OUR UNIVERSE AS A BLACK HOLE.

by beno.pehani@fe.uni-lj.si

SUMMARY: The article is engaged on reasons why the Friedmann equation for the speed of the mass expansion in our Universe is not good. After it explanates it, it delivers the appropriate substitution for the Friedmann equation. The rest of the article is then devoted to the consequences of this statements.

FOR THE BEGINNING FRIEDMANN EQUATION: In the year 1922, when the conception of the Black Hole (BH) was not yet so clear as it is to day, Friedmann originated for the global moving of galaxies in the expanding Universe after the Big Bang (BB) following equation

$$mv_R^2/2 - GmM/R = \Lambda c^2 \quad (e.1) .$$

In this equation represent: m the mass of particular galaxy, M the mass of the Universe, $v_R = v_R(t)$ the time dependent radial velocity of galaxies, R = R(t) the distance of galaxies from the BB at the time t elapsed from the BB, and Λ a constant. This equation, known as the Friedmann equation (FE), determines also the dependence of radial velocity $v_R(t)$ and of radius R(t) on time t elapsed from the BB. In the 4-dimensional space we imagine the mass of Universe as the 3D-surface of the 4D-sphere with the radius $R = \int v_R(t)dt = R(t)$ (e.2), as it is shown on Fig.1a.

The FE is based on the **Law of the Energy Conservation (LEC)**. By the LEC the quantity of energy, which has **the behavior of continually changing** from one it's form to the another, is conserved. In the FE energy is changing from the kinetic to its potential form or vice versa.

Constant Λ in the FE introduced Einstein to gain more solutions of this equation, if this constant has various values. He strove, as it is known, to have among the solutions, also the solution for an static Universe with expanding velocity $v_R = 0$. The constant Λ namely decides, whether the Universe is dynamic (open or closed) or static (but labile!).

INCORRECTNESS OF FRIEDMANN EQUATION : There are two reasons why the application of (e.1) at removing of galaxies each from the other is not correct.

If the Universe is expanding, it had to be born, as it is accepted, in the BB. Tight after the BB it was sure a huge BH (HBH). If it was BH then, it must be BH also to day, because the energy captured in the closed space, as the BH is, cannot easy and quickly escape out of it. The radiation of closed spaces (BH) is namely very low. Author of this paper is preparing also a wide paper about radiation of various kinds of bodies.

The energy captured in the BH, but also cannot rest there in peace, because the fundamental behavior of the energy is its standing changing. Therefore energy in BH must oscillate transforming itself from the electrical to the magnetic form, or, if it posses the rest mass M, from the kinetic to the potential form, or vice versa. In BH the local influence is so big, that the influence of the space out of it can be neglected.

In case that our Universe is HBH, it cannot be therefore one unlimited space, homogenous fulfilled with galaxies. **It is a huge 4-dimensional spherical cosmological body** with the mass M and with **the gravity center in the point of the BB,** as it is shown in Fig.1a. At the time t after the BB the mass M of the Universe forms (in average) homogenous 3D body, which has a form of the shell with radius $R(t) < R_r = ct$. In this shell as observers OB we are situated, and this, what we as observers OB see of the Universe at the time $t = t_0$ (= present time) is the Visible

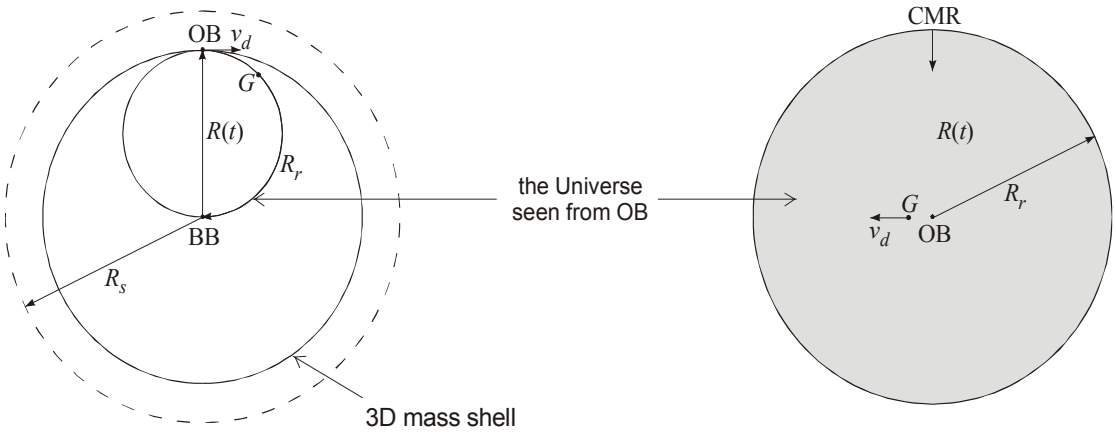

Fig.1: Our Universe a.) as the 4D-body and b.) as to OB visible 3D-body.

Part of Our Universe (VPOU). This part we see as the volume of the 3D sphere with the radius $R_r = ct$, as shown in Fig.1b. In Fig 1a but, VPOU is shown as the 3D-plane going through the points OB and BB. In case, the observer OB is looking in the sky, and wouldn't be blinded from the BB, he would see at the end of the sky how he looks himself.

Because the average mass density in the BH is $\rho(R) = [3M/(4\pi R_S^3](R_S/R)^3 = 3c^6/(32\pi G^3M^2)(R_S/R)^3$ (e.3), and decreases with the mass M, it is quite possible, that at huge masses M the density ρ can be so low, as it is in our Universe.

In any case but, the potential energy P of mass m in the center of gravity (GC), where R = 0, must be 0, as it is shown in Fig. 2. This Fig.2 represents the potential energy P of the mass m inside and outside the 3D homogenous, not rotating massive sphere, for instance our Earth, very far from other massive bodies. If mass m is a part of mass M, it oscillates inside the tunnel

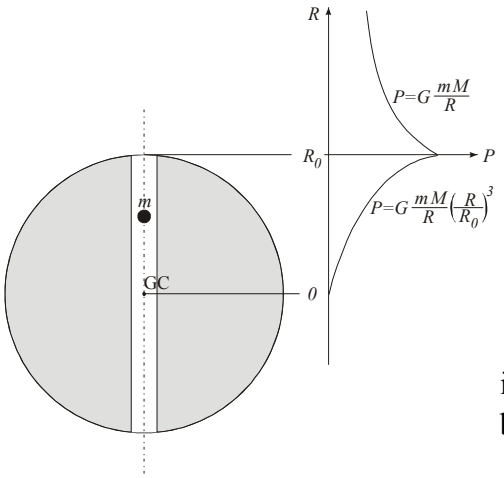

Fig.2: Potential energy P of mass m inside and outside homogeneous 3D-body with mas $M = 4\pi R_0^3\rho/3$.

through the GC. In GC is its total energy only kinetic of amount $K = mc^2 + mv^2/2 \# 3mc^2/2$. It is easy implement the situation on Fig. 2 also in Fig.1a, where all mass M and mass m are in the shell with $R(t) \# R_S$. We need in Fig 1a only replace R_0 with R_S , all other, as P = P(R) but, remains equal as shown in Fig.2

So we see that Friedmann's equation at R = 0 don't give right results. At R = 0 it gives: a.) P = GmM/R = 4 instead P = 0 and b.) $v_R = 4$ instead $v_R = c$. $v_R = 4$ is impossible because of

the second fundamental energetic law beside LES. This law, which we can call **Law of limited Energy (transforming) Speed (LES)** namely says, that the speed of energy transformation newer can be greater than speed c of light.

The FE (e.1) is then, because of exposed reasons, unacceptable. It is incorrect because it concerns the mass m as to be outside the mass M, instead it is inside it, as shown in Fig.2.

THE SUBSTITUTION OF THE FE: According with the given presentations the right Friedmann equation, i.e. the substitution of the equation (e.1), has the form

$$mv_R^2/2 + (GmM/R)(\rho_c/\rho) = \Lambda c^2 \quad (e.4).$$

We get equation (e.4) from (e.1) with two operations: a.) with multiplication of mass M with the ratio $(\rho_c/\rho) = (R/R_S)^3$, what is necessary, because the mass density ρ in the Universe grows with $1/R^3$, and b.) by changing the sign at P, what is a question only of an agreement connected but also with the value of the constant Λ.

After dividing (e.4) with $mc^2/2$ and introducing the Schwarzschild radius of the BH

$$R_S = 2GM/c^2 \quad (e.5)$$

in it, (e.4) gets following form

$$(v_R/c)^2 + (R/R_S)^2 = 2\Lambda/m \quad (e.6a),$$

or the form

$$(v_R/c) = [2\Lambda/m - (R/R_S)^2]^{1/2} \quad (e.6b)$$

Because from the LES the ratio (v_R/c) must be in the range $0 \# (v_R/c) \# 1$, and because the range of (R/R_S) is $0 \# (R/R_S) \# 1$, we see, that the unique value of constant Λ, which satisfies this condition is

$$\Lambda = m/2 \quad (e.7).$$

So we see one additional sense of the constant Λ , beside just mentioned at (e.1): it is its necessity in enabling LES.

Appropriate substitution of the FE (= SFE) gets so finally a form

$$\mathbf{(v_R/c)^2 + (R/R_S)^2 = 1 \quad (e.8)}$$

This equation has no deficiencies of the FE. In case of (e.8) when R = 0: $v_R = c$ and P = 0, and when $R = R_S$: $v_R = 0$ and $P = GmM/R_S = mc^2/2$

Solution of SFE: Let us write now (e.8) in the form $v = dR(t)/dt = c[1 + R(t)^2/R_S^2]^{1/2}$ or $dt = dR/[(c/R_S)(R_S^2 + R^2)^{1/2}]$ (e.9) and integrate it's left side with t and the right side with R. So we get $t = (R_S/c)\text{arc sin}(R/R_S)$ (e.10). If we denote the time at $R = R_S : t = t_m$ we have from (e.10): $(R_S/c)\text{arc sin}(1) = (R_S/c)(\pi/2) = t_m$, or

$$t_m = \pi R_S/(2c) = \pi GM/c^3 \quad (e.11).$$

The mass radius of the Universe from (e.10) is then

$$R(t) = R_S \sin[(\pi t/(2t_m)] < ct = R_r \quad (e.12),$$

where $R_r = ct$ is the radius of the primary radiation front from the BB.

With the differentiation of (e.12) we get for the speed of the mass expansion v_R

$$v_R = v_R(t) = dR/dt = R_S (2t_m/\pi)\cos[(\pi t/(2t_m)] = c.\cos[(\pi t/(2t_m)] \quad (e.13).$$

THE SIZE OF OUR UNIVERSE: If we want numerically estimate the size of our Universe at the present time, this it is its age $t = t_0$ and its radius $R = R_0$, we need beside of deduced equations also the knowledge about values of v_R and $\rho = \rho_0$ at this time.

First we establish that the expanding radial velocity $v_R(t)$ is equal to the removing velocity $v_d(t)$ of galaxy G from the Earth, if the distance D of galaxy G from the Earth approaches to 0

. Then we express $v_R(t) = v_R(t_0 - D/c)$ at $t = t_0$ as the Taylor series

$$v_R(t) = v_d(D=0) + [dv_d(t)/dt](t=t_0)D/c + ... \quad (e.14).$$

Because it is $v_d(D=0) = 0$, we discover neglecting members with higher potences of D in (e.14) the Hubble law $v_R \bullet H(t)D$, where the measured constant $H(t=t_0) = H_0 = (70 \pm 10)$ (km/s)/Mpc (e.15) [1, p. 33]. The present radial velocity is then $v_R = 70$ km/s « c. This means, that our Universe is quite near to the inversion from the expansion to the contraction. Nevertheless but, it will be still expanding in the next $0{,}23.10^{-3}.13{,}9.10^9 = 3{,}2.10^6$ years.

For the first approximation of the age t_0 of our Universe we get from $R(t_0)/c = 1$ Mpc/70 (km/s) = $t_0 = 1/H_0$. Because 1 Mpc (parsec) = $3{,}09.10^{19}$ km = $3{,}09.10^{19}/9{,}5.10^{15} = 3252$ ly we get

$$t_0 = 1/H_0 = 3{,}09.10^{19} \text{ (km/Mpc)/[70 (km/s)]} =$$
$$= 4{,}41.10^{17} \text{ (s)/3,17.10}^7\text{(s/year)} = 13{,}9.10^9 \text{ years} \quad (e.16).$$

Another, better estimation of this age t_0 . t_m we can get with the correct estimation of the average mass density $\rho = \rho(t=t_0) = \rho_0$ at the present time in our Universe. If we take, that it is $\rho_0 = (3{,}5 \pm 1{,}5).10^{-29}$ kg/m^3 /3, p. 86 and 4, p.1292/, we get that the mass M of our Universe is

$$M = \{3c^6\sin^3[(\pi t/(2t_m)]/(32\pi G^3\rho_o)\}^{1/2} \quad (e.18a),$$

this is $M = [2187.10^{48}/(1041.10^{-60})]^{1/2} = (2{,}09.10^{108})^{1/2} = 1{,}45.10^{54}$ kg (e.18b). If we use the result (e.18b) in (e.11), for t_m it follows:

$t_m = 3{,}14.6{,}67.10^{-11}.1{,}45.10^{54}/27.10^{24} = 1{,}125.10^{19}$ s/3,17.10^7(s/year) = 350.10^9 years.

This is $350.10^9/13{,}9.10^9 = 25$-times more, as gave the first approximation (e.16).

SOME CONSEQUENCES AND CONCLUSIONS:

1.) The time in the HBH and therefore also in our Universe **is absolute**, because we can in all its points measure it from the same common event, which simultaneously embraced all points of our Universe. This event was BB, when the whole Universe was crushed in one single point. In this absolute Universe don't exist any speed greater than c. In the absolute space the total energy $W = W_T$ with the equivalent mass $m = W_T/c^2$ has the rest mass $m_0 = 2W_T/(3c^2)$, with the sum of kinetic and potential energy $K + P = m_0c^2/2$ the kinetic and potential energy of this mass. So $W_T = mc^2/2 = 3m_0c^2/2$.

2.) Although the space in the Universe is absolute, there exists Einstein's Theory of Relativity (ETR) as the instrument, which helps sometimes to fulfill the fundamental energy laws: LEC and LES. Theory of relativity says, that the rest mass must increase with the coefficient $\gamma = 1/(1 - v^2/c^2)$, if we want accelerate it toward to the light velocity c. This is therefore impossible, because we would need for this an unlimited energy. The silent supposition here, but was, that the rest mass m_0 is constant. In the reality but, it is not true. At accelerating of the mass m_0 in praxis it is growing also its temperature. Therefore mass radiates and before it would reach the light speed, it disappears.

3.) No more searching for the missing mass is necessary. If our Universe is a HBH, each arbitrary value of the energy density is appropriate.

4.) Energy is tending to concentrate in bodies. These bodies from photons, over protons, atoms, to the celestial bodies form the energetic structure of the Universe. The attraction force varies in various levels of this structure. In protons this force is strong, in atoms it is electro weak, and between neutral atoms it is gravitational.

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