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ABOUT RECESSION OF GALAXIES

cosmological essay

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(second edition[1], revised)

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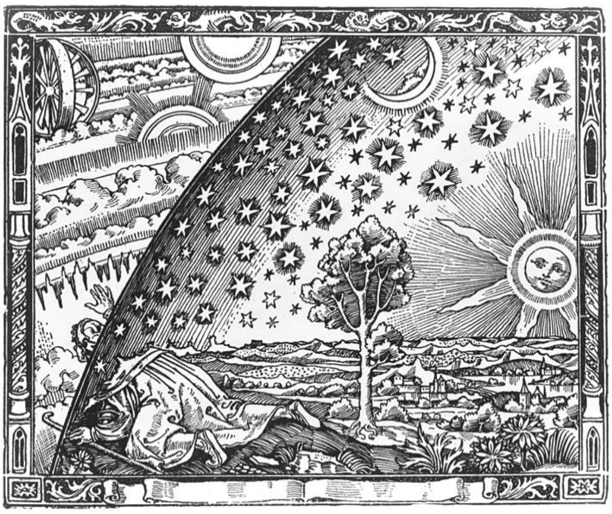

Vintage engraving

But the Emperor hasn't got anything on!- a little child said.
H. C. Andersen

Abstract. In this paper, we consider the mechanics of galaxies recession based on the postulate of the effect of gravity on them, as the only possible interaction at intergalactic distances, and this makes a more adequate representation of the observed galaxies. It is determined that each galaxy after its birth outside any center with zero speed, is subjected to a stable influence of gravity, while the duration of this influence for each galaxy is naturally limited and the acceleration of the galaxies is variable. After the acceleration ends, each galaxy moves by inertia at its own acquired speed. For these reasons, the recession of observed galaxies is described by variable Hubble parameter. Cosmos grows from outside and its flat three-dimensional space does not expand. When considering the latest discoveries by astronomers of distant galaxies, the possibility of observing only old galaxies has been established.

Along the way, the development of the topic allows us to reduce to trivial explanations such parameters that are still difficult to explain within the framework of the existing paradigm, such as the spongy structure and spatial uniformity of the cosmos, the origin of galactic filaments and voids, the impossibility of observing the young galaxies as well as developed ones and other astronomical entities and phenomena. The work uses the results of the theory of the Big Bang, namely for the phase transitions of matter from a time of 10^{-43} seconds to billions of years.

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1. Introduction. The earliest phase of matter at the time of the birth of the universe according to modern views, firmly based on laboratory data, is recognized as quark-gluon plasma, the earlier phases are assumed. Currently, the theory of Big Bang recognizes more than a dozen phase states of matter (this can be found everywhere in the Internet), and this is far from the limit, the limit is only in the energy possibilities of cognition of hot plasma. Within the framework of the Big Bang theory, these processes, starting from stellar structures, are known closer to the limit of 10^{-43}sec. And these phase transition are fully recognized by us.

Modern string theory partially removes the problem of the original matter at the birth of the universe **[1]** and makes it possible to describe the original matter itself, but the possibility of string theory to reduce the multidimensional space of the original matter to a three-dimensional space has not yet led to any unambiguity **[2]**. With all these successes, the explosion itself as the cause of the scattering of galaxies in cosmology persists[2], despite all the well-known shortcomings of the reconstruction of the universe born as a result of the Big Bang. And that require either the presence of additional hypotheses[3] or to be kept silent. One of the weak postulates of the Big Bang is the singularity[4], in the volume of which, to explain the observed recession of galaxies from one point, it is necessary to squeeze the entire universe. The relationship between general relativity and quantum mechanics has its own, less grandiose singularities, in which it is not entirely clear how to understand matter, time and space. Recognizing the existence of the universe at 10^{-43} seconds after its birth with the parameters of density of 10^{97} kg/m^3 and temperature of 10^{32} K, it is not necessary to recognize its volume, correlated with the Planck discrete of 10^{-35} m. According to Occam's razor principle, the idea of the existence of any initial matter (as hot as possible and as dense as possible) not in the form of a singularity, but in its inherent, most likely distributed state, is more acceptable than the idea of the existence of the same matter, fantastically compressed to the minimum imaginable size. If we do not limit the volume of the original matter, then its theoretical justification is quite possible – for example, in the form of a quantum field developed by theoretical physicist Ray Fleming.

According to modern views, one of the early phases of the existence of the original matter at the birth of the universe is assumed to be the matter of the Planck epoch **[4]**, since it is expressed in digital form, and not in the form of assumptions.

To justify the proposed purely theoretical development, it is assumed that all galaxies (not only observable ones) form a spherical three-dimensional *cold cosmos*, and around it there is a *hot shell*. The hot shell is spherically layered and from layer to layer undergoes several phase transitions **[5]**, more or less studied in the framework of the Big Bang theory, with the parameters of each layer unchanged. The inner layer of the hot shell is the coldest, and its outer layer is the hottest and is in contact with the initial matter. All the layers of the hot shell move outwards in a coordinated normal, forming new layers of the cosmos behind them. In the outer layers (initial phases) of the hot shell, a new mass is constantly being born. High-energy particles also have a gravitational charge. Under their summary attraction, the galaxies of the cosmos first accelerate, and then move by inertia.

With the existence of the hot shell around the cold cosmos, it becomes possible to justify the recession of galaxies by the only possible interaction at intergalactic distances namely the gravity.

You can arbitrarily be skeptical of the proposed reconstruction of the universe and its parts, but in its results it is more convenient, harmonic and more natural than unassailable conventional Big Bang theory [**6**],[**7**], whose protection by the bugbear of decayed negatives like creation a perpetuum mobile is actually something banal.

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[2] For example, conformal cyclical cosmology by Penrose and Gurzadyan **[3]**.

[3] Such as the hypothesis of initial non-homogeneity spectrum, the hypothesis of inflationary expansion, the hypothesis of four-dimensional space of the Universe, the hypothesis of dark energy, inabsorbtivity of microwave background radiation etc. The further in time the BV theory exists, the more additional ad hoc hypotheses, some kind of layering of additional hypotheses.

[4] The singularity was needed just as the geometrical point of recession of galaxies. The singularity should be transformed somehow for the recession to take place. The bang explains a little except the incomprehensible demonstration of recession and complicates the cosmological model.

2. Genesis. Hot shell. *Let's assume* that before the birth of the universe the initial matter having a multidimensional space **[1]** extends without. *Let's assume* also that in the moment of the birth of the universe some small region of the initial matter suffered the fluctuation that is spontaneously suffered the phase change. The matter of fluctuations is more stable because of its lower energy. So the single act of initial matter fluctuation could produce the self-maintaining process like spherical front. *Let's assume* also that this self-maintaining process continues on spherical surface of the formed cold region – future hot shell and further the cosmos – and the front of transformation of initial matter to hot shell moves outward along the normal to the surface of this region[5]. The velocity of this front isn't the velocity of any particles but the phase velocity of the process. It might be more or less but to set out better this velocity is equal to the light velocity[6] **c**.

Is the real existence of such a shell possible? To answer this question, we will change the concept of the Big Bang, which is largely recognized by us, in two of its aspects: 1 - the point of origin of the universe was not singular, i.e. did not contain the entire universe, 2 - the birth of the universe was not a one-time act, but once started, then continues continuously. These points are in agreement with the opinion of F. Hoyle, who was very skeptical about the Big Bang (BB) **[6]**.

So at 10^{-10} s after beginning the glowing globe having undergone several phase transitions had the radius of 3 cm. More glowing initial matter is situated outside the glowing globe. Inside the hot shell being born in accordance with BB theory the cooling of the matter takes place according to hyperbolic law. In our case the nearer center the cooler the matter (in the case of BB the later the cooler matter is in all the space). In this example (and forever) the time of transformation of initial matter at the edge of the universe is conditionally equal to zero (approaches to zero) and the time from the beginning for the center of the universe is already 10^{-10} s and this is the age of the universe at the moment. The temperature and the density of the matter change in congruence with such time distribution along the radius. In the center of the universe at the moment of 10^{-10} s (the end of lepton epoch) the matter consists of free quarks and anti-quarks, leptons and photons and has the temperature of 10^{15} K and the density more than the density of atom nuclei. That is these parameters in the center[7] are always essentially lower than those at the edge where they are metaforically too much.

In general, the universe is suitable to be divided by its phase states to cold and hot one. In the cold universe (cosmos) such phase states are possible as solid, liquid, gas and plasma, and the observed cosmos (metagalaxy) is situated in the middle part of the cold universe. First three phases are impossible in the hot universe (the shell).

Phase transitions of the matter in hot shell in its complete form take place in accordance to the BB theories **[7, 8]** but one essential difference occurs, namely the processes don't follow one other in all the shell. Vice versa all these processes take place simultaneously with space separation along the normal of the hot shell. That is the early hot globe consists of some spherical layers (or eras like in the BB theory) different by phase state of the matter. The temperature and the density decrease towards the center with well-known hyperbolic law of the Big Bang model. In other words qualitatively different matter of the hot globe is located in spherical layers embedded one into other that is the matter in every internal layer is not only colder but is characterized by other phase state. The formation of the hot shell is finished when the temperature in the center decrease to hundreds Kelvin grades and then the formation of the cold cosmos begins inside the shell. At the time scale this was one million years after the beginning of the universe "creation" when the radius of the outer sphere of the layered hot shell reached one million light years. Close to the end of this period the center of the universe had been cooled so much that the atoms of hydrogen and helium have been generated.

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[5] Like phase boundary between the crystal and the melt.

[6] The velocity cannot be less than 0,1**c** otherwise the dimensions of the universe should be less than its visible dimensions.

[7] The center might include a set of some centers situated in different places and times but they unite into some general center at some time. The term "the center of the universe" is just the abstraction analogous to the term "mass center" because the universe must have its mass center. Introduction of the term "center of the object" makes the object finite.

The most inner phase of the hot shell ended in the center but the hot shell itself continues moving outwards with the light velocity. And further the layered hot shell forever exists as a stable formation with the width of one million light years and with stable dimensions of the layers and processes in the layers. Just the radius of the hot shell increases with the time but its surface density retains constant.

So, like in the BB theories, the gravity had been separated from other interactions at 10^{-43} – 10^{-42} s and a bit later some particles have acquired the mass with participation of the Higgs boson. The matter in the form of mass is just beginning to appear at this moment. Further the strong, weak and electromagnetic interaction following the gravity will be separated to independent fields with their own set of phase states of the matter. But according to the BB theory all these processes take place once at a time and the separating of the fields and the transformation of the matter occur at once in all universe that is the mass of the universe after the bang of the singularity is constant because all the matter was condensed in the singularity. According to the model proposed the birth of the universe has the begin but further the birth of the universe constantly takes place at its edge that is the mass of the universe and its dimensions constantly increase from the moment of its birth.

3. The gravity of the hot shell. Beyond the last layer of the cold cosmos namely the layer of the of hydrogen and helium the layer of recombination of light nuclei and electrons is situated, further the layer of the synthesis of light nuclei and so on to the matter appropriate to the time of 10^{-43} s, that is close to the edge (begin) of the constant birth of the shell. All these layers inside the elemental solid angle interact by the gravity and suffer photon (and similar to it) pressure.

To answer the question how the galaxies gain the velocity it's enough to monitor in first variant the gravitational interaction between the layer of hydrogen-helium clouds and all outer layers and in second variant the layer of primary synthesis of the nuclei following that of light nuclei recombination and all outer layers. For the second variant the mutual attraction to the outer layers is suffered but *presumably* the layer of nuclei synthesis doesn't gain the notable velocity because its lifetime in the hot shell is limited by some minutes. The layer of hydrogen-helium clouds is not the case. Its density is very small and it doesn't suffer the pressure of photon radiation because hydrogen-helium plasma is untransparent for photon radiation. And the gravity affects this layer for more than one million years and consequently the velocity gained by hydrogen-helium clouds would higher. Therefore the layer of the clouds after its birth suffers (in the limits of an elementary solid angle) the acceleration caused by the attraction to the hot shell and gains the notable velocity.

To consider the acceleration of galaxies (clusters of galaxies) the affect of the cosmos and that of the hot shell on the galaxies might be treated separately as a first hypothesis. The affect of idealized hot shell might be considered at this condition, for example the affect of some layer of the hot shell reducing its phase transformation and transition to the later layer and further generation in outer region of the hot shell to simple geometrical movement relative to the center containing its average density. In accordance to the BB theory all velocities and accelerations directed from the center are considered as positive. Using the term "hot shell" one should separate the hot shell from new cosmos that is generated just after the hot shell "had passed" as a first hypothesis. This cosmos doesn't move as a first hypothesis whereas the hot shell moves at a vast velocity.

Continuous movement of the hot shell from the point of view of stationary test body **m** inside the shell in discreet step presentation constitutes a new discreet mass which haven't yet interact to the test body **m** at this step. This is the fact of continuous attraction between the test body **m** and the hot shell**.** The movement of the hot shell has phase nature but the test body **m** suffers the real gravitation. The gravity of idealized hot shell at its movement outward the center in elementary solid angle at some selected direction does not change in any placement of the hot shell (at any radius of the hot shell) because the average density of the hot shell remains constant. And the gravity of new cosmos situated back to the test body **m** along radius, growing in radial direction at the same conditions constantly increases (without limitations). The gravitational field of the hot shell in the elementary solid angle doesn't depend on the distance because the surface (the mass) of the part of the shell is proportional to the square of the distance. The test body **m** doesn't suffer the acceleration provided the shell had already been formed or the velocity of gravitational field is infinite.

In a very simplified form, the gravitational effect of the shell can be represented as follows. Let's create in mind the test body **m** and spherical shell **M** (**M** >> **m**) simultaneously in empty space so as the body **m** is situated with some eccentricity **e** (Figure 1-a). The creation of the shell and the body **m** is meant to be instantaneous that is the time of creation is essentially less than the ratio of 2**e/c** where **c** is the light velocity. Because of the finiteness of the velocity of gravitation the body **m** first will be attracted by the nearest part of the shell (Figure 1-b). At this moment the body **m** will suffer the acceleration directed from the center which would act until the gravitational field of the opposite part of the shell would reach the point of body **m**, more exactly until the field would get thru the distance of 2**e**. And at this moment the body will stop accelerate forever. Naturally, the duration of the acceleration of the body **m** (2**e**/**c**) depends only on the absolute value of distance **e** and doesn't depend on the radius of the shell or on the ratio of 2**e** to the radius of the shell (Figure 1-c) and the force of the attraction of the body **m** to the shell is acting constantly during the period (2**e**/**c**).

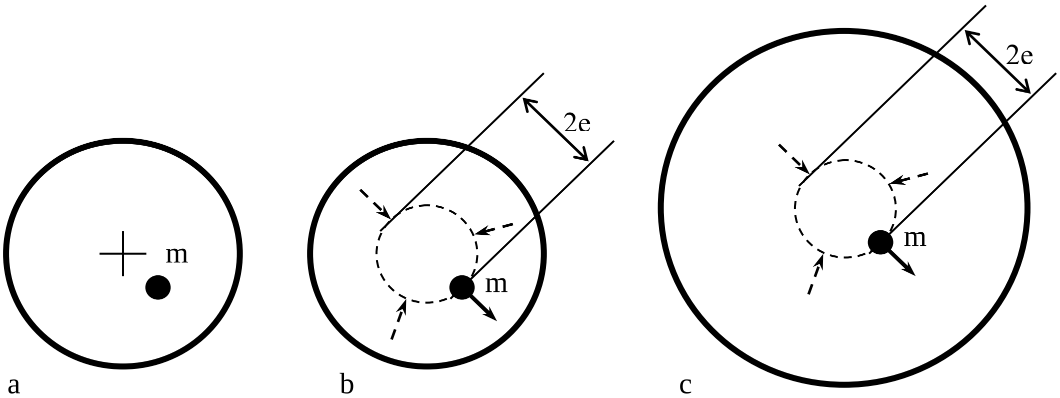

Figure 1. Acceleration of a mass point in quickly created shell caused by the finiteness of the velocity of gravitational field. Solid circles are the layer of new generated mass, dashed lines and arrows are the front of the expansion of gravitational field of the shell. Solid arrows are the gravitation forces.

For our case the gravity of idealized hot shell is considered (see Figure 2) at different radial placements, for example at **e**, 2**e** and 3**e** in elementary solid angle **φ** (solid circles). The value **e**, being the parameter of the placement of the test body **m,** should be mentioned to be equal to the age of the center of cosmos ($\mathbf{e}_t$) at the moment of birth of the test body **m** from the hydrogen-helium cloud, whereas the line **e** (plane **e**) divides the space to positive (upper part at Figure 2) and negative (lower part at Figure 2) parts. As a first hypothesis the gravitational forces are directed normally to the axis of the eccentricity because their projection to this axis is close to zero.

The gravitational field of the hot shell is uniform at all said placements of the hot shell but the gravity limited by solid angle **φ** caused by negative region of the hot shell reaches the test body **m** by 2$\mathbf{e}_t$ later than the gravity caused by its positive region after which "negative" and "positive" gravities compensate for one other. Subsequently the test body **m** just after its generation from the hot shell suffers the acceleration for the time of 2$\mathbf{e}_t$. And after the time of 2$\mathbf{e}_t$, when the hot shell will be placed at 3**e**, the front of the gravitational field caused by the negative part of the hot shell will come to the test body **m** so that it would never be accelerated by the hot shell. That is the new gravity would reach the test body from any two upcoming directions, but it will be always compensated after the time of 2$\mathbf{e}_t$.

So any test body **m**, beginning from the moment of its birth from the hot shell (**e** moment) suffers the constant acceleration caused by the hot shell for the time of 2$\mathbf{e}_t$ and gains the velocity proportional to the time $\mathbf{e}_t$. The test body **m** can possibly have some small initial velocity that its elements have gained being inside the hot shell but the time of acceleration inside the hot shell is quite small relative to $\mathbf{e}_t$.

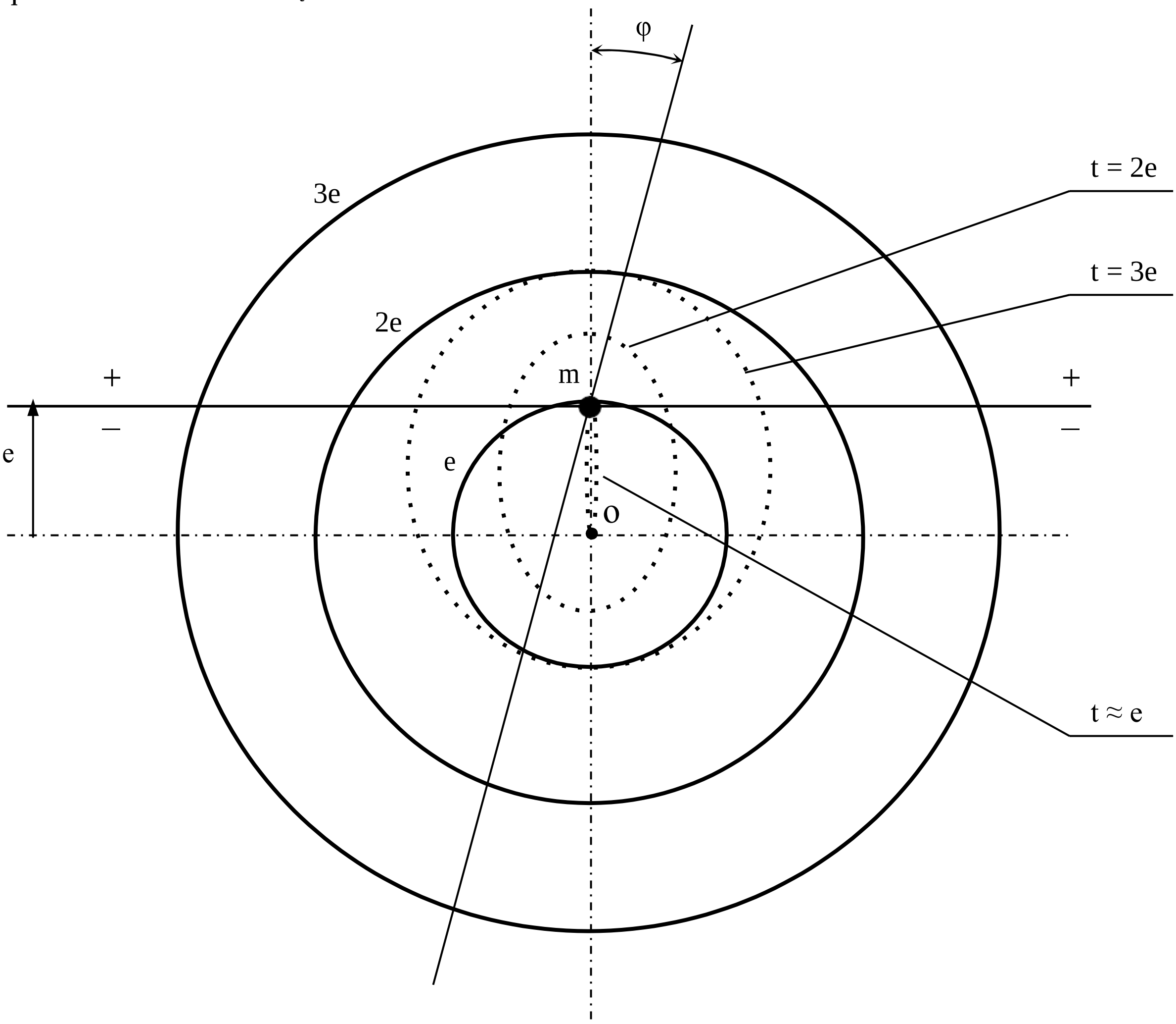

Figure 2. The diagram of time development of the attraction of the test body **m** to the hot shell (solid circles) and to the galaxies of the cosmos (dotted ellipses).

At the moment 3**e**, when the hot shell moved from the test body **m** to the distance of 2**e** light years (3**e** placement), the test body **m** would reach its maximum velocity and would further move by inertia with constant velocity as a first hypothesis. So the galaxies (for example **m**), situated at one third of the current radius of the cosmos ($3\mathbf{e}_r$) move by inertia. And at this interval (inside the sphere with the radius **e**) their constant velocities are determined by the Hubble parameter that is their velocities are proportional to the distance to the center. This is so because the intrinsic acceleration time of any galaxy ($2\mathbf{e}_t$) is determined by its eccentricity **e** at the first third of the cosmos. And the galaxies placed further at other two thirds of the current cosmos radius suffer the acceleration caused by the hot shell (at any moment of time), and their velocity decrease with the radius to almost zero value at the edge of the cosmos (close to the hot shell). At this interval the velocity depends on the radius *presumably* linearly with the negative coefficient 0,5**H** where **H** is the Hubble parameter (for the young universe when the maximum velocities of the galaxies didn't exceed 0.1**c**). When the relativistic galaxies appear with the time this simple picture changes because the graph of the galaxies velocity dependence on the time (from the moment of the begin of generation of the galaxy) asymptotically approaches to the light velocity and the peak of the triangle velocity graph flattens more and more (see Part 9 and Figure 3).

Let's assume the value of acceleration $\boldsymbol{a}_o$, affecting all the galaxies moving much slowly than the light to neglect the relativistic effects. The acceleration $\boldsymbol{a}_o$ is the vector sum of the accelerations caused by the hot shell and the galaxies of the cosmos (Part 4) acting for the time $2\mathbf{e}_t$ $\mathbf{e}_t$ is the time it takes for light to travel the distance **e** ($\mathbf{e}_\mathbf{r}$). The maximum velocity of every galaxy at the time $\mathbf{t} = 3\mathbf{e_t}$ is $\mathbf{V} = \boldsymbol{a}_o \cdot 2\mathbf{e}_t$ ($2\mathbf{e}_t$ is the time of acceleration and the acceleration of the galaxies is considered to be constant for simplicity). Comparison of this relationship and the expression of the Hubble parameter $\mathbf{V} = \mathbf{H} \cdot \mathbf{e}_r$ (without taking into account relativistic correction of **H** parameter[8]) results in

$$\boldsymbol{a}_o = \mathbf{H} \cdot \mathbf{e}_r / 2\mathbf{e}_t.$$

Taking into account that, $\mathbf{e}_r / \mathbf{e}_t = \mathbf{c}$, we obtain

$$2\boldsymbol{a}_o = \mathbf{H} \cdot \mathbf{c}.$$

More precisely $\mathbf{H} = 2\boldsymbol{a}_o / \mathbf{c}$, because $\boldsymbol{a}_o$ is the reason whereas **H** is the consequence, that is the value of Hubble parameter is determined only by the acceleration $\boldsymbol{a}_o$.

Following the values of **H** and **c**, we can calculate the acceleration

$$\boldsymbol{a}_o = 0{,}5 \cdot 2{,}2 \cdot 10^{-18} (^1/\mathrm{s}) \cdot 3 \cdot 10^{10} (\mathrm{cm/s}) = \mathbf{3 \cdot 10^{-8}} (\mathrm{cm/s^2}).$$

And the maximum velocities of the galaxies become relativistic as the age of the universe $2\mathbf{e}_t$ increases in spite of so small acceleration**.**

Maximum velocity of the relativistic galaxy generated at the moment $\mathbf{e_t}$ gained by the moment of $2\mathbf{e}_t$ (when the hot shell moved from it to the distance of 2**e** light years) depends on the time non-linearly and is determined by the following expression (in terms of the simplest consideration without taking into account the change of the eccentricity of the galaxy):

$$\mathbf{V} = \mathbf{c} \cdot \frac{\mathbf{exp}\left(\frac{2\,\boldsymbol{a}_o \cdot 2\mathbf{e}_t}{\mathbf{c}}\right) - 1}{\mathbf{exp}\left(\frac{2\boldsymbol{a}_o \cdot 2\mathbf{e}_t}{\mathbf{c}}\right) + 1}$$

The presented formula is obtained without taking into account the movement of the galaxy under the influence of the gravity of the shell, that is, without taking into account the increase in the acceleration time from the gravity of the shell. Taking into account the movement of the galaxy will lead to an increase in the maximum speed of the galaxy due to an increase in the duration of the acceleration from the positive gravity of the shell, which is caused by the delay in the arrival of gravity from the negative gravity of the shell. The movement of the galaxy is equivalent to an increase in its eccentricity, and this leads to an increase in the time of the moment of compensation of the gravity of the entire shell.

Very small value of the acceleration affecting the test body might be surprising. But we should take into account that the gravitational affect of the hot shell on the test body **m** decreases because its velocity is close to the light velocity (without being distracted by the fact that it is a phase velocity). This is because, in general, at relativistic velocities, naturally, mutually relative, the intensity of the gravitational field changes (within the solid angle **φ**). In other words, the effect of the gravitational charge $(\mathbf{GM})^{0.5}$ decreases when the velocity of the galaxy becomes relativistic, where **G** is the gravitational constant, **M** is the gravitational mass, and the gravitational field changes when the shell is moving away from the galaxy **[9]**. For the same reasons, the attraction of the galaxy to the shell increases additionally due to the fact that at about the light velocity of the galaxy, its gravitational charge shifts in the direction of the velocity vector and thereby further increases the acceleration of the galaxy.

Whether the astronomical observations could determine quite precisely the distance between

[8] The difference in the values of the distance to the far galaxies observed nowadays determined by Hubble parameter and by standard candle method (the last one gives larger values) is considered as the expansion of the space. In fact this is the relativistic correction to the Hubble parameter (see Part 9).

the center and the galaxies that stopped accelerating and started moving steadily then this distance would be equal to one third of the radius of the cosmos. And this border is quite sharp in space scale though this border is mobile. The galaxies situated within this border move steadily and those situated outside the border are accelerated. The galaxies situated inside the rest two thirds of the cosmos finish their accelerating from zero to the maximum velocity. One can assume that the first third of the cosmos radius is 13,3 billion light years (this is the metagalaxy) because the galaxies moving with the velocities close to the light velocity are observed at this distance. It's not important that the galaxies situated at the distance of 13,3 billion light years from us was moving out while the light was moving to our devices. The radius of the cosmos increases sufficiently faster and it has grown by 13,3 billion light years. Therefore, nowadays the universe has the radius of approximately 53 billion light years (3·13,3+13,3), and its age is also approximately 53 billion years. If the galaxy after its birth already suffers the constant acceleration but its velocity is close to zero then this galaxy is at the edge of the cosmos close to the hot shell where the galaxies are being generated. The region of the cosmos situated at last two thirds of its radius is the space where the galaxies are accelerating until every one would have its maximum velocity. We apparently cannot observe all this space but the last half of the cosmos (nowadays its radius is more than 20 billion light years) cannot be observed in principle (see Part 9). Now we see only the "back" of the hot shell namely its microwave background radiation that was generated 26 billion years ago. While this radiation was moving to us the radius of the universe was also increased by 26 billion light years. Provided the better technology of the observations was developed and the distances up to 20 billion light years could determined precisely[9], we could observe the galaxies whose velocity doesn't increase with the distance but decreases whereas all they move with acceleration (see Part 9 and Figure 3). The most remote regions situated close to the hot shell where the galaxies are just beginning to be generated have *presumably* some higher density as well as the regions of the center of the universe at the moment of cosmos birth (before the galaxies recession). And only gradually, according to the hyperbolic law (see Part 5), does this density come to the value of the average density of the visible space, which is observed in the first third of the current value of its radius.

So the velocity gained by any galaxy is definitely peculiar and is caused by the acceleration to the hot shell but the time interval of the action of this acceleration is determined by the eccentricity of the galaxy. Therefore the Hubble parameter obtained from astronomical observations confirms our model of the recession of the galaxies because the mechanism of galaxies recession presented here releases the dependence of the velocity of the galaxy on its distance to the center.

The consideration of Hubble parameter at small galaxy eccentricity is assumed to be incorrect because the peculiar velocities of the galaxies are compared to those of their chaotic movement (at small time $2\mathbf{e}_t$). This is confirmed by the observations of the cosmos at the distance of $15\cdot10^6$ light years (now, as far as earlier this region was less in dimensions). And this isn't explained by the theory of the Big bang. The Hubble parameter of relativistic galaxies changes because of nonlinear dependence of their velocities on the distance that is the relativistic expression of the Hubble parameter should be applied (Part 9). At intermediate distances the Hubble parameter correctly reflects the acceleration of the galaxies by the hot shell. So there is presumably the separation of the cosmos to the region of constant galaxies velocities where the density of the cosmos is uniform and the region of galaxies acceleration by the hot shell where the density and the temperature of the cosmos change in accordance to hyperbolical law intrinsic to the hot shell. So the cosmos even as first hypothesis consists of different layers[10] (taking into account the layer of the clouds and the layer of primary stars) similar to the hot shell.

4. The gravity of the cosmos.

While the hot shell move outwards position **e** (Figure 3) the regions of the cosmos are generated that are new relative the test body **m** (from **e** to 3 **e**). That is

[9] This possibly would be done for some hundred of years.

[10] This could disprove the research presented according to Popper's criterion if the observations didn't confirm the layered structure of the cosmos.

the space inside the spherical layer of the hot shell is gradually filled by the new galaxies for example to the moment when the hot shell is at 3**e** the galaxies form the spherical layer 2**e** thick. This layer is immobile and is graviting continuously. The boundary between the galaxies causing positive and negative accelerations of the test body **m**, is the line (plane) of the eccentricity **e**.

In general the attraction of the test body **m** to all the galaxies of the cosmos at any moment (any value n·**e**) is presented at the Figure 2. The positions of the hot shell are indicated by solid circles, for example at the moments **e,** 2**e** and 3**e** (and these are the dimensions of the cosmos whose center is in the point **O**). The line **e** (the plane **e**) divides the space to the regions of positive and negative influence of cosmos gravity. The dotted lines are the ellipsoids indicating the boundaries of the galaxies interacting with the test body **m** at selected moments **e**, 2**e** and 3**e**. The focuses of the ellipsoids are the points **m** and **O**, and the radius-vector of the focus **O** of the ellipsoid indicates the time of the generation of boundary galaxy (and its own eccentricity), whereas the radius-vector of the focus **m** indicates the time when the gravity of this galaxy reaches the point **m**. Their sums are **e**, 2**e** and 3**e** light years respectively. The galaxies situated outside these ellipsoids don't interact with the body **m** by gravity (at these moments of time)[11]. At the moment **e** the region including the galaxies interacting with the test body **m**, is very prolate ellipsoid in theory reduced to the line connecting its focuses.

As the galaxy has been generated the constant negative acceleration $\boldsymbol{a}_n$ and positive acceleration appear simultaneously. The presence of the negative acceleration $\boldsymbol{a}_n$ caused by the galaxies of the cosmos might be released by analysis of the Figure 2 as follows: the region of the galaxies interacting with the test body **m** positively (dotted ellipse at the moment $3\mathbf{e_t}$) should be reflected and subtracted from the region of the galaxies causing the negative acceleration. The rest region of the cosmos below line **e** will determine the negative acceleration $\boldsymbol{a}_n$ that is continuous and quite small. More precisely the negative acceleration will decrease a bit because the density of the galaxies closer to the center decreases with the recession faster than the cube of the distance to these galaxies increases.

If the density of baryon matter of the cosmos ($(3{,}5\pm1{,}5)\cdot10^{-31}$ g/cm^3) is five times less than the density of the dark matter then the density of the cosmos observed is $6\cdot3{,}5\cdot10^{-31}$ g/cm^3. For such a density the gravitational energy of the galaxies moving by inertia at any moment is (even without the gravity of the galaxies of new cosmos) 4,4 times less than their kinetic energy so the collapse of the universe will not take place.

5. The hot shell. Appendix.

The width of the layers of the hot shell sufficiently increases from layer to layer towards the center resulting from their cooling (and consequently decreasing their density). The swelling of the layers comparing to previous phase state is caused by the following: the outer boundary of the layer moves out with the light velocity but in the layer itself the temperature of such uncompleted layer decreases gradually according to well-known empirical law $\mathbf{T} = 10^{10} / \mathbf{t}^{0,5}$ K (t is in seconds) until the conditions appropriate for the generation of the new layer with new phase state of the matter will be available. And just after begin of the new process the inner boundary of the layer under consideration will move from the center with the light velocity. When the temperature at the inner boundary of the layer became lower than the threshold value of the phase state of this layer (the placement closer to the center means more long time and lower temperature) the conditions appropriate for the birth of new phase state (new layer) would occur. As the temperature and the density decrease in accordance to hyperbolic law the width of the layers towards the center increases. For example, the layer of primary nucleosynthesis is 3 minutes width in time scale whereas the following layer of light nuclei recombination is 700 thousand years width. And further when the hot shell will be completed all this procedure in layered hot shell would be conserved as the hot shell moves outward the center.

In the case of BB the explosion of the singularity is the expansion of the space of this singularity that is the density decreases very quickly in the begin and slower and slower. Fast

[11] This highlights Neumann-Selinger gravitational paradox **[10]** in a new way since it is formulated for an infinite universe.

expansion that takes place between 10^{-35} and 10^{-32} s is known as inflation[12]. In the case of the layered hot shell under consideration the expansion of the space occurs with the decrease in the temperature of its internal layers. *Presumably*, the expansion of the space of early layers of the hot shell takes place due to the reduction of the first “folded” n-dimensional space of Planck era to three-dimensional space (with variants, up to four-dimensional spacetime).

Phase transitions of the matter (the boundaries between the layers) at decrease of the temperature and density in the hot shell are the expression of the decrease of the energy: at the temperature of 10^{28} K the so-called Grand unification of the interaction decayed, at the temperature of 10^{15} K the decay of electroweak interaction occurred, at the temperature of 10^{12} K the quarks began unify into the hadrons. The inverse procedure is described by P. Davis **[11]**: “At first this is Weinberg-Salam threshold equivalent to almost 90 proton masses behind which electromagnetic and weak interaction are unified into the electroweak one. The second scale corresponding to 10^{14} proton masses is peculiar for the Grand unification and the new physics based on this. At last the ultimate scale is the Planck mass equivalent to 10^{19} proton masses corresponds to full unification of all interactions resulting in surprising simplification of the world”. The second part of the procedures according to P. Davis requires incredibly large amount of energy following by the problems of experimental determination of hotter phase transitions. At that time the processes in the hot shell move in inverse direction in terms of energy. They take place by natural transition from ultimately high density of energy to lower energy levels leading in increased stability of the following phase states.

Almost a million years after the birth of the universe its central region was filled by low-frequency photons and atoms of hydrogen and helium. These atoms began to form the clouds of the mixture of hydrogen and helium. These clouds served as the basis of first galaxies when the radius of the universe was $5 \cdot 10^8$ light years (when the age of the universe was $5 \cdot 10^8$ years), that is the clouds have reached the dimension at which the formula of Jeans mass is fair[13]. Because of inner gravity the clouds began to condense around their centers giving rise to the galaxies and consequently primary intergalactic voids. The stars of every cloud have formed their own galaxies, and with growing of their number the phase of the cold universe – the cosmos. The cosmos of variable but always finite radius has been formed[14].

As this process is stochastic the galaxies close to the edge of the cosmos are naturally situated inequitably in radial directions: the ones are a bit closer to the hot shell and the others are a bit further. Because of gravitational interaction between the clouds they first move to those clouds that have been formed just behind the closest concretions – the galaxies situated close in radial direction. So some gravitational branches of the cosmos are continuously formed (future galactic threads). And the lateral clouds would move towards these branches forming the galactic hollows (future voids). This determines the bubbly structure of the cosmos. The gravitational branches are formed like the dendrites until the tangent direction to the cosmos is reached. The atoms of hydrogen and helium that have just recombined are condensed close to the edges of these branches.

Large-scale uniformity of the cosmos and its isotropy (in the region of inertial recession) is determined by the same process of formation of hydrogen-helium clouds and their transformation to the galactic systems.

As it was mentioned the layered hot shell continuously “gains” the new mass at its edge close to the initial matter that is the part of high energy plasma transforms into the energy condensed in the mass (simply $\mathbf{E=mc^2}$). In turn the cosmos is continuously refilled by the star matter from the inner and most cold layer of the hot shell. Taking into account the hyperbolic laws of change of the temperature and the density of the universe the boundary between cold cosmos and hot shell is conditional that is in principle it can be signed in a wide region bearing in mind that the cosmos is also layered. The layer of hydrogen-helium clouds is included into the cosmos because its density is close to the density of cosmos and in this layer the differentiation of the

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[12] This was necessary to explain the flat space of the cosmos although it is flat without these constructions.

[13] The theory of James Jeans seemed to be unclaimed by the BB theory. But Jeans theory is the best one for the recession model presented here.

[14] This highlights Cheseaux-Olbers photometric paradox **[12]** from new point of view.

substance to blobs and hollows takes place for the first time.

As the cosmos is the inner layer of the hot shell at the beginning of cosmos generation its radius also increases with the light velocity as well as the radius of the hot shell. Primary stars and other conglomerations of the matter mostly consist of hydrogen and helium. Through the tens billion years after the birth of the universe the hot shell compared to the cosmos is the thin spherical skin around the cosmos but this doesn't lessen its value for the fate of the cosmos especially of the galaxies situated within last two thirds of its radius.

All the layers of the hot shell circumjacent the cosmos don't move in the space that is their simple transfer does not occur. But as the front of the external layer of the hot shell moves presumably with the light velocity (phase velocity) so all the hot shell as though moves in the space with the light velocity but the matter of the hot shell doesn't move (in the first approximation). As the velocity of any matter is significantly less than the light velocity so this explains why the vast pressure (barometric) of outer layers doesn't affect the inner layers and why the layers don't mix.

This might seem strange that almost empty cosmos with very low density is the result of transformation of ultra-dense initial matter but this must be noted that the transition from n-dimensional space of initial matter to three-dimensional space of the cosmos might result in decrease of the density because of reducing of the dimension, not only due to the cooling of the matter. Also the larger part of the energy transformed into the matter. In general it might *be presumed* that the energetic compact of initial matter (provisionally presented as **hν**) in every layer-era of the hot shell transforms to the mass mc^2 with consequent decrease of the radiation energy **hν** (simply **hν=E=mc^2**). In multi-stage transformation of energy quanta to the matter the "conservation" of the energy takes place.

Before the time of a little less than a second, the particles of matter and antimatter were born in pairs and mutually annihilated and were born again, and in general were in a state of thermal equilibrium. After almost one second, the annihilation became universal.

In the situation of the existence of a hot shell around a cold cosmos, in its layer at one second from zero time, the annihilation of antimatter and matter with a small remainder occurs and this is inevitable in this layer. Not one-time, but constantly in this layer, which moves with phase velocity. Within the limits of an elementary solid angle directed from any point within the cosmos, this procedure can be assumed. Two billion parts of both antimatter and matter are carried away by the photons of this annihilation in the form of one billion gamma particles of very high energies. But as the hot shell moves in a phase manner, these gamma particles permeate the innermost and colder layers of the hot shell, where exactly one billionth of the former matter remains from annihilation. Apparently, these photons are absorbed and re-emitted by matter particles, but they are emitted with a lower frequency, and the matter particles slightly increase their temperature against the background of its general decrease. In the early layers of the hot shell the density of matter is very high, so the annihilation photons have a short free path and, accordingly, a high frequency of encounters with matter. Thus, these photons appear (in almost a million years of constant absorption and re-emission) in the recombination layer of light nuclei and electrons already in the form of background microwave radiation. The stream of annihilation photons coming to us is mixed with photons that are close in frequency, but photons generated in other physical processes.

The gravitational charge of matter particles with a rest mass is mainly concentrated in the earliest layer with a thickness of 300,000 km (in time, this is slightly less than a second from zero time). Its density is comparable to that of the nucleus of an atom[15]. It's just a monstrous gravitational charge if it were stationary in space[16]. But since the layers of the hot shell move at the velocity of light, their gravitational influence is reduced significantly **[9]**. But in the form of a kind of compensation, the gravity of these layers can act for billions of years. And as a result, each galaxy has its own velocity.

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[15] As if this layer was densely packed with white dwarfs.

[16] It is the effect of this gravity that the followers of the BB theory unconsciously mean under the empty wording "dark energy".

6. Some general conclusions.

Gravity is the only cause of the acceleration and recession of galaxies. It's possible to determine other parameters of the recession of galaxies in addition to their observed characteristics[17], and in general, to change the attitude to some other questions of cosmology. *Presumably* the cosmos might be considered to grow from the hot shell in flat (in general) three-dimensional space. The cosmos expands in this space at first because of the gravity of the hot shell and later by inertia (suffering relatively weak deceleration). Three-dimensional space rises from n-dimensional "twisted" space of the initial matter and doesn't expand itself. The elder universe (in other words the larger its current radius) the larger its gravitational mass. In any moment of time the mass of the cosmos if finite and is proportional to the third power of the age of the universe. The presence of the hot shell makes the collapse of the cosmos impossible that determines gravitational stability of the cosmos. Local gravitational fluctuations lead to chaotic movement of galaxies and clusters of galaxies. The galaxy is unlikely to leave the limits of its cluster. The cosmos expands because of the recession of galaxies so that its average density decreases simultaneously in all the region where the galaxies move evenly without acceleration caused by the hot shell. Accelerated movement of the galaxies always was and always will take place at last two thirds of current radius of the cosmos. The acceleration caused by the hot shell is constant and seems to be the parameter of the universe. In general the velocities of the recession of galaxies are peculiar. The gravity of the hot shell *completely supersedes* the artificial dark matter primitively introduced into the theory of BV by necessity, when supposing the acceleration of galaxies. The hot shell growing outside the cosmos and the cosmos arising from it form the all-sufficient open universe. The galaxies don't born in internal regions of the cosmos. In spite of its expansion the cosmos will never disperse because the dimensions of the cosmos in average increase with the light velocity that is faster than the cosmos expands.

So the presence of the Hubble parameter in itself (without respect to its value) is a necessary result of the recession of galaxies according to the proposed model, which is its priority feature.

A cluster of galaxies formed for the first time in the history of the universe has by definition zero peculiar velocity, because their eccentricity is zero (the radius of the cosmos at that time was zero).

7. Background radiation.

The existence of microwave background radiation is natural for the BB theory as the longtime and one time phenomenon in the history of the universe.

Whether the universe consists of the cosmos and the hot shell around the cosmos that is moving radially one should consider the microwave background radiation of the photons of annihilation to be continuously emitted. According to Ray Fleming's theory, the quantum field always exists, and protons, electrons, neutrons, hydrogen, helium, and also microwave background radiation are formed continuously from the quantum field. Most likely, background microwave radiation is formed in the latest layer of the shell namely the layer of the recombination of light nuclei and electrons under action of hard gamma quanta formed earlier in the annihilation layer of hadrons and antihadrons. In the Lepton era, hard gamma quanta are transformed according to the following scheme: two-quanta generate an electron-positron pair, and the remaining quanta reach the recombination layer. Already in this less dense, but much thicker layer, gamma quanta of annihilation are scattered on light atoms, generating microwave radiation. In the recombination layer, under the action of hard gamma quanta, light atoms are destroyed, followed by their repeated recombination, but at the same time with the weakening of gamma quanta. During the stay in the recombination layer, each light atom has the possibility of colliding with a hard gamma quantum a little less than a billion times, since each nucleon accounts for about a billion gamma quanta - subsequently microwave photons. Nevertheless, some hard gamma quanta sometimes break through the opaque recombination layer for them and reach the earth's atmosphere in the form of isotropic radiation of hard particles "from the depths of space"[18]..

[17] Mathematical formalization of the model isn't the aim of this work. The author negatively perceives unnatural constructions of BB, and in an amateur manner he was only interested in studying the possibility of gravitational recession of galaxies.

[18] This is the new one obscure invention of BB, because there is nothing in space except galaxies.

For microwave radiation, the recombination layer is already transparent

To this microwave radiation other radiation is mixed, close in frequency, but this is the radiation generated by other physical processes. This radiation has intrinsic angular anisotropy (fluctuations) considered in terms of the BB theory. The influence of the edges of gravitational branches of the cosmos might be superimposed on the anisotropy (see the Part 5). These edges affect the density distribution of the layer of light nuclei recombination because this layer is adjacent to the cosmos.

The recombinating nuclei of hydrogen and helium (or already the atoms) will condense close to the ends of gravitational branches of outer regions of the cosmos. And the denser these blobs the brighter their emission is. Consequently less dense blobs give rise to the emission with lower brightness thus these are future intergalactic holes - voids. It might be *presumed* that at any moment the clusters (superclasters) of galaxies situated at the edge of the cosmos should be placed close to the bright spots of emission fluctuation. But we cannot observe these clusters directly. Nowadays the emission of the hot shell generated 20 billion years ago comes to us and whether the instruments allowing the observation of the objects situated at the distance of 16 billion light years appeared then we would be able to observe the placement of the clusters of galaxies correlated to the placement of the spots of background radiation. The chaotic character of fluctuation genesis leads to principally temporal coordinates of the fluctuations of background radiation in large time scale. This might be registered by means of periodical observations. If this be the case this would be hardly explained by the BB theory[19].

Close dimensions of the spots of emission fluctuations placed oppositely at the diameter of the cosmos lead to following result: the milky way is situated close to the center of the cosmos. Whether we were closer to the edge of the cosmos then the angular dimensions of the fluctuations would be asymmetrical but the summary brightness of the emission would be constant because the total emission of the shell doesn’t depend on the observation placement. It is possible that the emission of ultra-high-energy cosmic particles comes from gamma quanta of annihilation of matter and antimatter, when they occasionally break through the hydrogen-helium plasma. This radiation is too uniform in different directions.

The presence and properties of observed microwave background radiation is in accordance with the existence of the layered hot shell (and first layer of the cosmos) and so confirms its existence.

And the fact of mass genesis is more probably to be the constant process than the one time phenomenon in the history of the universe. If this was an old single phenomenon then the mass of the universe should be considered to be constant. In this case the problems of finite mass of infinite universe, its four-dimensional space and similar constructions (whereas observable space is flat and three-dimensional) appear. The singularity and consequent one time act of the generation of all the universe leads to many problems in reconstruction of the universe.

The universe might be considered as the whole object without division to the cold and hot one that is the cosmos might be considered as the last in time and most thick layer of the universe. In general, being layered is the fate of the universe.

8. Application experience. Modern researchers of distant galaxies, based on the Big Bang theory, have difficulty interpreting the parameters of distant galaxies, for example, the recently discovered galaxies ALESS 073.1 (**z** = 4,75), SPT 0418-47 (**z** = 9,6) and UDFj-39546284 (**z** = 11,9). Basically, these researchers are confused by the contradiction between the young age of galaxies and the state of their advanced maturity. Thus, Federico Lelli, the leader of the group that discovered the galaxy ALESS 073.1, put it as follows: "Galaxies such as ALESS 073.1 challenge our understanding of the evolution of galaxies" **[13]**. Filippo Fraternali, co-author of the discovery of the galaxy SPT0418-47, shared the following: “It was a great surprise to find that this very young galaxy is so similar to our neighboring spiral galaxies, and contrary to all theoretical models and previous observations” **[14]**. Here: “our neighbors” are old galaxies, and the new galaxy is “very young”. And his colleague Simona Vegetti stated: “What we saw was rather mysterious:

[19] The constant microwave background radiation is one of the basic arguments in favor of BB theory for its adepts.

despite the high rate of star formation and the associated high-energy processes, the galactic disk SPT0418-47 turned out to be the most ordered of all ever observed in the early Universe” **[14]**. Indeed, it is impossible, while remaining within the terms of the Big Bang, to explain all this[20].

These difficulties are resolved by the hypothesis of the gravitational recession of galaxies, because the hypothesis resolves the weaknesses and contradictions of the Big Bang theory.

According to this hypothesis, it all boils down to the fact that we can only observe old galaxies. The light of young, and even more so, early galaxies is still only coming to us, and will reach our location only in 10 – 30 billion years. This, only at first glance, a strange conclusion follows from Parts 3 – 7 of this work. It is possible that quasars are the feature of young galaxies (which we don't see yet), and that in aging galaxies quasars die over time. In any case, no quasars have been found in the cores of old galaxies in the middle part of the cosmos.

The resolution of modern difficulties is illustrated in Figure 3 (**c** is the speed of light), which shows the distributions of the velocities of the observed and unobserved galaxies in space both in the modern universe (solid blue line) and in the earlier our universe (dashed green line), as well as in the future our universe (dash-dotted red line) - all universes are shown as their instant state - without taking into account the time of arrival of light from the galaxies and with some allowance for the movement of galaxies at near-light speed. For the sake of simplicity of the image, the drawing has a qualitative character, because a coefficient of 2.7 has been artificially added to the formula of the speed of galaxies. The distribution of the velocities of galaxies is based on the fact that, in accordance with the above, galaxies, after their birth, first accelerate, and then, when the gravity causing their acceleration is compensated, each moves with its own constant velocity by inertia (for more information, see the Part 3).

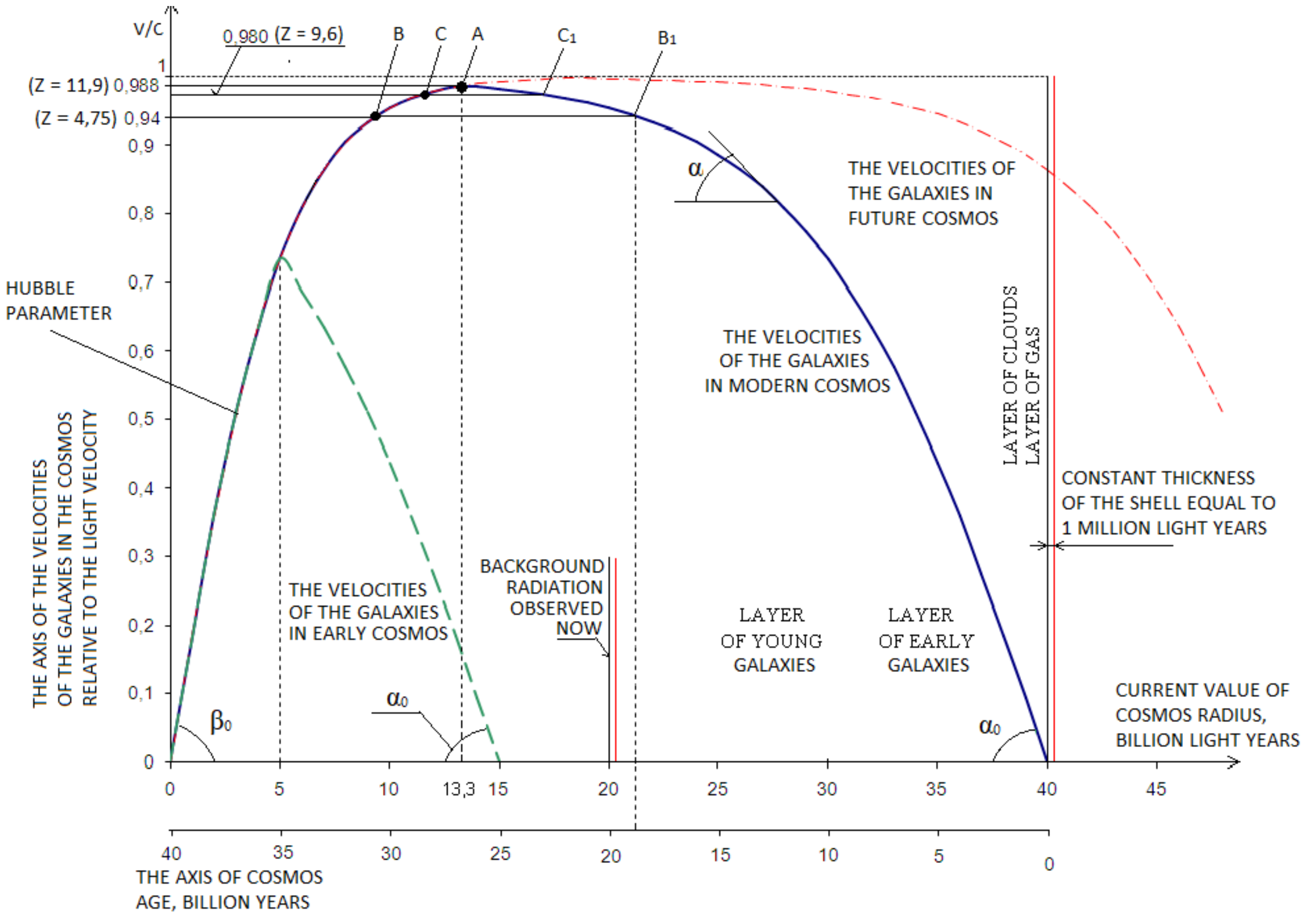

Figure 3 – The distribution of the velocities of the galaxies in the cosmos (instantaneous distribution state).

The distribution of galaxies with a constant velocity is shown on the left side of the graph and

[20] Without another ad hoc additional hypothesis, which will appear immediately. Who would doubt that.

obeys the Hubble parameter, but for the modern universe, this parameter is due to near-light velocities of galaxies. This velocity distribution is related to the distance coordinate axis on the left side of the graph from the zero distance to the vertical point "A" and is expressed by the following formula with variable Hubble parameter (taking into account the above assumptions of the velocity formula):

$$\mathbf{V} = \mathbf{c} \cdot \frac{\exp\left(\frac{2\,\boldsymbol{a_0} \cdot 2\mathbf{e_t}}{\mathbf{c}}\right) - 1}{\exp\left(\frac{2\,\boldsymbol{a_0} \cdot 2\mathbf{e_t}}{\mathbf{c}}\right) + 1} = \mathbf{H} \cdot \mathbf{e}_r ,$$

in accordance with the initial naive Hubble formula **V** = **H·r**,

where $\mathbf{e}_r$ is the distance to the galaxy in light years, numerically equal to the time of arrival of light from this galaxy, and practically obtained by the luminosity of supernovae, although this may be approximate result, so far no better way has been found, and $2\mathbf{e_t}$ is the time of the effect of gravity on the galaxy.

It makes no sense to change this distance with the help of all sorts of tricks and existing several principles of measuring distances in modern cosmology, which are influenced by the swirls of hypothetical theories of BB.

On the right side of the graph, which better correlates with the coordinate of time, the distribution of the velocities of galaxies in modern space from zero time to the vertical of point "A" is shown. Zero time[21] corresponds to the beginning of the modern universe (for more details, see Part 2 and 5) On this part of the curve, the velocities of the galaxies are fixed from zero to almost light velocity. At point "A" the galaxy stops accelerating (the derivative is almost horizontal) and moves at a constant speed in accordance with the Hubble parameter. Similar distributions of the velocities of galaxies are shown in the graphs of the early and future universes. For the early universe, time zero was plotted at a radius of 15 billion light years on the distance scale.

The tangent to the left of the curve of modern space (the tangent of the inclination angle β) is an expression of the variable value of the Hubble parameter. The Hubble parameter repeats itself in all ages of our universe. The tangent (derivative) to the right side of the curve (the tangent of angle α) is an expression of the current value of the acceleration with which the galaxies are accelerating. The acceleration is variable due to the relativistic effects of increasing the mass of galaxies. The initial slope of the curve (tangent of angle α_0) is the same for any age of the Universe. The curvature of the right curve of the early universe is identical to the same part of the curve of the modern universe. In this case, the initial slope of the right side is always 2 times less than the initial slope of the left side (Hubble parameter): $\mathrm{tg}\alpha_0 = 0.5\mathrm{tg}\beta_0$. This is due to the fact that, ideally (without taking into account the distance of the galaxy's movement) for a universe of any age, the distance from the center of space to point "A" is half the distance from point "A" to the beginning of this universe (for more details, see Part 2). This is especially evident for the early universes.

The **z** parameter of any galaxy is only an indicator of its line-of-sight velocity, no more than what is twisted in the Big Bang theory by additional hypotheses that is, **z** is equal to the ratio of the increase in the wavelength of light from the galaxy (spectral shift) to the wavelength of laboratory light. (Firstly, the gravitational change in **z** is small, and secondly, it is compensated when approaching the Milky Way). With this interpretation of the magnitude of **z**, the velocity of the galaxy is determined by the formula

$$\mathbf{V} = \mathbf{c} \cdot \frac{(z+1)^2 - 1}{(z+1)^2 + 1} ,$$

from the primary formula **V** = **c·z**.

[21] Zero time always moves with the speed of light to the right along the distance scale.

In Figure 3, it is determined that in modern space, old galaxies are located at a space radius $\mathbf{r_s}$ up to $15 \cdot 10^9$ light years, the radial velocity of these galaxies ranges from almost zero (**z** = 0) to almost light velocity (**z** = 11,9). In general, noting the presence of old galaxies, one has to note the presence of others in age, for example, mature and young. They can also be distinguished by the speed of star formation, since it is obvious that after the birth of a galaxy, its star formation first somehow increases, then reaches a maximum, then somehow decreases. Obviously, star formation is minimal in old galaxies. It is also obvious that in mature galaxies star formation gradually decreases to a minimum. Star formation (own, without the "help" of other galaxies) in old and mature galaxies differs in spectral terms - in old galaxies the presence of heavy elements is noticeably greater.

An interesting point in the Figure 3 is the mark ~ $20 \cdot 10^9$ years (it is also at the radius of space $\mathbf{r_s}$ ~ 20 billion light years). On this radius of modern space, the hot shell of the earlier universe (at its age equal to 20 billion years) was previously located, and the hot shell itself, in 20 billion years, moved according to the scheme to the right to the beginning of time in the modern universe (**t** = 0). After the same 20 billion years, its image, and this background radiation, which is currently observed (originating from the gas layer and the recombination layer, for more details see Part 7), moved along the figure to the left and reached the center of the cosmos, i.e. our location, and we now see it as background microwave radiation in all its glory. But this observation occurs with some parallax, since the Milky Way, from which we are observing, is not located exactly in the center of space. This is noticeable if we consider the background radiation as a whole, abstracting from its details.

The background radiation is very weak, but it is not a point object, but an area one, and even its fluctuations have a large angular size. Accordingly, now we cannot see what is located behind the former hot shell (at a mark of more than 20 billion years), i.e. we do not see young galaxies of the modern universe - their radiation has not yet reached us. Young galaxies in the modern universe are located to the right of the birth of background radiation at a distance (conditionally) of up to 10 billion light years from it (early galaxies are located up to 18 billion light years). The transition from gas to gas clouds in time scale always takes about 2 billion years from the instantaneous location of the hot envelope (for more details, see Part 2). For the modern universe, this occurs at a distance of just under 40 billion light years.

Radiation from mature galaxies located further than 15 billion light years from us, comes to us, and in principle we could observe them, but their light is very weak for our capabilities. For example, we can observe the galaxy ALESS 073.1 (point B in the figure) with its **z** = 4,75 and, accordingly, an expansion velocity equal to 0,94**c**, as an old galaxy, but with the same **z**, we do not observe the galaxy at point B_1, this is too far. Apparently, all this also applies to the galaxy SPT 0418-47 with its **z** = 9,6 and radial velocity of 0,980**c** (point C in the figure) and to the galaxy with the same **z** = 9,6, but has not yet reached the final speed (point C_1 in the figure).

At point C_1, the acceleration is several orders of magnitude less than the initial (“microscopic”, for more details, see Part 3) acceleration $\mathbf{a_0}$, corresponding to the angle α_0 in Figure 3. If by long-term observation of the parameter **z** it is possible to fix the acceleration at point C_1 or at a point somewhat closer, then this will be direct evidence of the hypothesis considered in the essay.

Galaxy UDFj-39546284 with its **z** = 11,9 and radial velocity of 0,988**c** is approximately borderline between two curves, since it is distinguished as the farthest galaxy (point A in the Figure 3). In accordance with the Big Bang theory, it was even called a proto-galaxy, they say, it has not yet formed, although this is an ordinary old galaxy, the same as above. If it were a protogalaxy, then its spectrum would contain mainly helium and hydrogen. It has existed for about 25 billion years (if it did not merge with other galaxies) and it was formed from a cloud of helium and hydrogen in the early universe, when the universe was only 15 billion years old.

It is clear from the figure that it is impossible to observe mature galaxies by existing means, much less to observe young galaxies. Except, perhaps, dwarf galaxies, in which development is slowed down due to the smallness of the initial cloud of hydrogen and helium, like small stars that live longer.

And what we observe is all old galaxies, and there is absolutely no point in bothering with the quirks of the Big Bang theory **[13, 14]** about young, early and protogalaxies.

The recently commissioned JWST telescope has significantly increased the distances to extremely distinguishable galaxies. And now it is possible to observe galaxies of type C or B with their analogues C_1 or B_1 (Figure 3). Their peculiarity lies in the fact that with equal spectral shifts **z** (equal velocities) of galaxies C and C_1 (as well as galaxies B and B_1) the distances to them are significantly different. And when astronomers from NASA provide the data necessary for this analysis, this will be the best confirmation of the simplified hypothesis. But to do this, the **z** and distance data must comply with the above principles.

In modern space, any galaxy, while gaining speed to its maximum value, travels along the radius of space a considerable distance from its place of birth. Accordingly, the onset time of the negative acceleration from the opposite part of the envelope (see Part 3 and Figure 2) increases, which leads to some change in the size of the space region occupied by accelerating galaxies in relation to the region of galaxies obeying the Hubble parameter.

At earlier age of our universe, for example, at the age of 15 billion years (green dashed line in Figure 3), the distribution of the velocities of galaxies then had an almost triangular shape (the smaller the age of the universe, the closer to the triangle), and with a sharp top of the maximum speed. With our capabilities, almost all but the youngest galaxies could be observed in that early universe. In the future universe, for example, at the age of the center of the cosmos over 60 billion years (the distribution of the velocities of galaxies is partially shown by the red dash-dotted line), we would be able to distinguish only the oldest galaxies.

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cosmos, universe, cosmology, recession of galaxies, acceleration of galaxies, phase transitions, gravity, Hubble parameter, galactic filaments, voids, Big bang, dark matter, dark energy.

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