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Alternative Cosmology

V. V. Petrov

vvpetrov@mksat.net

Introduction

A question about finiteness or infiniteness of the Universe has a great importance in cosmology:

- if the Universe is finite, then, as shown by Friedman, it can not be in a stationary condition and must be either expanding or shrinking;
- if the Universe is infinite, then assumptions about its collapsing or expanding do not make any sense.

It is known that the so-called cosmological paradoxes were suggested as the objections against the possibility of the infinite Universe, unlimited in the sense that neither its size nor its lifespan nor the mass of its matter could be expressed by any great number. Let us see in what extent these objections are motivated.

Cosmological Paradoxes - the Essence and Study

The main objections against the possibility of existence of eternal and infinite Universe are summarized in the following.

1. "In 1744, the Swiss astronomer J. P. Cheseaux was the first who set a doubt in correctness of belief about endless Universe: if the number of stars in the Universe is infinite, why all the sky does not shine as a single star surface? Why is the sky so dark? Why are the stars separated by dark space?" [1]. It is believed that such objection against the model of endless universe has been disputed by German philosopher H. Olbers in 1823.

"Counterargument of Olbers was that the light coming to us from distant stars should be dimmed because of absorption by matter on its way to an observer. But in such case this matter should heat up and shine as bright as stars." [2]. Actually, the dimming can still be happening! According to recent ideas, the vacuum is not a "nothingness", but represents "something" that has quite real physical properties. Then why not to assume that the light interacts with this "something" in such a way that every photon propagating through "something" loses energy proportionally to the traveled distance, causing the shift of the photon wavelength to the red part of spectrum. As a consequence, the absorption of photons' energy by vacuum is accompanied by increase of vacuum temperature, so that the vacuum becomes a source of secondary radiation, which can be called a background radiation. When a distance from Earth to radiating object – star or galaxy – reaches a certain limit, the light from this object gains such a large red shift that it blends together with background radiation of vacuum. Therefore, although the number of stars in the Universe is infinite, the number of stars (galaxies) observed from Earth or any other point of the Universe, which a local observer could consider as the center of the Universe, is only limited. At the same time, at the frequency of the background radiation all the sky radiates as a surface of a uniform star, as is actually observed.

It is known that the "red shift" has been discovered by Edwin Hubble in 1929. As described by T.A.Agekian in [5], "Hubble has established that red shift in spectra of light coming from distant galaxies is proportional to their distance (underlined by me - V.P.). This law called as the redshift law (describing the dependence of red-shift factor on distance to galaxies - V.P.) … is one of most fundamental laws of the Universe, one of the basic laws of nature (whereas the dependence of red shift factor on recessional speed of galaxies is just an interpretation of this law - V.P.).

The red shift law, i.e. dependence of spectral shift factor $z=\Delta\lambda/\lambda$ on distance to radiating object, can be written down as:

$$c \times z = H \times r, \qquad (1)$$

whence it follows:

$$r = c \times z / H,$$

where H = 75 (km/sec) / Mpc, and r is the distance to radiating object.

As the ratio of c to H equals 4000, we obtain a simple dependence between distance to a source of radiation and its red shift factor:

$$r = 4000 \times z \text{ Mpc}. \qquad (2)$$

Having studied in 1956 the radiation of 806 galaxies, Humason, Mayall and Sandidge have confirmed the validity of the Hubble law in the form of formula (1). It enables determination of distances to most remote objects currently known – quasars. So, for quasar OQ 172 the value of red shift is z = 3.53. Substituting it into formula (2), we obtain:

r = 4000×3.53 = 14120 Mega parsec or about 46 billions light years.

It means that we are observing the light radiated by quasar 46 billions years ago from the point in space where it appears to be now. Thus, the age of the universe cannot be less than 46 billions years, which is in complete disagreement with the Big Bang theory.

For a source registered in the catalogue BATSE under number 6665, the red shift factor z equals 5.0. Then, from (2), 4000×5.0 = 20000 Mpc = 65.2 billions light years, that by four times exceeds the age of the Universe determined from the Big Bang theory. Thus, the Big Bang theory does not correspond to some of the observational data.

2. In 1850, the German physicist Rudolf Clausius "... has come to a conclusion that in nature the heat is transferred from a warmer body to a colder one... The state of the Universe should always change in a certain direction... These ideas were further developed by English physicist William Thomson, according to whom all physical processes in the Universe are accompanied by transformation of light energy into heat" [1]. Hence, the thermal death fate for the Universe implies that the eternal existence of the Universe is impossible. Actually, it is not so. According to nowadays understanding, the matter turns into "light energy" and "heat" as a result of fusion processes in stars. "The Thermal Death" will happen as soon as all matter in the Universe will burn down in thermonuclear reactions. However, in the infinite universe the amount of matter is also infinite, hence, it can be burning for indefinitely large time. "The Thermal Death" rather threatens to a finite universe, as the amount of matter in it is limited. However, even in the case of the finite universe the "Thermal Death" is not inevitable. Newton was saying approximately the following: "The nature likes transformations. Why, among various transformations, there can not be such, in which the matter turns into light and light into mater". Nowadays, such transformations are well known: on one hand, the matter turns into light in fusion reactions, on the other hand - photons, i.e. light, under certain conditions turn into two quite material particles - electron and positron. In the process of "combustion" of matter of mass m, the energy E equal mc^2 is allocated; accordingly, in process of matter formation as an electron-positron pair, the mass m withdraws the same amount of energy. The result is a maintained thermal equilibrium, in which temperature of vacuum (ether) appears equal 2.7 K. Thus, in nature a circulation of matter and energy is carried out that excludes "Thermal Death" of the Universe.

3. In 1895 the German astronomer H. Seeliger "...has come to a conclusion that the idea of infinite space filled with matter at a finite density is incompatible with the gravity law of Newton... If in infinite space the density of matter is not infinitesimal, and each two particles under the law of Newton are mutually attracted, the force of gravity acting on any body would be infinitely large, and due to it the body would gain an infinitely large acceleration" [1].

As explains, for example, I. D. Novikov in [3], the essence of gravitational paradox consists in the

following. “Let the Universe be filled with celestial bodies at regular intervals, so that average density of matter in any large volumes of space is the same. Let's try to calculate, according to the Newton’s law, the value of gravitational force acting on a body (for example, galaxy) due to all infinite matter in the Universe. Assume first that the Universe is empty. Place a trial body *A* somewhere in space. Let's surround this body with matter filling a sphere of radius *R*, with the body *A* at its center. Clearly, by virtue of symmetry the opposite parts of sphere counterbalance each other at the center, and the resulting force is zero, i.e. there is no force acting on body *A*. Add now new and new spherical layers of matter of same density to a sphere… The uniform spherical layers do not produce gravitational forces in their interior, so the addition of these layers changes nothing, i.e. the resultant force at point *A* remains zero. Continuing the process of addition of layers, we come to a limit of the infinite universe filled uniformly with matter, in which the resulting gravitational force acting on *A* is zero.

However, the reasoning can be also carried out in a different way. Let's again place a uniform sphere of radius *R* in the empty universe. In contrast with the previous case, let's place our trial body not in the center of the sphere, but at its edge (surface). Now the gravity force acting on body *A*, according to the Newton’s law, is

$$F = GMm / R^2, \qquad (3)$$

where *M* is the mass of the sphere and *m* is the mass of the trial body *A*.

Let's add now spherical layers of matter to the sphere. A uniform spherical envelope does not produce gravitational force in its interior. Hence, the gravity force acting on body *A* does not change and is still equal to *F* from equation (3).

Let's continue the process of addition of spherical envelopes of matter having same density. The force *F* remains unchanged. Asymptotically, we again obtain the infinite universe filled uniformly with matter. However, now there is a force *F* acting on body *A*. Thus, depending on how the initial sphere is chosen, it is possible to get different force *F* in the uniformly filled infinite universe. This ambiguity has received the name “gravitational paradox”... The theory of Newton does not give an opportunity to calculate gravitational forces in the infinite universe without making additional assumptions. Only Einstein's theory allows calculating these forces without any contradictions”.

The contradictions, however, disappear at once, if we recall that the infinite universe is not the same as a very large universe:

- in the infinite universe, no matter how many mass layers we add to a sphere, there is still infinitely much of mass beyond each layer;

- in the infinite universe, it is always possible to surround a sphere of any radius with a trial body on its surface with a sphere of even greater radius in such a way that the first sphere and the trial body will be inside the new outer sphere filled uniformly with mass of same density as the inner sphere; if the trial body is at the center of the outer sphere, the gravity forces acting on the trial body become zero.

Then, if we further increase the radius of the outer sphere or add more layers to fill the infinite universe with uniform density, the gravity force acting on a trial body remains zero. In other words, the gravity force produced by all the mass in the universe is zero at any point. However, if there is no mass outside of the sphere on whose surface the trial body lays, i.e. if all the mass of the universe is localized inside this sphere, then the gravity force on the trial body is proportional to the mass contained by the sphere. Under action of this force the trial body and also all external layers of the sphere will be drawn towards its center; so, the sphere of finite size uniformly filled with mass will be inevitably collapsing under action of the gravity force. This conclusion follows both from the Newton’s gravity law and from the Einstein's general theory of relativity: the universe of finite size cannot exist eternally, as under action of gravity force its matter should be on a collapse course towards the center of the universe.

“Newton had an understanding that according to his theory of gravitation the stars should be drawn to each other and consequently they would seem to fall into each other, if they get close at some point...

Newton was arguing that it *ought to be* the case indeed if we had only *finite* number of stars in *finite* area of space (Italic formatting is by me – V.P.). But...if the number of stars is *infinite*, and if they are distributed more or less *uniformly* in the *infinite* space, such scenario would *never* take place, as there is no central point where they would need to fall. This reasoning is the example of how easy it is to fall into an error when talking about infinity. In the infinite universe any point can be considered a center because the number of starts in all directions from it is infinite. [Then it is possible]…to choose a finite system in which all stars are pulled together, falling towards the center, and see what happens if more and more stars are added with approximately uniform density distribution outside of considered region. No matter how many stars we add they will always be pulled towards the center" [2].

So, according to this author, if we don't want "to fall into an error", we should allocate some finite region in the infinite Universe, make sure that the stars in this region are falling towards the center of the region, and then extend this conclusion to the infinite Universe and declare that the existence of such Universe is impossible. Actually, since "in the infinite universe any point can be considered a center", the number of such points is infinite. Towards which of this infinite set of points will the stars be pulled? Besides, even if such a point is found, the infinite number of stars will be moving towards this point during an infinite period of time, so the process of collapsing of the whole universe into this point will take infinite period of time, i.e. will never end. The different story is when the universe is finite. In such a universe there is a unique point that is the center of the universe – it is the point where the expansion of the universe started, and into which all the matter in the universe will fall back when the expansion is followed by collapse. Thus, it is the finite universe, i.e. the universe whose boundaries and amount of matter can be expressed by some finite number, is doomed for collapse. Being collapsed, the universe would never be able to change its state without an external force. But since there is no matter, space or time outside of the universe, the only cause for expansion of the universe can be the action expressed by words "Let it be light!" As written by Friedrich Engels, "We can turn and twist as we want, but... each time we come again... to God's finger" (F. Engels, Anti-During). However, the finger of God cannot be a subject of science.

The conclusion

The analysis of the so-called cosmological paradoxes leads to the following conclusions.

1. The Space is not empty but is filled with some medium, which can be called the ether or physical vacuum – the terminology is of no importance. Propagating through this medium, the photons lose energy proportionally to the covered distance, so that their wavelength is shifted to the red part of spectrum. As a result of such interaction of photons with vacuum, the temperature of vacuum raises by few degrees above absolute zero, and the vacuum becomes a source of secondary radiation with corresponding absolute temperature; this is what observed actually. At the frequency of this radiation, which is the background radiation of vacuum, all sky appears uniformly bright, as was expected by J. P. Cheseaux.

2. Contrary to the assumption of Rudolf Clausius, the "Thermal Death" is not inevitable for the infinite universe with an infinite amount of matter; the transformation of infinite amount of matter into heat would take infinitely large period, i.e. forever. The "Thermal Death" is a menace for the finite universe with finite amount of matter, the transformation of which into heat can happen in a finite period of time. For this reason the existence of the finite universe appears impossible.

3. In the infinite universe, which sizes cannot be expressed by any large number and which is filled uniformly with non-zero density matter, the gravity force at any point is zero – this is a true gravitational paradox of the infinite universe. The absence of gravity force at any point of the infinite universe filled uniformly with matter means that the space in such universe is flat (Euclidean) everywhere.

In the finite universe, i.e. the universe, which sizes can be expressed by some – maybe very large – number, a trial body "at the edge" of the universe experiences the force of attraction proportional to the mass of all matter contained in the universe; as a result, this body will be pulled to the center of the universe. Therefore, the finite universe with a uniform distribution of matter is doomed for collapse, which can never change into expansion without some external force.

Thus, all the objections or paradoxes that are directed, as believed, against a possibility of existence of the infinite and eternal universe, are actually directed against existence of the finite universe. In fact, the Universe is infinite both in space and in time; it is infinite in the sense that neither its sizes nor the amount of matter in it nor its lifespan could be expressed by any large numbers - the infinity is just the infinity. The infinite universe was neither born as a result of a sudden and inexplicable expansion of some "pre-material" object, nor as a result of “Divine Creation”.

Probably, the above-mentioned arguments will seem absolutely unpersuasive to the supporters of the Big Bang theory. As believed by the well-known scientist H. Alfven, “The less there scientific proofs, the more fanatical the faith in this myth becomes. It seems that in a present intellectual atmosphere, the huge advantage of the Big Bang cosmology is that it insults common sense: credo quia absurdum (I believe, for it is an absurd)” (quoted from [4]). Unfortunately, the “fanatic faith” in some theories became a tradition: the more proofs of scientific inconsistency of such theories appear the more fanatical the faith in their absolute infallibility becomes.

In his time, Erasmus Rotterdamus was arguing with the known church reformer Luther: “Here, I know, some people will close their ears and shout: Erasmus has dared to battle with Luther!” This is like a fly against an elephant. If somebody wants to attribute it to my ignorance, I would not argue, only let even the ignorant – even for the sake of learning – allow to argue with others whom the God has given more... Maybe my opinion is self-deception; therefore I would like to discuss, not to judge; to be a researcher, not a founder; I am ready to learn from everyone who offers something more correct and reliable... If the reader will see that the core of my composition is equal to what the opposite side can offer, he will weigh and judge by himself about what has the greater meaning: the judgment of all educated people..., all universities..., or a private opinion of a person... I know it happens frequently that the larger part wins over the better part. I also know that for the goal of finding the truth it is never out of place to add a personal diligence to what was done before.

By these words we will finish our brief study.

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