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The Illusory Nature of Earthquake Precursors

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Abstract

According to the definition of seismologists, a precursor of an earthquake is one of the signs of an upcoming seismic event, expressed in a different form or phenomenon that is not typical for a given area. As a result of the systematization of signs of seismic activity over the past ~300 years, a number of typical phenomena have been identified that are considered precursors of earthquakes. They have different mechanisms of occurrence, occur in different geological conditions, at different times of the day and year, and may be different in nature and manifestation. Geophysicists often use earthquake precursors to predict long-term seismic events and do not use them to promptly alert the public about seismic hazards, because they recognize that precursor phenomena are not specific to specifically and only for earthquakes that may occur in the near future, or may never occur. For example, atmospheric phenomena can occur during periods of geomagnetic storms, and widespread animal disturbance can be caused by weather conditions. We believe that when declaring earthquake precursors as signs of an approaching earthquake, some seismologists are mistaken, because earthquake precursors are most often evidence of an already begun and ongoing earthquake. The article is devoted to clarifying the issue of the mechanism of occurrence of earthquake precursors, and how they affect the prediction of the seismic situation in geological regions.

Key Points

1. *The current state of the earthquake forecasting issue.*
2. *Earthquake forecasting is impossible at the present stage of scientific development.*
3. *It is more rational to use financial resources intended to solve the problem of earthquake forecasting.*

Introduction

Currently, seismology identifies phenomena that, according to some geophysicists, serve as precursors of earthquakes. These are foreshocks, abnormal atmospheric phenomena, changes in the groundwater level, restless behavior of animals, sparking of closely located electrical wires, bluish glow inside rooms, etc. There are ~ 600 earthquake precursors that seismologists refer to, and on the basis of which geophysicists make earthquake predictions, despite the fact that there is no scientifically sound way to make earthquake predictions. Geological surveys in many countries, such as the USGS, make statements about the frequency of earthquakes and describe the places most susceptible to seismic tremors. However, none of the staff of geological centers or reputable scientists undertakes to predict the magnitude, time, and place of an earthquake, because everyone understands perfectly well that earthquake forecasting, as a scientifically sound algorithm, contradicts the fundamental laws of science [1,2,3,4] and is an exclusively fortune-telling field in seismology. Earthquake prediction is

a kind of roulette game, i.e. an earthquake may happen somewhere and someday, or it may not happen. Despite the fact that numerous cases of earthquake precursors are known, expressed in the unusual behavior of animals before earthquakes, but a reproducible relationship between the specific behavior of animals and the occurrence of an earthquake has not yet been established. On the one hand, there are examples of abnormal animal behavior before the Great Lisbon earthquake of 1755, the Crimean earthquakes of 1927, and the Ashgabat earthquake (1948), but before the catastrophic earthquakes in Armenian Spitak (1988) and in Russian Neftegorsk (1995), as in other places of the world, nothing like this was noticed. There are many mystical stories about the unusual behavior of animals before earthquakes, but they are all at the level of rumors. One thing is obvious: thanks to their finely tuned senses, animals can sense an earthquake at the earliest stages, before the people around them can, which fuels the myths that animals knew in advance about the approach of an earthquake. But animals also change their behavior for many reasons, and it is likely that some of the animals will accidentally start behaving strangely before an earthquake. In other words, an earthquake harbinger is a set of ideas, facts, or phenomena that create the illusion of an approaching earthquake and a forecast based on this feature. In fact, earthquake precursors are misinterpreted physico-seismic events, and these are not precursors of future earthquakes, but parts of ongoing seismic processes.

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The Theoretical Part: Foreshocks as harbingers of earthquakes

Modern seismology has not yet determined what foreshocks mean in the seismic process, some geophysicists claim that these are precursors of earthquakes; others claim that this is part of an already begun process [5]. Obviously, only the latter are right, because it is possible to imagine and assert that foreshocks of magnitude M5, M6, M7, and more are not full-scale earthquakes, but are precursors of earthquakes as a product of verbal bureaucracy justifying some narrow direction in earthquake theory. For example, the earthquake that destroyed the millionth city of Tashkent on April 26, 1966, had a magnitude of only M5.2. A good example of a bureaucratic approach to this issue is the unjustifiably exaggerated forecast made by Chinese scientists on February 4, 1975, in the city of Haicheng, where tremors were recorded in late January and early February 1975 [6], the most powerful of which had a magnitude of M5.1. On the morning of February 3, 1975, workers at the Chinese seismic station in the Yingkou area, it has been hypothesized that these tremors were harbingers (!) of a strong earthquake. Based on this report, the authorities of Liaoning Province have taken measures to evacuate residents. And the earthquake in Haicheng with a magnitude of M7.3 actually occurred on February 4, 1975, at 19:36, and thanks to the measures taken, a large number of victims were avoided. This event was recognized by most geophysicists as an important milestone in the history of seismology, and from that moment on, some seismologists imagined that they were able to predict earthquakes and finally, for the first time in the history of seismology, they managed to make the most accurate earthquake forecast! It should be noted that this is indeed the only major earthquake that was "officially predicted" before it occurred, which made it a landmark case in the study of earthquake precursors and their prediction. It's not for nothing that we put the words "officially predicted" in quotation marks, because in fact, no geophysical miracle happened in Haicheng. The decisive factor for the evacuation of a million local residents was the sequence of earthquakes around the city, which lasted two weeks and intensified for two days before the main tremor. When the walls of your house have been shaking for two weeks, and the shaking is getting worse by the minute, only the reckless, blind, and deaf residents of the city could stay under the roof of their house and wait for it to fall on their heads or not. With this development, Chinese scientists decided to play it safe, announced the evacuation of residents, and did not lose. This episode allowed Chinese scientists to announce their victory in earthquake forecasting to the whole world. But all sensible scientists realized that, unfortunately, the geophysical event of the century did not take place, because it was predicted two weeks after its beginning, that is, retroactively. As for naive geophysicists who believe in miracles, they still talk about the Haicheng forecast as the greatest miracle and firmly believe in the possibility of predicting earthquakes. This happened; although it could well happen that the earthquake process could also easily stop after the first series of impacts, as it has happened many times in the history of seismology. However, the question of whether there is any value in this prediction is still the subject of fierce debate among geophysicists. Another argument against the position of earthquake forecasters is the secrecy of basic data. No details about the evacuation have been reported so far, which has led to a lack of official written sources. Chen Qi-Fu, a professor at the China Earthquake Administration, also doubts this "historical forecast," but added that the Haicheng earthquake *"showed the*

importance of educating the public", which sparked further discussion about the need to inform the public about the dangers, preparations, and warning signs associated with earthquakes. [7, 8]. Now let's take a closer look at such earthquake precursors as foreshocks and how do we classify swarms of earthquakes, which are essentially foreshocks, and all of them actually belong to the same seismic process? This begs the question: in this case, how do we classify swarms of earthquakes, which are essentially foreshocks, and all of them actually belong to the same seismic process? For example, how can we explain the mechanism of the formation of a swarm of tremors in southern Greece, where the earthquake that swept through the cities of Phocis, Euboea, Attica, and Peloponnese began on July 29, 1870, with tremors on the island of Lissa? By the evening of July 31, seismic activity increased markedly, and at 3 a.m., the above-mentioned cities were destroyed by rotational movements of the ground. After this disaster, the earthquake turned into a chronic, three-year shaking of the earth's surface! There were days when there were from 1,700 to 2,000 strokes per day. On some days, soil fluctuations occurred every 3 seconds and, in three years, about 86 thousand impacts occurred. Question: What was that? One extended earthquake or 86,000 earthquakes? Or maybe it was the harbingers of an earthquake in the amount of 86 thousand? Other examples: - the phenomenon of a swarm of tremors was noted in October 2006 in the Gulf of Fonseca, whose waters are washed by Honduras, Nicaragua, and El Salvador. 691 tremors occurred here during the day. More than 500 aftershocks occurred over two weeks in February 2008 near the city of Mexicali, Mexico. In 2014, an area of land near the borders of California, Oregon, and Nevada experienced more than 800 aftershocks over a three-month period. In 2017, the Philippine province of Batangas experienced a swarm of earthquakes (800 tremors). So often repeated tremors in one area, are they swarms of an earthquake or its precursors? And if these are the harbingers of an earthquake, when is it expected: in a week, a month, a year? The bureaucratic definition of foreshocks as harbingers of earthquakes does not allow us to give a real picture of the ongoing process and a clear definition of this geophysical term. We offer our own version: Foreshocks are parts of a seismic process consisting of several phases of a single earthquake stretched over time.

Sudden Rock Ejections

To understand how foreshocks and similar phenomena are formed: sudden release of large volumes of gases and rocks, various kinds of noise in the rock massif, shooting pieces of rock from the chest of the mining face, and other seismic events, we propose to analyze the mechanism of their formation and the physical nature of foreshocks. Experienced miners know that if a higher concentration of methane gas appears in a mining operation than usual, a crackling and knocking sound inside the surrounding mining massif, shooting or slaughtering of pieces of coal, it is necessary to immediately leave the mining operation. These well-known precursors of a seismic event in mining indicate the approach of a sudden release of rocks and gas from the mining area [9], and mining engineers, echoing seismologists, claim that these are harbingers of a sudden release and may soon be followed by the release of rocks and gas. A sudden release of more than one million CH_4 m³ is known at the Sanhuba mine in China, which is equivalent to about a daily discharge rate of a highly productive well in rich deposits of combustible gases. We believe that these are not harbingers of an outburst, but signs of an already ongoing seismic process that may intensify or even fade away. In other words, in fact, the

phenomena preceding sudden rock and gas emissions are the same foreshocks, only in mining practice. Otherwise, how to interpret all these manifestations of a sudden change in mining conditions? Where did the gas come from? Why do the pieces of coal have kinetic energy sufficient to separate from the rock mass and move at high speed through the mine? What can make noise, knock, or creak in the surrounding rock massif? And several other questions that can be easily answered if you understand that the rock massif has lost its stability and moved into a non-equilibrium state. This means that the process of realizing the energy of a seismic event is in full swing, and mining engineers, when talking about the precursors of a sudden release of rocks and gas, are mistaken, because these are not harbingers, but signs of an already ongoing process, and the gas and sound effects are the products of its realization.

The theory of rock ejection from the massif, or how are foreshocks formed?

Let's consider the process of rock ejection and the mechanism of formation of foreshocks from the dynamics of the event, where we are primarily interested in the total mechanical energy of the body, consisting of kinetic, potential, and internal energy. Based on the formula $E_k = mv^2/2$, the kinetic energy before the start of the sudden rock release and before the foreshock at the initial time $t = 0$, and the displacement velocity of the rock and gas mass $v = 0$, $E_k = 0$. Consequently, the source of sudden rock emissions, foreshocks, and all other seismic events is potential energy, the physical essence of which is the interaction of a body with a physical field. Therefore, the source of the rock ejection and the source of the foreshock must be in the force field. There are only two types of force fields – the gravitational field and the electromagnetic field. Due to the insignificance of gravitational interactions compared to electromagnetic interactions (10^{-39}), we can confidently say that the energy of sudden emissions and foreshocks is the energy of the electromagnetic field created by the charge. But in order for a charge to appear, charged elementary particles are needed. Due to the fact that only electrons and a proton exist forever in a free state, the energy sources of sudden emissions and foreshocks (and all seismic events) are electrons and protons. It is known that the interaction of a force field with a body depends on three determining factors: the field strength, the coordinates of the body in space, and its ability to perceive the field. For an electromagnetic field, the ability of a body to interact is a charge. Field strength is an uneven distribution of force field parameters over the body volume (nonequilibrium state): charges, P , T , rock pressure gradients, physical, chemical, and thermodynamic parameters that overlap each other, causing the appearance of charges and potential differences (plus, minus). Consequently, the transition of a body to a nonequilibrium state serves as the starting point for the release of energy by elementary particles, Fig. 1 a, б, c.

Where:

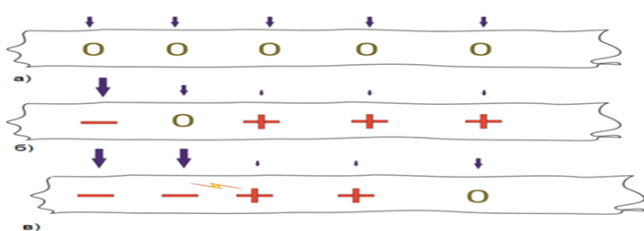


Figure 1. Changes in the rock pressure parameter; which lead to the appearance of charges and an electromagnetic field.

In Fig. 1a, the rock pressure is evenly distributed in the volume of the rock massif. No charges are formed, which makes the mountain range seismically neutral.

In Fig.1б, the pressure gradient in the rock massif began to change, which leads to the appearance of charges and the induction of an electromagnetic field, and the chance of an earthquake.

In Fig.1b, the pressure in the rock massif changes dramatically, which leads to the formation of charges and a high-intensity electromagnetic field. At this moment, in accordance with the Second Law of Thermodynamics, forces will appear in the rock massif seeking to eliminate the imbalance of the medium by transferring charges, eliminating the potential difference between the system and its environment, dissipating energy into the surrounding space in accordance with the fundamental principle of Minimum the Energy of any system. If the speed of the process, and therefore the rate of energy release, is not high, then it dissipates without rock movement. If at some point in time the rate of energy release increases and a sufficiently strong electromagnetic field is induced, then subtle movements of seismic processes occur in the form of firing and slaughtering pieces of rock, gas release, noise in the array, and, in the case of earthquakes, foreshocks. And if the processes proceed with high rates of energy release and an increase in the intensity of the electromagnetic field, then there are full-scale emissions of rocks and gas and movements of the earth's crust by the energy of foreshocks, leading to catastrophic consequences. Based on the described process, we can draw the following conclusion: the energy of sudden rock ejections and the energy of foreshocks (seismic processes) is the energy of an electromagnetic field, the magnitude of which depends on the intensity and speed of interaction of charges of this field, and the energy source of sudden emissions and foreshocks are elementary particles - electrons, protons and the electromagnetic field induced by them.

The mechanism of formation of underground rumble, tremors, and shaking in the earthquake source

Let us consider an example of the occurrence of a rumble in the rock massif when the rock pressure in the massif changes, as a harbinger of a sudden earthquake release or foreshock from the point of view of N. Bohr's theory. It should be noted that the transition of the rock massif to a nonequilibrium state can occur not only with a change in the rock pressure, but also with other changes in thermodynamic parameters. Mr. Bohr's theory states that atomic systems exist only in stationary states, and any change in the energy of an atom as a result of absorption or emission of electromagnetic radiation can occur only with a complete transition from one state to another stationary state. As soon as the rock massif goes into a non-equilibrium state (for example, there will be a pressure gradient in the volume of the

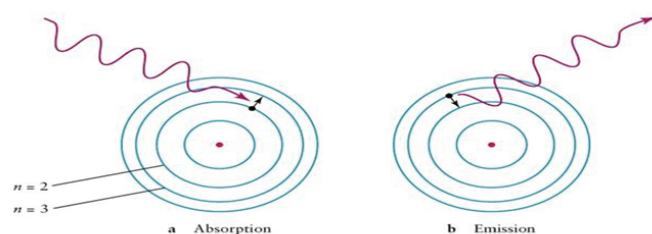


Figure 2. The graphical meaning of Bohr's postulates.

rock massif), charges will appear in it, and an electromagnetic field will be induced. The energy of the field will be transferred to the electrons, which, according to the postulate of H. Bohr 2a. Subsequently, at some point during the existence of the rock massif, three possible behaviors of atoms are possible, the probability of which will depend on the magnitude of the deformation forces and some physical and chemical parameters on which the magnitude of the critical potential depends.

Option 1. If the effect of deformation forces in the rock massif was elastic, then the critical potential will not be reached. The electron will try to move to another stationary orbit with the absorption of a quantum of energy, but in accordance with Mr. Bohr's law, it will not be able to make the jump. But the electron cannot be between stationary orbits either, and in $\sim 10^{-8}$ seconds it will return to its previous orbit without releasing energy. A rock mass can stay in this state forever. For example, continental platforms are where seismic events are very rare.

Option 2. At a certain value of the deformation forces the rock massif, the energy of the electromagnetic field can be enough to exceed the critical potential, and the electrons will jump out of their stationary orbit, emitting a quantum of energy. In this case, a foreshock or sudden release of rocks and gas will occur. In this case, the rock massif may return to a neutral state (option 1) or, if the process of energy release continues and causes further rock displacement, this will lead to a further change in mountain pressure and a significant increase in electromagnetic field strength and option 3.

Option 3. In case of significant movements of geological bodies, changes in their physical or chemical state, thermal factors, sudden relief of rock pressure, etc., the rock block will be reset. Electrons, in accordance with Niels Bohr's postulate, will jump from orbit to orbit, and at the same time release a quantum of energy, Fig.2 b. Moreover, an electron can jump through several orbits at once, which will significantly increase the energy of the induced electromagnetic field and its intensity, which can lead to fluctuations in the rocks of the future hearth, a sudden release of rocks or a foreshock. Based on the mechanism described above, it becomes obvious that the process of earthquake energy formation directly depends on the strength of the electromagnetic field of the rocks at the source of the seismic event. However, there is another important factor that will determine the probability of a sudden outburst or aftershock and their power. This factor is called the inductance of planet Earth, and its essence is described in G. Joseph's theory of self-induction our planet is a generator that creates its own magnetic field, then the bowels of the Earth play the role of windings of a huge induction coil, and the magnetic induction created by it will determine the strength of the Earth's magnetic field on moving charged rock particles and the electromagnetic field of the earthquake source. Obviously, the more potential energy is converted into kinetic energy of a geological body, the more powerful the earthquake will be, and since, figuratively speaking, inductance is a kind of kinetic energy of a force field, the higher the inductance, the stronger the earthquake will be. A comparison of the formula of inductance energy and the formula of mechanical kinetic energy of a body clearly shows the identical physical meaning of inductance and kinetic energy. The inductance B determines the energy of the magnetic field E_l generated by the current I :

$$E_l = 1/2 \cdot B \cdot I^2$$

Similarly, the mechanical kinetic energy of a body is determined by the mass of the body m and its velocity V :

$$E_k = 1/2 \cdot m \cdot V^2$$

From this, it can be concluded that the inductance creates energy in kinetic form during the movement of the charge. Moving along the coils, the charge does not accumulate, but enhances the magnetic field. Therefore, inductance is the ability of an inductor to extract energy from an electric current source and store it as a magnetic field. Thus, if the current in the inductor increases, the magnetic field expands within its boundaries, and if the current decreases, the field will contract until it disappears. As soon as the electrons jump to another orbit according to option 3 described above and the electromagnetic field of the future earthquake source is induced, it will immediately interact with the magnetic field created by the planet's generator. As a result of the interaction of two magnetic fields, the magnetization [10, 11] of the rocks of the future focus of the seismic event will change dramatically, which will cause another phenomenon called magnetostriction [12], which will cause the vibration of the rock massif and, accordingly, buildings with the frequency of the magnetic field and all other seismic effects. The essence of the phenomenon of magnetostriction lies in the fact that when the magnetization of a physical body changes, its volume and linear dimensions will change with a certain frequency (pulsate), while emitting the characteristic sound of a powerful transformer, and the stronger the magnetization changes, the stronger the tremors and other manifestations of seismic effects will be. The analogy of such a process is an inductor with a movable core that will move back and forth (pulsate) when voltage is applied to the winding. This pulsation will propagate not only in the form of shock waves, but also in the form of infrasound, which is well confirmed by earthquake observation experience. For example, it is only the pulsation of rocks that can explain the impacts, trembling, wobbling and shaking of the seismic event center for several tens of seconds and minutes, and the rumble, which is nothing more than a low-frequency acoustic wave from the pulsation of rocks of the seismic event center, which can propagate in the form of infrasound picked up by various animals. For example, this is exactly the process we observe when viewing frames of video files of past earthquakes. Since the inductance depends only on the geometric dimensions of the contour (hearth) and the magnetic parameters of the medium (fluids, rocks, and minerals composing the seismic hearth), they will directly proportionally affect its power. It should be added to this that magnetic storms in the Sun, with certain coincidences of random factors, can affect the overall inductance of the source of any outburst or earthquake in the direction of increasing the magnetization of the source and, in some cases, serve as a trigger. Making an intermediate conclusion, we can confidently assert that the underground rumble, tremors and shaking are not harbingers of a sudden release of rocks and gas, but acts of an already begun seismic process. At the end of this part of the article, we should note that all the laws supporting the theory of the electromagnetic field and the forces and phenomena that arise from it are based not only on the works of Mr. Joseph, but also on the fundamental law of electromagnetic induction by Mr. Faraday, the works of Mr. Lenz, Coulomb and is supported by the equation of Mr. Maxwell. We don't think anyone has the courage to challenge their conclusions.

Light and acoustic effects in the atmosphere as precursors of earthquakes

Here is what Sergey Pulinets, chief researcher at the Institute for Space Research of the Russian Academy of Sciences, says about these phenomena [13]: "Flashes resembling lightning, the glow of the sky, reflections from the interior surfaces of

buildings, or sparks arising in the sky above an earthquake are manifestations of electric fields that arise as a result of the discharge of mechanical stress. The glow excites atmospheric gases. The electrons move to a higher energy level, and when they return, they emit a light wave. The color of the radiation is determined by the wavelength, that is, the difference between the energy levels. Another factor is air ionization, which is associated with both electrical discharges and the release of deep gases from the fault zone." Based on these definitions, Sergey Pulinetz and his Russian colleagues have developed a Lithosphere-Atmosphere-Ionosphere Coupling (LAIC) interaction model. This model, based on the analysis of a number of the above-mentioned light effects, an increase in air temperature, a decrease in humidity, and the formation of linear cloud structures, supposedly makes it possible to predict earthquakes. And we will show the general line of scientists such as Pulinetz on the prospects of prognosis using the example of his statement [14]: - "Back in the 70s of the XX century, the diagnosis of cancer sounded like a death sentence. Today, at least some cancers are completely curable, and hundreds of thousands, if not millions, of cases of complete cure of this terrible disease are known. Imagine what would have happened if a group of doctors had appeared, similar to Geller's group in seismology, and issued a decree: "Cancer is incurable," and research in this direction would have stopped?" It's funny, but this is what the Doctor of Sciences says, because this is outright nonsense and a naive fairy tale for people who think that everything the Doctor of Sciences says is true. And let's do this, instead of oncology, let's take the concept of a Perpetual motion machine. Then Pulinetz's phrase would look like this: "Imagine what would happen if a group of scientists appeared, similar to Geller's group in seismology, and issued a decree: 'It is impossible to build a perpetual motion machine,' and research in this direction would stop?" with a hint that very soon the Perpetual Motion Machine will be embodied in metal! But he won't say that, because the idea of building a Perpetual Motion machine contradicts the law of Conservation of energy. He is not one of the ranks of scientists, but still an academician of the Russian Academy of Natural Sciences! So why does he allow himself to talk nonsense, comparing cancer and earthquake forecasts? Is there a fundamental law or theory that says cancer is incurable? There is no such theory and law! Then why link cancer and prognosis together? It's simple, he's talking nonsense for the sake of a red, but deceitful word, because it sounds solid. After all, Mr. Pulinetz understands perfectly well that if he expresses the idea of a possible Perpetual Motion machine, even the children of the younger group of any kindergarten will laugh at him, but for some reason, he considers it possible to carry on such nonsense with cancers and earthquake precursors, and for some reason, he is not ashamed! Apparently, the academic level of the Russian Academy of Natural Sciences does not allow him to understand that there are laws of science that prohibit the prediction of earthquakes, as well as the construction of a Perpetual motion machine. These are the fundamental theories of such scientists as Buck P., Tan K., and Lorenz E., which have been mentioned more than once, and which are indisputably confirmed by practical models. Maybe one of the Russian Academy of Natural Sciences academics has refuted these theories? Maybe Pulinetz himself put these authors and classics of thermodynamics and mathematics in a scientific corner?? Well, in that case, share it with the whole scientific world and we'll believe you, but for now, your words: -"The complex model of the interrelationships of geoeffective phenomena in

the lithosphere, atmosphere and ionosphere of the Earth (Lithosphere-Atmosphere-Ionosphere Coupling Model – LAIC) created in the last few years provides a tool (a group of Indian geophysicists with similar ideas is working in the same direction [15]) that allows meaningful and purposeful monitoring of anomalies on the surface On Earth, in the atmosphere and ionosphere, which reliably indicate the approach of an earthquake. The most important thing is that these are not just theoretical developments, but also a proven forecasting technique that gives promising results," as they were empty and semi-scientific nonsense, and they remain. And a little bit about the effects that Pulinetz identifies as harbingers of earthquakes. In this case, we are also puzzled by Mr. Pulinetz's lack of logic. For what are the flashes of lightning, the radiance of the sky, the glow of the interior surfaces of houses, or the sparking of unplugged electrical wires that he writes about? Are these phenomena the result of an incipient and ongoing seismic process, indicating that the earthquake is not going to happen in the near future, but has already begun? This process has started moving like an express train and is gradually accelerating... or maybe slowing down. Or a real-life example: when we see lightning across the sky above our heads and hear deafening thunder, we do not think that these are the harbingers of a thunderstorm and it may soon break out over our heads, because we see and practically feel that the storm has already arrived. Or does Mr. Pulinetz think the opposite, and according to his logic, a thunderstorm will come only when lightning strikes us, or can an earthquake only be called a catastrophic movement of the earth's crust under our feet? And the shaking of the soil, the noise in the massif, the shooting of pieces of rock, changes in the water level in wells, the release of gases from the massif, etc., are these not seismic events but a prelude to them? No, gentlemen, seismologists and forecasters, these are already acts of an ongoing earthquake, and your attempts to make a forecast based on these acts are attempts to cast a shadow over a fence on an overcast day (excuse the pun). And one more thing, Mr. Pulinetz says that light effects are *"a manifestation of electric fields that arise from the release of mechanical stress"*. We agree that this is the effect of electromagnetic fields, and we noted this above. However, the passage about the release of mechanical stress is a utopia, as it is a consequence of the potential difference that arises when the physical, chemical, and thermodynamic parameters of the rock mass change and serves as the starting point for the release of energy by elementary particles (Fig. 1 a, b, c, Fig. 2). This is the very moment when the electrons begin to "jump" from one level to another. Mr. Pulinetz says it himself: *"The electrons move to a higher energy level, and when they come back, they emit a wave of light"*. And then, in accordance with the Second Law of Thermodynamics, this will lead to the appearance of forces seeking to eliminate the imbalance of the medium and, equalize the potential difference between the system and the environment. The concept of potential difference should be understood here. In physics, it will be a temperature difference, in electrical engineering, it will be a difference in the strength of the electromagnetic field, in mechanics, it will be a difference in mechanical stresses, in the dynamics of movement of two objects, it will be speed, etc. A potential difference simply means that we have a difference in parameters between the two parts of the object. Another important aspect of the concept of potential difference is that the potential difference shows us the direction of movement of the vector resulting from the action of the potential difference. Example: If a motorcyclist (A) is moving at a speed of 80 km/h and crashes into a car (B) that is

stationary, i.e., the car's speed is 0 km/h, then the potential difference will be $A - B = 80 - 0 = 80$ km/h. That is, the potential difference for our speed of the system will be 80 km/h, and the force vector will be directed in the direction of the motorcyclist's movement. As an example, we propose to analyze the Ashgabat earthquake M7.3, which occurred on the night of October 6, 1948, in the area of the city of Ashgabat (Turkmen SSR, USSR) at 2:17 a.m. local time. Its source was located at a depth of 18 km — almost directly under the city. The first was the longitudinal volume wave, which was vertically polarized, which predetermined the large number of deaths of ~ 110 thousand people. That is, before the earthquake, there was a potential difference in the 18 km segment between the hypocenter and the surface. The question is, why was the shock wave vector pointing upwards? The answer is surprisingly simple — it was on the hearth-surface segment that the maximum potential difference appeared; in this case, it was the maximum intensity of the electromagnetic field. An important question remains a mystery: why do some geophysicists still believe in the discharge of mechanical stresses of rocks as a source of earthquake energy, when it is hard to imagine that someone today does not know that a strictly mandatory sign of the accumulation of mechanical stresses by a physical body is the parameter of body size change and a change in its shape? The law of Elasticity states: - in order for a spring to begin to accumulate stress (like any other solid physical body, including rocks of the rock massif), the spring must change its size, and in order for the plate spring to begin to accumulate stress, it must change shape. If, as some seismologists claim, a tectonic plate is capable of storing energy, then it MUST constantly change its size or shape! But as we know, tectonic plates have not changing their size and shape for thousands or millions of years. Then what kind of discharge of mechanical stresses is Mr. Pulinetz talking about? We can ask the same question to physicists from MIPT and the Institute of Geospheric Dynamics of the Russian Academy of Sciences, Professor Gevorg Kocharyan, Alexey Ostapchuk and Dmitry Pavlov, who went a different way to predict earthquakes and developed a method based on the analysis of noise generated in the tectonic fault zone, in which, according to them, elastic energy accumulates of deformations. In their work, the researchers have shown that the spectrum of seismic noise ("Earth whisper") is changing in a potentially dangerous fault zone. *"The patterns we have discovered indicate that the transition of the fault to a state of readiness for a seismic shock can be detected by analyzing the spectrum of background noise. Detecting fluctuations occurring near a fault and monitoring their changes can become a useful new method of monitoring faults in real time"*, - says Alexey Ostapchuk [16]. What can we say? It is obvious that if there is an extraneous noise, then the "seismic express" has started moving, and this express can instantly gain catastrophic speed, as well as stop abruptly. This "Earth whisper" is not a harbinger of an earthquake; it is an ongoing seismic process. Plus, they have the same mistakes as other numerous researchers - the accumulation of elastic deformation energy by the body, which categorically contradicts the fundamental postulate of the Minimum energy of any system, which does not allow the accumulation of elastic energy! Not in any form! In its short history, mankind has invented many ways to accumulate energy accumulators a pneumatic accumulator, a hydraulic accumulator, a flywheel accumulator, a gravitational potential energy accumulator, thermal accumulators, electrochemical accumulators, flow accumulators, capacitors, etc., but for some reason, they have

not come up with an energy storage device for the deformation of rock blocks. Is it because such batteries do not exist and cannot exist? We believe that geophysicists who explain the source of earthquake energy in their articles should present to the scientific world a diagram of the tectonic accumulator and explain the principle of its operation. Or, to make it even easier, present to the world a piece of granite, basalt, sandstone, marble, and another piece of rock that emits the energy it has accumulated during deformation. Otherwise, all the talk about the accumulation of deformation energy by the rock massif should be considered pseudoscientific. Here's what some geophysicists write about it: *"Earthquakes are fundamentally processes where fault rupture release the strain energy accumulated in the surrounding rock volume"* [17]. Why did we choose this particular work out of the many works where the energy of rock deformation is unreasonably proclaimed the main source of earthquakes? Because in it they showed their second mistake, attributed to earthquake precursors the ability to indicate the beginning of earthquakes, and expressed the hope for the existence of a reliable precursor signal, which is currently not confirmed by any scientific developments: *"Highlighting again the challenge of identifying a reliable precursory signal before moderate to large earthquakes. Here, understanding the dominant factors that cause such differences is a crucial task to answer questions"*. Secondly, it is obvious that if there is an extraneous noise, then the "seismic express" started moving, and this express can instantly gain catastrophic speed, as well as stop abruptly. This "Earth whisper" is not a harbinger of an earthquake; it is an ongoing seismic process.

Seismic events predicted by earthquake precursors

If we are discussing earthquake precursors, we must present to the scientific community the facts about the earthquakes predicted on this basis. As it turned out, there was such a case in the history of mankind (confirmed).... one. The ONLY ONE in the history of mankind!!! Here is what the well-known seismological journal Bulletin of the Seismological Society of America writes today: [18] - "We invite you to publish an article. A special issue on earthquake physics, earthquake forecasting, and more – 50 years after the 7.3 magnitude earthquake in Haicheng in 1975. This year marks the 50th anniversary of the Haicheng earthquake of magnitude 7.3, which occurred in 1975 in northeast China, an event widely recognized as an important milestone in the history of seismology. This is perhaps the only major earthquake that was "officially predicted" before it occurred, making it a landmark case in the study of earthquake precursors and their prediction. Thus, this anniversary provides a timely and interesting opportunity to reflect on the legacy of Haicheng's prediction and advance the science based on it." I can't believe my eyes, the most reputable seismological journal has admitted that this was the only time in the history of seismology that it was possible to make an accurate earthquake forecast for the first time! But, as we noted above, when the walls of the houses shook for two weeks, as during the bombing, and the shaking intensified by the minute, only the short-sighted, blind, and deaf-mute residents of the city and the disabled without legs could stay under the roof of their house and wait for the walls to fall on their heads or not. The miracle did not work out, and seismologists realized that, unfortunately, the geophysical event of the century did not take place, because it was predicted retroactively. The strangest thing is that, analyzing the seismic experience of mankind, geophysicists do not want to admit that earthquake forecasting is impossible, and instead

of arousing interest in solving earthquake-resistant construction issues, magazines like the Bulletin of the Seismological Society of America, with enviable persistence, continue to push geophysicists to solve a problem that has no solution. In fact, such journals, including the Bulletin of the Seismological Society of America, are provocateurs who do everything to make some scientists fat on a completely "dead" topic, because I do not believe that scientists in the editorial offices of such journals and scientists like Mr. Pulinets have never heard of a "butterfly" Lorenz and the SOC system of Mr. Bak P. and Tan K., which forever buried the hope of all forecasters to invent an algorithm for predicting earthquakes and weather. Who are they, if not science charlatans! As for those geophysicists who still believe in miracles and speak of the Haicheng earthquake forecast as the greatest event in the world of geophysics, it is unclear what this belief is based on. Maybe they are hoping for forecasting methods using artificial intelligence and machine learning [19]? This is in vain, since SOC models are focused on non-integrated systems. Such systems do not allow the decomposition of the entire system into subsystems, which excludes their self-organization. Self-organizing systems evolve to a complex critical state without the intervention of any external factor. The process of self-organization occurs over a very long transition period, and judging by the geological structure of the Earth's crust, this time was measured in billions of years. Otherwise, our planet would have self-destructed in the course of geological development. The complexity of the behavior of systems always arises as a result of a long process of evolution. By studying the development of three generations of chimpanzees, it is impossible to understand the evolution of animal life. That is why it is impossible to understand the patterns and timing of the realization of earthquake energy, since it is necessary to take into account the geophysical processes that took place over hundreds of millions of years in the past and created the conditions for earthquakes in our time. And since these conditions are unknown to us, the idea of predicting seismic tremors based on the current state of the rock massif is absolutely utopian. Without options, as in the case of a Perpetual Motion machine. This was proved by the Lorentz butterfly, whose wing flap (the slightest change in the initial conditions) causes large changes in the final result..

The relationship of earthquake theory Elastic recoil with the precursors of seismic processes

The theory of Elastic recoil, published by G. Reid in 1911, is still the cornerstone in explaining the mechanism of earthquakes, and it is on the theoretical basis of this theory that all explanations of the reality of precursors of seismic processes, which, as we see, are an illusion, are based. Many scientists tried to challenge this theory, but the inertia of thinking of the scientific community of geophysicists did not allow timely pointing out the mistakes made in the theory. The fanatical belief in elastic rebound, not based on scientific facts, gave rise not only to the paucity of hypotheses for the formation of earthquake energy in seismology, but also forced geophysicists to come up with the reasons for the birth of earthquake precursors. We constantly find support for Reid's ideas by modern geophysicists who advocate the theory of Elastic recoil in modern educational literature, which leads to copying and spreading mistakes made in G.Reid. It should also be noted that the information content about the works of G. Reid, which, before the advent of the Internet, did not allow scientists to analyze and discuss in detail G. Reid's articles for their compliance with the laws of science. In this section, based on Mr. Reid's original work, his scientific

misconceptions will be shown, which led the geophysical world to uncertainty in determining the source of earthquake energy and the stagnation of scientific ideas fatal to seismology. And so that loyal supporters of the Elastic Recoil theory will not be tempted to unreasonably dismiss Mr. Reid's fatal mistakes or interpret his train of thought in a different way, we will quote controversial passages of his original texts and indicate pages where he made mistakes in his theory.

In the course of the presentation, we will refer to the original text of G. Reid's work Elastic Recoil [20] and the work based on the report of the commission investigating the circumstances of the 1906 San Francisco earthquake [21], which, in addition to G. Reid, included: Andrew C. Lawson, A. O. Leuschebr, G. K. Gilbert, George Davidson, Charles Burckhalter, J. C. Branner W. W. Campbell [22]. In theory, Elastic recoil, on p. 436 Reid made 5 important conclusions, which we propose to analyze, and from which it is clear that the source of earthquake energy is Reid determined the energy of elastic deformations of rocks, which, according to him, accumulates in rocks for years and centuries:

1. *"The fracture of the rock, which causes a tectonic earth quake, is the result of elastic strains, greater than the strength of the rock can withstand, produced by the relative displacements of neighboring portions of the earth's crust.*
2. *These relative displacements are not prodliced suddenly at the time of the fracture, but attain their maximum amounts gradually during a more or less long period of time.*
3. *The only mass movements that occur at the time of the earthquake are the sudden elastic rebounds of the sides of the fracture towards positions of no elastic strain; and these movements extend to distances of only a few miles from the fracture.*
4. *The earthquake vibrations originate in the surface of fracture; the surface from which they start has at first a very small area, which may quickly become very large, but at a rate not greater than the velocity of compressional al elastic waves in the rock.*
5. *The energy liberated at the time of an earthquake was, immediately before rupture in the form of energy of elastic strain of the rock."*

So what was he wrong about? First of all, he created the theory of Elastic recoil based on the results of experiments with pieces of culinary jelly, which he endowed with the elastic properties of rocks (???) p.20, fig.7, Fig.8, Fig.9, as well as on pages 422-423, Fig.3, 4, Fig.5. Incredibly, in his primitive experiments, he compared the mechanical properties of rocks in a mountain range with the mechanical properties of a piece of culinary jelly, and his supporters considered this completely normal, despite the fact that it is like talking about the identity of elastic and strength properties of rubber and, say, cast iron. We are not against his statement about the existence of elastic forces in rocks, but the question is not about their presence or absence, but about the physical processes of elastic energy formation during rock deformation, the amount of its release, accumulation and relaxation. In addition, if we recall from the university physics course that elastic forces are a manifestation of electromagnetic field forces and relate the effect of this field to its heterogeneity, then we will understand the fundamental principle of Saint-Venant and easily explain the insignificance or even the complete absence of elastic forces in a tectonic plate

at even a small distance from the plate deformation site. Mr. Reid himself spoke about this on page 29:- “*The distribution of the distortion of the rock at the time of the California earthquake shows that the elastic rebound and consequently the elastic shear was greatly concentrated near the fault-plane and was much reduced in intensity at even short distances from it ; this concentration of the shear brought about a strain sufficient to cause rupture after a comparatively small relative displacement of the surrounding regions; if the shear had been more uniformly distributed over a wider region, a larger relative displacement would have been necessary to cause a rupture and there would have been a greater slip at the fault-plane.*” That is, G. Reid confirmed the fundamental principle of Saint-Venant, according to which: - “At a distance greater than the maximum linear size of the load application zone, the uneven distribution of stress and strain turn out to be negligibly small.” He confirmed its existence in words, but in no way took it into account in his theory; otherwise he would not have talked about the presence of a significant amount of energy of elastic deformations in the rocks of the massif! And so that any supporter of Mr. Reid would think about the issues of elasticity of bodies, we will not retell the theory of Elasticity here, but advise them to put wheels with granite tires on their car and try to drive only a few kilometers, as described in [23], in order to visually feel the adventurousness of such a solution, for example, Fig.3.



Fig.3 Granite tires

By the way, there is another “little thing” that Mr. Reid did not take into account, namely that Hooke's law applies only to small samples and cannot be applied to massive bodies. Consequently, all the constructions in his drawings do not correspond to reality, since the deformations will not be proportional to the stresses, as he so confidently asserts on page 24 [20].- “*As the strains are proportional to the stresses, the curvature of the line D'C must become greater the further we go from the fault, until we reach the boundary where the forces are applied, puc.11.*” Here are a few more “little things” that Mr. Reid talks about, but forgets to take them into account in his work on page 15: “*Unfortunately we do not know any of the elements of the problem, neither the plasticity of the rock as dependent on pressure and temperature, nor the rate at which stress-differences accumulate at distances below surface.*” We can add a few more “little things” that Mr. Reid did not know: the geological structure of the fault, its stratigraphic section, depth, petrology, and rock flooding. In his work, he pointed out: “we will assume a fault depth of 20 km.” p. 22. His word “accept” does not speak about strict facts, but about assumptions and assumptions. And after that, how can we not doubt the reliability of the conclusions made by the patriarch of seismology? We believe that endowing rocks

with impressive elastic properties was the main mistake of G. Reid, which resulted in his second serious mistake – the idea of accumulating an array of energy of elastic deformations by rocks. In describing the role of the accumulated energy of elastic deformations of rocks in seismic processes, it seems strange that during the entire existence of the Reid theory, not a single geophysicist in the world (!) has determined the amount of elastic energy that an elementary block of rocks is able to accumulate. How is it that Mr. Reid and all his followers seem to carbon copy the existence of huge reserves of elastic energy in the rocks of the earth's crust, but no one can even tell us approximately how many electron volts 1 m3 of granite (basalt, etc.) can accumulate over a certain period of time? This situation in geophysics is very scandalous, because today some reputable scientist can claim that 1 m3 of granite can accumulate energy of 1 Tev in 1 year when plates collide, tomorrow another scientist will claim that 1 m3 of rock can accumulate 1000 Tev of energy, and the day after tomorrow a third scientist will claim a figure of one million billion Tev. (By the way, G.Reid defined the energy of the California earthquake as 130,000,000,000,000,000,000 ft-lb (1.77×10^{20} J) [20] p.22, [19] p.432. Who should we believe? And we will trust the one who will provide us with a calculation of the amount of accumulated energy by the rock block according to the laws of mechanics. You must agree, it is very strange that if today we can easily calculate the energy of a mosquito's flight, then why can't we calculate the elastic energy of an elementary block of rocks? Here is a curious but very illustrative example that highlights a serious problem: the mass of a hungry mosquito is ~ 2 mg. ($m = 2 \cdot 10^{-6}$ kg.) A mosquito is capable of reaching a speed of $V \sim 3$ km/h or ≈ 0.83 m/s. The kinetic energy of the mosquito will be $E = m \cdot V^2/2 \approx 2 \cdot 10^{-6} \cdot 0.83^2/2 \approx 0.7 \cdot 10^{-6}$ J. If we have easily determined the energy of a mosquito's flight, then why can't Mr. Reid's associates find the amount of elastic energy that an elementary block of rocks currently possesses and will possess in a year, ten years, or a century? Surprisingly, there are no such calculations, and it turns out that when geophysicists in their articles talk about the amount of elastic energy stored by rocks, are they just guessing on the coffee grounds? And the solution to this great mystery of geophysicists is explained very simply by the fact that rock blocks do not possess elastic energy in the quantities necessary for earthquake processes. To begin with, university students know that elastic energy is NOT additive, which means that it cannot accumulate (accumulate, add up) in the rocks of tectonic plates, as Mr. Reid claimed and for some reason most modern geophysicists claim. Is it so? Any deformation of the rocks of a rock mass (solid) creates an internal elastic stress, similar to the reaction force of a spring, which tends to return the material to its original state before the application of external forces, Fig.4..

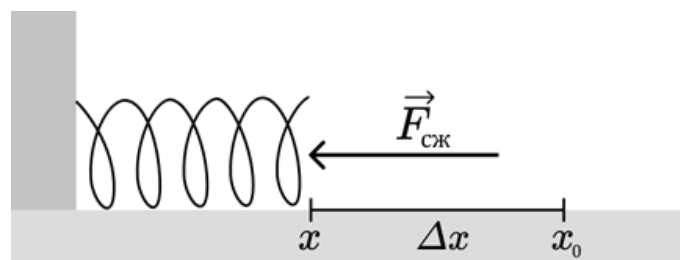


Fig.4. Compressed spring with force F from x_0 to x

Assume that the compression force of the spring $F = 10\text{N}$. Let's fix this result. If after that we continue to compress the spring, but with a force of $F_1 = 11\text{H}$, then the resulting compression force of the spring will not be the sum of $F_{\Sigma} = F + F_1 = 10 + 11 \neq 21\text{H}$, but F_{Σ} will be equal to 11H . For a science like mechanics, this conclusion is banal, because any student knows this from the first year of university, but in geophysics, this means the scientific collapse of Mr. Reid's theory, because it follows that if tectonic plates compress each other at a constant speed, then the compressive force, and therefore potential energy tectonic plates will NOT change until the speed of their movement increases sharply and there is a surge in the compressive force. Let's ask ourselves whether there are examples of discontinuous or monotonously accelerating tectonic plates. The answer is obvious. And even if such a fantastic event occurs and the speed of movement of the tectonic plate and, consequently, the compressive forces change dramatically, the fundamental principle of Saint-Venant will stop this jump to a minuscule value. Plus, in order for the body to begin accumulating the energy of elastic deformations, it must: a) Have elastic properties or the ability of a body to instantly change its crystal lattice following a change in overpressure. b) It is quite free to change its shape from the action of the applied force (for example, a spring). c) It is quite easy to change its dimensions (for example, a spring). Strictly speaking, neither one nor the other, nor the third is absolutely not inherent in breeds. But, strangely enough, this did not prevent G.Reid and does not prevent geophysicists from endowing plates with the properties of a spring. I quote the words of a very reputable scientist: "A compressed tectonic plate and a compressed spring are physically absolutely identical. The difference is only in potential $E(r)$ (E is energy, r is a distance). In a plate, r is the interatomic distance, in a spring it is between its ends. This is a cool function for a plate, but a smooth, weak function for a spring. To a good approximation, $E(r)$ is an exponential whose exponents for these two systems differ by 6-8 orders of magnitude." (Spelling and word order are preserved). How this scientist is naively mistaken, because not only the properties of the rocks, but also the size of the plates and the geology, the difference in temperatures and pressures at different depths of the plate and the presence of fluids do not create conditions for comprehensive compression of the rocks, therefore, in different parts of the plate, atoms will slide relative to each other caused by unequal compressive forces. The interatomic distance r will not decrease, creating an elastic force, but on the contrary, the rock atoms will push each other apart in all directions. It is precisely on the possibility of such a shift that all metalworking technologies are based: pressing, forging, stamping, and this were well known by the craftsmen in the village forges many centuries ago. It's time to talk about the third serious mistake of Mr. Reid – about the time of impact of the load on the mountain range. It clearly follows from Reid's theory that the longer the time interval between earthquakes, the more powerful the tremors will be, because over a longer period of time, more energy of elastic deformations of rocks will be accumulated by the earthquake source. Например, в работе [20] стр.19 отмечено: "... therefore 50 years ago the elastic strain, which caused the rupture in 1906, had already accumulated to nearly half its final amount. It seems not improbable, therefore, that the strain was accumulating for 100 years, altho there is no satisfactory reason to suppose that it accumulated at a uniform rate."

This is absolutely not true. Here is an example from a school physics curriculum: the preserved glass of old churches in

France has a thickening at the bottom due to the creep of the glass. Over the hundreds of years that the glasses were in an upright position, their upper part became thinner than the lower part, that is, the molecules of the crystalline body, even in a relatively cold state (average annual temperature in France + 16 ° C), gradually flowed to the base under the influence of their own weight. This leads to a conclusion that shows the misconception of G.Reid and his followers - under prolonged loads and high temperatures measured in tens of hundreds of degrees at a depth of tens of kilometers, the rocks of the plates will exhibit not elastic properties, but flow properties. That is, when plates collide, elastic deformations of rocks will gradually turn not into elastic, but into plastic deformations. It is known that when plates move, they are exposed to insignificant energy impulses from elastic deformations compared to the energy level of earthquakes, because the strength properties of rocks physically prevent the achievement of any significant elastic deformations in the mountain range. A simple example: It is well known that the seismic energy released during an M8 earthquake is equal to the equivalent of the energy of an earthquake with a capacity of 1 gigaton TNT, which corresponds to a pressure in the rocks of the earthquake source of hundreds of thousands of MPa, and the maximum theoretical strength of Earth rocks is, given the fracturing of rocks, only 50-100 MPa. This gigantic difference in the ultimate pressure strengths in rocks indicates a glaring discrepancy between the theory of Elastic recoil and the laws of mechanics. The next moment: According to the Law of Conservation of Energy, in order to obtain a high density and power of stored energy, we are primarily obliged to provide this body with energy of high power and density. But, according to the laws of thermodynamics, there is a limit to the energy supplied to the body in the form of a melting point, above which energy will not be stored. And since the melting point of rocks is low, it will not be possible to transmit high-density energy to the rocks of the rock massif. But that's not all, the level of energy supplied to the reserve will be limited not only by the melting point, but also by the ultimate strength of the rock, which is also not very high, taking into account cracks, shells, fractures, etc. It means that Nature is unable to saturate the energy of the high density of the rock massif. But that's not all, according to experiments and measurements [24], the rocks of the earth's crust can "store" only ~1.0% of the energy they receive out of all 100% of the energy they receive. Then, based on the energy level of the Great Chilean Earthquake of $\sim 2.0 \times 10^{24}\text{J}$, the level of impact on the rocks of the Nazco plate should have corresponded to the level of $\sim 2.0 \times 10^{26}\text{J}$, which is highly questionable. In general, we do not even need to go into details of the molecular structure of springs and plates, interatomic distances, but to analyze the issue from the point of view of loads on plates and springs, i.e. from the point of view of the mechanics of the process. We know from the books of resistance of materials that there are concentrated and distributed loads. When calculating mechanical systems, it is important not only the value of the force, but also the direction and point of its application. One of the reasons for this is the bending moment, which is bound to occur during compression if the length of the body exceeds the thickness by more than a 2:1 ratio. In our case, this is ~ 40:1 and the plate will not work for a shift in any way, as Mr. Reid claimed, but will perceive the load like a pole for high jumps. Moreover, springs are a concentrated load and only one direction of action. And the plate is a distributed load, and UNEVENLY distributed, that is, in addition to the main direction, there are thousands more

possible vectors, and therefore thousands of bending moments of varying magnitude that will compensate each other. Moreover, any plate is a huge block of rocks broken by cracks, faults, discharges, repeatedly disrupted by synclines and anticlines and other geological disturbances and flooded with various kinds of fluids. So questions arise about Elastic recoil: - Will a spring with defects work: kinks, cracks, shells filled with liquids, etc. and why do we not know anything about springs made of granite, chalcopyrite, basalt, and dolomite? The questions are rhetorical. Now we come to another serious mistake by G. Reid, which puts an end to his work and which is that he violated the fundamental law of thermodynamics and the principle of Minimum energy of any system. G. Reid and the modern part of geophysicists claim the mythical possibility of rocks to accumulate the energy of elastic deformations, thereby allowing a fantastic thermodynamic situation where heat can supposedly spontaneously transfer from a cold body to a hot one. But a simple proof of the opposite is the direction of energy transformation of two connected batteries with different charge values. For the sake of fairness, it should be noted that the seemingly simple Second Law of Thermodynamics is actually not so simple, and more than one great scientist has “broken his teeth on it.” The same Planck, the same Vernadsky. And many others: It was the apparent simplicity of the Second Law of Thermodynamics that confused the thoughts of more than one scientist and served as a brake on the development of the theoretical foundations of various sciences and theories, including Mr. Reid's theory of Elastic recoil, on the basis of which all the main hypotheses of modern geophysics were built: dilatants diffusion hypothesis [25], consolidation hypothesis [26], frictional earthquake hypothesis [27], the hypothesis of avalanche-unstable fracturing [28], the hypothesis of deep phase transformations [26] and some other well-known hypotheses [29]. The seemingly colorful variety of theoretical approaches to the problem of seismicity in these hypotheses cleverly masks their main idea and the one they share with G. Reid – the idea of the accumulation of elastic deformation energy by a mountain range, which makes these hypotheses clones of the theory of Elastic recoil. Let's look at the thermodynamic foundation of Elastic Recoil for its compliance with the Second Law. Considering the question of the origin of the energy sources of tremors, a logical question arises: why, in more than a century of the existence of Elastic recoil, almost no one remembered the Second Law of thermodynamics? Why did none of the cohort of venerable scientists, adherents of the Reid hypothesis, pay attention to the fact that the Second Law of thermodynamics and, in particular, its principle of Minimum energy systems categorically do not allow a stable state of systems in which there is an excess of energy and, consequently, the mountain range in no way and in no form cannot for years, neither does it take centuries to accumulate the energy of elastic deformations with its subsequent realization in the form of seismic events, because in this case we have the right to imagine a mountain range in the form of a glass of boiling water., which at some point in time received excess energy and which, after that, can stand on the table for a week, a year, or a hundred years and not cool down and store excess energy in order to release it into the environment at hour “X”. Is it possible for such a situation in life that a mountain range, like a glass of boiling water, has been in a heated state for many years? Our experience and the laws of thermodynamics unequivocally say no, because in this case the principle of Minimum energy will be violated, since the earthquake source (a glass of boiling water) from the very

second it receives the first, even a small portion of energy, in relation to the surrounding mountain range will become a hot object in the energy sense, and the surrounding space will remain cold and thus, energy, fulfilling the will of the Second Law of thermodynamics, will not accumulate, but flow away strictly in one direction. - from the hot hearth to the surrounding mountain range, just like in the scheme with two batteries, when connected to the electrodes of the working battery of a discharged battery, the charge will flow strictly in the direction from the working battery to the discharged one and in no other way! Consequently, the “cold” mountain range cannot in any way and in any form pump the “hot” earthquake source with deformation energy, but on the contrary, it can only take (vampirize) energy from a more energetically saturated source, which the mountain range tirelessly performs, “sucking and digesting” energy in the form of incessant for a second the process of tectogenesis. And one should not look for clever loopholes from this process, as some geophysicists do, because there can be no exceptions here. And although the reverse process, as a result of which a cold body would cool down even more and a hot body would heat up even more, is possible from an energy point of view, in reality it does not happen by itself, and for our case, refrigerators are needed in the mountain range, which so far no one has found in natural areas. G.Reid was not able to understand that in order for an earthquake (release of energy, explosion) to occur, according to the law of thermodynamics, one of the changes in the thermodynamic state of the system (mountain range) is necessary. In other words, in order for an earthquake to occur, it is necessary that there is not a plate shift with a ripping fault, as Mr. Reid and his associates claimed, but a sharp change in T or R in the mountain range, and after this event, as a result of the release of energy, the plates will move. To this problem of understanding the thermodynamic conditions of earthquake energy formation, one more thing should be added – the thing is that to this day in the scientific community there is a deeply ingrained and widespread stereotype that accompanies the Second Law of Thermodynamics from the very first day of its introduction into the world of science by Rudolf Clausius [30] – supposedly the Second Law of Thermodynamics is strictly applicable isolated equilibrium systems, when the mass, energy, and configuration of the system do not change, and the time of the system state change does not matter. Until now, it was believed [31] that seismic processes are not equilibrium systems, and it is on this basis that the Second Law of Thermodynamics and, in particular, its principle of Minimizing the energy of the system in no way concerns seismic processes, which supposedly allows the earthquake source to accumulate energy of elastic deformations for centuries, like an ordinary accumulator. And although the work, the physical essence and the principle of operation of this magical accumulator are in no way explained by modern geophysics, it was this misconception that allowed Reid's theory to successfully lead the scientific problem to a dead end, where it has been “comfortable and carefree to exist and multiply indefinitely” for more than a hundred years in the form of a huge number of various kinds of theoretical works. By the way, it is precisely this misconception in the foundations of the Second Law of Thermodynamics that has led some scientists, both in the past and in the present, to predict the thermal death of the universe. Consider the situation: The sun rose over the Sahara Desert, and the sand quickly warmed up to ~60°C. An hour passes, the second..., the tenth. The radiation of energy from the sun does not stop for a second, and the T⁰ of the sand, as it was ~ 60°C, remains all day. From Mr. Reid's point of view,

this is not correct, and the T0 scale, which continuously absorbs the energy of solar radiation, should increase monotonously. This is very similar to the reasoning of H. Reid in his theory: - The plates are continuously pressing against each other, and the elastic energy of the plates will monotonously increase (100 years) and accumulate in the hypocenter of a future earthquake. But, as the Second Law of Thermodynamics, the principle of Minimum energy, and our life experience show, the energy level of the plates will remain (!) unchanged, just like the temperature in the desert. That is, we are not talking about any accumulation of energy by the plates! Why is that? It's all about the increasing speed of movement of sand molecules and slab rocks with the influx of energy, the concept of critical potential, and the discreteness of the electric charge, which can only take on certain, "fractional" values. Experience shows that sand atoms are unable to overcome the next critical potential after heating to a temperature of $\sim 60^{\circ}\text{C}$, and all the energy coming from the sun will be sprayed into space. If the sun increases its radiation, then the critical potential will increase according to the law of hyperbola. Otherwise, all the sand on our planet would have melted long ago. And one last remark: For the sake of justice, it should be noted that G. Reid did not have the opportunity to know a number of modern geodetic GPS data, which allow us to exclude elastic forces from the list of earthquake culprits without hesitation. We sincerely believe that knowing the geodetic fact that the Hindustan plate is compressed by only $\sim 10\ \mu\text{m}$ daily, Mr. Reid would never have argued about the dominant role of elastic forces in the earthquake process, because $10\ \mu\text{m}$ for a plate with a volume of $1.2 \times 10^9\ \text{km}^3$ is like a drop of water in the Pacific Ocean. For clarity, we note that the tidal "humps" that occur in the earth's crust twice a day from the action of the Moon and the Sun are $\sim 360,000\ \mu$ and $\sim 160,000\ \mu$. The question arises, if the energy of tidal forces in the rocks of the earth's crust is tens of thousands of times greater than the energy of the elastic forces of the Indian Plate, then why does tidal energy not accumulate in the rocks of the earth's crust and cause destructive earthquakes twice a day around the globe? The answer is obvious to every literate person. Other examples of the fallacy of the Elastic Recoil theory can be cited, but the examples given are enough to throw the false theory off the geophysical scales and admit that Mr. Reid's theory plunged geophysics into a quagmire of fantasies and dogmatic prohibitions, which led to stagnation in geophysics and the appearance of illusory harbingers of seismic processes, which further confused the issue of earthquake energy generation.

Conclusion

If we look at all the known earthquake precursors (~ 600) and analyze them in detail, as we did in this article with foreshocks, we will see that all earthquake precursors turn out to be illusions. It is obvious that foreshocks and other seismic phenomena are not harbingers of earthquakes, but already begun seismic processes that can escalate into catastrophic events, can scare people with mild consequences, or can simply quietly and peacefully stop. Obviously, it is time to give an objective assessment of the role of earthquake precursors in seismology and formulate geophysical concepts without bureaucratic costs. As for the source of earthquake energy, it is desirable that some geophysicists finally stop calling the discharge of elastic deformations by rocks of the Earth's crust an earthquake energy source, since tectonic plates and stone blocks are not energy accumulators and cannot physically, chemically, or mechanically accumulate deformation energy. And please do not

appeal to laboratory experiments on compressing rocks of the earth's crust, because it is one thing to compress a granite cube the size of a Rubik's cube on laboratory presses, and another to compress a tectonic plate thousands of kilometers in size and hundreds of thousands of meters thick. Otherwise, you are going against the law of elasticity and, in particular, contradict Robert Hooke's law, which operates only within the limits of elasticity, that is, with small deformations that do not cause irreversible changes in the structure of the material. And if we add to this the resulting bending of the tectonic plate during compression, then Mr. Reid's theory should be forgotten forever. It follows from this that the theory of elastic recoil, revered by all geophysicists of the planet, is the same fairy tale, myth, or illusion [2, 32] as all the precursors of earthquakes. Aesop would say in that case: - Earthquake predictors – *mare interbibere*. And one more important note: dear readers, are you not amused by that moment in Mr. Reid's attempt to explain the earthquake process by the law of Elasticity, when in his practical experiments he primitively imitated an elastic rebound with pieces of jelly??? Instead of granite samples, he boldly (!) took pieces of culinary jelly and moved them along a sheet of plywood until they elastically moved relative to each other [21, page 422]. A question for the proponents of his theory: - why did he use jelly and not pieces of granite? It was hard to cut several granite tiles out of cobblestones, and why do naive geophysicists believe him and his pieces of springy elements? It's simple, fans of his theory have never studied his work in the original and therefore do not know how Mr. Reid actually modeled the situation leading to the elastic rebound of jelly tiles. Or was the English language an insurmountable obstacle on which this work was written, and therefore, scientists for whom English is not their native language have no idea what this work really contains? Yes, they had heard something and somewhere, but they had no idea how Mr. Reid actually conducted his experiments. Read this work carefully, gentlemen seismologists, and maybe then it will become obvious to you that in the case of granite tiles, Mr. Reid would not have received any elastic rebound, because jelly (although stiff, as Mr. Reid writes on page 422) and granite are completely different substances and will behave under stress in completely different ways. About the same as cast iron and rubber. Who doubts that he will try to taste a jelly bean and a piece of granite, and maybe when an adherent of the theory of Elastic recoil loses a few teeth, he will realize that Mr. Reid was an ordinary forger. I don't think he did it consciously, but it's true nonetheless.

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