

# UNIVERSE as WHOLE

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## Abstract

The different versions of the Universe structure are reviewed and its mean density is calculated.

Till now there is no unified view on the Universe as a whole.

"We do not know a little precisely mass or sizes of an explored system (Universe). We do not know, whether the apparent expansion of the Universe will be prolonged indefinitely or, eventually, will be stopped and will be replaced by squeezing. We do not know, whether there is in the Universe in any significant amounts antimatter. Whether there are antigalaxies? Probably, also is not present: we have not the reliable proofs of their existence. We do not know the nature of quasars radiating huge energy. We know very little about details of evolution of stars after stage of the red giant. We can not understand why in space there are molecules. We have not the reliable theory of cosmic rays of super-high energies. And, certainly, we nothing know about a genesis of the Universe, though the available now data indicate that its expansion is an result having place about 10 billions of years back of monstrous explosion, the power cannot to itself be presented which one even. But whence this huge quantity of initial energy has appeared?" J. B. Marion, *Physics and the Physical Universe*, "World", Moscow, 1975, page 612-613. New physics gives the exhausting answers to problems, listed in this quotation.

On some notions the Universe is stationary and is perpetual in space and in time, and on another - non-stationary. Naturally, that both notions have set of variations, for example, the fixed Universe is indefinitely dilated so, that density of matter and its kind remain invariable at the expense of constant "birth" of new matter.

"The main competitor of this theory was the theory of a stationary state, in the basis which one puts a generalized principle of homogeneity. The principle of homogeneity states, that the Universe should look equally from any point of space. This principle is difficult for mating with our last observations. But, besides, the principle of homogeneity asserts, that the Universe looks equally at any moment of time, i.e. it had the same kind in past and always will as look in the future. In the theory of a stationary state this principle of homogeneity is fair owing to an allowance, that the matter in the Universe forms continuously and uniformly, thus the generation rate of matter coincides a reduction rate of mean density of matter in the dilated Universe. According to measurements, the velocity of expansion of the Universe is those, that full density of matter in it remain to a stationary value, if in a volume, equal  $10^{15} \text{ cm}^3$  (or  $1 \text{ km}^3$ ), will be spontaneous annually to arise one neutron (or atom of hydrogen). It is possible to object, that the spontaneous appearance of neutrons contradicts energy conservation laws, momentum and heavy particles. But the speech goes about is insignificant feeble violation of these "conservation laws". J. Orir, *Popular physics*, "World", Moscow, 1969, page 359. Let's note here, that the orthodoxes at any handle skip the fundamental laws of the nature. Sinned with it and Einstein, being the supporter of the fixed Universe.

The non-stationary Universe is indefinitely dilated or the expansion is alternated with a collapse behind which one the next Big Bang - Universe eternally follows pulses.

"Therefore, the moves away galaxies are similar on debris blown-up "manual grenade". This explanation of the dilated Universe is termed as the theory "of Big Bang" (Fundamentals of the theory of the dilated Universe were included in 1922 by work of the A.A. Fridman). Now Fridman's the model of a world has received wide recognition, for gives, apparently, most adequate description of actual state of the Universe. - Comment of editor). Is possible, the satisfactory version of the similar approach is the theory of the pulsatory Universe. In this theory of a galaxy are slowed down, return, the expansion turn, while all galaxies do not interflow, that then results to new "Big Bang". Ibidem, page 358-359.

Main answer against the pulsatory Universe is the ungrounded statement about increase of entropy of the Universe, both during expansion, and at squeezing (collapse).

"It seemed recurring cycles is possible. However second beginning of thermodynamics prohibits oscillating model. Really, the entropy of the Universe only grows. The entropy grows both during expansion and during squeezing. At a collapse it is possible to expect especially strong ascending of entropy". I.D. Novikov, Evolution of the Universe, "Science", M., 1983, page 166." In view of increase of entropy the oscillating model of the Universe does not allow to describe eternal existence of the Universe from  $t=-\infty$ . The theory of the oscillating Universe does not achieve a goal, facing this theory, - to give the description of the eternal Universe". Ibidem, page 167.

Here author follows widespread fallacy, that the laws of thermodynamics can be applied to space systems. The thermodynamics can be applied only to statistical ensembles not interacting with each other of particles capable freely to interchange energy, i.e. to ideal gas, which one does not have the relevant objects of an actual world. The description of a condition of real gases already requires corrective action. The interaction of the terms of an ensemble results in structuring a system and in this case laws of thermodynamics are inapplicable not only to a system as a whole, but also to its any terms. Himself author is the convincing proof of violation of the second law of thermodynamics.

As is known, the entropy is proportional to the logarithm of number of possible system conditions (J.I. Gerasimov etc., Course of physical chemistry, v.1, Moscow, 1963, page 107). With increase of clutter in arrangement of particles the entropy of a system will increase is an outflow from positions of statistical thermodynamics. Therefore basic factor of reduction of entropy of a system is the gravitation, and a basic factor of increase it is a coulomb repulsion of parts of a supernucleus (see below). During expansion of the Universe it "entropy" is incremented, and in stage of a collapse - decreases. Earlier we scored and will below be shown, that the thermodynamics generally is inapplicable to space systems, and therefore it is necessary the term "entropy" to utilize in quotes.

Apparently, that of the law of world attraction of the Newton already it is quite enough that the Universe to make non-stationary: eventually, following to this law, the matter of the Universe should collect in one place.

"Dynamics of expansion of Metagalaxy - one of main problems of a cosmology. It is known, that in a Metagalaxy the gravitational forces act, which one aim to collect matter of a Metagalaxy, however, according to observations, it is dilated. For separate space bodies (stars, galaxies etc.) the conditions of a dynamic balance are clarified. In stars the action of gravitation is counterpoised by a pressure differential of gas and radiation increased to center of a star together with temperature. In galaxies gravity is counteracted by a centrifugal force and dispersion of velocities of stars. In scales of a Metagalaxy there are no differences of density or temperature, in it there is no and some noticeable rotation. If not to enter of any hypothetical forces, opposing gravitation, there is an alone conclusion: the Metagalaxy is dilated on inertia. Its expansion is a corollary of some starting conditions - high speeds, which one the matter had at early stage of development of the Universe. The reason of this initial expansion is not known yet. From known physical processes neither nuclear detonation, nor any other, bound with known power sources, can not give of the characteristics of apparent expansion". Physics of space, "Soviet encyclopedia", M., 1976, page 119.

That the Universe all the same "to make" stationary (if it would be very desirable, it is possible!), the Einstein in the equations GRT has entered a cosmological constant  $\Lambda$  sense by which one that to it the repulsion between gravitational charges is entered. The repulsion is proportional to distance between them and does not depend on value of these charges - so-called "the gravitation of vacuum" (one more example that with mathematics and common sense it is possible to make that want in a favour to subjective needs).

Without  $\Lambda$ -term the Universe can not be stationary on account of to the theorem of the Irnshow. "The analysis of different equilibrium configurations of fixed charges convinces that always there is such reconfiguration of charges, at which one the potential energy of a system will be diminished, and has become to be, the considered equilibrium of charges is unstable. The formulation of the theorem of the Irnshow: steady static distribution electrical (and gravitational - V.K.) charges it is impossible. From the theorem Irnshow follows, that the atoms and molecules representing stable systems of electric charges, should be dynamic systems, the parts which one are in continuous motion". N.I. Kariakin etc., Brief

manual on physics, "Higher School", M., 1962, page 196. It seemed, the stable state of nuclei of atoms contradicts the theorem Irnshow, however this inconsistency apparent, since the coulomb repulsion of protons is compensated by gravidynamic attraction (nuclear forces). Note, that the theorem of the Irnshow disclaims notions of a quantum mechanics, on which one the electron in a *S*-condition is not gyrated around of a nucleus.

Without  $\Lambda$ -term in the Universe of the Einstein there would be unsolvable problems with GRT, for example, in dilated or collapsing by the Universe the curvature of space changes, therefore, quantity of matter in it should change, an energy conservation law therefore is not executed. When the Einstein was acquainted with the theory of the dilated Universe of the A.A. Fridman, he has refused from  $\Lambda$ -term. "The Einstein has termed introduction of a cosmological constant in the equations "as the bloomer in the life"". I.D. Novikov, Evolution of the Universe, "Science", M., 1983, page 60. But birdie already has taken off also it will not catch. Completely worn to a frazzle Einstein's  $\Lambda$ -term till now nomadizes from one work adherents of doctrines in science in another, it periodically that bury, that exhumes. To make both ends meet in a world of elementary particles, of physicists have given rise here again of twin the  $\Lambda$ -term and same physical monster - gluon - accountable for deduction of quarks components baryons. The more than distance between quarks, the stronger gluon retains them in a baryon.

The idea of static character of the Universe going from times Aristotle and reflected in GRT, has appeared error and it with all conspicuity has become clear after discovery of natural radioactivity of elements and law Hubble. "It is possible to remind, that the evolution are made already in nonreversible decay of radioactive matters. If the celestial body - Earth - existed eternally, all radioactive matters for a long time disintegrated... So, the static picture is unacceptable for any astronomical systems if only to view rather large periods. If today it was necessary anew to plot model of the Universe, it would be necessary to demand, that the model was evolving, that in model there was an indicating on epoch, when in the Universe began birth of stars, galaxies etc." I.D. Novikov, Evolution of the Universe, "Science", M., 1983, page 9.

A.A. Fridman has demonstrated necessity of global evolution of the Universe. By a hard blow on GRT was the fact of obtaining of much it experimentally apparent results in frameworks of the theory of the Newton. However Newtonian (so-called by nonrelativistic) the cosmologies have hurried to assign particular "difficulties", as it was similarly made for the theory of atoms of the Bohr to push a quantum mechanics. "In 30-th, already after creation GRT, it was possible to show, that its many results can be received and within the framework of a Newtonian, nonrelativistic cosmology. However nonrelativistic cosmology is interfere with series of serious difficulties". Physics of space, "Soviet encyclopedia", M., 1976, page 120. Thus frankly the shady method is utilized. The theory of the Newton results to unambiguous non-steady-state by the Universe, and it apply to fixed infinite in time and space of the Universe. Thus at once there are two paradoxes: gravitational (paradox of the Zeeliger, 1895) and photometric (paradox of the Olbers, 1826) on the basis of that conclude an inconsistency of the Newtonian theory and validity GRT instead of drawing a conclusion about boundedness of the Universe in space and perpetuity in time, i.e. about oscillations of the Universe, that is an alone reasonable corollary of the law of world attraction. In this case indicated paradoxes do not arise, as are a corollary only of error judgement on infinite extent of the Universe, and the picture of a world will be completely agreed with apparent and contradicts GRT.

The essence of gravitational paradox is encompass therein, that in the infinite Universe on any body "to the right" and "to the left" indefinitely large attractive force acts, signifies, the resulting force is determined by expression:  $F=\infty-\infty$ . This expression correctly at any values  $F$  in the left-hand part, i.e. the resulting force is indefinite, that is dispossessed of physical sense. The essence of photometric paradox that in the infinite Universe at uniform filling by its stars increase of number of stars in layers, farther from the spectator, is compensated by attenuation of a luminous flux from them, as a result of which each layer creates identical illumination intensity. In the infinite Universe the number of layers is indefinite, therefore illumination intensity created by all stars should be indefinitely large, and if to take into account mutual screening of stars, the sky brightness should approximately equal surface brightness of the Sun. If for restricted in space of the Universe the indicated paradoxes are removed without problems, "explanation" by their relativistic cosmology (theory GRT) is represented disputable. "In a relativistic cosmology grounded on

the Einstein theory of gravitation, the gravitational paradox does not arise. The system of the gravitational Einstein's equations allows removing mentioned ambiguity of a field of accelerations (uncertainty of a resulting force of gravitation - V.K.). To avoid photometric paradox, it is enough to take into account non-steady-state by the Universe: by virtue of red displacement the luminous fluxes from far objects are attenuated". Ibidem, page 121. Here gravitational paradox is not explained from a physical point of view, shifting liability on formal mathematical equations exhausted from the finger, and the shift of a radiation spectrum in red area, apparently, can not explain photometric paradox, and only to aggravate it, since maximum of radiation of the majority of stars specially far (we them see young) it is necessary on a ultra-violet segment of a spectrum. Besides the author of this quotation has managed to mate not compatible: combined system equations featuring the fixed Universe on GRT and red displacement, contradicting GRT.

If only one law of gravitation suffices for the statement of a finiteness of the Universe in space, the problem on perpetuity it in time requires the philosophical approach. Internally we can not imagine perpetuity in time, being set a problem, and whence and why all this has appears, perpetuity in space, asking itself: and what there, beyond the horizon? It is connected to all daily experience of the man, therefore statement of perpetuity of the Universe in time, though leaves internal feeling of dissatisfaction, it is necessary to recognize fair. Otherwise again there is an insuperable logic inconsistency: who has created the Creator, whence has appears the Creator of the Creator etc. ad infinitum. Summing up said, the Universe is represented indefinitely pulsatory in time on the mechanism: the Big Bang - collapse and as a corollary it is always restricted in space, since the matter can not be moves faster than light.

To ensure perpetuity of the Universe in time, the speed of light should be less or peer to the first cosmic velocity for the Universe as a whole. In this case, the energy can not be lost in any kind and the process of oscillation of the Universe can be prolonged eternally. Let's look; what should be the Universe in the present moment to satisfy this requirement.

The first cosmic velocity is determined from simple equality of an attractive force and centrifugal force on orbit of radius of a central body around of it:

$$\frac{GMm}{r^2} = \frac{mC^2}{r} \quad (1),$$

where  $G$  - gravitation constant ( $6.67 \cdot 10^{-8}$  dynes·cm<sup>2</sup>/g<sup>2</sup>),  $C$  - speed of light ( $2.99793 \cdot 10^{10}$  cm/sec),  $r$  - radius of the Universe (we shall accept equal 10 billions light years,  $9.461 \cdot 10^{27}$  cm), ("For a recent epoch the observation horizon makes ~10 billions light years. The light sources, which one are on farther distances, now are basic unobservable. It is interesting to mark, that modern optical and the radio telescopes allow seeing powerful sources - quasars on distances compared to distance up to horizon". Physics of space, "Soviet encyclopedia", M., 1976, page 124),  $m$  - mass of a photon or neutrino,  $M$  - mass of the Universe. From (1) we shall discover mass of the Universe:

$$M = \frac{C^2 r}{G} \quad (2).$$

By substituting in (2) numerical values, we shall receive mass of the Universe equal not less than  $1.275 \cdot 10^{56}$  g and at its volume  $3.547 \cdot 10^{84}$  cm<sup>3</sup>, density of the Universe should be not less than  $3.59 \cdot 10^{-29}$  g/cm<sup>3</sup>, that six times exceeds critical density ( $6 \cdot 10^{-30}$  g/cm<sup>3</sup>) at which one expansion of the Universe should be replaced with a collapse it. Density, retrieved by us, of the Universe in the present moment is undervalued (below it can not be in any case). There is no sense to speak about "rest mass", since "mass of motion" by anything from it does not differ, therefore mass of photons should be included in common balance of mass of the Universe, concerns and to a neutrino. In this case mass a neutrino and photons considerably will exceed mass of all remaining matter in the Universe.

Now it is necessary to find out, what physical reasons result in the next Big Bang after stage of a collapse of the Universe. Then we shall understand the mechanism of its oscillation. On modern notions the collapse is as a matter of fact nonreversible also all Universe owes (if the collapse is possible) collapsed in "a black hole". On it the evolution of the Universe should be finished. In modern notions about Big Bang there are two key deficiencies: 1. Why should be blasted out that owes collapses - you see a gravitational interaction resulting in to a collapse, nobody removes? 2. At explosion the matter should scatter as a spherical shell, inside which one almost anything is not present, and the

observation display a uniform distribution of matter on the average in a visible part of the Universe (Metagalaxy).

Therefore:

1. At final stage of a collapse there should be a qualitative change collapsing of matter or processes neutralizing gravitational squeezing. New physics tenders at once two versions of compensation of a collapse - transmutation of neutral matter at nuclear density in a positively charged supernucleus at the expense of formation of protons from neutrons pursuant to the theory of a nucleus. And violation of motion a neutrino at density of matter compared to density of protons ( $1.85 \cdot 10^{15} \text{ g/cm}^3$ ), as a result of which neutrino on many orders reduce mass and consequently are capable to abandon collapses a body. There is in first case come up coulomb repulsion of parts of a supernucleus, which one on force on 36 orders exceeds a gravitational interaction, and is described by the similar formulas, i.e. the interchange of attraction with a repulsion is provided in any situation. "The ratio of dimensionless parameters, proportional squares of constants of strong, electromagnetic, feeble and gravitational interactions and describing "force" interactions of a proton with a proton at energy 1 GeV in a system of their centre of mass makes under the order of values  $1:10^{-2}:10^{-10}:10^{-38}$ ". Physics of a microcosm, "Soviet encyclopedia", M., 1980, page 468. In the second case the matter "is volatilized" from of a collapses body at the expense of emitting a high-energy neutrino.

2. The Big Bang should be introduced, as the gradual efflux of matter from Protouniverse, instead of as non-recurrent event. And the efflux of matter in the beginning happens intensively, and these flows have vast energy (quasars on purlieus by the Universe), and with flow of time intensity of the efflux and the energy of flows descends before full exhaustion of energy of Protouniverse. The gradualness of the efflux of matter at Big Bang is promoted by that circumstance, that the parts of a supernucleus scatter with relativistic velocities, at which one metastable become not only nuclei of super heavy elements, but masses compared to masses of galaxies. At expansion of the Universe there is spraying supernuclei in all sides that causes peculiar velocities of the terms of a Metagalaxy and is the physical basis of the law of the Hubble (velocity of components of a Metagalaxy changes from zero point in center of Big Bang up to speed of light on its periphery).

References:

<http://www.new-physics.narod.ru>