LETTERS TO PROGRESS IN PHYSICS

General Relativity Theory Explains the Shnoll Effect and Makes Possible Forecasting Earthquakes and Weather Cataclysms

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The Shnoll effect manifests itself in the fine structure of the noise registered in very stable processes, where the magnitude of signal and the average noise remain unchanged. It is found in the periodic fluctuation of the fine structure of the noise according to the cosmic cycles connected with stars, the Sun, and the Moon. The Shnoll effect is explained herein, employing the framework of General Relativity, as the twin/entangled synchronization states of the observer's reference frame. The states are repeated while the observer travels, in common with the Earth, through the cosmic grid of the geodesic synchronization paths that connect his local reference frame with the reference frames of other cosmic bodies. These synchronization periods match the periods that are manifested due to the Shnoll effect, regardless of which process produces the noise. These synchronization periods are expected to exist in the noise of natural processes of any type (physics, biology, social, etc.) as well as in such artificial processes as computer-software random-number generation. This conclusion accords with what was registered according the Shnoll effect. The theory not only explains the Shnoll effect but also allows for forecasting fluctuations in the stock exchange market, fluctuations of weather, earthquakes, and other cataclysms.

1 The whole truth about the Shnoll effect

Fundamental misunderstandings of the Shnoll effect can be found in published articles as reported by journalists and scientists. Therefore, now is a good time to tell the whole truth about the Shnoll effect, to dot all the i's and to cross all the t's. We express our deep appreciation to Prof. Simon Shnoll, with whom we have enjoyed many years of friendly acquaintance and scientific collaboration.

The principal error in understanding the Shnoll effect is that some people think it is a periodical fluctuation of the magnitude of the signal that is measured. This is incorrect, since the magnitude of the signal and the average noise remain the same during the long-term measurements done by Shnoll and his workgroup. Further, such processes are specifically chosen for the study that are very stable in time. Simply put, nothing allegedly changes in the experiments which continue during days, months, and even years. The subject of the measurement is the *fine structure of the noise* registered in stable processes.

Every process contains noise. The noise originates due to the influence of random factors and satisfies the Gaussian distribution (i.e., the Gauss continuous distribution function of the probability of the measured value between any two moments of time). Gaussian distribution is attributed to any random process, such as noise, and is based on the averaging and smoothing of the noise fluctuation measured during a long enough interval of time. Nevertheless, if considering very small intervals of time, the real noise has a bizarre structure of the probability distribution function, which differs for each interval of time. Each of these real functions being considered "per se" cannot be averaged to a Gaussian curve. This is what Shnoll called the fine structure of noise and is the object of research studies originally conducted by Simon Shnoll, commencing in 1951–1954 to this day.

So, the magnitude of noise is measured in a very stable process during a long enough duration of time (days, months, and even years). Then the full row of the measured data is taken under study. The full duration of time is split into small intervals. A histogram of the probability distribution function is then created for each of the small intervals. Each interval of time has its own bizarre distribution function (form of the histogram) that differs from Gaussian function. Nevertheless, Shnoll found that "paired histograms," which have a very similar (almost identical) form, exist along the row of the measured data. That is, the histogram created for each interval of time has its own "twin" which has a similar form. The similar form was found in the histograms which were registered with the following periods of repetition connected with stars, the Sun, and the Moon:

- 24 hours = 1440 min (solar day);
- 365 days = 525 600 min (calendar year);
- 23 hours, 56 min = 1436 min (stellar day);
- 365 days, 6 hours, 9 min = 525 969 min (stellar year);
- 24 hours, 50 min = 1490 min (lunar day);
- 27 days, 7 hours, 43 min = 39 343 min (lunar month);
- 31 days, 19 hours, 29 min = 45 809 min (period of the lunar evection).

Also, aside as the similar forms of histograms, appearance the mirrored forms of histograms was registered by Shnoll with periods of:

- 720 min (half of the calendar/solar day);
- 182 days, 12 hours = 262 800 min (half of the calendar/solar year).

Shnoll called this phenomenon the "palindrome effect". It is one of Shnoll's newest findings: despite his having started the research studies in 1951, the possibility of the appearance of the mirrored forms of histograms only came to his attention in 2004. The "palindrome effect" was first registered in December 2007. Aside from these two periods of the "palindromes", a number of other palindrome cycles were found. However, certain circumstances have not allowed a continuation of these studies in full force yet.

As was shown by Shnoll after many experiments done synchronously at different locations from South Pole to North Pole, an appearance of the similar form (or the mirrored form) of the histograms does not depend on the geographical latitude, but depends only on the geographical longitude, i.e., the same *local time* at the point of observation. In other words, the Shnoll effect is manifested equally at any location on the Earth's surface, according to the local time, meaning the same locations of the celestial objects in the sky with respect to the visible horizon.

It is significant that the process producing the noise that we measure can be absolutely anything. Initially, in 1951, Shnoll started his research studies from measurements of the speed of chemical reactions in the aqueous solutions of proteins. Then many other biochemical processes attracted his attention. After decades of successful findings, he focused on such purely physical processes as α-decay and β-decay of the atomic nuclei. It was shown that not only all the random natural processes of different origins, but even artificial processes as random-number generation by computer software manifest the Shnoll effect. In other words, this is a fundamental effect.

That in a nutshell is the whole truth about the Shnoll effect. A detailed history of these research studies can be found in Shnoll's book [1], which also contains hundreds of references to the primary publications on this theme commencing in the 1950s to this day. A brief description of the Shnoll effect can also be found in his short presentation of 2006 [2].

A theoretical explanation of the Shnoll effect on the basis of General Relativity follows. But first, we need to explain two important misunderstandings which are popular among the general public.

2 The two most popular mistakes in the understandings of General Relativity

There are two main mistakes in the understanding of General Relativity. These mistakes originate due to the popular explanations of the theory provided by the reporters and other writers unfamiliar with the details of Riemannian geometry. The first is the prejudice that an absolute reference frame allegedly is impossible according to Einstein's theory. The second is the prejudice that Einstein's theory allegedly "prohibits" speeds of information transfer faster than the speed of light, including the instantaneous transfer of information.

These two prejudices originate due to the superficial explanation of Einstein's theory, which can be encountered in the majority of books on the subject. The superficial explanation limits the reader by the historical path in which Special Relativity and General Relativity were created, and by the simplest analysis of the basics of the theory of space-time-matter. As a result, the aforementioned two prejudices became widely popular among laymen as well as among the scientists who did not study the special aspects of Einstein's theory connected with these two problems.

Nevertheless there are a number of fundamental research studies that cover the aforementioned two problems in detail. While these research results may be unknown to reporters or the majority of the scientific community, relativists who work in the field of reference frames and observable quantities have long been aware of them.

So, in 1944 Abraham Zelmanov published his massive theoretical study [3], where he first determined physical observable quantities as the projections of four-dimensional quantities onto the line of time and the three-dimensional spatial section of the observer's reference frame. His mathematical apparatus for calculating physically observable quantities in the space-time of General Relativity then became known as the theory of chronometric invariants [4, 5]. Roger Penrose, Kip Thorne, and Stephen Hawking as young researchers visited Zelmanov in Sternberg Astronomical Institute (Moscow), and listened to his presentations about physical reference frames and observable quantities at his seminar. In particular, Zelmanov showed [3] that an absolute reference frame is allowed in a finite closed universe, if such a reference frame is linked to the global rotation or the global deformation of the universe.

Later, Zelmanov's followers also voiced, in their scientific presentations, the possibility of an absolute reference frame in a finite closed universe.

It should be noted that an absolute reference frame is impossible in the space-time of Special Relativity. This is because Special Relativity considers the simplified version of the four-dimensional pseudo-Riemannian space (space-time), which is always infinite, and also is free of curvature, rotation, and deformation. Therefore, an absolute reference frame is allowed only in the space-time of General Relativity, and only in those cosmological models where the universe exists as a finite closed volume of space, which rotates or deforms as a whole.

The second of the aforementioned prejudices claim that Einstein's theory allegedly "prohibits" the particles which travel faster than light. This claim is not true. The theoretical possibility of faster-than-light particles — tachyons — was first considered in 1958 by Frank Tangherlini, in the space-time of Special Relativity. He presented this theoretical research in his PhD thesis [6] prepared under the supervision of Sidney Drell and Leonard Schiff, in the Department of Physics at Stanford University. A similar theory of tachyons in the framework of Special Relativity was suggested, independently of Tanglerlini, in 1979 by Torgny Sjödin [7] (he was a Swedish scientist working in Theoretical Physics Department at Vrije Universiteit in Brussels). The most important surveys on tachyons such as [8,9] referred to Tangherlini. Tachyons were first illuminated in the journal publications on the theory of relativity in a principal paper of 1960 [10], authored by Jakov Terletski. Then a more detailed paper [11] was published in 1962 by Bilaniuk, Deshpande, and Sudarshan. The term "tachyons" first appeared later, in 1967 by Gerald Feinberg [12]. See the newest historical survey and analysis of this problem in [13]. Detailed consideration of tachyons in the space-time of General Relativity was included in our books [14, 15].

The main problem with tachyons is that they cannot be registered by means of direct experimentation by a regular observer [16]. Really, regular observers synchronize their reference frames by light signals. In this case, as was already pointed out by Einstein, the speed of light is the ultimate maximum speed that can be registered by an observer: in this case superluminal displacements cannot be registered. More precisely, in reference frames synchronized by light signals, any superluminal displacement will still be registered as a light signal. See [16] or §1.15 of our book [14] for details. This problem arises not from the ideology of Einstein's theory (as many people erroneously think), but only from the general theory of physical experiments.

So, as was explained by international experts on reference frames, an absolute reference frame is allowed in the space-time of General Relativity, in a finite closed universe, if such a reference frame is linked to the global rotation or the global deformation of the universe. But an absolute reference frame is impossible in the space (space-time) of Special Relativity, because the space is infinite, and is free of rotation and deformation.

Faster-than-light particles (tachyons) are allowed in the space (space-time) of both Special Relativity and General Relativity. But superluminal speeds of such particles cannot be registered by a regular observer because his reference frame is synchronized to others by light signals. Such an observer will register any superluminal motion as motion with the speed of light.

Aside from the tachyon problem, there is also the problem of the instant transfer of information. We mean the instant transfer of information without applying quantum mechanics methods (we call it non-quantum teleportation). This problem was first investigated by us, in 1991–1995. These theoretical results were first published in 2001, in the first edition of our book [14]. A short explanation of the theory can also be found in our presentation [17].

The know-how of our theoretical research was that we considered the four-dimensional pseudo-Riemannian space (the space-time of General Relativity) without any limitations pre-imposed on the space geometry according to physical sense or philosophical concepts. In other words, we studied the space-time of General Relativity "per se". We found that, in addition to the regular state of space-time, a fully degenerate state is possible. From the point of view of a regular observer, whose home is our regular space-time, the fully degenerate space-time appears as a point: all four-dimensional (space-time) intervals, all three-dimensional intervals, and all intervals of time are zero therein. We therefore called the fully degenerate space-time *zero-space*. But this fact does not mean that zero-space is nonsense. Once the observer enters zero-space, he sees that the space and time intervals are nonzero therein.

We showed that zero-space is inhabited by light-like particles which are similar to regular photons. We called these particles *zero-particles*. Zero-particles travel in zero-space with the speed of light. But their motion is perceived by a regular observer as instantaneous displacement. This is one of the effects of relativity theory, which is due to the space-time geometry. We only see that particles travel instantaneously while they travel at the speed of light in their home space (zero-space), which appears to us, the external observers, as the space wherein all intervals of time and all three-dimensional intervals are zero.

We also showed that the regular relation between energy and momentum is not true for zero-particles. Zero-particles bear the properties of virtual photons, which are known from Quantum Electrodynamics (i.e., they transfer interactions between regular particles). This means that zero-particles play the rôle of virtual photons, which are material carriers of interaction between regular particles of our world.

Zero-space as a whole is connected to our regular space-time in every point: at every point of our regular space-time, we have full access to any location inside zero-space. Once a regular photon has entered into such a zero-space "gate" at one location of our regular space, it can be instantly connected to another regular photon which has entered into a similar "gate" at another location. This is a way for non-quantum teleportation of photons.

We also showed that zero-particles manifest themselves as standing light waves (stopped light) while zero-space as a whole is filled with the global system of the standing light waves (the world-hologram). This matches with what Lene Hau registered in the frozen light experiment [18, 19]: there, a light beam being stopped is "stored" in atomic vapor, remaining invisible to the observer until that moment of time when it is set free again in its regularly "travelling state". The complete theory of stopped light according to General Relativity was first given in 2011, in our presentations [20, 21], then again in 2012, in the third edition of our book [14]. The obtained theoretical results mean that the frozen light experiment pioneered at Harvard by Lene Hau is an experimental "foreword" to the discovery of zero-particles and, hence, a way for non-quantum teleportation.

Until recently, teleportation has had an explanation given only by Quantum Mechanics [22]. It was previously achieved only in the strict quantum way: e.g., quantum teleportation of photons, in 1998 [23], and of atoms, in 2004 [24, 25]. Now the situation changes: with our theory we can find physical conditions for non-quantum teleportation of photons, which is not due to the probabilistic laws of Quantum Mechanics but according to the laws of General Relativity following the space-time geometry.

Thus, the instant transfer of information is allowed in the space-time of General Relativity (though the real speeds of the particles do not exceed the velocity of light). But this is impossible in the space-time of Special Relativity, because it is free of rotation and a gravitational field (whereas by contrast, the main physical condition of zero-space is a strong gravitational potential or a near-light-speed rotation).

Of course, the general reader cannot find all these important details in general-purpose books explaining Einstein's theory. Special skills in Riemannian geometry are needed to understand what has been written in the special publications that we surveyed herein. It is not surprising, therefore, that the majority of people are still puzzled by the aforementioned prejudices and misunderstandings about Einstein's theory.

3 General Relativity Theory explains the Shnoll effect: the scanning of the world-hologram along the Earth's path in the cosmos

As we shall set forth, the instantaneous synchronization of remote reference frames in our Universe via non-quantum teleportation has a direct connection with the Shnoll effect.

First, let us understand what is the Shnoll effect in terms of the theory of relativity.

The form of a histogram obtained as a result from a series of measurements of noise (note that the average magnitude of the noise remains the same) shows the fine structure of the countdown of the measured value, according to the structure of the physical coordinates and of the physical time of the observer. It does not matter which type of processes produces the registered noise; only the physical reference frame of the observer is substantial. In other words, the form of the histogram's resulting measurement of noise shows the fine structure of the physical coordinates and of the physical time of the observer. If two histograms' resulting measurements of noise taken at two different time intervals have the same form, then two of these different states of the same system that generates the noise are synchronized to each other. If these two synchronized states appear periodically in the moments of time associated with the same coordinates of a cosmic body on the celestial sphere, the two synchronized states are also synchronized with the cosmic body.

Therefore, we arrive at the following conclusion. In terms of relativity theory, the Shnoll effect means that the reference frame of a terrestrial observer is somehow synchronized with remote cosmic bodies. This synchronization is done at each moment of time with respect to coordinates connected with stars (cycles of the stellar day and the sidereal year), and with respect to the coordinates connected with the Sun (cycles of the solar day and the calendar year). Also, the synchronization condition (the form of the histogram) is repeated in the reversed mode in time at each of two opposite points in the Earth's orbit around the Sun, and at each of two opposite points of the observer's location with respect to stars (due to the daily rotation of the Earth): this is the "palindrome effect", including the half-year and half-day palindromes.

Now the second question arises. How is this synchronization accomplished? Regularly, and according to the initial suggestion of Einstein (which was introduced in the framework of Special Relativity), reference frames are synchronized by light signals. But in the case of experiments where the Schnoll effect was registered, the noise source and the measurement equipment were located in a laboratory building under a massive roof. So the laboratory is surely isolated from light signals and other (low-magnitude) electromagnetic radiations which come from stars... The answer comes from General Relativity.

First, as is known from General Relativity, two remote reference frames can be synchronized through the shortest path (known as geodesic line) connecting them in the space (space-time). A geodesic path can be paved between any two points at every fixed moment of time. If these points oscillate with respect to each other, the synchronized states are repeated with the period of the oscillation. In terms of a regular terrestrial observer, who is located on the surface of the Earth, this means that his reference frame can be synchronized with the reference frame of a celestial object, which is located in the depths of the cosmos, at any moment of time. Each single state (moment of time) of the synchronization has twin states of synchronization. The twin states are repeated due to the daily rotation and to the yearly rotation of the observer (at his location on the Earth's surface) with respect to stars*, with respect to the Sun, and also due to his cyclic motion with respect to the Moon. Thus the respective cycles of repetition of the synchronized twin states of the observer's reference frame (the cycles of appearance of the similar forms of histograms) must exist. The cycles of repetition of the twin states are, with precision, to the nearest minute:

*This refers to the International Celestial Reference System, which is the standard celestial coordinate system centered at the barycentre of the Solar System, with axes that are fixed with respect to objects in far-reaches of the cosmos. These coordinates are approximately the same as the equatorial coordinates on the celestial sphere. The International Celestial Reference System is defined by the measured positions of more than two hundred extragalactic objects (mainly quasars). It is the standard stellar reference system accepted by the International Astronomical Union.

- Solar day (24 hours = 1440 min), the period of daily rotation of the terrestrial observer together with the Earth with respect to the Sun;
- Calendar year (365 days = 525 600 min), the period of orbital revolution of the terrestrial observer together with the Earth around the Sun;
- Sidereal (stellar) day: 23 hours, 56 min = 1436 min. It is the period of daily rotation of the terrestrial observer, together with the Earth with respect to stars;
- Sidereal (stellar) year: 365 days, 6 hours, 9 min = 525 969 min. It is the period of orbital revolution of the terrestrial observer, together with the Earth around the Sun with respect to stars;
- Lunar day (24 hours, 50 min = 1490 min), the period between two observed moonrises. It is longer than a 24-hour solar day, because the Moon revolves around the Earth in the same direction that the Earth rotates around her own axis;
- Sidereal month: 27 days, 7 hours, 43 min = 39 343 min. It is the period of the Moon's revolution around the Earth with respect to stars;
- Period of the lunar evection (31 days, 19 hours, 29 min = 45 809 min), which is the period of the oscillatory deviation of the Moon's orbit from its average position with respect to the Earth.

Also, the cycles of reverse synchronization (appearance of the mirrored forms of histograms, that means the "palindrome effect") shall exist according to the half-periods:

- Half of the solar day (12 hours = 720 min);
- Half of the calendar year (182 days, 12 hours = 262 800 min);
- Half of the stellar day (11 hours, 58 min = 718 min);
- Half of the sidereal year (182 days, 15 hours, 5 min = 262 985 min);
- Half of the lunar day (12 hours, 25 min = 745 min);
- Half of the sidereal month (13 days, 15 hours, 52 min = 19 672 min);
- Half-period of the lunar evection (15 days, 21 hours, 45 min = 22 905 min).

Also there exist a number of other periods of appearance of the synchronized states of the observer's reference frame (appearance of the similar form of histograms), which manifest cyclic synchronization with some other celestial objects. We do not discuss them herein because of brevity of this presentation.

Second. Synchronization is possible not only of light signals or other electromagnetic signals moving at the speed of light. Instant synchronization of remote reference frames is possible in the space-time of General Relativity [14, 17]. This can be done through zero-space — the fully degenerate space-time. It will appear to a regular observer as a point; that is the necessary condition of non-quantum teleportation at any distance in our world. Therefore the "non-quantum teleportation channel" is constantly allowed between any two points of our space. Zero-particles — the particles that are hosted by zero-space — are material carriers in non-quantum teleportation. Zero-particles are standing light waves (i.e. stopped light), thus zero-space is filled with a global system of standing light waves — the world-hologram of non-quantum teleportation channels. According to space topology, there is univalent mapping of zero-space (the world-hologram) onto our regular space (our universe). This means that the local physical reference frame of a terrestrial observer, travelling together with the Earth in the cosmos, "scans" the world-hologram of teleportation channels.

Each point of the Earth's surface, including the observer's location, makes a daily revolution around the Earth's centre. The Earth revolves around the Sun at a speed of 30 km/sec. The Sun revolves, at a speed of 250 km/sec, around the centre of our Galaxy called the Milky Way. As a result, the observer located on the surface of the Earth travels in the Galaxy along the highly elongated double helix (which is like the DNA helix), through the cosmic grid of the "stargates" into the non-quantum teleportation channels which instantly synchronize his local reference frame with stars, the Sun, and other cosmic objects. Because of the cycles of the turbinal motion of the observer, each single stargate has its own twin respectively to the periods of the motion. The states of the observer's reference frame at these twin locations, due to entering into the same teleportation channel, are not only synchronized but also entangled with each other.*

The moments of a terrestrial observer's entering into the gate of the same teleportation channel are the same as the moments of repetition of the twin synchronized states of his local reference frame. Therefore, it is obvious that the appearance of the similar forms of histograms (and the appearance of the mirrored forms of histograms) manifests not only the synchronized (and, respectively, — reverse synchronized) twin states of the observer's reference frame, but also that these states are entangled with each other.

Such a synchronization occurs regardless of whether the observer sees the sky or is isolated in a laboratory building. It is done by zero-particles through zero-space, independently of the obstacles that can be met by electromagnetic signals in our regular space.

Recall, the Shnoll effect is periodic repetition of a similar form (or mirrored forms) of the histograms' resulting measurement of noise. Most of the periods that are expected according to the theory and listed above coincide with the periods registered by Shnoll and his workgroup [1]. These are the solar day (1440 min), the stellar day (1436 min), the calendar year (525 600 min), the stellar year (525 969 min),

*In a sense similar to the quantum entangled states, according to Quantum Mechanics.

the lunar day (1490 min), the lunar month (registered as the "near-27-day period"), and the period of the lunar evection (45 809 min). The mirrored forms of histograms were registered with periods of half of a solar day (720 min), and half of the calendar year (262 800 min), while analysis of the measurements is still under development. Nevertheless, there are enough coincidences of the theory with Shnoll's experimental data.

We therefore conclude that the Shnoll effect manifests the scanning of the world-hologram of the non-quantum teleportation channels along the Earth's path in the cosmos. So, the Shnoll effect has been explained according to General Relativity Theory.

It is important to understand the following: to find entangled moments of time (the "gates" into the same teleportation channel in the cosmos), it does not matter which stable process (which type of processes) produces the random noise that we register. Not only natural processes, but also the processes such as random-number generation by a computer's software will show the Shnoll effect, as well as such social phenomena as fluctuations in the stock exchange market. This means that the theoretical explanation that is given here on the basis of General Relativity provides a theoretical ground for a wide range of fundamental effects in physics, biology, geophysics, social behaviour and other fields of science. This fact leads us to a number of important sequels and applications, which can be achieved from further research studies of the Shnoll effect.

4 Forecasting earthquakes and other cataclysms on the basis of the scanning of the Earth's path in the cosmos

So, we have arrived at a conclusion that the Shnoll effect is a fundamental effect, which is explained according to General Relativity. Therefore, we expect the Shnoll effect to be found not just in noise that the terrestrial observer registers in such processes as biochemical reactions or nuclear decay. The noise of other terrestrial processes which have natural and artificial origin should also show the Shnoll effect. Because practical applications are important, the following important types of noise should be taken into account:

- Random mass migrations of people;
- Fluctuations in the stock exchange market;
- Fluctuations of the sickness rate among the masses of people, animals, and plants;
- Fluctuations of social unrest (local conflicts, etc.)
- Fluctuations of the Earth's crust — earthquakes;
- Fluctuations of weather (weather events and weather cataclysms);
- and many others.

Here within we've touched so far only on the last two items on this list. These are earthquakes and weather.

Our planet Earth is so large that earthquakes can be considered as the noise fluctuations of the Earth's crust, while weather events and weather cataclysms are the noise fluctuations in the atmosphere. Therefore, this is a proper background where the Shnoll effect should be manifested.

Indeed, there is a huge scientific study that shows the statistical behaviour of background earthquakes and weather events [26–32]. The study was done in the 1930–1940's. It was conducted by Nikolai Morozov, Hon. Member of the USSR Academy of Sciences.*

Morozov and his assistants analysed the observational data about the background earthquakes and weather events that were collected at all the world-known weather observatories and seismic stations of the world (located from the equator to the extreme north and south). The observational data were recorded throughout all periods of the systematic scientific observations, during the second half of the 19th century and the first half of the 20th century, which has then been accessed from yearbooks of the observatories and stations.

In addition to the statistical behaviour of the background earthquakes and weather events, Morozov found that air temperature, barometric pressure, humidity and other geophysical parameters depend on the height of the centre of our Galaxy (and other compact star clusters in our Galaxy) above the horizon. In other words, the weather factors depend on the stellar (sidereal) time at the point of observations. As a result, Morozov arrived at the following fundamental conclusion. All previous forecasts of earthquakes and weather cataclysms did not give satisfying results because the forecasters took into account only the influence of the Sun and Moon on the Earth's crust and the atmosphere (which influences were dated according to solar time), while the influence of objects in the farther-reaches of the cosmos, such as the centre of our Galaxy and other (as visible and invisible) compact stellar clusters, which are dated according to the stellar (sidereal) time, were not taken into account.

We can therefore say that Morozov's geophysical studies show that we can surely consider micro-earthquakes as random noise, which always exist in the Earth's crust. The same is true about weather where random noise is nothing but small fluctuations of air temperature, barometric pressure, humidity, etc.

A confirmation of the conclusion follows from Shnoll's experiments. Already by the 1980s, synchronous fluctuations of forms of the histograms (the Shnoll effect) were registered on the basis of seismic observations [33]. This means, according to our theoretical explanation herein, that the twin entangled synchronization states of the local physical reference frame of the terrestrial observer (the Shnoll effect, according to General Relativity) coincide with the seismic noise registered in the Earth's crust.

*This study was not continued after the death of its author, Prof. Morozov, in 1946.

Therefore, proceeding from our theoretical explanation of the Shnoll effect, we can forecast how, where, and when powerful earthquakes will appear in the Earth's crust; how, where, and when weather cataclysms will occur in the atmosphere. Essentially, here's how to go about doing it.

Two things are needed to understand this method. First, we need to understand that every real observer has his own local physical reference frame. The physical reference frame consists of real coordinate grids spanning over the real physical bodies around him (his real reference bodies), and also of the real clocks that are fixed on the real coordinate grids.* In the case of a terrestrial observer (us, for instance), the real coordinate grids and clocks are connected with the physical environment around us. Therefore, noise fluctuations of the environment mean noise fluctuations of the real physical measurement units of the observer.

Second, as follows from the theory of physical observable quantities in General Relativity, if the fine structure of noises in two physical reference frames match with each other, these two reference frames are synchronized with each other. Therefore, as we've shown above, the Shnoll effect manifests the twin/entangled states of the local physical reference frame of the observer. These twin/entangled states are instantly synchronized with each other, along with other cosmic bodies located along the entire synchronization path in the cosmos. If their physical reference frames are synchronized at a very close frequency, a resonance of noise fluctuations occurs. In this case, concerning seismic noise, a powerful earthquake occurs in the background of the noise from micro-earthquakes (that exist continuously and everywhere in the Earth's crust). Concerning the weather, this means that a weather cataclysm occurs in the background of noise fluctuations of the weather.

In other words, if one or more of the powerful cosmic bodies appear on the same path of synchronization with a terrestrial observer, noise fluctuations of these cosmic bodies become synchronized with the background noise of the observer's physical reference frame. A resonance occurs in the physical reference frame of the observer that is the local environment in the point of his observation. The background noise of the environment experiences a huge fluctuation: i.e., a powerful earthquake, a weather cataclysm, etc.

Thank to Morozov's geophysical studies we conclude that the Sun and the Moon are not the main "synchronizers" that cause a significant resonance in the physical reference frame of a terrestrial observer. We must therefore take into account the convergence of several "celestial synchronizers" of the Solar System and our Galaxy in one synchronization path.

Therefore, all that is required for forecasting earthquakes and weather cataclysms, according to our theoretical explanation of the Shnoll effect, is as follows.

1. First step — daily registrations of the basic noise fluctuations in different environments at different locations on the Earth. Analysis of the measurements, according to the histogram techniques that were used by Shnoll, in order to fix the details of the periods as determined by the Shnoll effect. In other words, this is the "scanning" of the local space of the planet in order to create the complex map of the background noise fluctuations of different environments of the Earth, according to solar time and stellar time;
2. Second step — creating a detailed list of the more or less powerful cosmic sources, which can be the main "synchronizers" affecting the physical reference frame of a terrestrial observer. The stellar (sidereal) coordinates of the cosmic sources, and their ephemerides will be needed in the third stage of the forecasting;
3. Third step — determining the moments of time when these celestial synchronizers converge on the same synchronization path, that is, their crossing the celestial meridian (hour circle) at approximately the same moment of time as the point of observation, then comparing these with the moments of time of the noise fluctuations registered due to the Shnoll effect (in the first step). As a result we will find those celestial synchronizers whose synchronization with the terrestrial environment produces the most powerful effect;
4. Fourth step — calculate further convergences of the most powerful synchronizers at every location on the Earth's surface. As a result, by taking into account the delay time of interaction rate in the respective terrestrial environment (the ground, the atmosphere, etc.), we will be able to forecast where and when the resonant states will occur in the Earth's crust (earthquakes) and in the atmosphere (weather cataclysms).

Forecasting the other events of the above list such as random mass migrations of people, fluctuations in the stock exchange market, fluctuations of the sickness rate, fluctuations of social unrest, and others, is possible analogously. The events predicted according to this method may have different periods of delay from the synchronization moment. The delay time depends on inertia in the medium that is being affected: the Earth's crust, atmosphere, interaction in the social medium, etc. Therefore, despite this, the moments of the resonant synchronization are the same for all processes that are registered at the point of observation; the resonant fluctuations will appear at different moments of time in different environments (including the technogenic environments and the social medium). Nevertheless the method of forecasting remains consistent for all the events around us.

So, forecasting powerful earthquakes and weather cataclysms is possible on the basis of our theoretical explanation of the Shnoll effect. Other practical applications of the the-

*See details about physical reference frames, and about physical observable quantities in Zelmanov's publications [3–5], or in our books [14, 15].

ory and experiment are also possible, but they are outside the scope of this short communication.

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