ГЕАЛОГІЯ

UDC 550.2

ON THE CONCEPT OF THE EXPANDING AND PULSATING EARTH

Yu. Lyakhnitskiy[1], Yu. Zaika[2]

[1]A. P. Karpinsky Russian Geological Research Institute («VSEGEI»)
74 Sredny Prospekt, 199106, St. Petersburg, Russia
E-mail: yuri_lyahnitsky@vsegei.ru
[2]Unitary Enterprise «Geoservice»
53 Yanki Maura St, 220015, Minsk, Belarus
E-mail: cyrtophyllum@gmail.com

This article deals with some debatable issues in the field of geology that can be resolved within the framework of the expanding and pulsating Earth hypothesis. It is assumed that cosmic factors, including the rotation of the Solar System around the center of the Galaxy, may cause periodic fluctuations in some parameters of the Earth, including its size. As proof of the concept of rhythmic pulsations of the Earth, statistical evidence is given for the confinement of various mineral deposits to different intervals of the planet's history. Pulsations in the size of the Earth are a secondary phenomenon in relation to its general expansion, which can be evidenced by both geological and paleontological data. The concept of the expansion and pulsations of the planet is proposed as the basis of a new geotectonic theory, in which certain provisions of all the previously proposed hypotheses of the evolution of the Earth will also find a place.

INTRODUCTION

Throughout the history of geology, dozens of hypotheses for the structure and evolution of our planet have been proposed. Among them, the *geosynclinal theory*, based on extensive empirical material, played a special role [27]. The geosynclinal theory significantly contributed to the development of minerageny, the discovery of huge reserves of mineral resources, and led to the understanding of a stable connection between the structure and history of the Earth's crust and the underlying mantle to a depth of hundreds of kilometers. At the same time, the configuration of the opposite shores of the Atlantic Ocean has long been striking; there were other facts that indicated, as it seemed, the splitting and displacement of the continents. Taken together, this formed the basis of *mobilism* [78]. Later, with the discovery of mid-ocean ridges, the magnetic striping of the Atlantic oceanic crust, the phenomenon of spreading, and with the development of earlier ideas about convection, *the hypothesis of plate tectonics* took shape [11; 21; 23; 74].

Plate tectonics attracted with its simplicity: the earth's crust, like a conveyor belt, is in a continuous cycle, the continents amalgamate and split, the oceans grow and then they close, and all this repeats endlessly. For many geologists, especially beginners, this concept was very convenient, since it did not require an understanding of the complex issues of geosynclinal theory. As a result, the plate tectonics hypothesis was very quickly adopted and permeated all areas of geology. However, having received actual recognition as the «official» paradigm, from the very beginning it faced a variety of geological and geophysical objections, the number of which grew over time [9; 25; 50; 61]. To eliminate them, plate tectonists had to split the plates into blocks and various units of different sizes, and "move" them in different directions, creating numerous versions that contradict each other and the facts. For all that, reasonable doubts were completely ignored as to whether crustal units and plates can drift at all, based on geophysical evidence that the mantle is solid, and the centers of magmatic melting are not connected into a single whole. No less speculative are the hypotheses about convection currents and convection cells in the mantle that move the plates. Particularly important in plate tectonics is the concept of subduction zones, despite the fact that convincing evidence of sinking into the mantle and absorption of oceanic crust in Benioff – Wadati zones has not yet been obtained. Not all geologists and geophysicists share the confidence with which plate tectonists are plunging the oceanic crust into a mantle with much greater density and under enormous pressure. Subduction is contradicted by many facts, including the horizontal occurrence of Upper Cenozoic sediments in deep-sea trenches, without obvious signs of their subsidence, numerous occurrences of the ancient Precambrian crust, which should have already been repeatedly passed through the subduction conveyor and disappear, and others [2; 9; 50]. There are no quantitative energy models of plate tectonics that do not contradict reliable knowledge about the Earth's energy sources [17]. The paleomagnetic foundations of plate tectonics are also the subject of considerable criticism [17; 61].

The bibliography on these issues is quite extensive and can hardly be fully considered here. However, an unbiased examination of the main objections is enough to cast doubt on the ability of plate tectonics in its current form to serve as a basic geotectonic theory. And, most importantly, plate tectonics has not become a reliable basis for predictive mineragenic research, although it allows explaining the occurrence of mineralization. But when thinking about a geotectonic concept that would also have practical applications, we should not forget that all concepts are models that are only approximations of reality. And if in the exact sciences new theories usually absorb the old ones, becoming more comprehensive, then why in geology is it possible to break everything and build a new hypothesis, completely neglecting all the successful experience of predecessors?

Undoubtedly, a truly universal geotectonic theory would be of exceptional importance. Apparently, the solution to many mysteries of the Earth's evolution can be obtained if we abandon the notion of the static nature of its dimensions and some physical parameters. According to N. E. Mart'yanov, who developed the hypothesis of the Earth's pulsations: «the main mistakes of geologists have always come from the idea of the Earth as an unshakable firmament, it is very difficult and reluctant to recognize the mobility of our planet» [40]. It is on this basis that the hypotheses of contraction and expansion of the Earth were previously suggested. Despite their apparent opposition, these concepts are actually compatible with each other, in particular, if expansion is considered as a process of a higher order. The hypothesis of the expanding Earth was put forward in the 19th century [82] and subsequently found many supporters [6; 22; 42; 45; 46; 68], although the details of their views differ significantly.

The hypothesis of the expansion of the Earth makes it possible to do without a highly controversial postulate that the continents «float» on the mantle. The growth of ancient platforms and their build-up by young ones may be the result of the expansion of the planet, and folded belts – geosynclines – are zones of tension and compression. Modern oceans, possibly partly associated with spreading zones (the reality of which is also disputed [50]), are relatively young Mesozoic – Cenozoic phenomena. The main reason for the expansion of the planet may be its huge heterogeneity: extremely high density (up to 12 g/cm^3), pressure (12–13 kbar) and temperature of the core (up to 7000 °C) and lower mantle compared to low values for the upper shells, especially the crust [76]. Sharp differences in pressure, density and temperature at «critical» depths indicate phase transitions of matter. This contributes to its transfer to the upper shells, a decrease in density and an increase in the volume of the planet. As its radius increases, its axial rotation slows down. The migration of matter and energy from the depths to the surface can take various forms, including hot plumes, flows of hydrothermal matter and hydrothermokarst. Degassing of the mantle and possibly the core can play an important role and occurs in a variety of ways, including mud volcanoes and gas craters. These processes result in deep internal decompaction and an increase in the volume of the planet. The reason for the expansion can also be electromagnetic processes in the core associated with tidal and other cosmic phenomena that cause it to heat up.

When considering a comprehensive concept of the Earth's geotectonics, one cannot ignore the issue of significant anisotropy of the crust and mantle, which has been proven from deep sounding and seismic tomography data [66]. The consequence of this is the mosaic structure of the crust. For the hypothesis of the planet's expansion, the occurrence of blocks different in scale, structure, and metallogenic specifics is quite logical and is explained by the heterogeneity of processes in the crust caused by complex processes in the mantle. The block structure of the Earth's crust is generally recognized, with differences in approaches to the selection of the blocks themselves [28; 29].

ASTRONOMY DATA

The diversity of geological phenomena, including many of those on which the earlier contractionist hypothesis was based, makes it undeniable that the entire history of the Earth cannot be explained by its expansion alone. And here it is necessary to dwell on the possible role of rhythmic processes, the nature of which can be determined by cosmic factors. Of these, the most important is the motion of the Solar System in its orbit around the center of the Galaxy. The recognition of cosmic rhythms and their substantiation by the methods of stellar astronomy led to the conclusion that the duration of the galactic year is about 214–220 million years [67; 83; 84]. A number of other estimates give a different duration, usually not exceeding 250 Ma. According to this model, the galactic year includes one long period (approximately 70 million years) – apogalacticon (A, or «summer»), one short period (approx. 35 million years) – perigalacticon (P, «winter») and two transitional periods (approx. 56 million years) – AP («autumn») and PA («spring») (fig. 1). During the transit of apogalacticon by the Solar System, transgressions and climate warming prevail on Earth under conditions of planetary contraction (Є; C; K), while during the transit of perigalacticon, regressions, climate cooling and planetary expansion take place (V_1; S; T; N_2–Q). For «spring», the beginning of contraction is characteristic (V_2; D; J), whereas in «autumn», an increase in expansion of the Earth takes place (O; P; Pg–N_1). The mechanism of the influence of cosmic rhythms on geotectonic processes can be associated with a change in the speed of rotation of the planet depending on the changing speed of the Solar System, according to the law of conservation of angular momentum in the system. The effect of inhomogeneity of the magnetic and gravitational fields when approaching the center of the Galaxy or fluctuations in the gravitational constant is also possible. Despite the fact that the exact nature of the influence is not entirely clear, the facts show that geotectonic processes, epochs of ore formation and the evolution of life can apparently be correlated with the change of the galactic «seasons». We must admit that the concept of the galactic year and its influence on geological and biological evolution is far from universally accepted. Nevertheless, this approach is reliably substantiated by geological studies. There are signs of rhythms in magmatism, orogenic and paleoecological events, simultaneous activation of transgressions and regressions in polar and equatorial regions due to rotational processes [51].

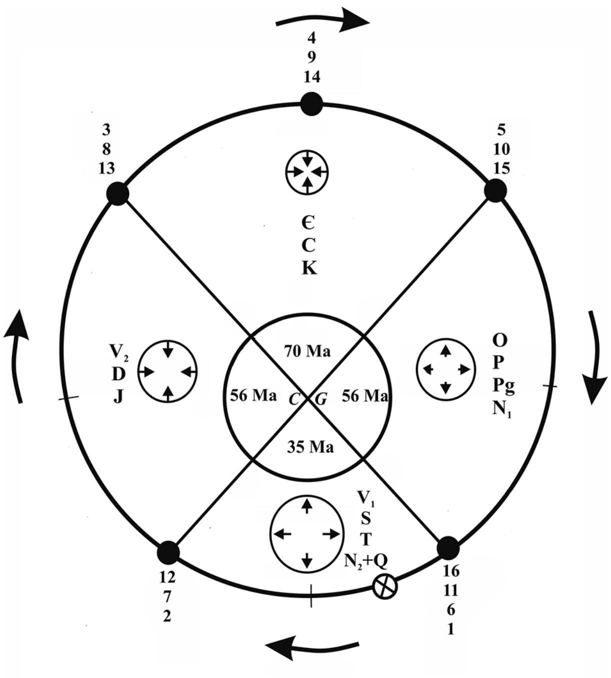
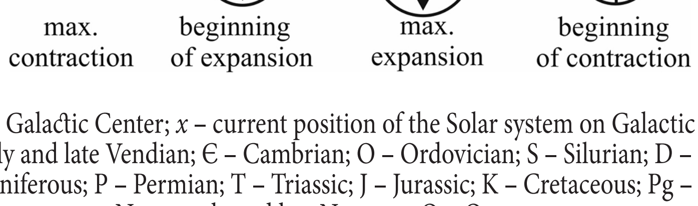


Figure 1 – Cycles of expansion and contraction of the Earth in the late Proterozoic and Phanerozoic in accordance with the concept of the Galactic year (modified after [67; 84])



CG – Galactic Center; *x* – current position of the Solar system on Galactic orbit.
$V_{1,2}$ – early and late Vendian; Є – Cambrian; O – Ordovician; S – Silurian; D – Devonian;
C – Carboniferous; P – Permian; T – Triassic; J – Jurassic; K – Cretaceous; Pg – Paleogene;
$N_{1,2}$ – early and late Neogene; Q – Quaternary.
1–16 – tectonic epochs: 1 – Baikalian; 2, 4 – unnamed; 3 – Late Baikalian; 5 – Salairian;
6 – Takonian; 7 – Late Caledonian; 8 – Bretonian; 9 – Sudetian; 10 – Uralian; 11 – Late Hercynian;
12 – Early Cimmerian; 13 – Late Cimmerian; 14 – Austrian; 15 – Laramian; 16 – Late Alpine.

MINERAGENIC DATA

Mineragenic evidence of cosmic rhythms is a convincing confirmation of the above hypothesis. Periods of the galactic year with different geotectonic regimes are characterized by specific complexes of minerals. Mineragenic epochs and regular formation of diamondiferous diatremes are confidently correlated with them [47].

Statistical analysis of ore formation in the Phanerozoic on the territory of the former USSR revealed a number of patterns [38; 39; 72]. By the number of deposits, the maximum epochs of ore formation are associated with the period «A», the minimum – with «P», whereas «autumn» (AP) and «spring» (PA) account for an intermediate intensity of ore genesis [38]. «A-mineralization» is confined mainly to orogens, activation zones and mature geosynclines, and «P-mineralization» – to rift zones, epochs of basalt eruption, formation of trap rocks, basic and ultrabasic magmatism. The epochs of hydrothermal and magmatic mineralization in 44 ore formations in the Phanerozoic are distributed as follows: P – 9 %, PA – 19 %, A – 42 %, AP – 30 %. A-periods account for most of the tin, gold, molybdenum, lead-zinc, porphyry copper, almost all chromite and antimony-mercury, half of the gold-silver and tungsten occurrences. The AP periods are characterized by pure mercury, molybdenum-tungsten and copper-pyrite deposits, while the PA periods are characterized by copper-pyrite, rare-metal-fluorite, tungsten and iron-skarn deposits. The P-periods are characterized by the development of copper-nickel and platinum ores under conditions of continental rifting, basalt magmatism, formation of traps, basic and ultrabasic intrusions. These data are explained by the fact that granitoid magmatism is widespread during contraction («A») epochs, while basalts erupt and traps form during expansion («P»).

Stratiform mineralization is confined mainly to periods «A» (37 %) and «PA» (29 %); lead-zinc, iron ore, manganese, and fluorite deposits also predominate. Most of the deposits of cupriferous sandstones (17 %) belong to «AP», and 17 % of deposits of predominantly telethermal hydrothermal-sedimentary lead-zinc deposits also belong to «P». Sedimentary ores, including coal and phosphorites, are more confined to periods «A» (34 %) and «AP» (38 %) and less often to the period «PA» (18 %). Only 9 % of sedimentary ores are associated with the «P» period [41].

Thus, the mineragenic patterns are in good agreement with the rhythms of the galactic year.

PALEONTOLOGICAL DATA

As suggested above, the Earth is undergoing gradual decompaction accompanied by an increase in its radius. A possible paleontological evidence of this trend is a decrease in the number of daily growth lines in the annual growth rhythms of the skeletons of fossil invertebrates, in particular, corals. Judging by them, the number of days in a year was about 400 in the Devonian, 390–385 in the Carboniferous, and 380 in the Triassic, while in extant corals the annual number of daily lines approximately corresponds to the length of the modern year [31; 79]. The decrease in the number of days could be caused by a slowdown in the rotation of the Earth due to an increase in its size. There is also paleontological evidence for a reduction in the number of days in a lunar month [65].

The possible long-term influence of changes in cosmic parameters on the history of life is a poorly studied issue. The direct ways of this influence are not entirely clear, and the most important planetary physical factors that last throughout the evolution of life are assumed to be constant. These include, for example, the force of gravity, which creates restrictions on the maximum body mass of organisms and determines many of their biological characteristics [19]. At the same time, some researchers do not rule out a progressive increase in gravity over the course of geological history or, on the contrary, its decrease [46]. There are also assumptions about fluctuations in the Earth's mass and gravity in different parts of the galactic orbit [84].

Below, some paleontological data are considered on the assumption that the force of gravity was indeed not constant. In this case, it can be expected that its fluctuations would have a more noticeable effect on the body mass of actively moving animals than those that move passively (drifting) or are attached to the substrate. Therefore, we combined the sequence of alleged epochs of the Earth's expansion and contraction in the Phanerozoic with estimates of the lifetime body mass of the largest animals in the history of the Earth, moving through active movements (fig. 2 and 3, compiled according to [5; 12; 13; 14; 15; 16; 18; 20; 33; 34; 35; 36; 43; 44; 49; 53; 55; 56; 57; 59; 62; 63; 64; 70; 73; 77; 81]). It should be admitted that estimates of the body mass of fossil animals essentially depend on the method of calculation and on how complete the preservation of the fossil material is. Some of the estimates are based on comparisons with modern and extinct animals of similar sizes, body proportions and close systematic position.

Figure 2 shows a graph of the maximum body mass of **aquatic animals** over time. The threshold of 1 ton could have been reached in the Middle Ordovician (cephalopod *Endoceras giganteum* Hall). At the end of the Paleozoic, the maximum body weight of the largest shark-like fish could exceed 5 tons, by analogy with some modern sharks. A noticeable increase – up to 80 tons – is observed in Triassic ichthyosaurs. Marine organisms of the Mesozoic that existed after the Triassic marine extinction reached a mass of up to 45 tons in the Jurassic (bone fish *Leedsichthys*) and more than 10 tons in the Cretaceous (some reptiles). The next epoch of increase is dated to the late Cenozoic: in some Neogene whales, the mass approached almost 60 tons, and in Neogene *Otodus* sharks, according to various estimates, it reached 100 tons or more. The heaviest animal in the history of the Earth is the blue whale (average weight is about 115 tons, the maximum ever recorded – 199 tons) – known from the Pleistocene to the present. In addition to the blue whale, the modern fauna includes other cetaceans and representatives of some systematic groups (for example, the whale shark), whose mass is measured in tens of tons. Thus, the body mass of mobile aquatic organisms has undergone a general increase over time, which does not contradict the hypotheses of the decompaction of the Earth and the decrease in gravity [46].

The maximum body mass of **terrestrial animals** (see fig. 3) could reach 2 tons at the end of the Paleozoic and approached 9 tons in the Triassic (*Lisowicia*), after which it increased to several tens of tons (possibly more than 100 tons) in Jurassic and Cretaceous sauropods. The existence of such heavy vertebrates on land, in addition to morphophysiological adaptations and other reasons, may well be explained by the gravity favoring gigantism. In the Paleogene – the beginning of the Neogene, there is a new megafauna, represented by mammals with an upper mass limit of over 20 tons. In Pleistocene the diversity of terrestrial giants decreases, and the maximum body mass is now 10–12 tons (African elephant). However, judging by figure 4, the modern fauna is approximately at the same level of the largest body mass as the Neogene.

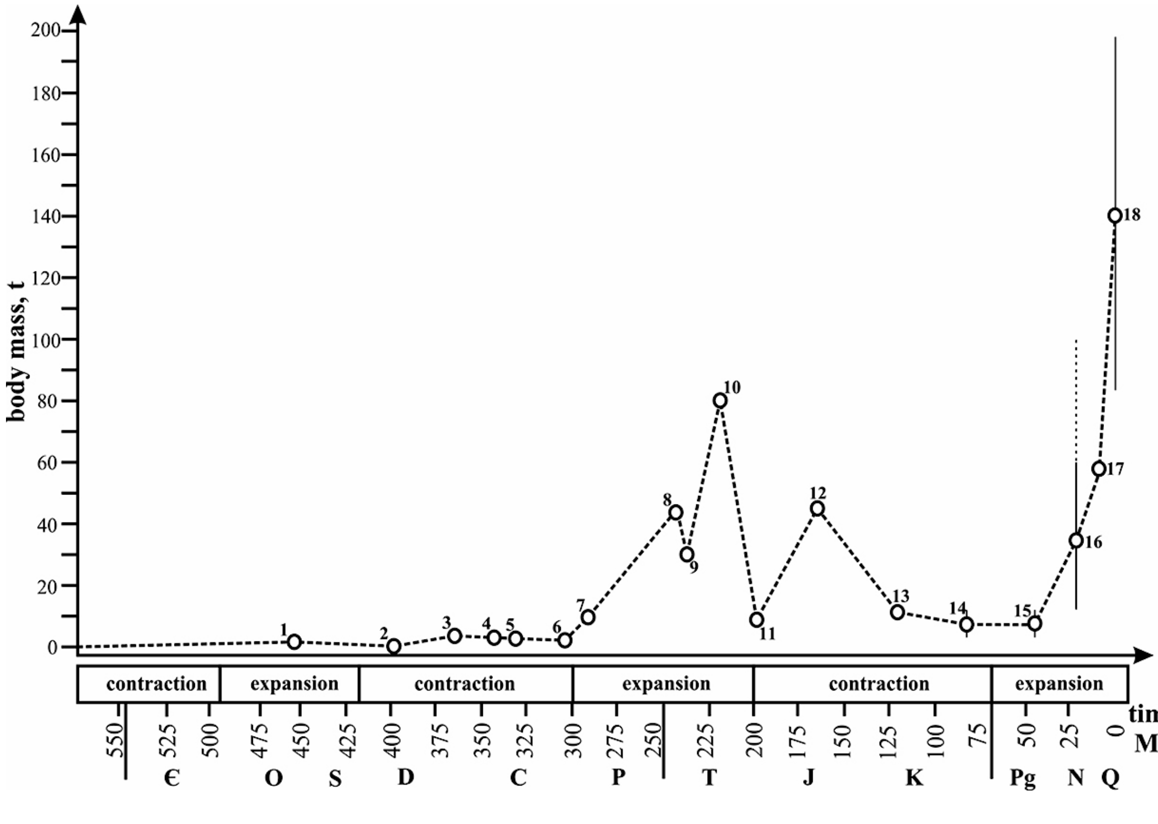


Figure 2 – Maximum (average maximum) body mass of aquatic animals
1 – *Endoceras giganteum* Hall (? 0,5–1,0 t); 2, 3 – Placodermi (*Tityosteus*, *Dunkleosteus* spp. (? 0,2–2,0 t); 4 – *Saivodus striatus* (Agassiz) (? 2,0–3,0 t); 5 – *Rhizodus hibberti* Owen (? 1,5–2,5 t); 6 – *Edestus heinrichi* Newberry et Worthen (? 1,5–2,5 t); 7 – *Helicoprion bessonowi* Karpinsky (> 5,0 t); 8 – *Cymbospondylus* spp. (> 40,0 t); 9 – *Shonisaurus popularis* Camp (30,0 t); 10 – *Shastasaurus sikanniensis* (Nicholls et Manabe) (80,0 t); 11 – *Temnodontosaurus platyodon* (Conybeare) (5,0–10,0 t); 12 – *Leedsichthys problematicus* Woodward (45,0 t); 13 – *Kronosaurus* and *Eiectus* spp. (10,0-12,0 t); 14 – *Tylosaurus proriger* Cope (6,0–7,0 t); 15 – *Basilosaurus* spp. (5,0–7,0 t); 16 – *Otodus megalodon* (Agassiz) (12,0–60,0 t); 17 – *Livyatan melvillei* (Lambert et al.) (50,0–60,0 t); 18 – *Balaenoptera musculus* (Linnaeus) (80,0–199,0 t). Compiled primarily from sources cited in the text.

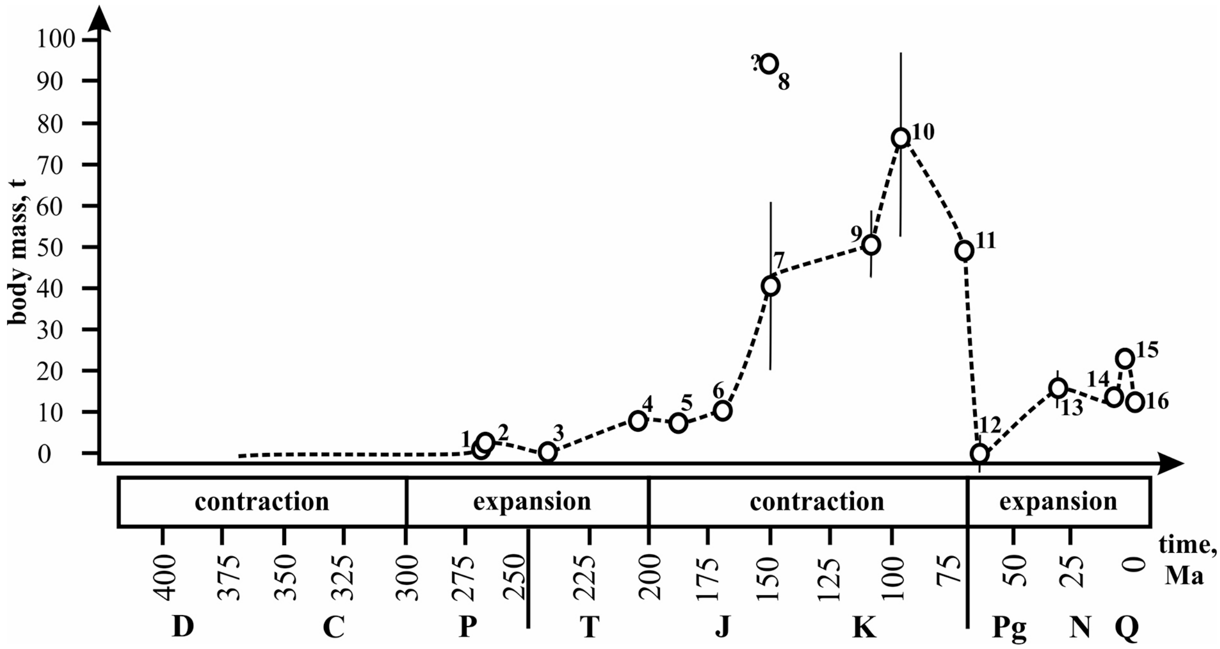


Figure 3 – Maximum (average maximum) body mass of terrestrial animals
1 – *Tapinocaninus pamelae* Rubidge (0,5–1,0 t); 2 – *Tapinocephalus atherstonei* Owen (1,0–2,0 t);
3 – *Kannemeyeria* spp. (0,5–1,0 t); 4 – *Lisowicia bojan*i Sulej et Niedźwiedzki (7,0–9,0 t);
5 – *Barapasaurus tagorei* Jain et al. (7,0 t); 6 – *Omeisaurus* spp. (9,0–10,0 t); 7 – *Barosaurus lentus* Marsh (20,0–60,0 t); 8 – *Maraapunisaurus fragillimus* (Cope) (? 70,0–125,0 t); 9 – *Sauroposeidon proteles* Wedel et al. (40,0–60,0 t);
10 – *Argentinosaurus huinculensis* Bonaparte et Coria (50,0–100,0 t); 11 – *Dreadnoughtus schrani* Lacovara et al. (45,0–50,0 t);
12 – *Titanoboa cerrejonensis* Head et al. (0,7–1,1 t); 13 – *Paraceratherium transouralicum* (Pavlova) (10,0–20,0 t);
14 – *Deinotherium* spp. (12,0–14,0 t); 15 – *Palaeoloxodon namadicus* (Falconer et Cautley) (22,0 t);
16 – *Loxodonta africana* (Blumenbach) (12,2 t). Compiled primarily from sources cited in the text.

Thus, the most general pattern is an increase in the body mass of terrestrial animals, with peak values in the second half of the Mesozoic, a hypothetical epoch of increasing contraction and maximum contraction of the Earth.

For **flying organisms**, due to the lack of reliable data on body mass, we take the wingspan as the main criterion, supplemented, when possible, by body mass estimates (see fig. 4, compiled according to [1; 3; 4; 7; 8; 24; 26; 30; 32; 33; 34; 37; 48; 52; 54; 58; 69; 71; 75; 80; 81]). Flying animals of the late Paleozoic are represented by insects with a wingspan of about 0,7 m, which, obviously, were quite light. The largest flying organisms (reptiles) of the Mesozoic, dated to the end of the Cretaceous, had a wingspan of about 12 m and a body mass of up to 250 kg or even more. There are different opinions about their ability to fly, but the question of whether they could fly at all in modern conditions is far from clear. The Cenozoic part of the diagram is represented by the birds *Pelagornis*, with a maximum wingspan of more than 7 m and a mass of up to 40 kg, and *Argentavis*, with a wingspan of more than 6 m and with an estimated body mass of more than 70 kg. This significantly exceeds the same characteristics of the largest modern flying birds such as the wandering albatross (wingspan of about 3,5 m, average body mass over 10 kg) and the kori bustard (wingspan over 2,5 m, mass nearly 20 kg). The ability of *Argentavis* and *Pelagornis* to fly at such a large body mass is not entirely clear, based on the knowledge of the flight of modern birds. It can be assumed that the flight of giant flying vertebrates of the Mesozoic and Cenozoic, in addition to probable causes related to the composition and physical properties of the atmosphere of the past, or with various adaptations, could also be favored by the factor of lower gravity.

Thus, according to figures 2–4, the relationship between historical changes in body mass of animals and the Earth's pulsations is not very clear. We can only note the general similarity of all three diagrams: the growth begins during the period of expansion, reaches a maximum during the period of contraction (in aquatic animals – at the end of the expansion – the beginning of the contraction), decreases in the second half of the contraction period, and then again experiences growth during the time of expansion.

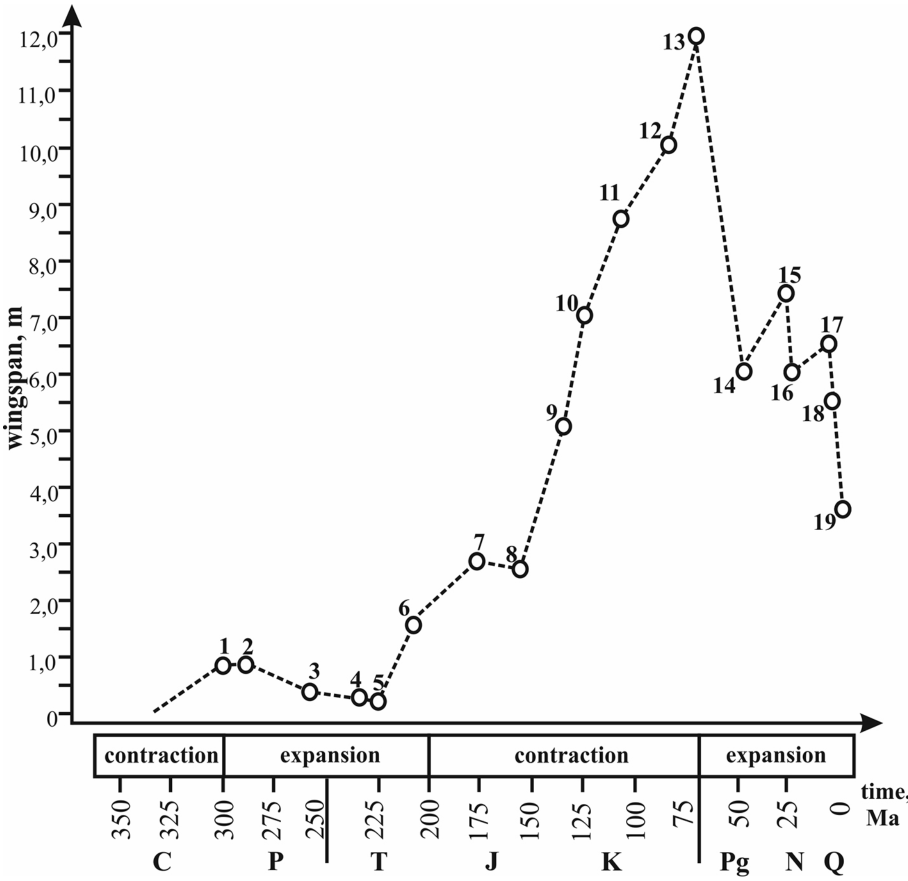


Figure 4 – Maximum wingspan of flying animals
1 – *Meganeura monyi* (Brongniart) (0,70 m); 2 – *Meganeuropsis permiana* Carpenter (> 0,70 m); 3 – *Weigeltisaurus jaekeli* (Weigelt) (? 0,20–0,40 m); 4 – *Gigatitan* spp. (0,4 m); 5 – *Sharovipteryx mirabilis* (Sharov) (? 0,20–0,30 m); 6 – *Caelestiventus hanseni* Britt et al. (> 1,5 m); 7 – *Dearc sgiathanach* Jagielska et al. (2,5–3,0 m); 8 – *Harpactognathus gentryii* Carpenter (2,5 m); 9 – *Caulkicephalus trimicrodon* Steel et al. (5,0 m); 10 – *Moganopterus zhuiana* Lü et al. (? 7,0 m); 11 – *Tropeognathus mesembrinus* Wellnhofer (? 8,0–9,0 m); 12 – *Cryodrakon boreas* Hone et al. (10,0 m); 13 – *Quetzalcoatlus northropi* Lawson (12,0 m; 70–250 kg); 14 – *Gigantornis eaglesomei* Andrews (6,0 m); 15 – *Pelagornis sandersi* Ksepka (6,0–7,4 m); 16 – *Pelagornis miocaenus* Lartet (5,5–6,5 m); 17 – *Argentavis magnificens* Campbell et Tonni (6,5 m, 70–80 kg); 18 – *Aiolornis incredibilis* (Howard) (5,5 m, > 20 kg); 19 – *Diomedea exulans* L. (3,7 m, 12 kg). Compiled primarily from sources cited in the text.

More definitely, one can observe the pattern of the general increase in body mass over time. It is important to note that during the history of life, there has also been an increase in the overall size of organisms [60]. Together, this may reflect historical changes in the physical parameters of the Earth. This general pattern, apparently, was violated by biotic events and rearrangements of the geographical and ecological situation.

Nevertheless, possible signs of the influence of the Earth's pulsations on the history of life can be seen in the similarity of the sizes and body masses of organisms confined to the same epochs of expansion or contraction of the Earth. In particular, we can point to examples from the modern and Triassic epochs of the maximum expansion of the Earth. Among them, the maximum mass of the largest modern land animal (African elephant) and the supposed largest land animal of the Triassic (*Lisowicia*) are very close to each other. Giant Triassic crocodile-shaped amphibians (*Mastodonsaurus*) are probably identical in size and mass to largest modern crocodiles. Apparently, the largest Triassic crocodile-like reptiles (such as *Colossosuchus* [10]) are also characterized by sizes close to largest modern crocodiles. The largest ichthyosaurs of the Triassic in length and mass resemble recent cetaceans. The wingspan of *Caelestiventus*, the largest known Triassic pterosaur, is almost identical to the largest modern bats (*Pteropus*).

We can also assume a correlation between the supposed sequence of the Earth's pulsations and the time of appearance of a number of morphological analogies in animals. For example, comparing the faunas of the Triassic and the late Cenozoic, one can point to the well-known convergence of ichthyosaurs, which flourished in the Triassic, and toothed whales of the Neogene – Quaternary. Also noteworthy is the presence of a number of similar features in Permian and Triassic synapsids and Cenozoic mammals (epochs of the beginning of expansion and maximum expansion of the Earth). As follows from the extensive coral literature, many examples of similarity can be traced among coral polyps (Anthozoa). The Octocoral genus *Heliopora* (modern, occurs since the Miocene) is similar to Heliolitoidea of the Upper Ordovician and Silurian (both are confined to epochs of the beginning of expansion and maximum expansion of the Earth). In a similar way, Octocorals *Tubipora* (recent, occurs from the Miocene) are identical to the Upper Ordovician tabulate coral genus *Sarcinula* and the Lower Silurian *Cannapora*. Tabulates *Paleofavosites*, *Favosites or Thecia* (Upper Ordovician and Silurian, the beginning of expansion and maximum expansion of the Earth) are almost identical to the scleractinian genus *Alveopora* (recent, known since the Paleogene, the beginning of expansion and maximum expansion of the Earth). Rugose corals *Tjanshanophyllum* and scleractiniamorphs *Kilbuchophyllia* (Upper Ordovician, the epoch of the beginning of expansion of the Earth) are reminiscent of the scleractinian genus *Fungia* (modern, known from the Eocene, the beginning of expansion of the Earth). Tabulate corals *Scoliopora* and *Alveolites* (Devonian), are similar to the Jurassic scleractinians *Hispaniastraea* (both are confined to epochs of the beginning of contraction of the Earth). There are also examples that, at first glance, do not quite agree with this pattern. In particular, the Rugose corals of the *Waagenophyllidae* family (Permian, the beginning of expansion of the Earth) are very similar to the scleractinians of the *Faviidae* family (modern, known from the Jurassic, the beginning of the contraction of the Earth). However, as seen in figure 1, during these time intervals the Solar System occupied symmetrical segments of the orbit, equidistant from the galactic center.

The above review allows us to suggest the following assumptions.

There is a historical increase in the maximum body mass of actively moving animals, which is consistent with the idea of a decrease in gravity. This trend was likely disrupted by secondary events, including extinctions, geographic and ecological transformations. The influence of the different location of the Solar System during its movement along the Galactic orbit is also possible.

The body mass of terrestrial and flying animals are supposedly more dependent on changes in gravity than in aquatic animals, since their motion occurs without the support of the hydrostatic underwater weighing. In this case, the gigantism of terrestrial and flying vertebrates may be an indication of periods of lower gravity than in our time. It is possible that changes in gravity could be subject to long-term fluctuations of various orders, which are superimposed on the general downward trend.

There are examples of the similarity in size, mass, and body shape of animals that lived in analogical or symmetrical epochs of contraction or expansion. Presumably, this can be explained by the similarity of physical parameters when the Solar System passes through similar parts of the Galactic orbit.

CONCLUSIONS

The theory of plate tectonics, which has the status of an official paradigm in geology, encounters many objections and, in its current form, contradicts a large number of facts. Elimination of these contradictions is possible within the framework of a new comprehensive theory of the structure and evolution of the Earth. This new geotectonic concept should incorporate the experience and empiricism of the geosynclinal theory, ideas about the pulsations of the planet and its general expansion, its multi-block structure, and other essential data about the Earth. It will also have a place for some elements of plate tectonics.

The reality of epochs of the Earth's pulsations, superimposed on its gradual expansion, is indicated by the predominant confinement of various complexes of mineral deposits to certain periods of geological history. Supposedly, the dynamics of long-term changes in the physical parameters of the planet has an effect also on the organic evolution. The hypotheses of the expansion of the Earth and the progressive decrease in gravity are consistent with the general increase in the body mass of animals, which is most noticeable in aquatic forms, as well as with an increase in the overall size of organisms. An indication of the expansion of the planet may be a slowdown in its rotation and a decrease in the number of days in a year, as evidenced by daily growth lines in fossil invertebrates, primarily corals.

It is possible that the hypothetical fluctuations in gravity accompanying the pulsations of the Earth, in some time intervals, could favor the growth of body mass and gigantism, or, conversely, were among the causes of extinctions of large organisms.

We hope that the new concept will be based on the synthesis of geological data and the achievements of other fields of knowledge, and will allow moving towards a universal theory of the structure and evolution of the Earth.

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АБ КАНЦЭПЦЫІ ПАШЫРЭННЯ І ПУЛЬСАЦЫІ ЗЯМЛІ

Ю. С. Ляхніцкі[1], Ю. У. Заіка[2]

[1]Усерасійскі навукова-даследчы геалагічны інстытут імя А. П. Карпінскага
Сярэдні праспект, 74, 199106, Санкт-Пецярбург, Расія
E-mail: yuri_lyahnitsky@vsegei.ru
[2]Унітарнае прадпрыемства «Геасервіс»
вул. Я. Маўра, 53, 220015, Мінск, Беларусь
E-mail: cyrtophyllum@gmail.com

Разгледжаны некаторыя дыскусійныя пытанні геалогіі, якія могуць быць вырашаны на аснове гіпотэзы пашырэння і пульсацыі Зямлі. Прыпускаецца, што касмічныя фактары, у тым ліку кручэнне Сонечнай сістэмы вакол галактычнага цэнтру, могуць спрычыніцца да перыядычных зменаў некаторых фізічных параметраў Зямлі, уключна з яе памерамі. Доказам канцэпцыі рытмічных пульсацыяў Зямлі з'яўляюцца статыстычныя заканамернасці прымеркаванасці радовішчаў карысных выкапняў да тых ці іншых інтэрвалаў геалагічнага часу. Пульсацыі памераў Зямлі адбываюцца як другасная з'ява ў дачыненні да больш агульнай тэндэнцыі – пашырэння Зямлі. Аб гэтым сведчаць не толькі геалагічныя, але і палеанталагічныя факты. Канцэпцыя пульсацый і пашырэння Зямлі прапануецца ў якасці асновы для новай агульнай геатэктанічнай тэорыі, дзе могуць знайсці месца асобныя палажэнні ўсіх ранейшых поглядаў на эвалюцыю планеты.

О КОНЦЕПЦИИ РАСШИРЯЮЩЕЙСЯ И ПУЛЬСИРУЮЩЕЙ ЗЕМЛИ

Ю.С. Ляхницкий[1], Ю.В. Заика[2]

[1]Всероссийский научно-исследовательский геологический институт
им. А. П. Карпинского
Средний проспект, 74, 199106, Санкт-Петербург, Россия
E-mail: yuri_lyahnitsky@vsegei.ru
[2]Унитарное предприятие «Геосервис»
ул. Я. Мавра, 53, 220015, Минск, Беларусь
E-mail: cyrtophyllum@gmail.com

Рассмотрены некоторые дискуссионные вопросы геологии, которые могут быть разрешены в рамках гипотезы расширяющейся и пульсирующей Земли. Предполагается, что космические факторы, в том числе изменение положения Солнечной системы относительно центра Галактики, могут быть причиной периодического изменения некоторых физических параметров Земли, включая ее размеры. В доказательство концепции ритмичных пульсаций Земли приводятся статистические закономерности приуроченности месторождений полезных ископаемых к различным интервалам истории планеты. Пульсации размеров Земли происходят на фоне ее общего расширения, о котором могут свидетельствовать не только геологические, но и палеонтологические данные. Концепция расширения и пульсаций планеты предлагается в качестве основы новой общей геотектонической теории, в которой найдут место также отдельные положения всех предлагавшихся ранее воззрений на эволюцию Земли.