the result of that instead c_2 in the expression of the force of causality $c_2/n\pi$ must be figured.

Here it is timely to ask why there had been no discovery of the effects of causal mechanics long ago? In fact, from estimation (2) it follows that $\Delta F/F$ has an order of 10^{-4} under u ~ 10m/s, the value is not too small to be undiscoverible on the modern level. Energy consequences of such effects have to be, probably, over very broad sphere of the irreversible phenomena. N.A.Kozyrev (1977) gave his answer, comparing the situation with the physical laboratory located aboard of the freely flying spacecraft. Physicist at this labo-

ratory should discover the phenomenon of gravitation, although movement of all heavenly bodies, including the laboratory, is governed by the Kelvin-Gelmgolts's scale for the stars is short only on cosmological one, relative losses of energy are so small, that it is impossible to observe by accidental way vanish compensating specific influx of energy (even if it caused by a principal new type of interaction). Notice from us, that additional peculiarity of the effects of causal mechanics is pairity of the force $\Delta \vec{F}$, i.e. for its macroscopical registration one needs macroscopical separation of the causes and consequences. Without realising this fact it is unprobably to perform any experiment where $\Delta \vec{F}$ is registered systematically, but not treated as random errors.

The reasons dwelled on here advantageously distinguishes Kozyrev's construction of time that directly point out the way for an experiment.

3. Experiments

As a rather detailed description of Kozyrev's experiments is presented in Levich's review in this volume, only their summary will be presented here with aim to show their logical sequence. In addition some significant details will be emphasized (by impression of author who observed those experiments personally).

3.1. Measurements of force of causality in the gyro system

3.1.1. Weighing of the excited gyro on the leveral balance

The experiment with the gyro with vertical axis has confirmed correctness of conclusion on availability of the pair of forces of causality governed by (8) and (9). Recently those results were independently confirmed (Hayasaka et al. 1989). This coincidence is practically full down to unexplained by N.A.Kozyrev the peculiarity just experiment (availability of the effect by only one direction of rotation).

3.1.2. Pendulum measurements

The experiments are the same to those in 3.1.1, but with the gyro with horizontal axis. The experiments of group 3.1 have allowed to determine the value and sign of c_2 ($c_2 = +700 \pm 30$ km/s in the right coordinate system).

Both kinds of experiments have given evidence of shift of zero-level of the force presumably connected with rotation of the Earth.

3.2. Measurements of force of causality using gyro effect of the Earth

3.2.1. Weighing on the leveral balance

At the same performance that 3.1.1, the motionless body excited by causal-consequential interaction was weighed. The vertical component of force of causality, depending on latitude of the site, has been found.

3.2.2. Meridional deflection of the pendulum

The same as 3.1.2, but with motionless body with excitation of causal-consequential interaction the point of suspension —the body of pendulum. The horizontal component of force of causality depending on latitude of site and directed along the meridian has been found.

The experiments of group 3.2 has shown availability of force of causality on the Earth directed parallel of its axis, had order to 10^{-5} of the weigh and depended on latitude.

The experiments of groups 3.1 and 3.2 have shown that threshold energy of excitation change very strongly in dependence on circumstances lying out of laboratory control. There are, for example, seasonal variations: in autumn-winter period the threshold of excitation is essentially less than in spring-summer one; latitudinal variation: the threshold of excitation is less at higher latitudes.

3.3. Interinfluence of the processes

3.3.1. Alteration of the threshold of excitation

It appears in practice that any process with large (relatively of sizes of the measurement system) space separation the causes and the consequences have an effect on the result. Vis.: near the consequences the threshold of excitation falls, near the causes — rises.

The effect decreases inversely with distance and it undergoes screening by a matter. From here N.A.Kozyrev has input an important but unfortunately, neatly intuitive definition of density of time. The processes reinforcing causal action in a system increase the density of time in their environmental space. The processes of opposite action decrease its density. In the former case one can say about the emission of time, in the latter one — about its absorption. The processes increasing entropy where they occur, emit time. They are, for example, processes such as warming up a body, melting of ice, evaporation of liquid, dissolving of different substances in the water, and even fading of plants. The processes opposed them —cooling of a body, freezing up of water —absorb time and its de nsity decreases at their vicinity" (Kozyrev 1977, pp.213-214).

The next logical step, from recognition of density as some scalar property, was to study the vector property connected with gradient of density, which is naturally called "flow of time".

3.3.2. Experiments with torsion balance

For study of the flow, dampened asymmetrical torsion balance has been selected (and as the experiment has shown rather successfully). Dampening and asymmetry are necessary for making of causal-consequential dipole on the arms of balance.

N.A.Kozyrev in the report presented to A.A.Mihaylov's commission on examination of his experiments has considered in detail all the possible sources of disturbances in the work of the torsion balance (convection, radiation pressure, electrostatics et al.) and actions on protection with them. Critically summarising Kozyrev's data and our own exp e-

rience, one can say that the most dangerous disturbance is convection. It requires that inhomogeneity of temperature in the volume of detector does not exceed 0.1°. Evacuation eliminates the convective disturbance, but complicates dampening and reduces sensitivity. In the torsion balance with air dampening sensitivity ~10^{-6} dyne was realised.

The experiments with torsion balance have showed that long arm of the beam repelled off the processes emitting time and attracted to the absorbing ones. Literally any irreversible processes provoke reaction on the torsion balance include isothermal ones. Numerous concrete examples presented in (Kozyrev 1971, Kozyrev 1977). Turn of the beam may achieve ten degrees. That is why those experiments are the most visible. Among the most expressive note reactions of the torsion balance on mixing of liquids (including mixing of water of different temperatures in a thermostatic vessel) and even dry substances, dissolution. It is interesting that, for example, mixing ink in water and water in ink bring in opposite reaction of torsion balance. That corresponds to opposite change of polarity of the solution.

General rule of determination of sign of the reaction: long arm of the beam repels off the region of increasing of entropy and attracts to the region of decreasing of one. Unfortunately quantitative relationship with velocity of alteration of entropy was not investigated.

The time flow is found to be not only absorbs but reflects by the matter. The largest coefficient of reflection from number of examined matters has aluminium (0.5). That allows to fulfil experiments similar to optical ones. It can focus action of a process increasing entropy (i.e. emitting time). Beautiful example of such experiment is the following. The test glass with melting snow is placed in the focus of the reflector. Effect on the torsion balance increases and may be transmitted over long distance.

The experiments of group 3.3.1 and 3.3.2 point out transport energy and moment of rotation (but not impulse!) by the flow of time.

3.3.3. Experiments with the homogeneous disk

The moment of rotation transport can be detected if instead of the beam of torsion balance we use the homogeneous disk by effect on the point of suspension of the disk. By effect of the processes increasing entropy (emitting time), the disk turns clockwise (looking from the point of suspension) and on the contrary. By reflection in the mirror, there is a change of sign.

The experiments 3.3.1 – 3.3.3 have raised the question on the possibility of existence of a principal new type of interinfluence of the processes any by nature.

3.3.4. Experiments with non-mechanical detectors

In this series, direct influence of exploring process upon a test-process in the detector was established. In the latter electromechanical oscillations of quartz, photoeffect and ohmic resistance were studied. Measurements were conducted by a differential scheme. Two sensors were placed at the ends of the thermal and electrical screened long case. The scheme is completely symmetrical. Effect of the process was carried out on the

arms. Due to the screening of classical sources of the noise, disbalance of the scheme reproduced under such conditions might be attributed to temporal interaction of the processes.

Variations of frequency of the quartz were observed, but the results were evidently unreliable. It was expected, as oscillation of quartz is an extremely unsuccessful type of the testing process because of its low dissipation.

The experiments with photoelectronic cells were found to be more successful. It appeared that all processes increasing entropy (emitting time) decreased photocurrent, i.e. in fact, increased work function and on the contrary. Relative value of the effect is 10^{-5}–10^{-6}. By reflection in the mirror, we obtaned the opposite result.

The experiments with change of resistance are the simplest and as a result more reliable. Technics of the experiment described in detail in (Kozyrev 1977, Kozyrev et al. 1978, Kozyrev et al. 1980). All processes with increasing entropy (emitting time) decrease the resistance and on the contrary. Relative value of change is 10^{-5}–10^{-6}. By reflection in the mirror the sign of effect does not change.

Typical feature of all the experiment of groups 3.1 – 3.3 is slow (10 seconds) recurrence of the detector to zero reading by cutting off the influence.

3.4. Effect of memory

Investigation of this effect have shown that samples of the substances placed near processes, emitting time, then, after some time, they themselves have such effect on the detector! Examples are: lead $\tau = 14\,\mathrm{s}$, aluminium $\tau = 20\,\mathrm{s}$, wood $\tau = 70\,\mathrm{s}$.

N.A.Kozyrev has given the following, unfortunately, intuitive interpretation of those facts. The process emitting time is one losing organising, or in another way —emi t-ting negentropy. Substance absorbs this negentropy and then emits that according to its time constant τ. Concrete mechanism and its level are not clean.

4. Astrophysical investigation with Kozyrev's detectors

The possibility of observing the processes on heavenly bodies with the aid of physical properties of time is not only unique by its importance to astrophysics, but also carry the particular possibilities for verification provisions of causal mechanics. As the most part of the result was presented in Levich's review, only logical frame of the way have been covered by N.A.Kozyrev in collaboration with V.V. Naconov (1977, 1978, 1980, 1982) to the most important point: demonstration of the possibility of instantaneous interaction of the processes through time, is presented here.

4.1. Observations with vibratory balance

The vertical component of force of causality produced by rotation of the Earth was measured. On every step of alteration of weight is natural dispersion of quantities. Time variations of quantities at the first and second steps during solar eclipse in Pulkovo 1961,

1966, 1971, 1976 were registered. During the all eclipses decreasing of the force of causality have been registered. Relative alteration was 5%. The experiment indicates to availability of screening by the Moon the flow of time emitting by the Sun. The meteorological effects did not put on those variations since only partial eclipses was specially selected for observations; measurements conducts at the underground laboratory.

4.2. Observations with torsion balance

Those and further experiments were conducted on the large reflecting telescopes without employment of a refracting optics. Flow of time effect was focused on the bottom of detector near long arm of the balance. The light flow was shut off. Taking into account large time constant of the detector, which is necessary for the long (about 10 minutes) measurements, zero level was controlled every 2 minutes. Summary of the results was presented in Levich's review.

From them one easily see, that among the stars, the white dwarfs emit time most strongly (effect of Procion, Sirius and, probably, Regul connects with their satellites — white dwarfs). Taking into account, that the object CygX-1 has found in this group, generalising N.A.Kozyrev results, one can make conclusion that stars of final stages of the evolution are the most strongly emitting objects ("final consequences"). It is true that only one studied pulsar CPII33 had not given an effect on the torsion balance. During lunar eclipse emission from the areas of the Moon going out from the Earth's shadow has been found. That agrees with idea about emission of time from the region producing entropy (at present case by quick warming up of the Moon's surface).

4.3. Observations with the homogeneous disk

Though this modification of the detector is more proper than previous one, observation with it conducted in small extent.

4.4. Observation with differential resistancemeter

This type of detector is the most proper and observation technics with it has been brought to the most perfection. Relative sensitivity is about 10^{-7}, the observed effects is of order up to 10^{-5}.

First of all, the results of section 4.2 were confirmed completely. In particular, completely similar results were obtained by observation of the Moon's eclipse. More perfect technics has allowed to improve angular resolution. That has suffered to obtain some data on structure of emission of the extended objects. So, evidently, in galaxies the most intensive emitting regions are those located in equatorial plane symmetrically relatively the core. That has interpreted as the result of absorption of time in the core (Kozyrev et al. 1980).

But the most important that is those measurement have suffered to verify hypothesis on the possibility of instantaneous interaction through physical properties of time.

4.5. Hypothesis on the possibility of instantaneous interaction and its verification

Since time does not transport impulse, although experimentally established attenuation of interaction with distance (inversely distance — for density, measured by energy of the threshold of excitation, and inversely of square of distance — for flow, measured by the torsion balance), it can assume the possibility of instantaneous interaction of the processes. "In any coordinate action of time realises everywhere at the same moment. As nothing moves there is not a contradiction with the special principle of relativity" (Kozyrev 1977, p.224).

In appealing to the described experiments above, one can note, that instantaneous interaction allows reflection, but not refraction.

In (Kozyrev 1980) hypothesis of instantaneous interaction is connected with Minkowskian geometry by the following way. Consider the interval s:

$$ds^2 = (c_1 dt)^2 - dr^2,$$

where c_1 is velocity of light, r is the distance.

Let $d\vec{r}/dt = \vec{V}$ is velocity of a substration of information relatively given coordinate system. Then

$$ds^2 = dt^2 (c_1^2 - V^2).$$

If $V = 0$ then $ds = c_1 dt$, i.e. the interval is its own time of system, that a local timepiece takes a reading. Communication through time means fulfilment of condition ds = 0. This condition fulfils in three cases:

$$\text{(I)} \quad dt = 0, \qquad \text{(II)} \quad \vec{V} = \vec{c}_1, \qquad \text{(III)} \quad \vec{V} = -\vec{c}_1. \tag{10}$$

This simple argument leads to the complete unexpected possibility observation through properties of time an object in three states: at the moment of observation, in the past in according to time of light propagation and symmetrically — in future!

It is easy to understand that possibility to observe future state does not lead to known paradoxes. But if information on state of the object came by canal II, while effect on the object go by channel I, this means really effect on future. This conclusion is difficult to realise completely. Anyhow this possibility automatically leads to new type of violation of the classical determinism.

It is known to us that N.A.Kozyrev with particular responsibility regarded to experiments on verification of this point.

First evidences on reality of instantaneous transmission of effect through alteration of density of time the observation type 4.1 have given, where it has been established, that vibratory balance exactly within minute reacted to sunrise without accounting of refraction.

In the observation of type 4.2 for the first time it has been established that position "temporal" image really differs from optical one by a value of refraction (Kozyrev 1977).

In the extensive series of observation of type 4.4 (Kozyrev et al. 1978, 1980) position of "temporal" image of stars and other objects (in sum more than 30 objects) studied

with all possible thoroughness. For every object refraction and aberration were taken into account and for stars position at the moment of observation was computed (by extrapolation of known visual movement).

The main result is the following. Practically at the all cases "temporal" images of the object are observed: (1) at the site of the optical image (with subtracted refraction); (2) at the computed site of the actual image; (3) symmetrically to position (1) relatively (2) at the distance close to (1) —(2).

Significance of this fact is so great that we present it without any comments.

Recently the experiment have been repeated (Lavrentyev et al. 1990) with the close results.

REFERENCES

HAYASAKA Y. and TAKEUCHI S. (1989). Anomalous weight reduction on gyroscope's right rotation around the vertical axis on the Earth. Phys. Rev. Lett, V.63, N.25, pp.2701-2704.

KOROTAEV S.M. (1992). On the Possibility of Causal Analysis of the Geophysical Processes. Geomagnetism and Aeronomy, V.32, N.1, pp.27-33.

KOROTAEV S.M. (1993). Formal Definition of Causality and Kozyrev's Axioms. Galilean Electrodynamics, V.4, pp.15-19.

KOZYREV N.A. (1951). Theory of star's interior and the courses of star's energy. Izve s-tia Krymskoy Astrofizicheskoy Observatorii (Papers of Crimea Astrophysical Observatory), V.6, pp.54-83 (in Russian).

KOZYREV N.A. (1958). Causal or Unsymmetrical Mechanics at Linear Approximation. Leningrad (in Russian).

KOZYREV N.A. (1963). Causal mechanics and possibility of experimental investigation of physical properties of time. Istoria i Metodologia Estestvennyh Nauk. (History and Methodology of Natural Sciences), V.2, Moscow, pp.95-113 (in Russian).

KOZYREV N.A. (1968). Particularities of physical structure of the double stars. Izvestia Glavnoy Astronomicheskoy Observatorii. (Papers of the Main Astronomy Observatory), V.184, pp.108-115 (in Russian).

KOZYREV N.A. (1971). On the possibility of experimental investigation of the properties of time. In: Time in Science and Philosophy. Prague, pp.111-132.

KOZYREV N.A. (1977). Astronomy observation by means of physical properties of time. In: Flashing Stars. Erevan, pp.209-226 (in Russian).

KOZYREV N.A. (1980). Astronomical proofs of reality of 4D Minkowski geometry. In: Manifestation of Cosmic Factors on the Earth and Stars. Moscow-Leningrad, pp.85-93 (in Russian).

KOZYREV N.A. (1982). Time as physical phenomenon. In: Modelling and Prediction in Bioecology. Riga, pp.59-72 (in Russian).

KOZYREV N.A. and NASONOV V.V. (1978). New method of determination of trigonometric parallaxes on the base difference between actual and visible position of stars. In: Astrometry and Heavenly Mechanics. Moscow-Leningrad, pp.168-179 (in Russian).

KOZYREV N.A. and NASONOV V.V. (1980). On some properties of time detected by astronomical observations. In: Manifestation of Cosmic Factors on the Earth and Stars. Moscow-Leningrad, pp.76-84 (in Russian).

LAVRENTYEV M.M., YEGANOVA I.A., LUTSET M.K. and FOMINYKH S.F. (1990). Remote effect of stars on a resistor. Soviet Physics Doklady. September 1990, V.35(9), pp.818-820.

ZHELUDEV I.S. (1987). Physics of Crystals and Symmetry. Moscow (in Russian).