Changes in the Fine Structure of Stochastic Distributions as a Consequence of Space-Time Fluctuations

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This is a survey of the fine structure stochastic distributions in measurements obtained by me over 50 years. It is shown: (1) The forms of the histograms obtained at each geographic point (at each given moment of time) are similar with high probability, even if we register phenomena of completely different nature — from biochemical reactions to the noise in a gravitational antenna, or α-decay. (2) The forms of the histograms change with time. The iterations of the same form have the periods of the stellar day (1.436 min), the solar day (1.440 min), the calendar year (365 solar days), and the sidereal year (365 solar days plus 6 hours and 9 min). (3) At the same instants of the local time, at different geographic points, the forms of the histograms are the same, with high probability. (4) The forms of the histograms depend on the locations of the Moon and the Sun with respect to the horizon. (5) All the facts are proof of the dependance of the form of the histograms on the location of the measured objects with respect to stars, the Sun, and the Moon. (6) At the instants of New Moon and the maxima of solar eclipses there are specific forms of the histograms. (7) It is probable that the observed correlations are not connected to flow power changes (the changes of the gravity force) — we did not find the appropriate periods in changes in histogram form. (8) A sharp anisotropy of space was discovered, registered by α-decay detectors armed with collimators. Observations at 54° North (the collimator was pointed at the Pole Star) showed no day-long periods, as was also the case for observations at 82° North, near the Pole. Histograms obtained by observations with an Easterly-directed collimator were determined every 718 minutes (half stellar day) and with observations using a Westerly-directed collimator. (9) Collimators rotating counter-clockwise, in parallel with the celestial equator, gave the probability of changes in histograms as the number of the collimator rotations. (10) Collimators rotating clockwise once a day, show no day-long periods, and similarly, collimators pointed at the Pole Star, and measurements taken near the North Pole. All the above lead us to the conclusion (proposition) that the fine structure of the histograms should be a result of the interference of gravitational waves derived from orbital motions of space masses (the planets and stars).

Introduction

Earlier we showed that the fine structure of the spectrum of amplitude variations in the results of measurements of processes of different nature (in other words, the fine structure of the dispersion of results or the pattern of the corresponding histograms) is subject to “*macroscopic fluctuations*”, changing regularly with time. These changes indicate that the “dispersion of results” that remains after all artifacts are excluded inevitably accompanies any measurements and reflects very basic features of our world. In our research, we have come to the conclusion that this dispersion of results is the effect of space-time fluctuations, which, in their turn, are caused by the movement of the measured object in an anisotropic gravitational field. Among other things, this conclusion means that the examination of the detailed pattern of distributions obtained from the results of measurement of the dynamics of processes of different nature uncovers laws which cannot be revealed using traditional methods for the analysis of time series.

These assertions are based on the results of long-term experimental investigations conducted for many decades. The major part of these results, begun in 1958, is published in Russian. The goal of this paper is to give a brief review of those results and provide corresponding references.

The most general conclusion of our research is that there is evidence that the fine structure of stochastic distributions is not accidental. In other words, noncasual is the pattern of histograms plotted from a rather small number of the results of measurement of the dynamics of processes of different nature, from biochemical reactions and noise in gravitational antennae, to α-decay [1–24].

1 The "effect of near zone"

The first element of evidence of the histogram pattern changing regularly in time is the "effect of near zone". This effect means that similar histograms are significantly more likely to appear in the nearby (neighbouring) intervals of the time series of the results of measurements. The similarity of the pattern of histograms plotted from independent intervals of a time series implies the presence of an external (towards the process studied) factor, which determines the pattern of the histogram. The independence of the "near zone" effect of the nature of the process indicates that this factor has a quite general nature.

2 Measurements of processes of different nature

The second element of evidence comes from the similarity of the pattern of histograms plotted from the results of simultaneous independent measurements of processes of different nature at the same geographical point. In view of the fundamental difference in the nature of those processes and methods of their measurement, such a similarity also means that the factor, determining the histogram pattern, has a quite general nature. The similarity of histograms when under study are the processes, in which the ranges of transduced energy differ by dozens of orders (40 orders if the matter concerns the noise in a gravitational antenna, and the phenomenon of α-decay), implies that this factor has no relation to energy.

3 Regular changes in the histogram patterns

The third element of evidence for noncasuality of the histogram patterns is their regular changing with time. The regularities are revealed in the existence of the following periods in the change of the probability of similar histograms to appear.

3.1. Near-daily periods; these are well-resolvable "sidereal" (1436 min) and "solar" (1440 min) daily periods. These periods imply dependence of the histogram pattern on the rotation of the Earth around its axis. The pattern is determined by two independent factors: the position relative to the starry sky and that relative to the Sun.

3.2. Approximately 27-day periods. These periods can be considered as an indication of the dependence of the histogram pattern on the position relative to the nearby celestial bodies: the Sun, the Moon and, probably, the planets.

3.3. Yearly periods; these are well-resolvable "calendar" (365 solar days) and "sidereal" (365 solar days plus 6 h and 9 min) yearly periods.

All these periods imply the dependence of the obtained histogram pattern on two factors of rotation — (1) rotation of the Earth around its axis, and (2) movement of the Earth along its circumsolar orbit.

4 The observed local-time synchronism

The dependence of the histogram pattern on the Earth rotation around its axis is clearly revealed in the phenomenon of *synchronization at the local time*, when similar histograms are very likely to appear at different geographical points (from Arctic to Antarctic, in the Western and Eastern hemispheres) at the same *local* time. It is astonishing that the local-time synchronism with the precision of 1 min is observed independently of the regional latitude at the most extreme distances — as extreme as possible on the Earth (about 15,000 km).

5 The synchronism observed at different latitudes

The dependence of the histogram pattern on the Earth rotation around its axis is also revealed in the disappearance of the near-daily periods close to the North Pole. Such measurements were conducted at the latitude of 82° North in 2000. The analysis of histograms from the 15-min and 60-min segments showed no near-daily periods, but these periods remain in the sets of histograms plotted from the 1-min segments. Also remaining was the local-time synchronism in the appearance of similar histograms.

Following these results, it would be very interesting to conduct measurements as close as possible to the North Pole. That was unfeasible, and so we performed measurements with collimators, which channel α-particles emitted in a certain direction from a sample of ^{239}Pu. The results of those experiments made us change our views fundamentally.

6 The collimator directed at the Pole Star

Measurements were taken with the collimator directed at the Pole Star. In the analysis of histograms plotted from the results of counting α-particles that were travelling North (in the direction of the Pole Star), the near-daily periods were not observed, nor was the near-zone effect. The measurements were made in Pushchino (54° latitude North), but the effect is as would be expected at 90° North, i. e. at the North Pole. This means that the histogram pattern depends on the spatial direction of the process measured. Such a dependence, in its turn, implies a sharp anisotropy of space. Additionally, it becomes clear that the matter does not concern any "effect" or "influence" on the object under examination. The case in point is changes, fluctuations of the space-time emerging from the rotation of the Earth around its axis and the movement of the planet along its circumsolar orbit [9, 13, 14, 15, 19, 20, 21].

7 The East and West-directed collimators

This effect was confirmed in experiments with two collimators, directed East and West correspondingly. In those experiments, two important effects were discovered.

7.1. The histograms registered in the experiments with the East-directed collimator ("east histograms") are similar to those "west histograms" that are delayed by 718 min, i. e. by half of the sidereal day.

7.2. No similar histograms were observed in the simultaneous measurements with the "east" and "west" collimators. Without collimators, it is highly probable for similar histograms to appear at the same place and time. This space-time synchronism disappears when α-particles streaming in the opposing directions are counted.

These results are in agreement with the concept that the histogram pattern depends on the vector of the α-particle emission relative to a certain point at the coelosphere [20].

8 The experiments with the rotating collimators

These investigations were naturally followed by experiments with rotating collimators [22, 24].

8.1. With the collimator rotating counter-clockwise (i. e., together with the Earth), the coelosphere was scanned with a period equal to the number of the collimator rotations per day plus one rotation made by the Earth itself. We examined the dependence of the probability of similar histograms to appear on the number of collimator rotations per day. Just as expected, the probability turned out to jump with periods equal to 1440 min divided by the number of collimator rotations per day plus 1. We evaluated data at 1, 2, 3, 4, 5, 6, 7, 11 and 23 collimator rotations per day and found periods equal to 12, 8, 6 etc. hours. The analysis of highly resolved data (with a resolution of 1 min) revealed that each of these periods had two extrema: "sidereal" and "solar". These results indicate that the histogram pattern is indeed determined by how the direction of the α-particle emission relates to the "picture of the heaven" [24].

8.2. When the collimator made 1 clockwise rotation per day, the rotation of the Earth was compensated for (α-particles always undergo emission in the direction of the same region of the coelosphere) and, correspondingly, the daily periods dissappeared. This result was completely analogous to the results of measurements near the North Pole and measurements with the immobile collimator directed towards the Pole Star [20].

8.3. With the collimator placed in the ecliptic plane, directed at the Sun and making 1 clockwise rotation per day, α-particles are constantly emitted in the direction of the Sun. As was expected, the near-daily periods, both solar and sidereal, disappeared under such conditions.

9 The 718-min period

The pattern of histograms is determined by a complex set of cosmo-physical factors. It follows from the existence of the near-27-day periods, that amongst these factors may be the relative positions and states of the Sun, the Moon and the Earth. We repeatedly observed similar histograms during the risings and settings of the Sun and the Moon. A very large volume of work has been carried out. Yet we have not found a histogram pattern which would be characteristic for those instants. A review and analysis of the corresponding results will be given in a special paper. Here, I shall note one quite paradoxical result: on the days of equinox one can see a clear period in the appearance of similar histograms, which is equal to 718 min (i. e. half of the sidereal day). There is no such period on the days of solstice. This phenomenon indicates that the histogram pattern depends on the ecliptic position of the Sun. If that is indeed so, we can expect that on the equator the period of 718 min will be observed year-round.

10 The observations during eclipses

All the results presented above were obtained by the evaluation of tens of thousands of histogram pairs in every experiment, so these results have a stochastic character. A completely different approach is used in the search for characteristic histogram patterns in the periods of the New Moon and solar eclipses. In these cases, we go right to the analysis of the histogram patterns at a certain predetermined moment. Doing so, we have discovered an amazing phenomenon. At the moment of the New Moon, a certain characteristic histogram appears practically simultaneously at different longitudes and latitudes — all over the Earth. This characteristic histogram corresponds to a time segment of 0.5–1.0 min [21]. When the solar eclipse reaches maximum (as a rule, this moment does not coincide with the time of the New Moon), a specific histogram also appears; however, it has a different pattern. Such specific patterns emerge not only in the moments of the New Moon or solar eclipses. But the probability of their appearance at these very moments at different places and on different dates (months, years) being accidental is extremely low. These specific patterns do not relate to tidal effects. Nor do they depend on position on the Earth's surface, where the Moon's shadow falls during the eclipse or the New Moon.

11 The possible nature of "macroscopic fluctuations"

I have presented above a brief review of the main phenomena that are united by the notion of "macroscopic fluctuations". A number of works suggested different hypotheses on the nature of those phenomena [3, 9, 10, 13–15, 19, 27–31], concerning some general categories such as discreteness and continuity, symmetry, the nature of numbers, stochasticity. In this section of the paper I draw attention to the question of how some of the discovered phenomena can be considered in relation to these general categories.

11.1. The non-energetic nature of the phenomena. Fluctuations of space-time [14, 19].

It is clear that we deal with non-energetic phenomena. As mentioned above, the ranges of energies in biochemical reactions, noise in gravitational antennae, and α-decay, differ by many orders. At the same time, the corresponding histogram patterns are similar with a high probability at the same local time at different geographical points. The only thing common to such different processes is the space-time in which they occur. Therefore, the characteristics of space-time change every successive moment.

It is important to note that the "macroscopic fluctuations" do not result from the effect of any factors on the object under examination. They just reflect the state of the space-time.

The changes in space-time can follow the alterations of the gravitational field. These alterations are determined by the movement of the examined object in a heterogeneous gravitational field. The heterogeneity results from the existence of "mass thicknesses", i. e. heavenly bodies. The movement includes the daily rotation of the Earth, its translocation along its circumsolar orbit and, probably, the drift of the solar system in the galaxy. All these forms of movement seem to be reflected in the corresponding periods of variation of histogram patterns. How the fluctuations of space-time transform into the pattern of histograms is unclear.

11.2. Fractality [14, 19].

We suppose that the histogram pattern varies due to the change of the cosmo-physical conditions in the process of the Earth movement around its axis and along its circumsolar orbit. Then we might expect that the shorter are the intervals for which histograms are plotted, the more similar would be the histogram patterns. This corresponds to the concept of "lifetime" of a certain idea of form. This concept is an obvious consequence of the "effect of near zone", when the probability of histogram patterns to be similar is higher for the histograms from the neighbouring intervals.

However, we failed to find such a short interval for which the histogram pattern "would not have time to change". The maximum probability for histograms to be similar only in the first, the nearest interval, does not change upon variation of this interval from several hours to milliseconds. This phenomenon corresponds to the notion of "fractality"; however, the physical meaning of this fractality needs to be clarified.

Following the dependence of the histogram pattern on direction obtained in the experiments with collimators, we deal with a spatial heterogeneity on the scale of the order of 10^{-13} cm: the dependence of the histogram pattern should be determined before the emission of α-particles from the nucleus. Therefore, to "stop the instant", stop the histogram changing, we should have worked with correspondingly small time intervals. Perhaps this will be possible someday soon.

11.3. The mirror symmetry, chirality of histograms [7].

Quite often (up to 30% of cases), the patterns of the successive histograms are reflection symmetric. There are right and left forms, and they may be very complex. This phenomenon possibly means that chirality is an inherent feature of space-time.

11.4. "Stochasticity along abscissa and regularity along ordinate".

Our main result — evidence of non-stochasticity of the fine structure of sampling distributions, i. e. the fine structure of the spectrum of amplitude fluctuations in processes of any nature, i. e. the fine structure of the corresponding histograms — implies the existence of a particular class of macroscopic stochastic processes.

Among such processes is radioactive decay. This is an "*a priori* stochastic" (i. e. stochastic according to the accepted criteria) process. However, the pattern of histograms (i. e. the fine structure of the amplitudes of fluctuations of the decay rate) changes regularly with time.

The point is that in the majority of cases, stochasticity is treated as an irregular succession of events — succession in time, just one after another. This is "stochasticity along the axis of abscisses".

For macroscopic processes, the distributions of the amplitudes of fluctuations of measured quantities are considered to correspond to smooth distributions of Gauss-Poisson type. The available fitting criteria are integral, they are based on averaging, smoothing of those fluctuations. Such fitting criteria cannot "sense" the fine structure of distributions. According to these criteria, the processes we study, such as radioactive decay, correspond well to traditional views.

However, known for more then a hundred years is a noticeable exception — atomic spectra. While the transitions of electrons from one level to another are "*a priori* stochastic", the energies of the levels are sharply discrete. The "stochastic along the abscissa" process of transition is "regular along the ordinate".

The result of our work is the discovery of analogous macroscopic processes. In the process of fluctuating, the measured quantities take values, some of which are observed more often than the others; there are "forbidden" and "allowed" values of the measured quantities. This is what we see in the fine structure of histograms, with all its "peaks and troughs". The "macroscopic quantization" differs from the quantization in the microworld. Here only the "idea of histogram form" remains invariant, whereas the concrete values, corresponding to extrema, can change. This is the main difference between the spectra of amplitude fluctuations of macroscopic processes and the atomic spectra.

11.5. The fine structure of histograms. The presence of "peaks and troughs" in histogram patterns is a consequence of two causes: arithmetic (algorithmic) and physical [7, 14, 19].

11.5.1. The arithmetic or algorithmic cause of discreteness [7, 14, 19] lies in a very unequal number of factors (divisors) corresponding to the natural sequence. If the measured value is a result of operations based on the algorithms of division, multiplication, exponentiation, then discreteness will be unavoidable. Correspondingly, the histogram patterns will be determined by these algorithms. This can be seen, for example, in the computer simulation of the process of radioactive decay (Poisson statistics). The pattern of some histograms obtained in such a simulation is indistinguishable from the pattern of histograms plotted for the radioactive decay data. However, the sequence of "computer" histogram patterns, in contrast to that of "physical" ones, does not depend on time and can be reproduced over and over again by launching the simulation program with the same parameters. This sequence is determined by the nature of numbers and the algorithms used. In our work we experienced an unusual incident, when the sequence of histogram patterns created by a random number generator was similar, with high probability, to the sequence obtained from the radioactive decay data. If studied systematically, this case might give a clue to the nature of those "physical algorithms" that determine the time changes of the patterns of physical histograms [19].

11.5.2. The physical cause of discreteness is the interference of wave fluxes [19].

The fine structure of histograms, the presence of narrow extrema, cannot have a probabilistic nature. According to Poisson statistics, with which radioactive decay roughly accords, the width of such extrema should be of order $N^{1/2}$.

Therefore, if neighbouring extrema in the histogram pattern have similar values of N, they should overlap, but they do not. Such narrow extrema can arise only as a result of interference. Hence, the fine structure of histograms plotted from the results of measurements of any nature would be a result of an interference of some waves. As follows from all the material presented above, the issue concerns processes caused by the movement of the Earth (and objects on its surface) relative to the "mass thicknesses". So it would be logical to define the waves whose interference is reflected in the histogram patterns as "gravitational".

The results of experiments with collimators, producing narrow beams of α-particles, lead us to conclude for a sharp anisotropy of our world. The corresponding wave fluxes should be very narrow.

Collimators are not necessary to reveal this anisotropy. We observe highly resolved daily and yearly periods in the changing of the probability of a certain histogram pattern to appear repeatedly (the resolution is 1 min). The histogram patterns specific for the New Moon and solar eclipses can appear at different geographical points synchronously, with an accuracy of 0.5 min. The local-time synchronism at different geographical points (almost 15,000 km apart) is also determined by a sharp extremum on the curve of distribution over intervals with a resolution of 1 min. In the experiments with the rotation of collimators, the "sidereal" and "solar" periods are also observed with one-minute resolution.

Taken together, all these facts can mean that we deal with narrowly directed wave fluxes, "beams". The narrowness of these putative fluxes or beams is smaller than the aperture of collimators. Collimators with the diameter of 0.9 mm and length of 10 mm isolate in the coelosphere a window of about 5°, corresponding to approximately 20 min of the Earth's daily rotation rate. This fact, noted by Kharakoz, could be explained if we admit that the "beams" are more narrow than the aperture of our collimators.

Even with the fact that the matter concerns the changes of the histogram pattern and the movement of the Earth relative to the sphere of fixed stars, the Moon and the Sun, it is not necessary to consider anisotropy as being only due to the heterogeneous distribution of masses (presence of celestial bodies) in space. It is possible that this anisotropy is caused by a preferential direction, which, for example, is due to the drift of the solar system towards the constellation of Hercules. The existence of such a direction is an old problem of physics. In this connection, of great value for us are the results of the interference experiments of Dayton Miller [43], the experiments and conception of Alais [42], de Witte's measurements [47] and Cahill's conception [44, 46]. It is necessary to mention that several years ago, Lyapidevsky [29] and Dmitrievsky [30] considered the preferential direction in space as the cause of the effects we observed.

In this case, we can say that for many years, we have studied phenomena indicating the existence of gravitational waves. Then the problem of detection of gravitational waves can be approached differently: instead of using bulky and expensive devices, such as Weber's antennae, one could register the changes of the fine structure of histograms plotted from the results of measurements of certain chosen processes.

The fine structure of the histogram pattern we registered while solar eclipses manifests a resonance in an interference picture, built by a bulky space masses. Most probable this is a gravitational wave pattern. The histogram patterns specific for solar eclipses recall to Crother's analysis of Kepler's laws in General Relativity, wherein he showed that space-time is locally anisotropic for a rotating spherical body [49]. In this situation, we suppose that of principal importance are works by Borissova [50] and Rabounski [51] on the theory and methods of detection of gravitational waves and the concept of "global scaling" advanced by Hartmut Muller [52].

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References

1. Perevertun T. V., Udaltzova N. V., Kolombet V. A., Ivanova N. P., Britsina T. Ya., and Shnoll S. E. Macroscopic fluctuations in aqueous solutions of proteins and other substances as a possible consequence of cosmo-geophysical factors. *Biophysics*, 1981, v. 26(4), 613–624.
2. Shnoll S. E., Namiot V. A., Zhvirblis V. E., Morozov V. N., Temnov A. V., and Morozova T. Ya. Possible common nature of macroscopic fluctuations of the rates of biochemical and chemical reactions, electrophoretic mobility of the cells and fluctuations in measurements of radioactivity, optical activity and flicker noise. *Biophysics*, 1983, v. 28(1), 164–168.
3. Shnoll S. E. Discrete amplitude spectra (histograms) of macroscopic fluctuations in processes of various nature. *Itogi Nauki i Techniki. Molecular Biology Series*, ed. V. P. Skulachev, 1985, v. 5, Moscow, VINITI, 130–200.
4. Udaltzova N. V., Kolombet V. A., and Shnoll S. E. A possible cosmophysical origin of macroscopic fluctuations in various processes. Puschino, ONTI NtsBI, 1987.
5. Udaltzova N. V., Kolombet V. A., and Shnoll S. E. The possible gravitational nature of factor influensing discrete macroscopic fluctuations. *Proc. First Intern. Congress on Geo-Cosmic Relations*, Wageningen, Netherlands, 1989, 174–180.
6. Shnoll S. E. Correlation of the shape of macroscopic fluctuations amplitude spectra with position of the Moon relative to the horizon. *Biophysics*, 1989, v. 34(5), 911–912.
7. Shnoll S. E., Udaltsova N. V., Kolombet V. A., Namiot V. A., and Bodrova N. B. Patterns in the discrete distributions of the results of measurements (cosmophysical aspects). *Biophysics*, 1992, v. 37(3), 378–398.
8. Shnoll S. E. The form of the spectra of states realized in the course of macroscopic fluctuations depends on the rotation of the Earth about its axis. *Biophysics*, 1995, v. 40(4), 857–866.
9. Shnoll S. E., Kolombet V. A., Pozharski E. V., Zenchenko T. A., Zvereva I. M., and Konradov A. A., Realization of discrete states during fluctuations in macroscopic processes. *Physics-Uspekhi*, 1998, v. 162(10), 1129–1140.
10. Shnoll S. E., Kolombet V. A., Zenchenko T. A., Pozharski E. V., Zvereva I. M., and Konradov A. A. Cosmophysical origin of "macroscopic fluctations". *Biophysics*, 1998, v. 43(5), 909–915.
11. Zvereva I. M., Zenchenko T. A., Pozharski E. V., Kolombet V. A., Konradov A. A., and Shnoll S. E. Radioactive decay of radium family isotopes as an illustration of synchronous changes in the fine structure of measurement result distributions. *Biophysics*, 1998, v. 43(4), 693–695.
12. Shnoll S. E., Pozharski E. V., Zenchenko T. A., Kolombet V. A., Zvereva I. M., and Konradov A. A. Fine structure of distributions in measurements of different processes as affected by geophysical and cosmophysical factors. *Phys. & Chem. Earth A: Solid Earth & Geod.*, 1999, v. 24(8), 711–714.
13. Shnoll S. E., Zenchenko T. A., Zenchenko K. I., Pozharski E. V., Kolombet V. A., and Konradov A.A.: Regular variation of the fine structure of statistical distributions as a consequence of cosmophysical agents. *Physics-Uspekhi*, 2000, v. 43(2), 205–209.
14. Shnoll S. E. Discrete distribution patterns: arithmetic and cosmophysical origins of their macroscopic fluctuations. *Biophysics*, 2001, v. 46(5), 733–741.
15. Shnoll S. E., Zenchenko K. I., Zenchenko T. A., Fedorov M. V., and Konradov A. A. The non-random character of fine structure of various measurement results distributions as a possible consequence of cosmophysical and arithmetical causes. *Gravitation & Cosmology*, 2002, v. 8, Supppl., 231.
16. Fedorov M. V., Belousov L. V., Voeikov V. L., Zenchenko T. A., Zenchenko K. I., Pozharski E. V., Konradov A. A., Shnoll S. E. Synchronous changes in dark current fluctuations in two separate photomultipliers in relation to Earth rotation *Astrophysics and Space Science*, 2003, v. 283, 3–10.
17. Shnoll S. E., Rubinstein I. A., Zenchenko K. I., Zenchenko T. A., Konradov A. A., Shapovalov S. N., Makarevich A. V., Gorshkov E. S., and Troshichev O. A. Dependence of "macroscopic fluctuations" on geographic coordinates (by data of Arctic and Antarctic expeditions). *Biophysics*, 2003, v. 48(5), 1123–1131.
18. Shnoll S. E., Zenchenko K. I., Berulis I. I., Udaltsova N. V., Zhirkov S. S., and Rubinstein I. A. The dependence of "macroscopic fluctuations" on cosmophysical factors. Spatial anisotropy. *Biophysics*, 2004, v. 49(1), 129–139.
19. Shnoll S. E. Periodical changes in the fine structure of statistic distributions in stochastic processes as a result of arithmetic and cosmophysical reasons. *Time, Chaos, and Math. Problems*, No. 3, University Publ. House, Moscow, 2004, 121–154.
20. Shnoll S. E., Zenchenko K. I., Berulis I. I., Udaltsova N. V., and Rubinstein I. A. Fine structure of histograms of α-activity measurements depends on direction of alpha particles flow and the Earth rotation: experiments with collimators. arXiv: physics/0412007.
21. Shnoll S. E., Zenchenko K. I., Shapovalov S. N., Gorshkov S. N., Makarevich A. V., and Troshichev O. A. The specific form of histograms presenting the distribution of data of α-decay measurements appears simultaneously in the moment of New Moon in different points from Arctic to Antarctic. arXiv: physics/0412152.
22. Shnoll S. E., Rubinshtein I. A., Zenchenko K. I, Shlekhtarev V. A., Kaminsky A. V., Konradov A. A., Udaltsova N. V. Experiments with rotating collimators cutting out pencil of

α-particles at radioactive decay of Pu-239 evidence sharp anisotropy of space. arXiv: physics/0501004.

23. Shnoll S. E., Zenchenko K. I., and Udaltsova N. V. Cosmophysical effects in structure of the daily and yearly periods of change in the shape of the histograms constructed by results of measurements of α-activity Pu-239. arXiv: physics/0504092.
24. Shnoll S. E., Rubinshtein I. A., Zenchenko K. I, Shlekhtarev V. A., Kaminsky A. V., Konradov A. A., Udaltsova N. V. Experiments with rotating collimators cutting out pencil of α-particles at radioactive decay of Pu-239 evidence sharp anisotropy of space. *Progress in Physics*, 2005, v. 1, 81–84.
25. Goleminov N. G. Possible nuclear activity of dark matter. *Gravitation & Cosmology*, 2002, v. 8, Supplement, 219.
26. Rodionov B. U. On the way to new physics. *Gravitation & Cosmology*, 2002, v. 8, Supplement, 214–215.
27. Namiot V. A. On the theory of the effect of “macroscopic fluctuations”. *Biophysics*, 2001, v. 46(5), 856–858.
28. Blumenfeld L. A. and Zenchenko T. A. Quantum transitions between states and cosmophysical fluctuations. *Biophysics*, 2001, v. 46(5), 859–861.
29. Lyapidevskii V. K. Diurnal variations in the flux of α-particles as possible evidence for changes in the vector of velocity of movement of an experimental set-up relative to a relic system. *Biophysics*, 2001, v. 46(5), 850–851.
30. Dmitrievski I. M. A possible explanation of the phenomenon of cosmophysical fluctuations. *Biophysics*, 2001, v. 46(5), 852–855.
31. Kirillov A. A. and Zenchenko K. I. On the probability of of disturbance of the poisson statistics in processes of radioactive decay type. *Biophysics*, 2001, v. 46(5), 841–849.
32. Baurov Yu. A., Konradov A. A., Kuznetsov E. A., Kushniruk V. F., Ryabov Y. B., Senkevich A. P., Sobolev Yu. G., and Zadorozsny S. Experimental investigations of changes in beta-decay rate of ^{60}Co and ^{137}Cs. *Mod. Phys. Lett. A*, 2001, v. 16(32), 2089.
33. Baurov Yu. A. and Shutov V. L. On influence of the vector magnetic potentials of the Earth and the Sun in the в-decay rate. *Applied Physics*, 1995, No. 1, 40.
34. Baurov Yu. A., Klimenko E. Yu., and Novikov S. I. Observations of magnetic anisotropy of the space in experiments. *Doklady Akad. Sci. USSR*, 1990, v. 315(5), 1116.
35. Baurov Yu. A. Space magnetic anisotropy and a new interaction in nature. *Phys. Lett. A*, 1993, v. 181, 283.
36. Baurov Yu. A., Timofeev I. B., Chernikov V. A., and Chalkin S. I. Experimental research for space anisotropy in the radiations by impulse plasmatron. *Appl. Physics*, 2002, No. 4, 48–57.
37. Zenchenko T. A., Konradov A. A., and Zenchenko K. I. Correlation between dynamics of the “nearest zone effect” amplitude and parameters of the interplanetary magnetic field. *Geophysical Processes and Biosphere*, 2005, v. 4, No. 1/2, 125–132.
38. Zenchenko T. A., Konradov A. A., and Zenchenko K. I. Macroscopic fluctuations: on the fact that the “nearest zone effect” appears periodically. *Biophysics*, 2003, v. 48(6), 1132–1136.
39. Qian-shen Wang, Xin-she Yang, Chuan-zhen Wu, Hong-gang Guo, Hong-chen Liu, and Chang-chai Hua. Precise measurement of gravity variations during a total solar eclipse. *Phys. Rev. D*, 2000, v. 62, 041101.
40. Vezzoli G. Private communications.
41. Lucatelli F. Private communications.
42. Allais M. L’anisotropie de l’espace. Paris, Éditions Clement Juglar, 1997.
43. Miller D. C. The ether-drift experiment and the determination of the absolute motion of the Earth. *Review of Modern Physics*, 1933, v. 5, 204–241.
44. Cahill R. T. Gravitation, the “dark matter” effect and the fine structure constant. arxiv: physics/0401047.
45. Cahill R. T. Novel Gravity Probe B gravitational wave detection. arXiv: physics/0408097.
46. Cahill R. T. Absolute motion and gravitational effects. *Apeiron*, 2004, v. 11(1), 53–111.
47. The DeWitte Experiment: 1991, R. DeWitte.
48. DeMeo J. Critical review of the Shankland et al. analysis of Dayton Miller’s aether-drift experiments. *Meetings of the Natural Philosophy Alliance*, Berkeley (California) and Storrs (Connecticut), May and June, 2000.
49. Crothers S. J. On the generalisation of Kepler’s 3rd law for the vacuum field of the point-mass. *Progress in Physics*, 2005, v. 2, 70–75.
50. Borissova L. Gravitational waves and gravitational inertial waves in the General Theory of Relativity. A theory and experiments. *Progress in Physics*, 2005, v. 2, 59–91.
51. Rabounski D. A theory of gravity like electrodynamics. *Progress in Physics*, 2005, v. 2, 15–29.
52. Muller H. Global Scaling. Die Basis ganzheitlicher Naturwissenschaft. *Raum & Zeit*, Special 1, 2004.