Evolutionary Stages of the Metagalaxy

R. Natsvlishvili *

E. Kharadze Georgian National Astrophysical Observatory, Georgia

Abstract

The matter from which the Metagalaxy is formed is constantly changing, evolving. Since the speed of propagation of the electromagnetic wave in space is not instantaneous, it is limited, within the capabilities of existing powerful telescopes, we can observe the forms of matter in different stages of the evolution of the Metagalaxy in chronological order. So, the more distant the form of matter in the Metagalaxy, the earlier, or younger, it is. In this article, we tried to characterize the stages of the Metagalaxy evolution from a dynamic point of view. In the case of such a model of the Universe, quasars are objects of earlier stage of the evolution of galaxies, and blazars are objects of an intermediate stage between quasars and galaxies.

Keywords: *Universe - Universe Structure - Metagalaxy - Evolutionary Stages of the Metagalaxy*

1. Preamble

Great persons Viktor Amazasp Ambartsumian and Eugene Kirile Kharadze established the groundwork for the bond between Georgian and Armenian astronomers and deepened friendly relations of the Georgian and Armenian people. Ludwik Vasili Mirzoyan was further continuing this connection. During a conference commemorating the 90th anniversary of his birth, I briefly characterized Mr. Ludwik Mirzoyan and referred to him as a "crystal person". Ludwik Mirzoyan was truly crystal man, he possessed strong principles and displayed generosity, showing kindness to everyone. His kind and hospitable wife, Nelly Ruben, was standing next to him, alongside their charming daughters Anait and Nune, their science and sports-loving son, Ara, with their families.


Figure 1. Viktor Amazasp Ambartsumian and Eugene Kirile Kharadze

2. Introduction

When trying to explain the energy of quasars by the accretion of matter onto a rotating massive black hole, the presence of the most massive black hole at an early stage of the Metagalaxy evolution is no less problematic. From where such a mass of matter accumulated in the Metagalaxy at an early, protoquasar stage of evolution?! We believe it is logical to assume that quasars represent an early stage in the evolution

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Figure 2. Ludwik Vasili Mirzoyan

of galaxies. This opinion is supported by the fact that the farther away the quasar, the brighter it is. The diagram in Fig. 3 is a clear confirmation of this.

As the redshift z increases, the apparent magnitude of quasars does not change. Therefore, it is illogical to call objects with redshift z=11 and z=13.5 (Oesch et al., 2016), (Pacucci et al., 2022) galaxies in Fig. 4 when these objects do not have any characteristics of a galaxy. These objects could be protoquasars, but not galaxies!!!

And again, when discussing the regions of the birth of stars in the Metagalaxy, for some reason there is a tendency that if an object is surrounded by a nebulous medium, then the process of accretion on the core is unambiguously assumed. Could this nebulous environment be the result of matter being ejected and flowing out of the core (Ambartsumian, 1958)? In a small encyclopedia of physics (Prokhorov et al., 1984), we read that quasars are the nuclei of distant galaxies. The word "distant" does not mean anything cosmological, it means distant galaxies, because these are objects with large redshifts. From our point of view, quasars are not the nuclei of distant galaxies, but objects of an early stage in the evolution of galaxies. Since we believe that the action of non-gravitational forces of internal repulsion has been eliminated by now, the expansion of the Universe should occur at a slower rate. Starting from the Big Bang, according to the chronological dynamic picture of the expansion and contraction of the Universe, depending on the nature of the change in time of the internal repulsive force, in the case of a pulsation of the Universe, its specific nature can be determined in principle. Large-scale Metagalactic objects appear to have formed as a result of the fragmentation of a supermassive singular body, similar to what would happen if the contents of a vessel filled with mercury were to shatter in the weightlessness of space. It would be divided into spherical fragments of different masses (see Fig. 5).

To imagine the structure of the Universe, let's try to find out how reasonable the assumption of empty space was, based on the views of Newton at that time? In our opinion, if there is at least one particle in space, it cannot have zero temperature, because it (the particle) moves and accelerates. It is also completely black radiating and the electromagnetic waves generated by it penetrate the space around the particle in all directions. The radiation flux also depends on its mass according to the mass-luminosity relation. Modern classical cosmological models always imply an accretion process. But if galaxies were formed as a result of the gravitational condensation of rarefied matter after the Big Bang, then protogalaxies should have a lower density when move from nearby galaxies to distant galaxies. In the case of such a hierarchy of the Metagalaxy, the evolutionary status of quasars due to their large mass and luminosity is unclear. Thus, Newton's empty space is unreal and non-existent, in which he needed trigger forse to set matter in motion. Sometimes the concept of empty space is such that particles are scattered in outer space in such a way that one or more particles are in one cubic meter of space. Since we know the geometric dimensions of the particles, the rest of the space may appear empty. But these particles themselves are absolutely black emitters with temperature. So the space around them is penetrated in all directions by electromagnetic radiation. The radiation flux also depends on the mass of the particle through the universal mass-luminosity relation $E = mc^2$ (Einstein, 1917). Thus, any notion of empty space is false. This idea, in turn, poses the problem of vacuum inflationary space, when an increase in the volume of space does not change its density. In this space, as it were, matter arises that violates the universal law of nature, and an a priori assumption is made about Perpetuum Mobile. According to the universal fundamental law of nature, the Perpetuum

*rezonatsvlishvili@gmail.com

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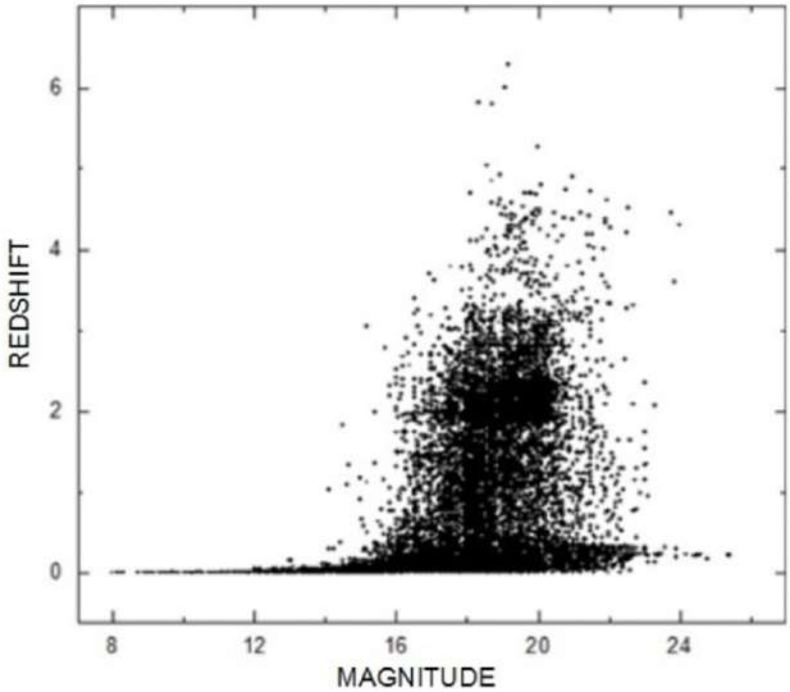

Figure 3. The dependence of redshift vs apparent magnitude for the extragalactic objects. There are objects with known redshifts (Hubble, 1929), (Huchra et al., 1996), (Veron-Cetty & Veron, 1998), (Fan et al., 2000),(Zheng et al., 2000), (Schneider et al., 2001), (Natsvlishvili, 2002), (Natsvlishvili, 2010), (Natsvlishvili & Kochiashvili, 2017) on the diagram: quasars, Lacertae objects, Seyfert galaxies and galaxies, about 36930 objects altogether

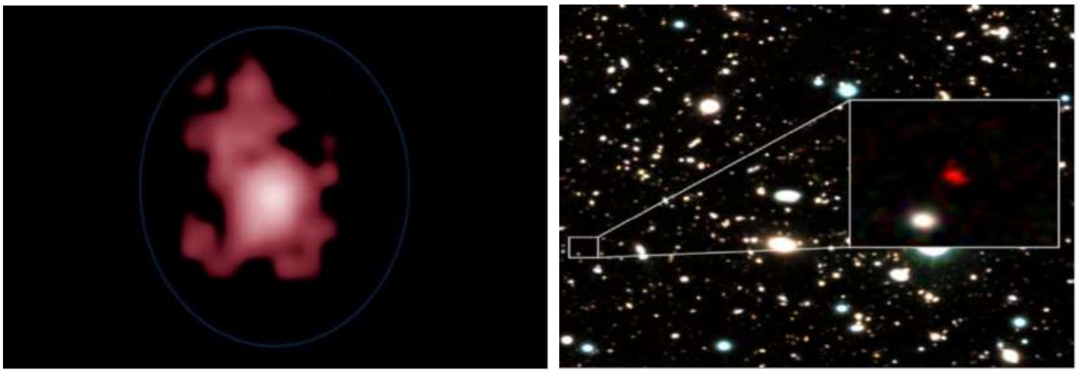

Figure 4. Galaxy GN-z11, z=11 and galaxy HD 1, z=13.5

Mobile does not exist!!!

Thus, since the zero temperature of matter does not exist, space is always penetrated by electromagnetic waves of an absolutely black emitter with a temperature of some t_k. Therefore, space is always permeated with electromagnetic waves, which means that it is not empty, as Newton imagined, and it was a problem for matter to move, which required pulling a trigger to set matter in motion. Matter does not need to be triggered because it always has a temperature above zero (Friedmann, 1922). That is, it always has radiation corresponding to the temperature that permeates the space around it, and it cannot be empty. So, there is no absolute vacuum.

3. Dynamics of the Metagalaxy Displacement

In the volume of the small encyclopedia of physics (Prokhorov et al., 1984) we read that quasars are the nuclei of distant galaxies. Here the word distant does not mean anything cosmological, the word distant refers to distant galaxies, since they are objects with large redshifts. In our opinion, quasars are not the nuclei of distant galaxies, but are objects of an earlier evolutionary stage of galaxies. Since we believe

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Figure 5. Spherical fragments of various masses formed when the vessel filled with mercury is destroyed.

that the action of the internal repulsion, antigravitational forces is removed, therefore, the expansion of the Universe should occur at a decreasing rate. A chronological dynamic picture of the expansion and contraction of the Universe, depending on the nature of the change in the internal repulsive force from the moment of the Big Bang for a pulsating model of the Universe, the specific form of which, in principle, can be determined.

We can ask the opposite question. If objects in the Universe have a disposable origin, which we consider logical, due to the undisputable fact that the Universe is constantly expanding, and consequently, decreasing in density after the Big Bang, then why should we assume that under conditions of different densities, events repeat analogically and of the similar objects are formed in absolutely different environments? Then what hierarchy of evolution of the Universe should we expect?

In the case of a pulsating Universe, if the cosmological constant $\Lambda = 0$, the change of Hubble's constant at the stage of contraction of the Universe should be symmetrical or quasi-symmetric with the one at the stage of the expansion stage. As the internal repulsive forces in the Universe from the moment of the Big Bang in the stage of increase of the Hubble constant, to the initial singular state, and the phase of slow expansion of the Universe, which should be caused by the gravitational action, will start from the moment when the internal repulsive forces become less than gravity. This stage of contraction will be symmetrical to the expansion stage. So there is no absolute vacuum. Thus, Newton's trigger force is not needed to set matter in motion.

Wrong interpretation of the Hubble law v=Hr can (Hubble, 1929) lead us to a paradoxical result, the law seems simple, but requires an objective perception. The form of its discovery is not connected with any process occurring in time in the Universe (Metagalaxy). The law does not contain a parameter that depends on time. It relates the spatial parameters v and r determined by the distance. The parameter v expresses the speed of an object at a distance r and cannot reflect the nature of the time shifts of this value. The Hubble law v=Hr in its original form is a formula that expresses the instantaneous state of the Universe in terms of distance and does not consider the change of the constant H over time. It would be correct to write this as H=H(r). At the same time, we a priori assume that the Hubble constant is a value that changes in time due to changes in the expansion rate of the Universe, since objects located at different distances are observed in different epochs.

The nature of the displacement of the Universe (Metagalaxy) over time will be characterized by the change of the Hubble's constant in time H=H(t) and Hubble's law will have a general form: v(t)=H(t)r i.e. H(t)=$\frac{1}{r}\frac{dr}{dt}$, therefore, the change in speed of objects at a distance r over time, and based on this, we can present a chronological picture of the displacement of the Universe (Metagalaxy).

Due to the isotropy of the Universe, it is uniform at every moment, but the observed Universe is uniform only spherically-concentrically.

Even if the Hubble constant is constant, the Universe is expanding at an accelerating rate. Thus, Hubble's law is a kinematic characteristic of the displacement of the Universe, given that the Hubble constant H is not a function that changes with time. But in general, the Hubble constant depends on time, and H=H(t)

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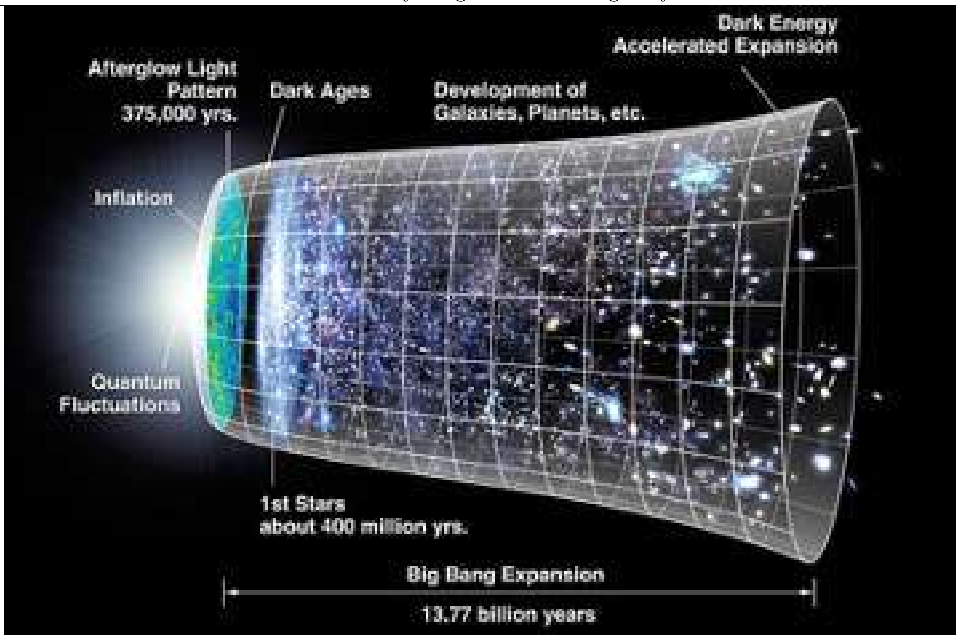

Figure 6. A graphical representation of the expansion of the universe from the Big Bang to the present day, with the inflationary epoch represented as the dramatic expansion of the metric seen on the left

is a function of time. In this case, if we give the Hubble law a general form, we will have v(t)=H(t)r, and this general Hubble law already characterizes the dynamics of the Universe.

On the other hand, if one can somehow determine the nature of the change in the speed v(t) of objects at each distance r, then the picture of the dynamic evolution of the Universe can be reconstructed from the change in time of the speed of objects at different distances. This is a theoretical perspective since it is practically impossible to determine the nature of the change in the speed of objects at large distances in a short period of time. Based on the fact that H(t)=$\frac{1}{r}\frac{dr}{dt}$ and the change in the speed of each object is relative, so it becomes more difficult to determine the nature of the change in the speed of objects if H(t)=$\frac{1}{r}\frac{dr}{dt}$ is not a very rapidly variable, i.e. the Hubble constant H(t) is not a rapidly changing function of time. It is practically impossible to notice a change in the recessional velocity of objects in a short period of time, so determining the functional form of H(t) is problematic.

When they talk about the expansion of the Universe at an accelerated rate, kind of dark energy is mentioned as the reason for this. Because the issue is about the movement of objects with acceleration, it follows that kind of repulsive, anti-gravitational force must act on these objects, the nature of which today is impossible to express any opinion, except that if we are dealing with accelerated motion, a force should act on a body moving with acceleration. This force moves apart objects, it pulls these objects away from each other. This force compensates the force of gravity and even surpasses it quantitatively, because if there were no strong pulling force, the Universe would expand more slowly, that is, the Hubble constant H=H(t) would be a decreasing function of time. And if the Universe is expanding at an accelerated rate, it turns out that the Hubble constant H=H(t) is an increasing function of time. If Hubble's constant were constant, the expansion of the universe would have to occur at a constant rate. Actually, r is a time variable, but Hubble's classical law v=Hr does not give us the nature of r's change. The variable r in the Hubble's law is not a function of time in the classical sense. It is parametric variable and equal to r for every fixed v speed. This does not show the nature of the change of r over time. Thus, the nature of the change in v is unclear.

Quasars as they were discovered in the 1960s seemed to be objects of a certain type, differing from the nearby objects only in their high radial velocities and high luminosity (Burbidge & Burbidge, 1967). So there was not even a hint that quasars represent an early evolutionary stage of galaxies. We see quasars in the distant past. If we could see the entire Universe instantly, we would notice that quasars are objects of a bygone era, and today they no longer exist, just as galaxies did not exist in the era of quasars. Because the further away a quasar is, the more absolute luminous it is, indicating that quasars are more massive objects than the galaxies. In Figure 3, Galaxies are the modern form of quasars, which in turn are evolving again. Thus, the evolutionary hierarchy of the Universe is a process of transition from high density to low density, since the observable fact is that the Universe is expanding. Since the Big Bang, the Universe has been in a state of constant expansion, as evidenced by the discovery of Hubble's law. The farther an object

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is, the faster it moves away from us, and wherever we are in space, it is isotropic, although the Universe we observe is not homogeneous. Instantly the Metagalaxy is only spherically concentrically homogeneous. Only the spherically concentric narrow layers of the observed Metagalaxy are homogeneous, because the rate of expansion of the Universe would be different in different epochs, so the rate included in the Hubble law and the Hubble constant are time-dependent quantities. The classical Hubble law does not tell us how the Hubble constant changes with time depending on distance. In principle, it is possible to determine the functional form of an object's speed using accurate unchanging light repers, but since there is nothing constant in the Metagalaxy and everything evolves, to determine the functional form of an object's speed in time is problematic. Without determining the dependence of speed on time, it is impossible to determine the age of the Metagalaxy and the Universe. When the age of the Universe is determined by the simple ratio $\frac{1}{H}$, this gives a very rough estimate of the age of the Universe, for a more accurate estimate, the functional form of v as a function of time is needed.

If the age of the Metagalaxy is Θ, it can be expressed through an integral and we will have:

$$\Theta = \frac{1}{c}\int_0^R \frac{dr}{v(r)}$$

where R is the radius of the Metagalaxy. If we denote by Ψ the time elapsed from the age of the objects on the border of the Metagalaxy to the moment of the Big Bang, the age of the universe, T will be $T = \Psi + \Theta$.

$$\frac{\Delta\lambda}{\lambda} = \frac{(\lambda - \lambda_0)}{\lambda} = z$$

We will have

$$v = \frac{(z+1)^2 - 1}{(z+1)+1}c$$

We will get

$$\Theta = \frac{1}{c}\int_0^R [1 + \frac{2}{z^2(r) + 2z(r)}]dr$$

At every fixed moment t_k, the age of all large-scale objects in space is the same. As for the fragmentation of matter from the Great Singularity, as we already mentioned, it should be similar to that in the weightless state of space, a vessel full of mercury is broken and fragments of different masses of mercury are scattered in space. They will all have a spherical shape and differ only in mass. So, even in the case of protoquasars, the universal dependence of mass-luminosity is preserved. An illustration of this process is in Fig. 5.

Space is always permeated with electromagnetic waves corresponding to the temperature of the matter in it with the corresponding quantitative dependence $E = mc^2$. Based on the evolutionary stages of quasars, it is not clear on what basis objects with the highest redshift z can be called galaxies. How did galaxies first exist, then quasars formed, and then galaxies again? It is logical if objects located at the corresponding redshift distance z=11 and z=13.5 can be called objects with an early evolutionary status of quasars, i.e. protoquasars. Protoquasars are objects of the early evolutionary stage of quasars. Matter of an earlier form than protoquasars is the region where the microwave background radiation of 2.7K is generated. It is not known whether this matter forms continuous layers or has a discrete structure (Penzias & Wilson, 1965), (Natsvlishvili, 2003), (Natsvlishvili, 2004). Then, as a result of evolution, quasars and, at the next stage, galaxies were formed. The objects of the next stage of protoquasars are quasars, and after quasars come the oldest large-scale intermediate objects: Seyfet galaxies, radio galaxies, galaxies with active nuclei, stationary galaxies. They can be characterized dynamically by the time change of the Hubble constant.

4. Dynamics of the Metagalaxy Motion

1. If H(t)= 0, the Metagalaxy is static.
2. If H(t)=const>0, the Metagalaxy is expanding at an increasing rate, accelerating.
3. If H(t)=const<0, the Metagalaxy is shrinking at a decreasing rate.
4. If H(t)= const > 0 and $\frac{dH(t)}{dt} > 0$, the Metagalaxy is compressible with increasing rate and acceleration.

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5. If H(t)>0 and $\frac{dH(t)}{dt} < 0$, then the Metagalaxy is expanding at a slower rate.

On Fig. 6 is given a picture of the evolutionary stages of the Universe. At the initial part, the inflation stage is shown, which raises many doubtful questions, since in the case of the inflationary model it turns out that matter is created, during which the volume of the medium increases, while its density remains unchanged. This indicates the formation of matter, in which the principle of the inadmissibility of Perpetuum Mobile in nature is violated.

5. Conclusion

The cosmogonic hierarchy of the Metagalaxy is a process of disposable formation of large-scale objects of the Universe. The Universe is pulsating, but it is not necessary to repeat every action exactly. The main principle of Perpetuum Mobile is excluded in nature, this universal principle must always be fulfilled. So, the assumption that the allegedly the Universe has an inflationary phase of development, we suspiciously consider, as well as an absolute vacuum. Because in the case of any volume of space, if material substance is present in it, the space around it cannot be empty, and it will be penetrated in every direction by electromagnetic waves according to the mass. Each particle or conglomerate of particles cannot be stationary, so it has electromagnetic radiation corresponding to its temperature, which penetrates the space around it in every direction.

Energy is quantified by Einstein's universal relation $E = mc^2$. Finally, we believe that quasars are the early evolutionary stage of galaxies. Objects with high z redshifts cannot be galaxies. They, in turn, are objects of the early evolutionary stage of quasars, protoquasars, from which later quasars were formed. Thus, quasars are not the nuclei of distant galaxies, but the objects of the early evolutionary stage of galaxies. At the distance of protoquasars cannot exist galaxies like at near distances – quasars. Quasars and protoquasars are objects of a bygone era and, in fact, no longer exist today, just as galaxies do not exist within the distance of quasars.

We must always keep in mind that we must distinguish between the instantaneous and the observable Universe, i.e. the state of objects and areas at any fixed moment of the Universe at any point in the Universe, from the state of objects and areas at different stages of evolution observed depending on the distance from us.

For a certain moment t_k, state of any places of the Universe must be identical to each other, which is confirmed by the isotropy of the Universe. But, in principle, it is impossible to observe them instantly. On the other hand, we simultaneously observe the state of objects and regions at different stages of the evolution of the Universe. This circumstance gives us the opportunity and perspective by observation to establish the chronological picture of the development of the Metagalaxy, from the Big Bang to the present.

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