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A Qualitative Model of the Universe

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## Introduction

It is known from the band theory of solids, which appeared due to Quantum Mechanics, that, in solids, there exist energy bands (or zones) where electrons have a definite energy in accordance with the laws of the Quantum Mechanics: these are valence bands and exclusion bands (energies which cannot be possessed by electrons). The solids are divided into conductors, semiconductors, and dielectrics by their electrical features.

If a valence band is not filled completely by electrons, then such solids are related to conductors; if between the filled and empty valence bands there exists an exclusion band lower than three electron-volts, then the solids are related to semiconductors; if the exclusion band is above this values, then we have dielectrics.

At low temperatures close to the absolute zero, some bodies reveal the superconductivity property; this phenomenon was explained 47 years after its discovery.

Studies of bodies under pressure discovered sequential changes of their quantum properties. Even though, in laboratory conditions, possibilities to increase the pressure have certain limits due to technical reasons, there can be traced a transformation of dielectrics and semiconductors into conductors. Some superconductivity properties appear which fail to exist in the normal conditions.

One can deduct therefore that there can exist a pressure under which any solid could acquire the superconductivity property.

Apart its quantum properties, the substance-matter has the gravitation property and the nucleus property, i.e., the fundamental component of the matter which also is a quantum property. At present, all the above properties are already studied both sufficiently and deeply.

**A real existence of the matter is manifested as the Universe determined by the whole complex of the properties of the matter.**

**The gravity tends always and anywhere in the Universe to concentrate the matter.**

Due to the gravity, the matter exists in the form of compact objects such as asteroids, comets, planets, the Sun (which is also a star forming the Solar system), other galaxy objects, galaxies in whole and galactic clusters, and, of course, the whole Universe.

Estimates of the electric force ratio to the gravity force as well as the magnetic field force to the gravity force are possible. The outstanding physicist P. Dirac gave an estimate of the electric force acting between an electron and a proton to the gravity force between them as follows:

$$\frac{e^2}{Gm_e m_p} \approx 10^{40}$$

This means that electric forces are greater than the gravity ones by a factor which equals the unit with forty zeros, which means that these values are practically immensurable. Now let us estimate the relation of the magnetic force to the gravity one; the results are known as Meissner effect which is the ability of a superconductivity sample to push out an externally applied magnetic field. In laboratory conditions, by means of a superconducting sample (with the mass equal to 1 kg) in the gravity field of the Earth with the mass  $6 \cdot 10^{24}$  kg we hang a small magnet in free hovering:

$$\frac{F_M}{F_G} \approx 6 \cdot 10^{24}$$

We arrive at a rather sensitive value. **This distinctive ratio of the magnetic force to that one of the gravity says that namely magnetic interaction (and not gravitational) plays a definitive role in the structure and evolution of the Universe.**

An analysis of a solid (which is the matter) leads to the conclusion that, under increasing

pressure, the electrical properties of the substance change, the matter in whole acquire gradually metallic properties and the state of superconductivity at respective temperatures. Further, the pressure is increasing up to value of condensation pressure  $P_c$ , under which the Bose condensation (BC) begins, i.e., the transformation of the matter into a macroquantum state.

If the pressure at the center of a material cosmic object satisfies the condition  $P > P_c$ , then such an object is a star; if  $P < P_c$ , then we have a planet.

This pressure cannot be achieved in laboratory conditions. However, there exists a “natural laboratory”, which is our Sun.

## The Sun

It is the nearest star available to researchers. Unfortunately, a unified theory which could answer with a sufficient completeness and without at least obvious contradictions where the solar activity comes from (revealing itself as sunspots, plages, solar bursts and characterized by periodicity and by change of magnetic poles polarity) was not yet created up to now.

The modern notion of the Sun is a white-hot gaseous sphere with every its elementary volume staying in an equilibrium state, the attraction force being equalized by gas pressure which is due to increasing temperature towards the center at the expense of thermonuclear reactions. After thermonuclear fuel will run out, the Sun will turn into a white dwarf star, or into a neutron star, or into a black hole (depends on the star's mass).

**One could have no doubts about such a future if there were no superconductivity phenomenon which is known to increase along with pressure growth.** The superconductivity reveals itself to the full extent under high pressures and is (along with gravity) a fundamental property of the matter. It is difficult to imagine that this incandescent sphere might reveal quantum properties of the matter.

A necessary condition for Sun's existence (as well as for other stars) is that the pressure in their interior was exceeding the condensation pressure  $P_c$ . In a sphere within the Sun, determined by the  $P_c$  –isobar (i.e., Bose condensation zone or BCZ), with the periodicity of approximately 11 years a dense core Bose condensation (CBC) grows accompanied by energy consumption. This leads in BCZ to a decrease of temperature and to a drop of temperature near the BCZ of the Sun. It is worth to note that the critical temperature  $T_c$  for existence of superconductivity in the interior of the Sun under pressures close to  $P_c$ , above the temperature of the neighborhood of BCZ. The presence of cause-effect relationships between solar cycles leads to appearance of a magnetic field related to originating of superconductivity.

The Bose condensation is a process within which endothermic reaction of nuclear synthesis take place in a zone determined by condensation pressure, in other words these are running with energy absorption (this is not a surprise because this is the behavior in synthesis of all elements (starting with the ferrum) of Mendeleev's periodic system. Let us consider this process in the Sun: at the BC zone, in spite of high temperature in the interior, the temperature decreases (if not to absolute zero, then to rather close value, because the thermal conductivity possesses a finite value, this defines the velocity of nuclear synthesis reactions. Outside the zone the gradient of temperature is formed, where the domain of electron superconductivity arises. In the BCZ surrounded by an electron superconductivity domain (as in a cocoon), the nuclear synthesis reactions continue up to the time of formation of a single monoatom, where nucleons are Bose-particles (paired fermions). This object possesses a high-temperature superconductivity and. as a consequence, a strong magnetic field. Thus, the saturation by energy of the Bose condensate takes place.

As soon as, while growing, CBC attains the size of BCZ, the saturation by energy occurs, this

leads to an acute increase of the temperature above  $T_c$  in the neighborhood of CBC, the superconductivity disappears as well as generated magnetic field, and only CBC's magnetic field will remain. The precipitancy of this process leads to the dividing of CBC onto the two approximately equal parts. This conducts to the afflux of plasma to BCZ. The condensation will be generated with a decrease of temperature, which in its turn supports the generation of superconductivity with the magnetic field of opposite polarity. This field will grow as long as fragments of CBC division will be pulled out from BCZ, i.e., Bose condensates into polar domains of the Sun moved by Meissner effect.

This explains how a new cycle of activity (with change of magnetic field polarity) was generated. Afterwards the superconductivity zone (along with magnetizing force) attains the maximal value which is capable to squeeze out and retain BC in near-surface regions of the Sun in a pendent state, while in BCZ new CBC continues its growth up to the saturation moment, which again conducts to the generation of a new solar activity cycle with the change of magnetic field polarity.

BC squeezed out by Meissner effect to polar domains will drift while vaporizing to equator zones, being captured by Sun's rotation. During their vaporization, BCs provoke in their neighborhoods nuclear reactions and increase of temperature, which in its turn increase the BCs' vaporization and exothermic nuclear reactions. The latter brings the locale heated plasma together with BC to their squeezing out to more external layers. The magnetic field of BC will appear on Sun's surface as sunspots, while the result of nuclear reactions appears as plages and solar bursts.

The nuclear reactions will strengthen up to the time when in BCs' neighborhoods the pressure will increase locally above  $P_c$ ; this will conduct to the cease of vaporization and nuclear reactions with a local decrease of temperature around and BC will lower to the previous level. This processes might repeat several times per cycle up to a complete evaporation of BC. Essentially, a controlled nuclear reaction takes place, which allows to the Sun to radiate energy during long time without exploding.

**Internal structure of the Sun consists of the two components which are an incandescent plasma sphere containing inside BCZ sphere, where the plasma condenses at low temperatures with absorption of energy into a Bose condensate and acquires macrophysical quantum properties which are definitive for the Universe structure as well.** All stars without exception have the same structure as the Sun has and they reveal the same activity differing only by CBC size and outside factors (close multiple systems, presence of accretion and so on).

Ideally, the stars do not explode; however, at the presence of some external factors such explosions are possible. If a star is on the stage where a new CBC is being formed in its center and near surface with latitude of 20 to 40 degrees BC are floating on magnetic-force lines due to Meissner effect, these initiate exothermic nuclear reaction by their evaporation. If by any reason BC will be pulled out to star's surface, a local nuclear explosion will take place with complete evaporation of BC. Such an explosion could be classified as a nova's explosion.

However, if nova's explosion will conduct to generation of proton-proton cycle nuclear reactions, those of carbon-nitrogen cycle, triple alpha process, and synthesis of more complex nuclei, then an explosion will happen embracing the whole star, i.e., a supernova explosion. **In spite of the fact that the surface layer will be heated up to several hundred million degrees, the interior layers will keep the lower temperature because the pressure will be above  $P_c$ ; this does not allow evaporation of CBC and BC and will help to the formation of heavy elements.** The supernova explosion dynamics ensure the synthesis of elements; closer to the explosion center, the greater are the synthesis and concentration of heavier elements. The latter will gradually settle over the cores of Bose condensates thus forming external envelopes of internal planets and to sun's surface. This leads to very large detention of solar energy radiation in a form habitual for us. Exothermic nuclear reactions taking place on the surface of Bose

condensates as the result of evaporation enrich the around ambient with light elements.

A part of star mass dissipates during the explosion into cosmic space; however, the core of Bose condensation and Bose condensates will survive at first stages after supernova explosion. It cannot be excluded that these will behave as pulsars, because they possess huge magnetic fields along with their great density. In the further development, in the result of accretion of substance transformed by nuclear explosion on CBC and BC, the rest of supernova will give life to a new star but now with a planetary system.

The analysis of matter properties and processes occurring on the Sun made is possible to clarify the presence of a **fundamental macroquantum process** which occurs in the Universe always and everywhere where a concentration of matter is present. The following two forces control the whole process; **the gravity force, i.e., attraction force** acting permanently and tending to condensate the matter, and **the repulsive force** arising as a **macroquantum effect, i.e., Meissner effect acting cyclically over definite periods.**

Their combined action looks as follows: as soon as the gravity force condenses the matter so that in a certain domain the pressure increases above  $P_C$ , Bose condensation arises with energy absorption. After a certain time this leads saturation of BC by energy and the repulsive force appearance which is incommensurably greater than the gravity force; it squeezes out BS's fragments outside the domain, where they vaporize and disintegrate revealing their activity including the nuclear one. The gravity force will condensate the matter again, then Bose condensation will take place and this leads to a cyclic process with a definite period.

**The fundamental macroquantum process** makes it possible to explain with a genius simplicity both **the structure and evolution of stars, galaxies, galactic clusters, quasars, and even planets.**

**The fundamental property of this cyclic physical process is revealed in the following: gravitational property of the matter together with the property of isotropic space are controlling not only the structure and also the evolution of the Universe, ensuring energy circulation in the Universe and allows the Universe to be a unique PERPETUUM MOBILE in agreement with the energy conservation law.**

**By its essence, the monoatom (the result of this process) along with solid, liquid, gaseous, and plasma states of the matter becomes the fifth state of the matter and is called Bose condensate  $B_C$ . The  $B_C$  state possesses proper magnetic field which disappears only after a complete evaporation of Bose condensate and is a condenser of the magnetic field energy and the nucleus energy.**

Up to now our knowledge in the universe physics were limited by black holes and singularity, while the nuclear physics is limited by black "box" with charm quarks and even below "charm" quarks. This constructions driven us to a conclusion that in investigating the Universe it does not worth to base onto theoretical works as well as not to overuse mathematical formulae. A search for the physical sense seems to be more important than the aforesaid means in the studying the Universe and this might be the single correct way of solution. The knowledge in the Solid State Physics can be a recipe for success. **It should be noted that, in the science, the matter properties are primary.**

Dwelling to the essence, it is possible to find a physical process on the base of matter's properties (solid body property) obtained experimentally without laying on any theory (we exclude a moment when the theory can be not true).

In general, in the history of the solid state physics, theories are known to appear later than the proper properties were found. The superconductivity theory arose 47 years later than this property was discovered; and this case is not the unique one.

## The Earth

Fundamentally, this is the birth of the solar system. A long time will pass before the Sun will start to emanate energy stably. Now we can certainly state that the magnetic field of the Earth is nothing else but a macrophysical quantum manifestation of BC. Besides of that, BC is responsible for Earth activity. Bose condensate during its evaporation during Earth's existence led to expansion of the Earth by approximately three times, which led to the appearance of the oceanic and ground crust. The principal element of evaporation is the hydrogen. Entering in regenerative reactions, it heats earth interior, responds for volcanic processes on the Earth and for formation of oceans, for formation of hydrocarbon crude in Earth's interior. A complete evaporation of Bose condensate will lead to the cease of active phase of Earth existence, the magnetic field (the main protector of the intellect life on the Earth) will disappear. In contrast to the Sun, where the BC evaporation provokes nuclear reactions, BC's evaporation in earth conditions takes place less intensively, under much lower temperatures, this mainly leads to chemical reactions.

Let us estimate the value of the condensation pressure  $P_c$  under which the growth of BC takes place. The magnitude of  $P_c$  lies in a range which is smaller than the pressure at the center of the most small star (red dwarf) but greater than the pressure at the center of the Saturn planet. Of course, this is not related to those almost fantastic pressures usual for astrophysicists at present time. The density of CBC might vary in a wide range in dependence on the size of BCZ, but it never reaches the nuclear density (the term appeared due to Academician Landau). In the present approach CBC is an energy substance which is formed in contrast to gravitational interaction, with absorption of energy that does not allow to the Universe to fall in a singularity.

## Galaxy and Galactic clusters

As early, as before twenties of past century, astronomers had no idea about distances and positions of elliptic and spiral galaxies. Only in 1923 E. Hubble distinguished successfully Andromeda Nebula into separate stars and determined that it is situated outside the limits of our Galaxy and represents a large stellar system, i.e., a galaxy. Thus, a new huge galactic world become the objective of studies. Galactic world turned to be surprisingly huge, but even a greater surprise was the variety of its forms. By their appearance, these can be divided into the three types:

1) Elliptic ones which have the form of regular circles or ellipses, whose brightness smoothly decreases to their periphery and their appearance says about their static character, their stationarity.

2) Spiral ones which are the most picturesque objects in the Universe and manifest dynamical forms. Their beautiful branches coming out from the central core with their shape vanishing and loosing shapes outside galactic boundaries indicate a powerful and quick movement.

3) Non-regular galaxies are related to objects without a distinct core and without visible rotation symmetry. In addition to the galaxies of the three types indicated above one can indicate also some transitory types (from non-regular galaxies to elliptic galaxies and from elliptic to spiral galaxies). Another striking thing is that all types of galaxies possess sizes from giant to dwarfs.

As concerns the distribution of galaxies in space, it was established that galaxies concentrate to clusters, that the distance between clusters is about 40 megaparsecs. This value is a characteristic meaning of the heterogeneity scale in the Universe. At scales above 40 megaparsecs the Universe is homogeneous and no hierarchic structures (except for galactic clusters) can be observed there.

In addition to stars, Bose condensation zones exist in the structures of galaxies and

galactic clusters determined by gravity property of the matter, at centers galactic clusters, in galactic cores, at centers of spherical clusters.

As concerns galactic cores, in the whole world these attract very large attention. This is related to the search of black holes and is well described in the work by Anatolij M. Cherepashchuk "Search for Black Holes". The results of observation of galactic cores are in good agreement with the Bose condensation zones present there.

The General Theory of Relativity (GTR) by Albert Einstein predicts black holes as a relativistic domain in the asymptotically plane space-and-time, from where no any causative signal can go out to the light infinity of future. In other words, a black hole is a domain which cannot communicate in a bidirectional form with the external Universe, because the second cosmic velocity for it is equal to the light velocity.

At the present time in cosmology (studying properties of the Universe in all its "available" part, considered as something integer), there exist two main directions (which are far to be of an equal worth as concerns the quantity of adepts). The first group unites adherents of cosmological models based on TGR, while the second group consists of adherents of the "stationary Universe". Both concepts are starting with the assumption that the large-scale structure of the Universe is same everywhere and for all directions: in other words, the Universe is supposed to be homogeneous and isotropic. The concept of "stationary Universe", on one hand, stays on so low level of development that the majority of physicists and astronomers continue to meet it even antagonistically; the second reason is the magnitude of both GRT and Einstein – this turns the adherent of the first conception into "blackholists" charmed by singularity. AT the same time, as long as already 95 years the adherents of cosmologic models based on GRT are talking nonsense, a rough scientific error is accomplished since **it is impossible to construct any model on the basis of a single and one property of the matter even if this were a fundamental one (as the gravity is indeed), because we would be obligatorily charmed by large explosions, singularities, and black holes. One must necessarily take into account other properties of the matter as well.**

In 1911, five years before the publication of FRT, the superconductivity property was discovered, being one of the most mystic phenomena of those times; a thorough study of this phenomenon started with experiments using magnetic fields, pressure. To the property that at temperatures near the absolute zero the electrical resistance of some metals vanishes the second principal property of superconductivity was being added – in 1933 it was discovered that a superconducting body expulses a magnetic field applied from exterior, this is known as **Meissner effect**. It is also known that under action of high pressure on solids their electrical properties change up to appearance of superconductivity. Unfortunately, one cannot increase limitlessly the pressure in laboratory conditions. So, the question arises: what should happen further? All material things should acquire a superconductivity property. However, pressures of that level might exists only in the interior of stars at high temperatures.

A condition for existence of superconductivity in interior of stars was considered on the example of the Sun, which might make it possible to explain for the first time the properties and processes going on Sun's surface without "artificially chafed ends".

In their major part the galaxies have in their central domains concentrations of stars, gas, and dust which are used to be called cores and which are perfectly observable in spiral galaxies (though are hard distinguishable in irregular galaxies).

The Bose condensation zone (BCZ) in galactic cores is formed at the expense of absorption of stars, stellar systems, and gas, and also due to radiation. BCZ of galactic cores grows due to permanent arrival of "constructive materials". This is why no saturation of the core of Bose concentration (CBC) happens. The saturation might take place if the energy component will exceed the arrival of material component, i.e., within deceleration of cease of BCZ growth. The arrival of energy component cannot be ceases and it permanently grows along with growth of BCZ.

CBC after saturation will undergo (as in the starts' interior) to division, it will be expelled

from the galactic center due to Meissner effect and will be observable as a radio-galaxy at initial moment and will turn into a spiral system of young stars. A part of the expelled fragment can be observed as irregular young galaxies which are satellites of “mother” galaxies. In our Galaxy these are the Large Magellanic Cloud and Small Magellanic Cloud. There exists a large probability that on another shoulder of blow-out an irregular young galaxy also was formed similar to LMC and SMC.

BCZ can be recognized in galactic cluster, where CBC attains saturation. This process results in blow-out that turns initially into a giant radio-galaxy, which boggles the imagination of astrophysicists. Further the radio-galaxy is fragmented onto irregular young galaxies varying from dwarfs to giants. Thus the cluster is lighted by the young stars’ light, turns thus younger, acquires a more active form and increases its size like a firework. As the result of evolution, irregular galaxies turn into elliptic ones, which in the result of CBC saturation and blow-outs in galactic cores will generate radio-galaxies of smaller sizes; the later will further turn into spirals of spiral galaxies. Meanwhile, at the center of cluster a new BCZ will born and start to grow, where CBC will saturate itself by energy and afterward saturation the cycle will be repeated with a period of several tens of billions years. **In the evolution of galactic clusters, complete dynamical processes can be traced due to fundamental properties of the matter such as gravity, superconductivity, and Bose condensation.**

Galaxies with active cores are used to be subdivided to four types: Seyfert galaxies, radio-galaxies, lizard galaxies, and quasars. All of their characteristics are known and comply rather satisfactory with the frameworks of the present conception.

“Radio-galaxies” do not have an immediate relation to active cores, these are simply a certain stage in the evolution of both galaxies and galactic clusters. In both cases, after saturation, fragments of Bose condensate BC after expulsion from cores form long branches which are vaporized passing through the transformation of Bose particles into Fermi ones. Fragments of BC, which are carriers of powerful magnetic fields, saturate the branches no strong magnetic fields on the background of the evaporation of BC takes its place. During evaporation BC (a superconducting liquid) comports itself as a liquefied gas which vaporizes with energy absorption; the energy thus become deficient in the long branches.

Under various conditions BC vaporizing leads to different results. In the interior of the Sun, where the energy is sufficient, intense evaporation leads to an increased concentration of neutrons in the neighborhood of BC; this provokes nuclear reactions. In the interior of the Earth, i.e., at the source of magnetic field, evaporation is extremely slow due to difficult energy influx into the center because of surrounding ferric envelop. As a result of the evaporation, the hydrogen mainly appears, which be entering into chemical reactions in earth’s interior generates water, heated internal parts, and synthesizes organic natural resources. The evaporation process continues more than four billions years, while on the Sun it takes only some 11 years.

In long branches the evaporation process of BC starts slowly, it goes and gradually covers the concentration of BC by evaporation products. Gradually conditions are created for nuclear and chemical reactions in presence of strong magnetic fields that transforms the branches into powerful sources of radio emission. Further in the branches stars born from BC and it becomes visible in optic range as well as spirals. Both galaxy and galactic cluster are developing in their evolution cyclically. At the start of a cycle, a blow-out takes place with matter dissipation into a more disperse state in the space due to a complex combination of properties of superconductivity and Bose condensation. The gravitational property always tend to matter’s accumulation in a more dense state in the space. The combination of these three components leads to the cyclic character in evolution of these objects. At the end of a cycle, where CBC is not eat saturated, it continues to grow along with its magnetic and gravitational fields under rather dense concentration of stars and other objects which form tight systems close to core domain. Any cataclysms should be expected related to the activity of cores of galactic clusters and galaxies, including Seyfert galaxies, lizard galaxies, and quasars. It should be also not lost from the mind that all processes are going in the magnetic field of CBC. No doubts, from the power of quasars’

emission one can deduct that the processes go in active core of galactic clusters, which by its size attained in evolution a volume not too larger than that of a giant galaxy.

Let us consider the evolution of a spiral galaxy. Spiral branches are rotating not in vacuum but in space filled by radiation of density  $\rho_1$ ; in that case, the rotation of each element of branches is equivalent to the motion in an infinite isotropic space, which leads to lowering of the motion. External part of spirals draw large circles with respect to interior spirals and this leads to a greater lowering. Spirals are gradually curl with reduction of their size and turn within their evolution into a ring and then a lens. Thus, a reduction of galaxy volume takes place as a result of evolution. The galactic clusters and other objects of the Universe behave similarly.

Nobody in the scientific world found that the key to answering the Universe mysteries lies just in front of an observer, it is in the processes going on the surface of our star, which is our Sun. People thought the answer is on far ends of the Universe. From the fact that superconducting state depends on pressure it followed that the superconductivity exists on the Sun in spite of existing temperatures. It turned clear that, in the central domain of the Sun, a powerful "refrigerator" exists because monoatom's condensation takes place, which is an energy condenser with energy absorption. This creates conditions for superconductivity existence in the neighborhood of the monoatom along with high pressure coupling fermions, transforming them to bosons, and transforming the monoatom into Bose condensate. Thus, the energy condensation takes place not leading to creation of black holes in the Universe.

## Large-scale structure of the Universe

The space of Universe should be considered as an energetic space where the energy exists as electromagnetic waves and in condensed form as the matter.

In 1959 – 1960 in the Harvard University, Pound and Rebka proved experimentally that electromagnetic wave can gravitate as the matter does, the change of electromagnetic frequency was discovered in gravitation field and this phenomenon brought them the Nobel prize.

The fact that the energy possesses a gravitational property can be easily seen in a powerful laser beam. Within the propagation of the beam its self-focusing takes place, within certain intervals of distance the thickness of the beam attains thin minimal size, passing gradually from its thick size, as if it were pulsing. This can be explained by the gravitational force acting inside the beam.

The Universe space is known to be filled by isotropic emission and emission of galactic clusters, which are situated in the space as islands.

"...it seems to me that if the matter of our Sun & Planets & all the matter in the Universe was evenly scattered throughout all the heavens, & every particle had an innate gravity towards all the rest & the whole space throughout which this matter was scattered, was but finite: the matter on the outside of this space would by its gravity tend towards all the matter on the inside & by consequence fall down to the middle of the whole space & there compose one great spherical mass. But if the matter was evenly diffused through an infinite space, it would never convene into one mass but some of it convene into one mass & some into another so as to make an infinite number of great masses scattered at great distances from one another throughout all that infinite space." This is an excerpt from the Newton's letter to Richard Bentley, dated 10 December 1692.

In 21<sup>st</sup> century, the science can answer confirming "Yes, the matter is evenly scattered throughout the Universe in a such manner that if one takes two equal large volumes of the Universe space, then these have equal masses and that the Universe is homogeneous and isotropic." The real structure of the Universe behaves so that it can be imagined as a homogeneous isotropic space. The most amazing is that Newton deducted this by his own mind – in 17<sup>th</sup> century and up to 20<sup>th</sup> century no conceptions on the large-scale structure of Universe existed.

Let us consider the motion of a material point of mass  $m_1$  in a homogeneous sphere of finite size and of density  $\rho \neq 0$ . The initial conditions are following: the mass  $m_1$  starts the motion from the sphere's center, possessing the kinetic energy  $T_0 = \frac{m_1 v_0^2}{2}$  insufficient for reaching the boundary of the sphere and  $c \gg v_0$ .

Following the Gauss theorem for Newton potential, upon the material point  $m_1$  at any moment of time  $t$  only the mass  $m_1$  which is inside the sphere of radius  $r_t$  defining the position of  $m_1$  will act; moreover, this action will be as if this mass were positioned at the center of the sphere:

$$F_t = -\frac{m_1 M_r}{r_t^2} = -\frac{4\pi\gamma\rho m_1}{3} r_t \quad (1)$$

Here  $\gamma$  is the gravity constant;  $M_r = \frac{4\pi\rho}{3} r_t^3$

At the moment where the kinetic energy of  $m_1$  will reach  $T=0$ ,  $m_1$  will be at the distance  $R$  from the sphere's center, and the potential energy will reach the value  $P_R = \frac{4\pi\gamma\rho m_1}{3} R^2$ . Following the law of energy conservation, for distances  $r=0$  and  $r=R$  the equality is valid  $T_0 + P_0 = T_R + P_R$ , where  $P_0 = T_R = 0$ . Now

$$\frac{m_1 v_0^2}{2} = \frac{4\pi\gamma\rho m_1}{3} R^2 \quad (2)$$

can be reduced to the form

$$v_0 = \sqrt{\frac{8\pi\gamma\rho}{3}} R \quad (3).$$

Extend the sphere to infinity so that the center of the sphere remains stationary and  $\rho$  remains constant.

In accordance with the Gauss theorem, in this case, equalities (2) and (3) will be valid as well for a **homogeneous  $\rho \neq 0$  isotropic infinite stationary space**. In what follows we will use an  $X$ -space

Since the infinity of the  $X$ -space means the parity of all points of the space, it follows that any point is a center of the space.

As soon as a material point  $m$  will exhaust the kinetic energy, it will appear that it has no place to fall down and therefore the notion of potential energy will vanish. The expression for potential energy in equation (2) will be defined as the energy in an interaction of the particle with the space.

The physical sense of the equality (3) in the  $X$ -space means that to cover the distance  $R$  the material point  $m_1$  must have the initial velocity  $v_0$ . We give to the equality (3) a general view

$$V = HR \text{ is the Hubble law,} \quad (4)$$

where

$$H = \sqrt{\frac{8\pi\gamma\rho}{3}} \text{ is the "Hubble" constant.} \quad (5)$$

If at any point of the  $X$ -space a perturbation arises with a velocity  $V$ , then the complete attenuation of the perturbation will take place by Hubble law at a finite domain defined by the radius  $R$ .

The electromagnetic radiation is also subject to attenuation in the  $X$ -space. Make replacement in the equation:

$$\frac{mV^2}{2} = \frac{H^2}{2} R^2 m \quad (6)$$

$m = \frac{\hbar\omega}{c^2}$ , while  $\frac{mV^2}{2} = \hbar\omega$  is transformed to the equation (6)

$$R = \frac{c}{H} \sqrt{\frac{2\omega}{\omega}} = \frac{c}{H} \sqrt{2} \quad (7)$$

Equation (7) has the physical sense: there exists a horizon for electromagnetic radiation, which is a distance after which an observed cannot acquire any information. The electromagnetic radiation propagates by the law

$$r = \frac{c}{H} \sqrt{\frac{2\Delta\omega}{\omega}} \quad (8)$$

where  $c$  is the light velocity,  $\Delta\omega$  stands for frequency red shift,  $\omega$  is the initial frequency of radiation.

If at any point of the  $X$ -space a perturbation arises with the velocity  $V$  or an electromagnetic radiation  $\omega$ , then the complete attenuation of the perturbation takes place on a finite location defined by the radius  $R$  in accordance with equations (4) and (8).

The notion of the  $X$ -space is defined not by a scattering of the real structure of the Universe upon a homogeneous density, from the idea that a real structure behaves in large scales as an **absolute, homogeneous with density  $\rho \neq 0$ , isotropic, infinite, stationary space** and is the principal property of the Universe.

Let us consider the real structure of the Universe. **The dynamics of galactic clusters is described by Kepler and Newton laws.** consider the interaction between clusters without violating the entropy of space. For each cluster, the following expression of gravitational interaction with other clusters is valid

$$\sum_2^{\infty} \vec{F}_{1n} = 0 \quad (9)$$

Its physical sense means that gravitational forces in the construction of large-scale structure of the Universe fail to work. This fact is a necessary condition for space isotropy.

Let us consider a sufficient condition for space isotropy. Galactic clusters are in a space filled by electromagnetic radiation. Every cluster applies a gravitational interaction over the radiation is such a way that the radiation density around the cluster is smoothly decreasing outside the limits of cluster. Between the cluster and close vicinity of clusters a domain forms surrounding the cluster with minimal radiation density; this leads to appearance of stable equilibrium state of the cluster; this is valid for every cluster in isotropic space. If by any means a displacement of cluster from the equilibrium position will happen, immediately a force arises proportional and transverse to this displacement; the latter leads to a **self-regeneration** of isotropy. Let us call denote this transverse force by  $F_P$ . The state of stable equilibrium for clusters arises only if the gravitational force  $F_\gamma$  proportional to  $l^{-n}$  appears

$$F_\gamma \ll F_P \quad (10).$$

Here  $l$  is the distance between the nearest clusters,  $n \gg 2$ . The forces  $F_\gamma$  and  $F_P$  appear only

with a local violation of isotropy of space, which might happen only under influence of strange forces on galaxies (a weakly probably factor). Internal forces arising in the galactic clusters do not lead to isotropy violation if only a significant surge prominence of Bose condensate BC would happen, which will leave the cluster's limits (also a little probable event). An insignificant surge prominence might make the cluster to oscillate in small range around the stable equilibrium state position.

The fact that every **galactic cluster has a stable equilibrium position in the space is a fundamental property of the Universe and a sufficient condition for space isotropy.**

The Universe represents a similitude of an infinite crystal in the nodes of the crystal matrix of which galactic clusters are situated. It implies a conclusion that the Universe is also stationary and is an absolute space.

We thus derive that the conclusions represented for the  $X$ -space are valid also for the real Universe. **The dynamics of the Universe is limited by boundaries of galactic clusters, it represents in the whole an infinite, homogeneous, isotropic, absolute, stationary space; and the Universe was same forever.**

For an observer situated in any point of an infinite space, its visibility is constricted by horizon (7). In front of this horizon he will find the radiation with an increasing frequency, i.e., isotropic radiation, which is limited only by the resolution features of the investigator's tools for separate objects whose red shift will decrease along with decrease of the distance to the observer up to the usual visual observation.

Hubble in twenties of 20<sup>th</sup> century interpreted the red shift of galactic radiation as their escape with a certain velocity. By considering the Universe as an infinite space, we observe the red shift of radiation as the influence of gravity factor on the propagation of radiation in space with the loss of energy, independently of directions.

In any finite space (no matter is it stationary or expanding), the action of gravity factor on the radiation leads to both red shift and blue shift of radiation for some directions. In the expanding Universe one cannot interpret the red shift as Doppler effect factor without taking into account the gravity factor action on radiation propagation.

Hubble's conclusions on that the red shift, which results from Doppler effect, do not correspond to reality and were made without taking into account the space influence on the emission propagation which is present in any case except for the case where space density is  $\rho = 0$  that does not correspond to the reality. It is necessary to take into account that condition  $\rho \neq 0$  embraces both material and energy components of the space.

Let us recall Newton's words that are "...for Nature is pleased with simplicity, and affects not the pomp of superfluous causes". This should be treated by our opinion as the Universe must be simple as well.

Let us consider a remarkable process taking place on the Earth. The water accumulated in oceans is evaporated and transferred as clouds which slop over surface as rains forming on grounds lakes, rivers above the ocean level and thus creates the conditions for life. It is called hydrologic cycle without which the existence of a human-mind were doubtful. Analogously, an **energy cycle exists in the Universe.** One should remember firmly that the energy does not disappear and does not arise but passes from one its form to another, while the matter is a similar form of the energy.

"Entropy postulate" by German physicist R. Clausius or the second principle of thermodynamics laid the foundation to one-and-half century discussion on a heat death of the Universe. The law is simple: the heat cannot pass from a colder body to a warmer one. This leads to the situation that bodies exchanging heat without producing a mechanical work are gradually turn equal by temperature, a "death stage of inertia" is finally attained, where changes are not possible as well as processes and this leads to a dying world. Not a very nice prospective though. Stoletov, Timiryazev, Vernadskii were convinced that there is an reversibility in the Universe, but have no tools to prove it.

**It turned out that the reversibility indeed exists and is in the circulation of energy in**

**the Universe, and objects like galactic clusters in their evolution represent such a circulation.** The gravity force always tends to concentrate maximally the matter, where Nose condensate is forming absorbing quickly up to a saturation. Afterwards fragments of BC are dissipated thus renewing a galactic cluster which starts to emanate with a new force the energy into the space. This leads, under certain conditions, to the **appearance of human-mind without which the existence of the Universe would lose any sense.** The existence of a higher reason is a vanity as the whole life of a man. Thus, the **Universe exists being a wonder not made with human hands.**

Nobody and never anybody on our planet could yet solve the Universe mystery, find a key to open its structure. **This discovery is not a standard one and is not an ordinary one, it does not fit in standards' frameworks invented by scientific leaders.** The knowledge that the matter's properties are determined in the great part by the change of acting pressure led to the question: what happens in the interior of the Sun? Signs of superconductivity existence which participate in forming magnetic fields on the led to obligate question: how the superconductivity is formed on the Sun? The answer turned to be elementary simple. It is necessary that, under pressure greater than the condensation pressure, endothermal nuclear synthesis reactions start with energy absorption, which **perfectly explains physical processes taking place on the Sun.**

**Any scientific thesis is correct if it explains also other processes. 1. The conception by Viktor A. Ambartsumyan is explained. 2. The structure and evolution of the Universe are explained.**

In 1958, in Brussels, on Solvay Congress the great astrophysicist Viktor A. Ambartsumyan formulated from observed data an important thesis on activity of galactic cores, without concrete indication of the mechanism of such an activity and postulating that there are data that testify on creation of new galaxies and spiral branches at the expense of substance included to galactic cores.

By our opinion, on a meeting on galactic cores which took place in Roma in 1970 the question was stated on what **concept** should we base in further studies: that of **Ambartsumyan** or that of **Big Bang**? There arose a discussion on sufficiency of the modern physics in its ability to describe galactic cores and quasars; Ambartsumyan and Hoyle regarded that means as insufficient, other specialists concluded "there are no a convincing testimony that the limit of the ordinary physics are passed over; however, many phenomena up to now cannot be adequately explained", and they were right. **The question about concept remained open.** If this work appeared in that period, we already forgot about black holes, singularities.

In addition, a **universal physical process** in the Universe is discovered, which completely explains both the structure and evolution in the Universe. I am deeply convinced that **this fundamental physical process cannot be hidden by any mathematical formulae.** Indeed, a **revolution took place in physics, without taking into account the fifth state of the matter nuclear physics is not possible,** however, this is another theme. The present work should draw an attention even if it only proved inadequacy of the Bag Bank theory, which is a scholastic dogma with its ghostlike black holes and singularity. Kanerlingh Onnes, the discoverer of superconductivity in 1911, could not even imagine that he staid at the source of the knowledge not only of the Universe, but the nuclei physics. We succeeded in finding a way to solve the complicates problem in the human history which is the **structure and evolution of the Universe**, a problem which was thought to be unsolvable. The present paper give a way to crate a more serious work, named "**General Theory of the Universe**" by efforts of the whole world in the nearest future and not sometime and somewhere. Probably, I will have a pleasure to see this moment as the result of 34 years of my work.

September of 2010, the Large Hadron Collider brings us a surprise not explicable in frames of conception existing among nuclear physicists. As a result of bombing f a lead target by heavy nuclei, in analyzing tacks (the result of such a bombing), some tracks appeared which were not observed earlier. Tacks trajectories prefer to appear in couples as if particles were

connected to each other. This phenomenon is perfectly explainable within the concept of Bose condensation.

In a collision of two nuclei, their merging happens and it says us on a sufficient energy for local increase of pressure above and sustain Bose condensation which goes with energy saturation. This implies that Bose condensation might happen in dynamical processes as the nuclei collision is under sufficient energy of collision. However, the local pressure is quickly discharged below which leads to an immediate evaporation of BC; however, Bose particles undergo evaporation, while after evaporation these take the form of fermions. After decay of Bose particle two fermions are formed, their expansion trajectories will be parallel. All the above stated confirms that the Large Hadron Collider is indeed LARGE.

$P_c$  is the pressure of condensation

$T_c$  means the critical temperature

BCZ stands for the Bose condensation zone.

CBC denotes the core of Bose condensation

BC stands for Bose condensation

GTR is General Theory of Relativity

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