About possibilities of physical unrealizability of cosmological and gravitational singularities in General relativity*

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The possibility to avoid physical realizability of cosmological singularity (singularity of Big Bang of the Universe) directly in the orthodoxal general theory of relativity (GR) is substantiated. This can take place in the case of counting of cosmological time in frame of reference of coordinates and time (FR) not co-moving with matter, in which by the Weyl hypothesis galaxies of the expanding Universe are motionless. The absence of any limitations of the value of mass of astronomical body, which self-contracts in Weyl FR, when it has hollow topological form in the space of Weyl FR and mirror symmetry of its intrinsic space, is shown. Because of this symmetry, both external and internal boundary surfaces of body are observed as convex. At that, in the “turned inside out” internal part of the intrinsic space (in the Fuller-Wheeler lost antiworld) unlike external part, instead of the phenomenon of expansion phenomenon of contraction of “internal universe” is observed. And there is antimatter instead of matter in this internal part of the space. Inevitability of self-organization in physical vacuum of spiral-wave structural elements, which correspond to elementary particles, and universal electromagnetic nature of all nonfictive particles are substantiated. Ultrahigh luminosity of quasars and certain types of supernovas is caused by annihilation of matter and antimatter.

1. Introduction

The existence of singularities in GR is considered by Einstein [1] and later by the most authoritative specialists in this branch of physics (Ivanenko [2], Möller [3, 4], Hawking [5]) not only as the most apparent difficulty of this theory, but also as the sign of limitation of its application region. Being based on this and on the evidence of mathematical inevitability of existence of singularities in GR [6,7], many attempts of radical upgrade of GR applying to big densities of matter are undertaken. We have chosen another way to solve this problem.

The process of expansion of the Universe as whole can take place only, if it takes place in every single point of its infinite space. The presence of this process may be caused only by evolutional variability of the properties of physical vacuum and, therefore, by “adaptation” of matter elementary particles to continuously renewed terms of their interaction. Therefore, apparently, distances between quasi-motionless in Weyl FR galaxies (according to Weyl hypothesis [8-10], in this FR they take part only in small peculiar motions) elongate in FR, co-moving with evolutionally self-contracting matter, not because of the expansion of cosmic space into “nowhere”, but because of the continuous shrinkage of length standard in Weyl FR. The last is caused by gauge change (which is unobservable in principle in matter FR because of gauge invariance of people’s world [11]) of values of spatial parameters of elementary particles, evolutionally self-contracting in Newton-Weyl absolute space. This is the cause of continuous decreasing of dimensions of all Universe objects in Weyl FR. The fact that process, which takes place in megaworld, is caused by the processes, which take place in microworld, is in good agreement with existence of many correspondences in correlations between atomic, gravitational and cosmological characteristics – Eddington-Dirac “large numbers” [2, 12, 13] and doesn’t contradict with modern physical notions. That’s why we can consider the expansion of the Universe, in analogy to daily solar motion on the celestial sphere, only as phenomenon that is observed in some selected FR. Already ancient Greeks (Aristarchus of Samos (ca.310 – ca.230 BC) and Seleucus of Seleucia (ca.190 - unknown BC)) presumed, that in fact Earth revolves on its axis and around the Sun. But it took near two thousand years to make this the apparent truth for all. We can only hope, that phenomenon of Universe expansion won’t have such fate.

2. Substantiation of admissibility of evolutional process of gauge self-contraction of matter in GR.

Because of motion relativity, at the first sight it seems that there is no difference if space expanses relatively to matter or matter self-contracts in space. But in fact the difference between these processes is present and this difference is very essential. World points, in which points of empty intrinsic space of self-contracting body move in Newton-Weyl absolute space with supraluminal velocity, are found beyond the limits of space-time continuum (STC) of this body. At that, empty intrinsic space becomes self-limited by observer horizon. Furthermore, inequality of relativistic shrinkages of dimensions and relativistic time dilations in different points of intrinsic space, which is caused by inequality of velocities of these points, leads to onset of curvature and physical inhomogeneity of intrinsic space of self-contracting body correspondingly.

The spaces, in which contraction takes place, don't have all this and may be unlimited and infinitely large. Therefore, if cosmic space expands relatively to matter, then observer horizon will limit Weyl FR space. And if, as we consider, matter contracts in cosmic space, then observer horizon will limit space of FR, co-moving with matter. In conventionally empty space of self-contracting body, viz in its distant regions, points of which move in Weyl FR at velocities higher then velocity of light, there are no physical bodies, dragged by this space, On the contrary, all astronomical objects, conventionally motionless in Weyl FR, are dragged by expanding cosmic space. And at as long as desired distances from observer they can move, according to Hubble relation, at as high as desired velocities. However, velocity of physical object can't exceed velocity of light in the point, where it's located. Therefore, at as long as desired distances from observer improper values of velocity of light must be as large as desired. This, however, doesn't follow from GR gravitational field equations. Otherwise, observer intrinsic space must be finite. And this is possible in case of Friedmann singular model of expanding Universe with its finite past, as well as in case of presence of observer horizon in matter intrinsic space. In case of eternal existence of Universe in the past, (this doesn't allow existence of cosmological singularity) there are no other known physical mechanisms, which form observer horizon of intrinsic space of any astronomical body, except relativistic shrinkage of dimensions and relativistic time dilation. Therefore, phenomenon of Universe expansion can be caused only by gauge process of evolutional self-contraction of matter in cosmic space.

Such gauge (for intrinsic observer) matter self-contraction, which becomes apparent in relativistic shrinkage of moving body dimensions, has been recognized as physically real for the first time in special theory of relativity. In GR it is caused by the influence of gravitational field on matter and may be rather substantial in the process of relativistic gravitational collapse. But if such gauge self-deformation of matter is possible in absolute space in case of transposition of body in space along the force lines of gravitational field, then why it can't be possible in case of "transposition" of body only in time? After all, because of unification of space and time in single STC (Minkowski four-dimensional space-time) coordinate time is equal to spatial coordinates in GR. In this case, gravitational field may be considered as demonstration of presence of time delay of the process of gauge matter self-contraction in the points more distanced from the center of astronomical body and as demonstration of presence of matter influence on the properties of physical vacuum via negative feedback. This feedback is realizing via changes of eigenvalue of molecules volume as well as of eigenvalues of densities of energy and enthalpy of matter. At the early stages of Universe evolution, when its whole space was filled in with matter, eigenvalue of molecules volume gradually increased and eigenvalues of densities of energy and enthalpy of matter gradually decreased. The same takes place in case of advance from the center of astronomical object to its boundary surface, in other words – in case of advance in space, but not in time.

3. Schwarzschild internal solution for ideal liquid in co-moving FR

Let's examine Schwarzschild internal solution for ideal liquid, which is gauge-self-contracting in Weyl FR and, therefore, has rigid co-moving (intrinsic) FR. In this intrinsic FR of liquid, which is

inhomogeneously contracted by the gravity, linear element has static and spherically symmetric form [10]:

$$ds^2 = a(r)dr^2 + r^2\left(d\theta^2 + \sin^2\theta \cdot d\varphi^2\right) - b(r)c^2dt^2,$$

where r - luminosity radius of spherical surface, value of which is determined by its area S $\left(r^2 = S/4\pi\right)$ and in principle can vary non-monotonically along metrical radial interval r in nonempty space with curvature. Functions $a(r)$ and $b(r)$, which characterize curvature and physical inhomogeneity of liquid intrinsic space correspondingly, are connected here with eigenvalue of mass density $\tilde{\mu}(r)$ and eigenvalue of pressure $\tilde{p}(r)$ by differential equations [10]:

$$d\tilde{p}/dr + \left(\tilde{\mu}c^2 + \tilde{p}\right)b'/2b = 0 \qquad (1)$$

$$b'/abr - \left(1/r^2\right)\left(1 - 1/a\right) + \lambda = \kappa\tilde{p} \qquad (2)$$

$$a'/a^2r + \left(1/r^2\right)\left(1 - 1/a\right) - \lambda = \kappa\tilde{\mu}c^2. \qquad (3)$$

From these equations we may find:

$$\frac{1}{a} \equiv \left(\frac{\partial r}{\partial r}\right)^2 = 1 - \left(1 - \frac{1}{a_i} - \frac{\lambda r_i^2}{3}\right)\frac{r_i}{r} - \frac{\kappa c^2}{r}\int_{r_i}^{r} r^2\tilde{\mu}dr - \frac{1}{3}\lambda r^2 =$$

$$= 1 - r_g(r)/r - \lambda r^2/3 = 1 - r_g(r)/r - \left(1 - r_{ge}/r_c\right)r^2/r_c^2, \qquad (4)$$

$$b \equiv \frac{v_c^2}{c^2} = \frac{1}{a}\exp\int_{r_e}^{r}\Phi(\mathrm{r})dr = \frac{r_e}{ra_e}\exp\int_{r_e}^{r}\varphi(r)dr, \qquad (5)$$

where: $\Phi(\mathrm{r}) = (ab)'/ab = \kappa\left(\tilde{\mu}c^2 + \tilde{p}\right)ar$; $\varphi(r) = \left(1/r^2 - \lambda + \kappa\tilde{p}\right)ar$;

$$a_i \equiv a(r_i);\ \ a_e \equiv a(r_e) = \left[1 - r_{ge}/r_e - \left(1 - r_{ge}/r_c\right)r_e^2/r_c^2\right]^{-1};$$

$$r_g(r) = \left(1 - \frac{1}{a_i} - \frac{1}{3}\lambda r_i^2\right)r_i + \kappa c^2\int_{r_i}^{r} r^2\tilde{\mu}dr \qquad (6)$$

- gravitational radius of internal part of liquid, separated from its upper external part by spherical surface with luminosity radius r;

r_i and r_e - values of luminosity radius in optional supporting point i of liquid body and on its boundary spherical surface correspondingly;

v_c - velocity of light, value of which is determined in astronomical time t of the whole liquid body FR and is not the same in different points of this body (depends on radial coordinate of the point of light propagation);

c - eigenvalue of velocity of light, which is determined in proper quantum time of the point of light propagation, and, because of this, is the same in all points of matter intrinsic spaces (constant of light velocity);

κ - Einstein constant;

$\lambda = 3\left(1 - r_{ge}/r_c\right)/r_c^2$ - cosmological constant, which determines (together with gravitational radius of the whole liquid $r_{ge} \equiv r_g(r_e)$) maximal value of luminosity radius in FR of liquid (radius r_c of observer horizon of conventionally empty space above liquid) and, thus, shows the presence of adiabatic equilibrium process of gauge-self-contraction of molecules of liquid in cosmic space.

4. The physical essence of observer horizon and Schwarzschild sphere. Cosmological age of the Universe.

It was shown by Lemaitre [10, 14] and independently by Robertson [10, 15], that there is an appropriate transformation of coordinates, using which we can proceed from rigid FR, co-moving

with matter, to not co-moving FR, in which dimensions of both macro- and microobjects of body matter mutually proportionally vary with time. When values of gravitational radius of this astronomical body, located far from other astronomical objects, are negligible ($r_{ge} \approx 0$, that only formally corresponds to de Sitter Universe), we'll have: $r_c \approx \sqrt{3/\lambda} = c/H_e$. At that, linear element of body in Weyl FR will have the following form [10]:

$$ds^2 = \left(1 - r^2/r_c^2\right)^{-1} dr^2 + r^2\left(d\theta^2 + \sin^2\theta \cdot d\varphi^2\right) - \left(1 - r^2/r_c^2\right)c^2 dt^2 =$$
$$= \exp\left[2c(T - T_k)/r_c\right] \cdot \left[dR^2 + R^2\left(d\theta^2 + \sin^2\theta \cdot d\varphi^2\right)\right] - c^2 dT^2 = \left[1 - H_e\left(\overset{\backsim}{T} - \overset{\backsim}{T}_k\right)\right]^{-2}\left[dL^2 - c^2 d\overset{\backsim}{T}^2\right], \quad (7)$$

where: $$dL = \sqrt{dR^2 + R^2\left(d\theta^2 + \sin^2\theta \cdot d\varphi^2\right)};$$

$$r \equiv R_k = R \cdot \exp\left[H_e(T - T_k)\right] = R\left[1 - H_e\left(\overset{\backsim}{T} - \overset{\backsim}{T}_k\right)\right]^{-1} < r_c \quad (8)$$

R_k - radial coordinate of optional world point of STC of evolutionally self-contracting body in Weyl FR in the time moment T_k $\left(\overset{\backsim}{T}_k\right)$ of calibration of the dimension of length standard in Weyl FR by its dimension in intrinsic FR of this body;

$T = t + (r_c/2c)\ln\left(1 - r^2/r_c^2\right)$ - time, which is counted in Weyl FR by the metrically homogeneous scale, by which the rate of quasi-equilibrium physical processes in matter doesn't vary, despite gradual shrinkage of distances between its interacting elementary particles. Therefore, this time will be considered by us further as cosmological time;

$\overset{\backsim}{T} = \overset{\backsim}{T}_k + (1/H_e)\left[1 - \exp\left\{H_e\left(T_k - T\right)\right\}\right]$ - time, which is counted in Weyl FR by physically homogeneous scale [16,17], which is metrically noncalibrated, but guarantees invariance of values of velocity of light $\overset{\backsim}{V}_c = \left(\partial L/\partial \overset{\backsim}{T}\right)_s$ and energy of photons during the process of light propagation. Therefore, this scale (like length scale in Weyl FR) requires continuous renormalization. Due to renormalization of this time scale the moment of imaginary singularity (moment of matter self-contraction to zero dimensions) will be "expected" by it after the same finite time interval $\overset{\backsim}{T} - \overset{\backsim}{T}_k = H_e^{-1}$ independently of duration of passed time. And, therefore, in fact this moment of time is unreachable in principle. This means the physical unrealizability of such singularity;

$H_e = -V_H/R$ - Hubble constant, which determines in Weyl FR by metrically homogeneous time scale proportionality between velocity of the points of self-contracting body V_H and radial distance R to this points in Euclidean space of Weyl FR. The value of H_e does not evolutionaly vary and, consequently, does not depend on the averaged value of density of matter in expanding Universe. Therefore, precise determination of the averaged value of this density, as well as the problem (connected with it) of existence of hidden mass or so called dark nonbaryon matter in the Universe, are nonactual. The value of the ratio $-\overset{\backsim}{V}_H/R \neq const\left(\overset{\backsim}{T}\right)$, which is determined in Weyl FR by physically homogeneous time scale, on the contrary, evolutionally varies and becomes invariant only when it's being continuously renormalized: $(-\overset{\backsim}{V}_H/R)[1 - H_e(\overset{\backsim}{T} - \overset{\backsim}{T}_k)] \equiv H_e$. Analogously, only continuously renormalized (in compliance with evolutional decreasing of material length standard) value of the velocity of light is invariant by the metrically homogeneous time scale in Weyl FR.

According to this, velocities of radial motion not only of macroparticles of self-contracting body matter, but also of all points of conventionally empty intrinsic space of gauge-self-contracting body are determined in Weyl FR by metrically homogeneous time scale via Hubble relation:

$$V = dR/dT = -H_e \cdot R_k \exp\left[-H_e\left(T - T_k\right)\right] = -H_e \cdot R. \quad (9)$$

And they absolutely don't depend, as it was shown in [16], on parameters of equations (1-3).

Taking into account relativistic time dilation, improper values of velocities of light in FR of evolutionally self-contracting body (v_c) and in Weyl FR (V_c) will be connected by relationship:

$$v_c = c\sqrt{b} = V_c\sqrt{1 - \left(V/V_c\right)^2}\, r/R, \quad (10)$$

from where:

$$V_c = c\sqrt{b + (Vr/cR)^2}\,R/r = \sqrt{c^2 b + H_e^2 r^2}\,R/r \neq const(T). \qquad (11)$$

Front of intrinsic time t of physical body corresponds to simultaneous (when intrinsic time is inhomogeneous – to coincident [17, 18]) events and propagates in intrinsic FR of body instantly in principle $(v_t = \infty)$. In Weyl FR this front will propagate, as it follows from Lorentz transformation for velocities, with finite velocity:

$$V_t = dR_t / dT_t = V_c^2 / V = -\left(c^2 b + H_e^2 r_t^2\right) R_t / H_e r_t^2 \qquad (12)$$

Since when $t(r) = const$:

$$V_t = \left(\frac{\partial R}{\partial r}\right)\frac{dr_t}{dT_t} + \frac{\partial R_t}{\partial T_t} = \left[\frac{\sqrt{ab}}{r_t\sqrt{b + r_t^2 H_e^2/c^2}}\left|\frac{dr_t}{dT_t}\right| - H_e\right]R_t, \qquad (13)$$

where taking into account relativistic shrinkage of dimensions, when $T(R) = const$:

$$\left|\frac{\partial R}{\partial r}\right| = \left|\frac{\partial r}{\partial r}\right|\sqrt{1 - \frac{V^2}{V_c^2}}\,\frac{R}{r} = \frac{\sqrt{a}}{\sqrt{1 + r^2 H_e^2/c^2 b}}\,\frac{R}{r},$$

then, when $\partial r / \partial R > 0$, we'll have:

$$dT_t = -\left[H_e / c\sqrt{\left(c^2 b + H_e^2 r_t^2\right) b/a}\right] r_t dr_t = -\left(v_H / v_c^2\right) dr_t = -dt_T, \qquad (14)$$

where: $v_H = -v_c V / V_c = H_e r / \sqrt{1 + r^2 H_e^2 / v_c^2}$ - Hubble velocity of object, distancing from observer in its intrinsic FR and conventionally motionless in Weyl FR space (Newton-Weyl absolute space [17, 18, 19]). This velocity doesn't exceed velocity of light v_c in every point of intrinsic space and is equal to zero on the motionless observer horizon $(r = r_c)$ of conventionally empty space, the same as velocity of light:

$$v_{Hc} = \left(v_c r / r_c\right)\sqrt{\left(1 - r_{ge}/r_c\right)/\left(1 - r_{ge}/r\right)} = H_e r\sqrt{1 - r^3\left(r_c - r_{ge}\right)/r_c^3\left(r - r_{ge}\right)} = 0.$$

From this, for conventionally empty space $(ab = 1)$ we have:

$$dT_t = -\frac{H_e r_t \left(1 - r_{ge}/r_t\right)^{-1/2} dr_t}{c^2\left(1 - r_{ge}/r_t - r_t^2 H_e^2/c^2\right)} = \frac{r_t^{5/2}\left(r_t - r_{ge}\right)^{-1/2} dr_t}{H_e\left(r_t - r_c\right)\left(r_t - r_s\right)\left(r_t + r_c + r_s\right)}, \qquad (15)$$

where: $r_s = \left[\sqrt{\left(r_c + 3r_{ge}\right)/\left(r_c - r_{ge}\right)} - 1\right] r_c / 2$ - Schwarzschild sphere radius.

After integrating (15), we'll receive formula for difference between cosmological ages of events, simultaneous in FR of evolutionally self-contracting physical body, in optional points j and i $(r_j > r_i)$ of intrinsic conventionally empty space of this body:

$$\Delta T_{ij} = T_{tj} - T_{ti} = \frac{2}{\tilde{H}_e}\left\{\ln\left|\frac{\left(\sqrt{r_j} + \sqrt{r_j - r_{ge}}\right)}{\left(\sqrt{r_i} + \sqrt{r_i - r_{ge}}\right)}\right| - \frac{\left(r_c + r_s\right)^{5/2}}{\left(2r_c + r_s\right)\left(r_c + 2r_s\right)\sqrt{r_c + r_s + r_{ge}}} \times \right.$$

$$\times \ln\left|\frac{\sqrt{r_i + r_c + r_s}\left[\sqrt{r_j\left(r_c + r_s + r_{ge}\right)} + \sqrt{\left(r_c + r_s\right)\left(r_j - r_{ge}\right)}\right]}{\sqrt{r_j + r_c + r_s}\left[\sqrt{r_i\left(r_c + r_s + r_{ge}\right)} + \sqrt{\left(r_c + r_s\right)\left(r_i - r_{ge}\right)}\right]}\right| +$$

$$\left. + \frac{r_s^{5/2}}{\left(r_c - r_s\right)\left(r_c + 2r_s\right)\sqrt{r_s - r_{ge}}} \times \ln\left|\frac{\sqrt{r_i - r_s}\left[\sqrt{r_j\left(r_s - r_{ge}\right)} + \sqrt{r_s\left(r_j - r_{ge}\right)}\right]}{\sqrt{r_j - r_s}\left[\sqrt{r_i\left(r_s - r_{ge}\right)} + \sqrt{r_s\left(r_i - r_{ge}\right)}\right]}\right| -$$

$$-\frac{\sqrt{r_c\left(r_c-r_{ge}\right)}}{\left(2r_c-3r_{ge}\right)}\ln\left|\frac{\sqrt{r_c-r_i}\left[\sqrt{r_j\left(r_c-r_{ge}\right)}+\sqrt{r_c\left(r_j-r_{ge}\right)}\right]}{\sqrt{r_c-r_j}\left[\sqrt{r_i\left(r_c-r_{ge}\right)}+\sqrt{r_c\left(r_i-r_{ge}\right)}\right]}\right|\Bigg\}, \qquad (16)$$

where $\tilde{H}_e = H_e$ when $\partial r/\partial R > 0$ and $\tilde{H}_e = -H_e$ when $\partial r/\partial R < 0$.

According to (16), for any values of r_{ge}, and, thus, for any values of body mass, events in points of observer horizon of intrinsic space of this body took place in cosmological time in infinitely far past (when $\partial r/\partial R > 0$ and $r_j = r_c : \Delta T_{ij} = -\infty$). And this means, that observer horizon of any evolutionally contracting body, as it was shown in [16, 17], covers all infinite absolute space (according to (8) and (16) when $t = const$: $R_c = \infty$). Higher concentration of astronomical objects near observer horizon, caused by this, and finiteness of intrinsic space of physical body, however, are not being observed in the process of astronomical observations. This is connected with determination of distances to distant stars by their luminosity, starting from assumption about isotropy of their brightness (which is valid, of course, for Euclidean absolute space, but not for intrinsic space of matter, which has curvature), and directly by their concentration in certain solid angle. But it means, that in fact not metrical radial distances $\tilde{r}$ to distant objects in finite noneuclidean metrical intrinsic space of body, from surface of which observation is taking place, but continuously renormalized radial distances $\tilde{r}_k \equiv R_k$ to these objects in infinite Euclidean absolute space are being determined.

Simultaneity in matter FR of infinitely far past on observer horizon (when distances between interacting elementary particles of protomatter in absolute space were as long as desired) with every concrete event in any point of matter intrinsic space causes the finiteness of metrical distance in intrinsic space to its observer horizon [16, 17] (the possibility of this was shown earlier by Penrose [20]). The fact, that observer horizon covers all infinite absolute space explains impossibility for radiation to reach this horizon and to come from horizon to observer within as long as desired but finite time interval. When $r_j = r_c$: $\Delta t_{cij} = \infty$, because for conventionally empty space:

$$\Delta t_{cij} = \int_{\tilde{r}_i}^{\tilde{r}_j}\frac{d\tilde{r}}{v_c} = \frac{1}{c}\int_{r_i}^{r_j}\sqrt{\frac{a}{b}}dr = \frac{c}{H_e^2}\int_{r_i}^{r_j}\frac{rdr}{\left(r_c-r\right)\left(r-r_s\right)\left(r+r_c+r_s\right)} =$$

$$= \frac{c}{H_e^2}\left[\frac{r_c}{\left(2r_c+r_s\right)\left(r_c-r_s\right)}\ln\frac{\left(r_c-r_i\right)}{\left(r_c-r_j\right)}+\frac{r_s}{\left(r_c+2r_s\right)\left(r_c-r_s\right)}\ln\frac{\left(r_j-r_s\right)}{\left(r_i-r_s\right)}+\frac{\left(r_c+r_s\right)}{\left(r_c+2r_s\right)\left(2r_c+r_s\right)}\ln\frac{\left(r_j+r_c+r_s\right)}{\left(r_i+r_c+r_s\right)}\right]. \qquad (17)$$

Therefore, near the observer horizon of any body the delayed (by the clock of the body) process of origination of matter is continuously "observed", which corresponds to Gold-Bondi-Hoyl theory [2, 21] only formally. If observer horizon of matter intrinsic space is in fact a pseudohorizon of past, then Schwarzschild sphere, according to (16) and (17), is a pseudohorizon of future of matter. Events, which take place on this sphere, are simultaneous in physical body FR with every event on the surface and in any other points of this body. Therefore, they can take place in cosmological time only in infinitely far future (when $r_i = r_s : \Delta T_{js} = -\Delta T_{ij} = \infty$ and $\Delta t_{cij} = \infty$). There is nothing inside the "fictive" Schwarzschild sphere in that "moment" of cosmological time, and thus, in any moment of intrinsic time of physical body, because, according to (16) and (8), when $t = const$ and $r_i = r_s$: $\Delta T_{js} = T_s - T_{kj} = \infty$, and $R_s = 0$ (and thus $\tilde{r}_s = 0$, despite value of r_s is nonzero). This, of course, is connected with principal conservation of finite eigenvalues of matter dimensions, when its dimensions are as large as desired or as small as desired (hypothetically – conventionally "zero" in infinitely far future) in absolute space, and, thus, with the fact that luminosity radius in principle can't obtain (analogously to absolute temperature) not only infinitely large value but also zero value.

The presence of negative feedback between eigenvalue of dimension (stabilizable output parameter) and length unit, which is being determined in absolute space by the material length standard, becomes apparent here. This negative feedback prevent from catastrophical decrease

not only intrinsic dimensions of self-cooling astronomical objects, but also rates of physical processes in matter (which is possible because of the decrease of absolute value of the velocity of light) and, thus, guarantees the stable existence of matter. Moreover it causes the self-organization and stable existence of spiral-wave structural elements (matter elementary particles) in physical vacuum, which gauge-evolves (becomes older) and is the pseudodissipative medium in Weyl FR. (*Evolutionary decreasing (pseudodissipation) of energy of photons and kinetic energy of micro- and macroobjects of matter in Weyl FR (in matter FR it's unobservable in principle) is connected neither with the transfer of this energy to any "dark nonbaryon matter" nor with its taking away by any quasiparticles. This decreasing is caused only by evolutionary change of improper value of the velocity of light* V_c *in Weyl FR.)*

Analogous phenomena take place in thermodynamics (Le Chatelier – Brown principle), in electromagnetic phenomena (Lenz rule) and in the process of motion (relativistic shrinkage of length [18]). The character of any physical law or phenomenon is being determined by the presence of explicit and implicit (hidden from observation in principle) negative feedbacks, which are formed between parameters and characteristics of matter in the process of its self-organization and are aimed at the maintaining of stability of steady phase state of matter. Revelation of global topology of direct communications and feedbacks between parameters and characteristics of matter is the supreme aim of physics.

The postulation of Universe stationarity in Weyl FR (as well as in Gold-Bondi-Hoyl theory) causes principal impossibility of finiteness of its cosmological age in future, as well as in the past. Thus the possibility of birth of Universe from "nothing" and its expansion into "nowhere" is excluded. Conception of Big Bang of Universe is based on using in cosmology instead of metrically homogeneous scale exponential scale of cosmological time $\grave{t} = \grave{t}_k - (1/H_e)[1 - \exp\{H_e(t - t_k)\}]$, which requires mutually proportional continuous renormalization of all time intervals and is inverse to physically homogeneous time scale in Weyl FR. If by the last in any moment of time $\grave{T}_k$ singularity will be realized in future after the same time interval $\grave{T} - \grave{T}_k = H_e^{-1}$, then by it in any moment of time $\grave{t}_k$ singularity distanced from present into past for the same time interval $\grave{t} - \grave{t}_k = -H_e^{-1}$, invariant only due to its renormalization.

(It is not excepted that scale of cosmological time, which is being used now, may be metrically homogeneous (uniform for self-cooling stellar matter) but only for noninitial phase state of matter, in which translucent substance started to cool down because of the origination of free (nonvirtual) photons. Then the singularity of Friedmann-like solution, which corresponds in this case to matter only after the origination of cosmic backgroung, will be located beyond the region of existence (physical realization) of this solution in coordinate time of FR that corresponds to it. The duration of cosmological time of self-inflation of the Universe [22] *before the start of self-cooling of its matter can't be finite, according to (16), and for as small as desired finite values* r_g *of uniformly distributed in early Universe protoparticles of matter.)*

Because of this, such conception substitutes infinitely long evolutional development of the Universe by revolutionary event, which took place "not known where and not known inside of what". Rejection of it, however, doesn't deny the possibility of hot condition of matter at early evolutional stages and other results in Universe evolution research, achieved by cosmology (only some remaking sense of this results is required). Moreover, this rejection leads only to metrical transformations of STC, which have no influence on sequence of cause and effect in evolutional physical processes.

According to physical notions stated here, exponential slowing down of all physical processes by used now in cosmology time scale is provided. Thus, exponential slowing down of matter self-contraction in the Newton-Weyl absolute space is provided too. And this is equal to exponentially quick Universe expansion in FR, co-moving with matter. Therefore, these notions are in good agreement with inflationary cosmology [22], based on the scenario of inflatory Universe.

Despite this, use of metrically inhomogeneous exponential time scale in cosmology in most cases may be expedient, the same as the use of metrically inhomogeneous logarithmical time scale in

physics sometimes. But we must remember, that cosmological singularity, born in this case, is fictive.

5. Black holes and astronomical objects, which are alternative to them.

According to (2), during the setting up of physical, and so metrical, singularities on the surface of the body ($1/a_e = b_e = 0$): the following condition takes place: $b'_e = \left[1 - 3\left(H_e \cdot r_e / c\right)^2\right] / r_e > 0$. Therefore, when values of functions $a(\overset{)}{r})$ and $b(\overset{)}{r})$ are nonnegative the value of luminosity radius mustn't decrease ($\partial r / \partial \overset{)}{r} \le 0$) in case of advance from the surface of the body to its center. The change of signature of linear element ($a \le 0$ and $b \le 0$) is not examined here, because it doesn't correspond to primordially accepted in GR physical notions about space and time.

However, monotone decreasing $(\partial r / \partial \overset{)}{r} < 0)$ of function $r(\overset{)}{r})$ in the layer near surface is also impossible. Since if it were possible, gravitational forces would be directed from within of ideal liquid to its surface $(db / d\overset{)}{r} < 0)$ and would be balanced by no other force, because of conventionally zero value of pressure above this surface. And furthermore, by the same reason, physical singularity can't arise on the surface of body before it is set up in the whole its volume. Therefore, in intrinsic space of such body its spherocylindrical metrics ($\partial r / \partial \overset{)}{r} = 0$ when $\overset{)}{r} \le \overset{)}{r}_e$), which guarantees the possibility of propagation of physical singularity in the whole body volume ($b(\overset{)}{r}) = 0$ when $\overset{)}{r} \le \overset{)}{r}_e$), must be formed.

According to (14), and taking into account $a_{\min} > 1$, let's find lower limit of values of difference between cosmological ages of simultaneous events in nonempty space of any physical body, and so, inside of examined by us ideal liquid:

$$\left|\Delta T_{ij}\right| > \left|\frac{H_e}{c}\int_{r_i}^{r_j}\sqrt{\frac{a_{\min}}{b_{\max}\left(c^2 b_{\max} + H_e^2 r_t^2\right)}}\, r_t dr_t\right| > \frac{1}{cH_e\sqrt{b_{\max}}}\left|\sqrt{c^2 b_{\max} + H_e^2 r_j^2} - \sqrt{c^2 b_{\max} + H_e^2 r_i^2}\right|. \quad (18)$$

According to obtained relation, condition $\left|\Delta T_{ij}\right| \ne \infty$ for as small as desired values of $\Delta\overset{)}{r}_{ij}$ is fulfilled when $b(\overset{)}{r}) = 0$ and also only in case of presence of spherocylindrical metrics of internal intrinsic body space. From all these follows the absence of both gravitation inside such "body" and radial pressure drop $(d\tilde{p} / d\overset{)}{r} = 0)$ in its "matter", elementary particles of which, because of equality of their hamiltonians to zero, have radiated all their energy with quasi-particles and, therefore, have proceeded from actual state into virtual and in fact have destroyed themselves (for external observer). Energy of such "dead" black hole is concentrated only in electromagnetic radiation, which propagates in Weyl FR at Hubble velocity. And, therefore, only "dead" black hole can correspond to GR gravitational field equations if values of functions $a(\overset{)}{r})$ and $b(\overset{)}{r})$ are nonnegative.

Let's examine also compatibility of existence of black holes with presence of Weyl FR. The observer horizon of rigid body in its internal (intrinsic) FR is motionless ($v_{Hc} = 0$). However, it moves in Weyl FR at the velocity of light. Therefore, matter, which has inertia, can't be on this horizon in principle. There necessarily must be a layer of empty space between the surface of the body and its external observer horizon (which, as it was shown before, is a pseudohorizon of past). But, according to (8) and (16) any as "photometrically" thin as desired layer ($r_c - r_e \to 0$ in sprite of the fact that $\overset{)}{r}_c - \overset{)}{r}_e >> 0$) of external conventionally empty part of intrinsic space of physical body contains whole Universe. In other words, both on and outside observer horizon of as massive as desired physical body no other physical objects can be in principle. Ultralow gravitational field strength, which is created near its observer horizon by astronomical body with as small as desired mass, doesn't prevent other astronomical objects near this horizon from spontaneous motion near this horizon. And, if observer horizon of body is "passing by" these astronomical objects in absolute space, then in intrinsic space of this body the distancing of these objects from observer at velocity of

light would be observed. Therefore, no physical body can be self-isolated from Universe by singular surface, which is located in empty space or at least contacts with this space.

So, according to physical notions taken here, such hypothetic astronomical objects as black holes can't exist in principle. Impossibility of motion of surface of evolutionally self-contracting in absolute space astronomical body at velocity of light in this space is imposing substantial restriction both on the value of luminosity radius of this surface in intrinsic space and on the value of body gravitational radius. So, for example, velocity of light on the surface of hypothetical absolutely incontractable ideal liquid, in whole volume of which both eigenvalues of mass density $\left(\tilde{\mu} = const\left(r'\right)\right)$ and, according to (1), improper values of enthalpy density $\left(\sigma = \tilde{\sigma}\sqrt{b} = \left(\tilde{\mu}c^2 + \tilde{p}\right)\sqrt{b} = \tilde{\mu}c^2\sqrt{b_e} = const\left(r\right)\right)$ are constant, when $r_0 = 0$ is the following:

$$v_{ce} \equiv \sqrt{b_e} = \sqrt{1 - \left(\kappa\tilde{\mu}c^2 + \lambda\right)r_e^2/3} = 1 - \left(2/3\right)\left(1 + \lambda/\kappa\tilde{\mu}c^2\right)\left(1 - \sqrt{b_0}\right).$$

It takes on minimal value $\left(v_{ce}\right)_{\min} = \left(1 - 2\lambda/\kappa\tilde{\mu}c^2\right)/3$ for the maximal value of surface radius: $\left(r_e\right)_{\max} = 2\sqrt{\left(2\kappa\tilde{\mu}c^2 - \lambda\right)/3}/\kappa\tilde{\mu}c^2$, for which gravitational singularity originates ($\tilde{p}_0 = \infty$; $a_0 \cdot b_0 = 0$) in the center of gravity of the liquid. Further growth of r_e, and so growth of liquid mass for such (normal: $a_0 = 1$) configuration of its STC, is impossible in principle, because it leads to negative values of not only b_0, but also $\tilde{p}_0$ and $\tilde{\sigma}_0$. And furthermore, when $\tilde{\mu} = 6H_e^2/\kappa c^4$: $r_e = r_s = r_c = \lambda^{-1/2} = c/\sqrt{3}H_e$. Thus, intrinsic space of liquid (both inside and outside it) has spherocylindrical metrics. And velocity of light v_c not only inside the liquid, but also in conventionally empty space above it, takes on a zero value.

Like in all other solutions of equation (3), in this solution integration begins only from zero value of luminosity radius of body. Therefore, upper layers of matter (even when they're as massive as desired) have no direct effect on the curvature of intrinsic space of body in lower layers of matter, while lower layers of matter have direct effect on the curvature of this space in upper layers. For hypothetic absolutely incontractable liquid function $a\left(r\right)$, which determines curvature of its intrinsic space, in the points of lower liquid layers doesn't depend on the presence of liquid higher than these layers at all. In fact, the pressure of upper layers of absolutely incontractable liquid has no effect on distribution of eigenvalue of its density in lower layers. This is not only a paradox, but not always may be a physical reality. Upper layers of matter, when their mass is very big, must have direct effect on curvature of the space of body in lower layers via some integral characteristics. According to (3), this is possible if in intrinsic spaces of very massive astronomical bodies physically realized values of luminosity radius are limited not only from the top $\left(r_{\max} \equiv r_c \neq \infty\right)$, but also from the bottom $\left(r_{\min} \equiv r_0 \neq 0\right)$. This limitation from the bottom of value of luminosity radius of body with strong gravitation field may be connected with existence of metrical singularity $\left(a_0 = \infty\right)$ inside of body. It takes place in the case of nonmonotone radial change of gravitational field strength in absolute and co-moving spaces. For such spatial distribution of gravitational field strength with decreasing of value of metrical radial distance r' luminosity radius r at first decreases $\left(\partial r/\partial r' > 0\right)$ to its minimal value r_0, and then begins to increase $\left(\partial r/\partial r' < 0\right)$ inside nonempty intrinsic space of this body. Physical singularity $\left(b\left(r_0\right) = 0\right)$, which, according to (5), always accompanies metrical singularity, will take place only in infinitely small neighborhood of the surface with luminosity radius r_0. Therefore, it can be expected that this singularity will be smeared by quantum fluctuations of inhomogeneous structure of STC. In this case it doesn't completely disturb the interaction between matter of internal and external parts of such body, due to possibility of tunneling of formally absolutely thin barrier, formed by it. According to quantum-mechanic notions, the motion of matter is not its mechanic transposition, but quasi-continuous change of its space-time states. Therefore, such singular surface can't be an absolutely insuperable barrier for penetration of matter through it.

6. Internal solution of GR equations for ideal liquid in Weyl FR

Due to covariance of GR gravitational field equations, their internal solution for ideal liquid may be received also in Weyl FR. In this FR nonzero components of metrical tensor are the following:

$$g_{11} = N^2(R,T) = r^2(R,T)/R^2, \quad g_{22} = r^2(R,T),$$

$$g_{33} = r^2(R,T)\sin^2\theta, \quad g_{44} = -f^2(R,T)c^2 = -N^2(R,T)V_c^2(R,T),$$

Here eigenvalue of radial coordinate $r(R,T)$ is determined by intrinsic length standard in world point with following absolute coordinates and is identical to the value of luminosity radius in intrinsic FR of the liquid. Relation $N(R,T) = r/R$ determines inequality of dimensions of identical matter objects in different points of Euclidean space of Weyl FR, and, therefore, characterizes metrical (scale) inhomogeneity of this space for matter. Average statistical relative value of frequency of interaction of matter elementary particles $f(R,T) = NV_c/c$ determines inequality of rates of identical physical processes in different points of Weyl FR space, and, therefore, characterizes physical inhomogeneity of Weyl FR space for matter.

(Due to gauge invariance of people's world [11] *to scaling transformations of matter in absolute space (this invariance is based on the principal metrical homogeneity of intrinsic space of matter* [17]*), geometrical properties of space are generally examined in GR with the use of such characteristics as curvature of space. However, mathematical apparatus of Riemannian geometry allows us in principle to describe geometrical properties of Euclidean spaces, which are metrically (by scale) inhomogeneous for matter according to Weyl hypothesis* [11, 23]*. This takes place because of possibility of one-to-one mapping (for the chosen coefficient of scaling transformation in one of the space points) of Riemannian metrically homogeneous space onto Euclidean metrically inhomogeneous space. Poincare* [24-26] *denotes the possibility of interpretation of curvature of matter intrinsic space as the consequence of nonuniform deformation of this matter in Euclidean space under the influence of physical fields. The possibility to determine space-time state of matter in scale-inhomogeneous pseudoeuclidean space is the important factor for quantum mechanics, in equations of which curvature of space is not taken into account.)*

According to this, gravitational field equations for ideal liquid [10]:

$$M_i^k = G_i^k - Gg_i^k/2 - \lambda g_i^k = -\kappa T_i^k = -\kappa\left[\left(\tilde{\mu} + \tilde{p}/c^2\right)U_iU^k + \tilde{p}\delta_i^k\right]$$

in pseudoeuclidean Minkowski space of Weyl FR will have the following form:

$$M_1^1 = -\frac{2R^2}{r^3 f}\frac{\partial f}{\partial R}\frac{\partial r}{\partial R} - \frac{2}{rc^2 f^3}\frac{\partial f}{\partial T}\frac{\partial r}{\partial T} + \frac{2}{rc^2 f^2}\frac{\partial^2 r}{\partial T^2} + \frac{1}{r^2 c^2 f^2}\left(\frac{\partial r}{\partial T}\right)^2 - \frac{R^2}{r^4}\left(\frac{\partial r}{\partial R}\right)^2 + \frac{1}{r^2} - \lambda =$$

$$= -\kappa\left[\tilde{\mu}c^2V^2/V_c^2 + \tilde{p}\right]\left(1 - V^2/V_c^2\right)^{-1}$$

$$M_1^4 = -\frac{r^2}{R^2c^2f^2}M_4^1 = \frac{2}{rc^2f^2}\left[\frac{1}{f}\frac{\partial f}{\partial R}\frac{\partial r}{\partial T} + \frac{1}{r}\frac{\partial r}{\partial R}\frac{\partial r}{\partial T} - \frac{\partial^2 r}{\partial R\partial T}\right] = -\frac{\kappa Vr\left(\tilde{\mu}c^2 + \tilde{p}\right)}{cV_c fR\left(1 - V^2/V_c^2\right)},$$

$$M_3^3 = M_2^2 = -\frac{R^2}{r^2 f}\frac{\partial^2 f}{\partial R^2} - \frac{R}{r^2 f}\frac{\partial f}{\partial R} - \frac{2}{rc^2 f^3}\frac{\partial f}{\partial T}\frac{\partial r}{\partial T} +$$

$$+ \frac{2}{rc^2 f^2}\frac{\partial^2 r}{\partial T^2} + \frac{1}{r^2c^2f^2}\left(\frac{\partial r}{\partial T}\right)^2 - \frac{R^2}{r^3}\frac{\partial^2 r}{\partial R^2} + \frac{R^2}{r^4}\left(\frac{\partial r}{\partial R}\right)^2 - \frac{R}{r^3}\frac{\partial r}{\partial R} - \lambda = -\kappa\tilde{p},$$

$$M_4^4 = \frac{3}{r^2c^2f^2}\left(\frac{\partial r}{\partial T}\right)^2 - \frac{2R^2}{r^3}\frac{\partial^2 r}{\partial R^2} + \frac{R^2}{r^4}\left(\frac{\partial r}{\partial R}\right)^2 - \frac{2R}{r^3}\frac{\partial r}{\partial R} + \frac{1}{r^2} - \lambda = \frac{\kappa[\tilde{\mu}c^2 + \tilde{p}V^2/V_c^2]}{\left(1 - V^2/V_c^2\right)},$$

where:

$$V \equiv dR/dT = -H_e \cdot R; \qquad V/V_c = -\sqrt{\lambda/3}\cdot r/f = const(T). \tag{19}$$

From these equations, taking into account (9,12,14) and rigidity of intrinsic FR of ideal liquid ($r = const(T)$, $f(r) = const(T)$, $\tilde{\mu}(r) = const(T)$, $\tilde{p}(r) = const(T)$) we find by the metrically homogeneous scale of cosmological time T ($dT \equiv dt = d\tilde{t} / \sqrt{b}$ when $dr = 0$) following dependences:

$$\left(\frac{\partial r}{\partial T}\right)_R = H_e \cdot R\left(\frac{\partial r}{\partial R}\right)_T = \tilde{H}_e \cdot r / \sqrt{a\left(1-(V/V_c)^2\right)} = \tilde{H}_e \cdot r / \sqrt{a\left(1-(H_e \cdot r/cf)^2\right)} = \tilde{H}_e \cdot rf(ab)^{-1/2},$$

$$f = \sqrt{b + \lambda\frac{r^2}{3}} = \sqrt{\frac{1}{a}\exp\int_{r_e}^{r}\kappa\left(\tilde{\mu}c^2 + \tilde{p}\right)ardr + H_e^2\frac{r^2}{c^2}}$$

and directly when $1/a_0 = 0$:

$$\frac{1}{a} = \frac{1}{r}\left[(r - r_0) - \kappa c^2\int_{r_0}^{r} r^2\tilde{\mu}dr - H_e^2\left(r^3 - r_0^3\right)/c^2\right],$$

$$T(r,t) = T_k + \frac{\left(\tilde{t} - \tilde{t}_k\right)}{\sqrt{b}} - \frac{\tilde{H}_e}{c^2}\int_{r_k}^{r}\sqrt{\frac{a}{b}}\frac{r}{f}dr = T_k + (t - t_k) - \frac{\tilde{H}_e}{c^2}\int_{r_k}^{r}\sqrt{\frac{a}{b}}\frac{r}{f}dr, \quad (20)$$

$$R(r,T) = R(r,T_k)\exp\left[-H_e(T - T_k)\right] = r_k\exp\left[-H_e\left((T - T_k) - \frac{1}{\tilde{H}_e}\int_{r_k}^{r}\frac{\sqrt{ab}}{fr}dr\right)\right],$$

$$R(r,t) = R(r,\tilde{t}_k)\exp\left[-\frac{H_e \cdot \left(\tilde{t} - \tilde{t}_k\right)}{\sqrt{b}}\right] = r_k\exp\left[-H_e\left((t - t_k) - \frac{1}{\tilde{H}_e}\int_{r_k}^{r}\sqrt{\frac{a}{b}}\frac{f}{r}\ dr\right)\right]. \quad (21)$$

Limiting minimal value of luminosity radius r_0 corresponds here to spherical surface, in the points of which there is no gravitational field strength $\left(db/d\tilde{r} \equiv b_0'/\sqrt{a_0} = 0\right)$, and the following conditions are fulfilled: $f_0 = H_e \cdot r_0 / c$, $V_{c0} = H_e \cdot R_0$. The values t_k and $\tilde{t}_k = \sqrt{b}t_k$ of the moment of time, in which in the point with radius r_k (separately for $R_k > R_0(T_k)$ and for $R_k < R_0(T_k)$) dimension of length standard is calibrated in Weyl FR by its dimension in co-moving FR $\left(R(r_k, T_k) \equiv R(r_k, t_k) \equiv r_k\right)$, are determined correspondingly in astronomical intrinsic time (common for whole liquid) and in proper quantum time of the point with radius r_k. In these relations $\tilde{H}_e = H_e$ for the region of Weyl FR space $R \in (R_0; \infty)$, in which $\partial r / \partial\tilde{r} > 0$, and $\tilde{H}_e = -H_e$ for the region $R \in (0; R_0)$, in which $\partial r / \partial\tilde{r} < 0$.

In spite of the fact that $db/d\tilde{r} = 0$ when $r = r_0$, the value of db/dr is nonzero $(b_0' \neq 0)$. This is caused by the fact that, according to (5), $a_0 b_0 \neq 0$. Therefore, according to (2), $\tilde{p}_0 \neq \infty$, even if the value of the mass of liquid is as large as desired, but finite. And so for compact astronomical formations the value of $r_0 << (\lambda - \kappa\tilde{p}_0)^{-1/2}$ may be guaranteed.

Because of presence of principal possibility of function $R(r)$ two-valuedness in this internal solution (the same as in external solution [16]), function $\tilde{r}(r)$ may also be two-valued. This means, that GR gravitational field equations really admit the possibility of existence of metrical singularity $(a_0 = \infty)$ inside physical body. Thus, according to (21), in any moments of cosmological and intrinsic time of matter they guarantee correspondence of eigenvalues of luminosity radius r, not smaller than r_0 $\left(r \geq r_0 > r_{ge}\right)$, to whole infinite Euclidean space of Weyl FR $\left(R \in (0; \infty)\right)$. Therefore, no region of Weyl FR space can correspond to Schwarzschild solution for $r < r_{ge}$, when $a \leq 0$ and $b \leq 0$ [7]. At the same time, both in external ($R > R_0$) and internal ($R < R_0$) conventionally empty intrinsic spaces of liquid velocity of motionless in Weyl FR objects is determined by Hubble relation:

$$v_H = \tilde{H}_e \cdot r\sqrt{1 - (V_e/V_c)^2} = \tilde{H}_e \cdot r\sqrt{1 - r^3\left(r_c - r_{ge}\right)/r_c^3\left(r - r_{ge}\right)}.$$

7. Extraordinary configuration of STC, which guarantees the presence of minimum of total enthalpy of the whole ideal liquid.

Such singular solution of GR gravitational field equations corresponds to hollow spherically symmetrical body with mirror symmetrical intrinsic space and many centers of gravity $\left(db/dr=0\right)$ in the points of median singular surface, which is concentric to external and internal boundary body surfaces. When $\lambda=0$ such configuration of intrinsic space consists of two asymptotically Euclidean half-spaces, connected by narrow gullet. This configuration is obtained by Fuller and Wheeler [27, 28], being based on geometrodynamic model of mass. When $\lambda\neq 0$, internal empty space of massive astronomical body is limited by fictive sphere of the pseudohorizon of future. In this internal empty space, which is as it were «turned inside-out» by very strong gravitational field, instead of the Universe expansion phenomenon, phenomenon of contraction of "internal universe" is "observed" and also internal planet system may be formed. In intrinsic FRs of these planets internal boundary surface of this astronomical body will be observed as convex (the same as external boundary surface). This is because of the fact that luminosity radiuses of their orbits will be longer than luminosity radius of this surface. Only absence of distant stellar systems in internal empty space will give the opportunity to differ it from external space.

The value of luminosity radius in the center of gravity is determined unambiguously, if the configuration of STC of liquid is ordinary ($r_0=0$ when $a_0=1$), and becomes indeterminate from GR equations, if the configuration is extraordinary $\left(a_0=\infty\right)$. Because of this, one should agree with the statement of Hawking [5]: "GR itself (without use of additional laws, obtained in classical physics) doesn't provide field equations with boundary conditions in singular points. And, therefore, it becomes incomplete near these points."

Absolute stability of thermodynamic equilibrium condition of matter, which is held by gravitational field and is self-contracting in Weyl FR as whole, may be guaranteed in case of invariability of entropy and external pressure only when the following condition is fulfilled. Spatial distribution of function $r\left(\overset{)}{r}\right)$ must correspond to the minimum of lagrangian of enthalpy of whole matter of liquid body in Weyl FR. This value of lagrangian is equal to enthalpy of liquid in FR, co-moving with it, and is determined in following way:

$$E_e\left(r_0,r_e\right)=4\pi\int\limits_{R_{\min}}^{R_{\max}}\sigma N^3R^2\left(1-V^2/V_c^2\right)^{-1/2}dR=4\pi\int\limits_{R_{\min}}^{R_{\max}}\tilde{\sigma}fN^3R^2dR=4\pi n\int\limits_{r_0}^{r_e}\left(\tilde{\mu}c^2+\tilde{p}\right)\sqrt{ab}r^2dr\,. \quad (22)$$

For concrete permanent quantity of homogeneous matter of liquid (eigenvalue of mass:

$$\tilde{m}_e=4\pi n\int\limits_0^{\overset{)}{r_e}}\tilde{\mu}r^2d\overset{)}{r}=4\pi n\int\limits_{r_0}^{r_e}\tilde{\mu}\sqrt{a}r^2dr \qquad (23)$$

of whole body) this is being realized:

$$\frac{dE_e}{dr_0}=\frac{\partial E_e}{\partial r_0}+\frac{\partial E_e}{\partial r_e}\frac{dr_e}{dr_0}=\frac{\partial E_e}{\partial r_0}-\left(\frac{\partial E_e}{\partial r_e}\frac{\partial\tilde{m}_e}{\partial r_0}\right)\left(\frac{\partial\tilde{m}_e}{\partial r_e}\right)^{-1}=0$$

in case of fulfillment of the following condition:

$$r_0^2=\left(\sqrt{a_e}\sigma_0-c^2\tilde{\mu}_0\right)^{-1}\times\lim_{r_i\to r_0}\left\{\frac{1}{\sqrt{a(r_i)}}\int\limits_{r_i}^{r_e}\left[\left(\sqrt{a_e}\frac{\partial\sigma}{\partial r_0}-c^2\frac{\partial\tilde{\mu}}{\partial r_0}\right)+\frac{1}{2a}\left(\sqrt{a_e}\sigma-c^2\tilde{\mu}\right)\frac{\partial a}{\partial r_0}\right]\sqrt{a}r^2dr\right\}\geq 0, \quad (24)$$

which takes into account direct influence of both upper and lower matter layers on the values of functions $a\left(r,r_0\right)$ and $b\left(r,r_0\right)$. Spatial distributions of improper (coordinate) value of enthalpy density $\sigma\left(r,r_0\right)$ and eigenvalue of mass density $\tilde{\mu}\left(r,r_0\right)$ are obtained via solving both GR gravitational field equations and equations of thermodynamic state of matter. These solutions can be found for solid (when of $n=1$) and for hollow (when $n=2$) spherically symmetrical bodies, due to equality of radial

distributions of eigenvalues of physical characteristics of homogeneous ideal liquid in internal and external half-layers of hollow body in its rigid intrinsic FR. In nonrigid intrinsic FR of self-cooling hollow body, which has unequal temperatures of external and internal boundary surfaces, eigenvalues of mass of internal and external half-layers of hollow body will be also unequal. And, therefore, fulfillment of the condition, which takes into account values of these temperatures, will be required instead of the fulfillment of the condition (24). That's why GR should be considered as component part of gravithermodynamics that takes into account additional intensive and extensive parameters, which characterize gauge effect of motion and gravitation on the gravithermodynamical state of matter.

When quantity of matter doesn't exceed its critical value, function $E_e(r_0, r_e)$ doesn't have minimum and zero value of luminosity radius $(r_0 = 0)$ corresponds to the smallest value of this function. Because of this, physical body can be only solid globular. When mass of astronomical body is close to critical value, solid spherically symmetrical topological form becomes unstable even to small perturbations of gravitational field strength. This may lead to its transformation into hollow spherically symmetrical topological form $(r_0 \neq 0)$, which corresponds to minimum of enthalpy of the body and, therefore, is gravitationally absolutely stable. Because of decrease of r_e value, such catastrophical change in body topology may be considered as relativistic gravitational collapse of matter. But in contrast to the black hole, this catactrophical change is not accompanied by matter self-closure inside the sphere of physical singularity $(b_e \equiv 1/a_e >> 0)$. Such hollow body (which contains Fuller-Wheeler lost world) at the completion stage of its evolution is alternative to hypothetical black hole. This body is very massive hollow neutron star, which doesn't differ from black hole by external observable features and is the result of smooth cooling down of quasar. Very high values of energy and mass of quasars denote the fact that they have hollow topological form. Quick loss of energy of quasars (due to their huge luminosity) makes their active life short. At the present moment of cosmological time all of them, apparently, proceed to the new forms of their existence. Very long distances to quasars denote this. However, only the small amount of quasars was transformed into hollow neutron stars. Most of quasars were gradually turned into the stars, which can't keep the stability of hollow topological form in future due to big energy loss. As soon as their energy exceeds the critical value, they are transformed into supernovas. After supernova sheds external layer of its matter, which is surplus for ordinary (not hollow) topological form of star, its evolution continues with new configuration of intrinsic STC. According to (23), and taking into account the fact that eigenvalue of mass density of liquid reaches minimum on its external surface $(\tilde{\mu} \geq \tilde{\mu}_e)$, let's find the lower limit for integral eigenvalue of mass of whole hollow liquid body:

$$\tilde{m}_e > 8\pi\tilde{\mu}_e \int_{r_0}^{r_e} \frac{r^{5/2}dr}{\sqrt{(r-r_0) - \kappa c^2 \tilde{\mu}_e \int_{r_0}^{r} r^2 dr - H_e^2 (r^3 - r_0^3)/c^2}} >$$

$$> \frac{8\pi\tilde{\mu}_e}{\sqrt{1 - r_0^2(\kappa c^2 \tilde{\mu}_e + 3H_e^2/c^2)}} \int_{r_0}^{r_e} \frac{r^{5/2}dr}{\sqrt{r - r_0}} = \frac{\pi\tilde{\mu}_e}{\sqrt{1 - r_0^2(\kappa c^2 \tilde{\mu}_e + 3H_e^2/c^2)}} \times$$

$$\times \left[\frac{1}{3}\sqrt{r_e(r_e - r_0)}(8r_e^2 + 10r_e r_0 + 15r_0^2) + 5r_0^3 \ln\left(\sqrt{r_e/r_0} + \sqrt{r_e/r_0 - 1}\right) \right], \quad (25)$$

where:

$$\sqrt{1 - r_0^2(\kappa c^2 \tilde{\mu}_e + 3H_e^2/c^2)} \geq \sqrt{1 - (r^2 + r_0 r + r_0^2)(\kappa c^2 \tilde{\mu}_e/3 + H_e^2/c^2)}.$$

As it was expected, according to (25), when the value of the relation r_e / r_0 is as large as desired, hollow spherical body may have as big as desired mass.

The value of enthalpy of ideal absolutely incontractable liquid is:

$$E_e = 4\pi m\sigma \int_{r_0}^{r_e} \sqrt{a} r^2 dr = \tilde{m}_e \sigma / \tilde{\mu} .$$

Therefore, equation (24) transforms into identity, and the value of minimal luminosity radius becomes indeterminate. This shows the degeneracy of such state for ideal liquid. Because of this, equilibrium state of absolutely incontractable liquid will be absolutely stable for any values of r_0. And thus, as large as desired quantity of absolutely incontractable liquid may be contained inside of hollow body, when the value of r_e is as small as desired (when $r_0 \to 0$, according to (25), $\tilde{m}_e \to \infty$). This, of course, is physically unreal, the same as existence of absolutely incontractable liquid. Therefore, such result may be considered as one more sign of degeneracy of state of ideal liquid, and, thus, as apparent confirmation of validity of selected by us criterion for determination of minimally possible value of luminosity radius of body when it has hollow topological form.

8. Conclusions

So, avoidance of physical realizability of cosmological singularity in GR is possible. It is necessary and enough for this to postulate the counting of cosmological time in Weyl FR and not to exclude (the most of physicists agree with this) cosmological λ-term from gravitational field equations. And thus, it is necessary to admit physical reality of infinitely long gauge process of matter self-contraction in absolute space of Weyl FR.

Avoidance of physical realizability of gravitational singularity ($\tilde{p}_0 = \infty$; $a_0 b_0 = 0$) for very massive astronomical body is also possible. It is necessary and enough for this to supplement gravitational field equations with condition of reaching the minimum of enthalpy of the whole matter of body and to admit physical reality of mathematically inevitable hollow topological form of body and configuration of STC with “turned inside out” internal half-space, which corresponds to this topology.

9. Supplement.
The substantiation of the possibility of stable existence of antimatter inside the hollow astronomical body.

Equations (19-21) describe only the motion in Weyl FR of the points of whole matter (ideal liquid) and its intrinsic space, which is rigidly connected with this matter. Free (inertial) motion of the test particles in the hollows inside the liquid or in an empty space above it will depend in Weyl FR not only on the strength of gravitational forces, which are determined by the metrical tensor of STC of liquid and are proportional to hamiltonians of these particles, but also on the strength:

$$\xi = F_\partial / P = -c(\lambda/3)^{-1/2} = -H_e \qquad (26)$$

of dissipative pseudoforces F_∂, which are determined by the cosmological λ-term of GR equations and are proportional to linear momentums P of these particles. The presence of these dissipative pseudoforces in empty space is caused only by the evolutional decrease of the value of absolute velocity of light [16, 17]. Therefore, hamiltonian of free-moving test particle in Weyl FR (as well as in nonrigid FR of matter) does not conserve. And, consequently, inertial motion of this particle realizes in Weyl FR not along the geodesic lines of the STC of liquid and is hyperbolic even in case of hypothetical absence of gravitational field [16, 17]. Analogously, because of evolutional decreasing of kinetic energy in Weyl FR the Earth moves in the space of this FR (in Newton-Weyl absolute space) not along the circular orbit, but along the logarithmic spiral. Unlike in Weyl FR and in nonrigid FR of naturally self-cooling body, in rigid FR of matter the strength of dissipative pseudoforces:

$$\tilde{\xi} = \overset{(}{v}_c \overset{(}{v}_{cc} / c r_c \approx \overset{(}{v}_c \overset{(}{v}_{cc} H_e / c^2 = 0 \qquad (27)$$

is equal to zero, as well as the velocity of light $\overset{(}{v}_{cc}$ on its observer horizon. This is connected with the principal unobservability in matter FR of evolutional changes of values of the velocity of light and of spatial parameters of matter elementary particles. And, therefore, hamiltonian conservation in

rigid FR of matter takes place only because of gauge-invariance of eigenvalues of matter space-time characteristics. Thus, physical vacuum is an active medium with energy dissipation in Weyl FR.

While in cybernetics and thermodynamics the most fundamental factor is the presence of negative feedbacks, which guarantee the stability of correspondingly complex systems and matter equilibrium states, in synergetics (the theory of dissipative systems) the most fundamental factor is the self-organization of spiral autowave structures in active mediums with energy dissipation. Spiral waves are the main type of elementary self-sustained structures in homogeneous excitable mediums [29]. The physical vacuum is exactly such medium. Therefore, matter elementary particles inevitably had to be self-organized in it exactly only as spiral waves. The following main regular properties, which are inherent for matter elementary particles and for spiral waves, also denote this:

1) wave-corpuscle nature of the elementary particles (they, like the nuclei of spiral waves, have spatial coordinates);
2) cooperative behavior of elementary particles, as well as of spiral waves;
3) presence of inertial motion (for elementary particles, as well as for spiral autowave structural elements);
4) presence of annihilation after collision (for elementary particles and antiparticles, as well as for diverging and converging spiral waves);
5) presence of uncertainty in time and space of execution of quantum of action (it's impossible in principle to determine the beginning and the end of any spiral turn, which transfers the quantum of action, and, therefore, it's impossible to determine precisely the coordinates of world points, in which action executes);
6) possibility to interpret final local sinks of spiral waves as negative electric elementary charges, and to interpret their initial local sources as positive electric elementary charges;
7) the fact that electron has intrinsic angular momentum, which is not connected with its rotation (radial propagation of turns of spiral wave is analogous to the effect of rotation of rigid logarithmic spiral);
8) the fact that spin of elementary particles may take on positive and negative values (analogously to right- and left-hand spirals);
9) the fact that electron in atom transforms itself into orbital wave (analogously to transformation of spiral waves into simple vortex rings);
10) impossibility of existence of single quark, as well as of single twisted vortex ring [29];
11) presence of asymptotical freedom for quarks, as well as for twisted vortex rings, which are linked (interaction forces appear only in case of attempt to separate quarks or twisted vortex rings);
12) resemblance of topological limitations (restrictions), which greatly reduce the number of permissible elementary particles and three-dimensional spiral structures [30-33];
13) very short lifetime of elementary particles, as well as of three-dimensional spiral structures, which can't be self-organized in structures of higher hierarchical level.

However, we need to find the answers on the following questions. Which of the known elementary particles are not fictive and, therefore, can be spiral autowaves? Space-time modulations of which parameters of physical vacuum can be three-dimensional spiral structures that correspond to elementary particles?

When we attribute to gravitational field the properties, such as has electromagnetic field, we can consider it as equal in rights with electromagnetic field and, therefore, – as something independent. But the well-known facts denote contrary. All four fundamental fields – strong, weak, electromagnetic and gravitational are based on electromagnetic properties of physical vacuum and matter and they are specific reflections of these properties on the various hierarchical levels of matter self-organization. Despite the presence of variety of resemblances of properties of fundamental fields, topological and other principal differences don't allow us to make total unification

of all fundamental intercouplings (interactions) between matter elementary particles. For example, gravitational potential in matter FR is the function of velocity of propagation of electromagnetic waves in vacuum $v_c = (\mu_0 \varepsilon_0)^{-1/2}$, the value of which is uniquely determined by the values of permittivity ε_0 and magnetic permeability μ_0 of physical vacuum. Furthermore, the gravity reveals itself in macroworld only because of the presence of Van-der-Waals forces of electromagnetic interactions between the molecules of hydrogen. After all, only due to these forces molecules of hydrogen began to mutually self-contract in absolute space. In case of hypothetical absence of electromagnetic interaction, separately self-contracting molecules of matter would remain absolutely uniformly distributed in cosmic space and, therefore, gravitational macrofields that reflect physical macroinhomogeneity ($v_c \neq const(x, y, z)$) of cosmic space would never be originated. This is the cause of absolutely different mechanism of action of gravitation. For electromagnetic interaction the change of linear momentum of elementary particle is realized merely because of the transfer of additional momentum from the free photon, adsorbed by it. Otherwise, the change of linear momentums of elementary particles in gravitational field is caused by principal nonconservation in physically inhomogeneous space of momentums of virtual particles and quasiparticles, which realize interaction between neighbouring stable particles as well as between these particles and the "cloud" of virtual particles [18]. Therefore, there is no necessity in the existence of specific quasiparticles (gravitons), which transfer momentum and energy during the process of matter motion in gravitational field.

Weak interaction of elementary particles also has electromagnetic nature. In fact, it is realized via exchange of virtual particles, which have not only mass, but also electric charge and in the process of their accelerated motion can generate ordinary electromagnetic waves. The possibility of unification of weak interaction with electromagnetic interaction into electroweak interaction also denotes this.

Strong couplings between quarks (between twisted vortex rings, according to 10) and 11)) are, apparently, absolutely topological couplings, such as couplings of chain links or couplings of nested structure elements. It wouldn't have been logical, if the nature hadn't used such simple mechanism of intercoupling of elementary particles. That's why there is no necessity in the existence of gluons, forced to "glue" quarks together.

Molecules of matter of real physical bodies execute heat oscillatory motions. Therefore, individual motion of molecules of hyperbolically accelerating body is not hyperbolic in fact. And, consequently, the values of strengths $-G_j(x,V) = (dP_A / dt) / H_A$ [18] of gravitational field, which appears in FR of hyperbolically accelerating body, are only the average statistical values. In the places of dislocations of the molecules of moving body space-time modulation of the values of strength of graviinertional field, as well as of the values of frequency of interaction of matter elementary particles, which determines rate of course of proper quantum (standard) time of matter, takes place. Therefore, intrinsic space of accelerating body is not only physically macroinhomogeneous, but also physically microinhomogeneous.

Because of high value of density of matter in atom nucleus average statistical relative value of the frequency of interactions *f* in the points of dislocations of protons and neutrons much lower than at the periphery of atom. As it follows from the solutions of GR equations, the decrease of the improper value of the velocity of light has the influence on the frequency of interaction of elementary particles, and this influence is partially compensated by the decreasing of the distance between the interacting particles in absolute space. This compensation is like the compensation, which is realized by relativistic length shrinkage of moving body [18]. Therefore, physical microinhomogeneity of intrinsic space of matter, which is identical with Salam strong gravity [2, 35], is always followed also by metrical microinhomogeneity or in another interpretation by the microcurvature (roughness) of this space. Already in 1870 Clifford in his paper "On the spatial theory of matter" denotes the possibility of this: "I consider that small regions of space are analogous (by their nature) to the little hillocks on the surface, which is plain on average. So ordinary geometrical laws are inapplicable here" [36-38]. Being based on Clifford-Einstein spatial theory of matter, Wheeler elaborated the geometrodynamical theory of small-scale structure of

space-time. This theory consider matter elementary particles as geometrodynamical excitons [38, 39]. The presence of physical and metrical (scale) microinhomogeneities of space in the places of high matter concentration (in atoms nuclei) has profound physical meaning. This is the demonstration of the presence of negative feedback between the values of measuring physical parameter (dimension) and the values of the unit of this parameter (dimension) in Weyl FR. This feedback prevents catastrophical change of the parameter (dimension) in internal FR of matter and makes unreachable for it both zero value and infinitely high value. Because of this, nuclei of atoms as well as astronomical bodies have individual pseudohorizons of past and future, which assign correspondingly maximal and minimal physically realizable values of the luminosity radius in their intrinsic FRs.

In such physically and metrically microinhomogeneous space improper values of energy and linear momentum of elementary particles have to be determined with using of additional conform transformations or renormalizations, which would take into account these microinhomogeneities and their variation under the influence of destabilizing factors. Such renormalizations of physical parameters are being made during the process of finding of approximate solutions of the equations of nuclear and quantum physics via the method of perturbation theory. These true values of energy and linear momentum will be substantially smaller than their eigenvalues, which don't differ from their values in hypothetical physically and metrically homogeneous space. In spite of the small mutual difference between the eigenvalues of effective cross-sections of neutron and proton, and, consequently, between their values in rough internal space of the matter, in the Euclidean space of Weyl FR the value of effective cross-section of neutron is much smaller than the value of effective cross-section of proton. This is caused by the fact that the intrinsic space of neutron is more curved, and, consequently, by more considerable increase in density of flux of scattered particles in Weyl FR during their approaching to neutron (than for the case of approaching to proton). Therefore, during the process of neutron transformation into proton the work on neutron expansion in self-gravitational field is being executed in Weyl FR. In matter FR the execution of this work is aimed to increase the eigenvalue of energy $U = \tilde{m} v_c c$ via the increase of local improper value of the velocity of light v_c, which is substantially higher for proton than for neutron. The fact that we don't take into account the changes of local improper values of the velocity of light in the process of neutron β-decay is the cause of pretended energy deficit. This deficit is being determined as the difference of not real but effective energy values in initial and final states of elementary particles. Nonconservation of the linear and angular momentums in the process of β-decay is caused by the substantial physical microinhomogeneity of the space in atom nucleus. And, therefore, the existence of additional particle, which takes away part of energy and linear and angular momentums, is not required. Bohr hypothesis about energy nonconservation in subatomic physics [40, 41] have to be considered as applied for effective values of energies of elementary particles (for "projections" of real values of energies on conventional metrically and physically microhomogeneous space of macroscopic FR).

Unlike eigenvalues, improper values of energies of different neutrons are unequal in Weyl FR even for the same atom. The dispersion of improper values of neutrons energy is caused by the substantial physical microinhomogeneity of the space inside the atom nucleus and by continuous oscillatory variation of gravitational energy of neutrons during the process of interaction of their quarks with the quarks of neighboring neutrons and protons, which are in actual as well as in virtual states. Analogously to the dispersion of kinetic energies of thermal oscillatory motion of molecules, it also obeys the certain statistical regularities. Therefore, like the spectra of frequencies and energies of the photons of thermal radiation, spectrum of the energies of electrons in the process of neutrons β-decay is continuous (unlike the case of the change of quantum-mechanical state of elementary particles, when the spectrum is discrete). Generally the dispersion of the energies of electrons during β-decay process is being explained by the dispersion of energies of antineutrinos, which are the thing in itself (like the black box in cybernetics) and as if they are radiated together with electrons. However, there is no intelligible explanation of the fact that antineutrinos itself have continuous spectra.

Of course, the using of individual average value of frequency of interaction of concrete elementary particle f in GR (or using of local improper value of the velocity of light v_c, which is equivalent to f in principally uniform intrinsic space of elementary particle) is the same nonsense as the using of individual values of temperature and relativistic dilation of proper (standard) time of every separate matter molecule correspondingly in thermodynamics and relativistic mechanics. However, not taking into account such, as it seems, absurd nuances, in phenomenological thermodynamics, in statistical thermodynamics we, nevertheless, take into account the fact that molecules of matter, which is in equilibrium state, have the dispersion of the values of thermal energy (kinetic energy of oscillatory motion). Why then we have to neglect the dispersion of the values of gravitational energy of elementary particles in nuclear physics? Therefore, we should consider physical parameters of neutrino and antineutrino nevertheless only as corrections to mathematical dependences, which are acceptable only for conventionally smooth (without microcurvature) and physically microinhomogeneous spaces of phenomenological GR. The neglect of not only physical and metrical microinhomogeneities of absolute space for elementary particles, but also of dispersions of gravitational energies of these particles, makes these corrections mathematically justified. And, therefore, fictive particles, which are the "carriers" of these corrections, can "take part" in nuclear reactions on a par with real elementary particles and, like them, can obey the laws of the symmetry of nuclear physics. Because of this, in nuclear reactions of transformations of elementary particles into new particles due to absorption or radiation of only neutrino (antineutrino) by them, in fact takes place only transition of these particles from one its metastable state into another its metastable or stable state. For example, transformation of negatively charged muon (STC topology of which is like the STC topology of hollow astronomical body) into electron is accompanied not only by pseudoconversion of wave-front of its internal spiral wave, but also by the substantial decrease in physical microinhomogeneity of its internal space $\left(v_{ce} >> v_{c\mu}\right)$.

(There is no wave reflection and, therefore, no change of the direction of its propagation during the process of pseudoconversation of wave-front. Only change of the wave character takes place – substitution, in this case, of wave divergence by wave convergence. But it takes place only in internal intrinsic microsubspace of muon, because in absolute space spiral wave, which converged initially, will continue to converge.)

Therefore, in spite of the equality of total energies (improper values of energies) of electron and muon, which had been transformed into this electron with conservation of total energy, effective values of energy and mass of electron in hypothetically microinhomogeneous and smooth (without microcurvature) space are approximately 207 times less than effective values of energy and mass of muon. And this takes place, despite the partial compensation of the effect, which is caused by more substantial physical microinhomogeneity of internal space, by the effect, which is caused by more substantial (than for electron) microcurvature of internal space of muon. Being based on hyperbole (excessive exaggeration) of this effect one can build geometrodynamical model of mass "without mass" (Wheeler geon [28, 39]). In fact in this model one associates nonzero effective (eigen-) value of energy of elementary particle with zero value of its total energy (because of $v_c = 0$). The possibility of such hyperbole is the ponderable argument in favour of the conception of neutrino fictitiousness. It becomes apparent that in fact we register not neutrino but only the indirect consequences of nuclear reactions, in which as if they had to be originated. After all, phase changes of collective space-time state of matter and its gravitational field propagate with supraluminal velocity [18] and can be registered in any point of space even without coming of hypothetical neutrinos to this point.

So among all well-known noncomposite fundamental particles of matter only electron with positron, muons and quarks with antiquarks can be for sure nonfictive. And photon is the only one fundamental quasiparticle, existence of which is irrefutable. Being based on electromagnetic nature of all elementary particles and taking into account principal impossibility to register separate turns of spiral waves, we can assume the following: Electron with muon and quarks are space-time modulations of permittivity and magnetic permeability of unstructured physical vacuum in the form of spiral waves, which form correspondingly simple and twisted vortex rings in atoms [29]. In this

connection, the topology of STC of muons, positively charged quarks and negatively charged antiquarks is like the topology of STC of hollow astronomical bodies. At such topology of quarks the twistedness of vortex rings is obligatory only for internal microsubspace of enveloping quark (antiquark) and for external microsubspace of antiquark (quark), which is confined in the internal microsubspace of any other enveloping quark (antiquark). Such nested structure, which consists of enveloping and confined quarks, corresponds to π-mesons. Due to untwistedness of vortex ring in external subspace of enveloping quark, π-meson can be transformed into muon. This transformation is the result of annihilation of twisted vortex rings of enveloping quark and antiquark, confined into it, which takes place in the internal microsubspace of this quark. Vortex lines of spiral waves of quarks, which form resonances and some other metastable particles, can not only form circle, but also can be tied in a knot [29, 32]. It is possible that closure of conventional vortex lines into rings, as well as closure of terrestrial orbit, takes place only in matter FR and is absent in Weyl FR.

Electromagnetic waves, which imbue these vortex rings and knots, are the waves of modulating oscillations of electric and magnetic strengths. These oscillations are superimposed on more high-frequency quasiperiodical carrier oscillations of these strengths. Carrier oscillations (as well as oscillations of permittivity and magnetic permeability) are realizing on de Broglie frequency of totality of all matter objects, on which collectivized turns of spiral waves surge at the velocity of propagation of front of matter intrinsic time in Weyl FR. Therefore, every of these turns corresponds to simultaneous (coincident) events, and thus, to certain collective space-time (microphase) state of whole matter, on which it executes quantum of action [18]. This is in a good agreement in Einstein-Podolki-Rosen paradox [42, 43] with momenrary mutual coordination of changes of quantum-mechanical characteristics of previously correlated photons or elementary particles after mutual self-distancing of them on long distances. The presence of metrical (which causes curvature of matter intrinsic space) and physical (identifiable with gravitational field) macroinhomogeneities of Weyl FR space may be caused by increasing (from periphery to the center) of spatial density of collectivized turns of spiral waves. This increasing of density of turns of spiral waves is inevitable because of shrinkage of distances between peaks of solitons, which form these turns, as they approach to the center. Also this increasing causes origination of metrical and physical microinhomogeneities of space in the places of dislocation of atom nuclei.

(In compliance with this, we should consider spiral waves of space-time modulation of permittivity and magnetic permeability of physical vacuum as primary phenomenon, while formed by them elementary particles (individual turns of spiral waves) and also electromagnetic and gravitational fields (collectivized, as well as individual, turns of spiral waves) – only as secondary phenomenon Therefore, conventional division of matter onto substance and field is not strongly correct. Substance "coincides" with physical vacuum, as well as with gravitational field, but not via superposition of it on them. Elementary particles are just excited state of physical vacuum and solitary zones of electromagnetic and gravitational fields.)

Microcurvature and physical microinhomogeneity of intrinsic spaces of protons and neutrons also take place because of increasing (from periphery to the center) of density of their individual spiral turns. But these localized inhomogeneities can't be determined via solving the equations of gravitational field. In fact, GR, as well as mechanics and thermodynamics, operates only with average statistical parameters and as well as SR (Heisenberg [44] paid attention on inadequacy of description of space-time relations in microworld by SR) provides only absolutely solid and locally uniform fullness of space by matter. Moreover, microcurvature and physical microinhomogeneity of space strongly vary in the process of interaction of elementary particles. Therefore, equations of quantum physics, which implicitly allow for (or must allow for) microcurvature and physical microinhomogeneity of space, have to be solved together with equations of renormalization group. And this means that metrical correlations in microworld are nontrivial (Zelmanov postulates that they are absent at all [26, 45]; Menger proposes to bring in statistical notion of distance between the points [46]) and don't allow us to formulate conservation laws in ordinary form. So, in matter rigid FR spatial distributions of the values of microcurvature and physical microinhomogeneity of its space are not stable in time (unlike the distributions of macrocurvature and physical

macroinhomogeneity). And this leads to nonconservation of momentary values of energy of photons, as well as of elementary particles. And, therefore, only average values (mathematical expectations) of energy of elementary particles can conserve in microworld [17]. Measure of inaccuracy in determination of this average value of energy: $\Delta E_{\min} = \eta / \Delta t$ will be smaller, if time interval of its measuring is longer. That's why Heisenberg uncertainty relations in fact formulate conservation laws in microworld (in subatomic physics). Statistical nature of the conservation laws is conditioned by two following main factors: by fulfillment of these laws in intrinsic physical space of matter, which is inseparable from matter and thus from natural clock of this matter, (not in intrinsic metrical space, in which matter is being deformed, and thus its natural clock are not motionless) [17, 18, 47]; and by stochasticity of microstructure of physical space, which have to be inseparable from every elementary particle of matter in intrinsic collective FR of the whole matter. The possibility of bringing in the notion of indeterminate system of coordinates (stochastic FR) considered Shirokov [48].

Vortex lines of converging spiral waves, which correspond, according to 6), to negatively charged particles, are stable only in the space or microsubspaces, in which $\partial r / \partial R > 0$. Vortex lines of diverging spiral waves, which correspond to positively charged particles, are stable only in the space or microsubspaces, in which $\partial r / \partial R < 0$. Only in these spaces or microsubspaces their phase trajectories are winding up on limit cycles. Therefore, positively charged quarks of absolutely stable particles (protons and neutrons) are self-isolated from external space by metrically singular surface and turns of their spiral waves are draining to pseudohorizon of future of microsubspace, limited by this singular surface. Because of this Schwarzschild-like radius of influence of strong gravitation is of the same order of magnitude with dimensions of protons and neutrons [2]. This singular surface is the sink of turns of spiral waves in external space and also it is their source in microsubspace, limited by it.

(In the absolute space the gradient of electric strength on the singular surface of the gullet of intermediate sink tends not to infinity (as it takes place in singular points of final sinks), but to its finite value, and only after passing through the gullet begins to increase more sharply. However, in intrinsic space of the particle the gradient of electric strength reaches its maximal value on the singular surface of the gullet and then begins to decrease. Therefore, spiral wave doesn't break (doesn't disappear) on this singular surface and only changes its character in intrinsic space of the particle – becomes divergent. For the same reason, the charge of intermediate sink in external space is not negative but positive.)

In this microsubspace singular surface is considered as convex surface, which contains whole Universe. That's why in the FR of positively charged quark of proton, which is confined in singular surface, the Universe can be considered as negatively charged baryon. And this is one of the reasons of utopian considering of elementary particles as microuniverses [2].

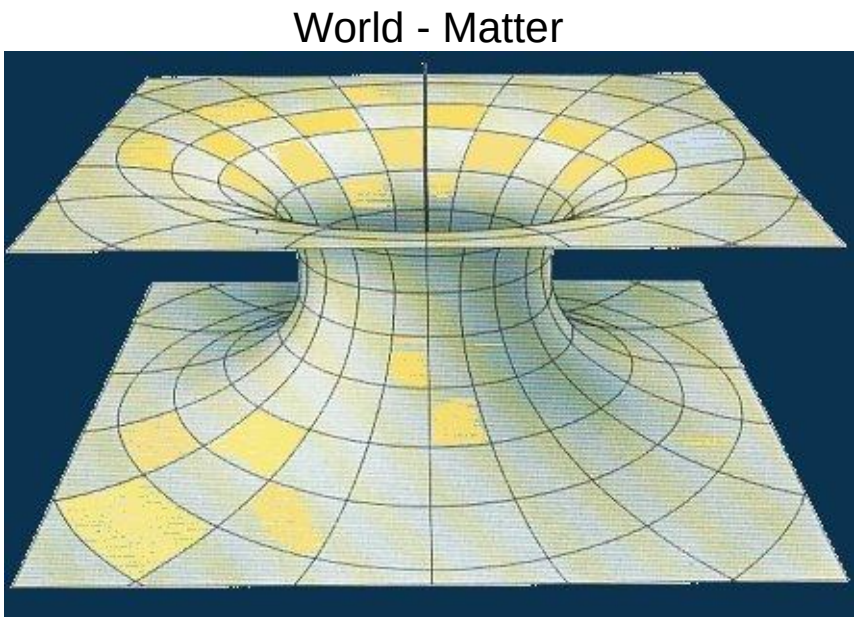
In general case two different topologies are possible. If positively charged quark have hollow topological form and is quasiconcentric to singular surface, in which it is confined, in absolute space, then in its FR the Universe will be confined in it. And when this quasiconcentricity is absent the planetary model will be realized. As if positively charged quark revolves around the negatively charged Universe. Transition from one topology to another corresponds to the change of metastable state of quark (to the change of the values of its quantum numbers) and not obligatory have to be connected with absorption or radiation of any specific particles or quasiparticles by it. Negatively charged d-quark of proton, confined in this singular surface, in addition may be confined in the singular surface of one of two positively charged u-quarks (as in multiple nested structure). Therefore, these two u-quarks will be in nonidentical quantum states (will have nonidentical "colour"). Because of this, d-quark itself can be only s-quark, which is additionally confined in singular surface, which hides ("screens") its strangeness, of any other quark.

(However, it is not excepted that not only positively charged, but also negatively charged quarks have the topology of hollow body. Then, on the contrary, two positively charged u-quarks, which have different signs of spin, can be confined in negatively charged d-quark of proton. And, therefore, singular surface, considered here, belongs exactly to this d-quark. d-quark itself can be just s-quark, which is in comfort conditions and so doesn't have strangeness.)

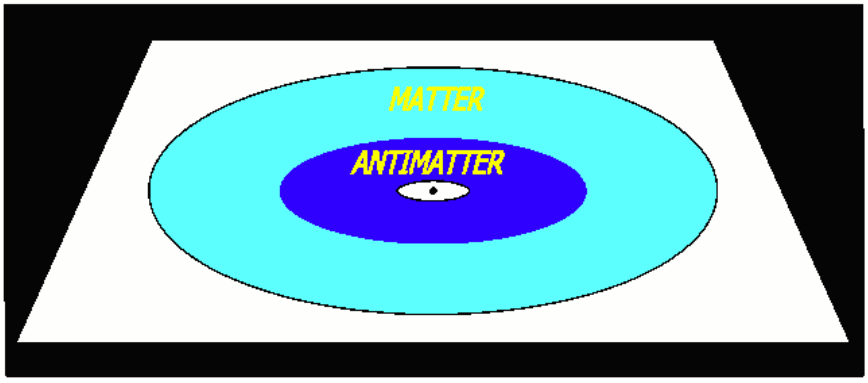
These singular surfaces can be spherical or ellipsoidal (when spiral wave tends to degeneration into concentric waves of pacemaker [29] in FR, in which elementary particle, formed by this spiral wave, is motionless) or toric, or maybe – they can be closed surfaces of more complex form in the case of formation of vortex knots. Confinement of several quarks by the same singular surface makes requirement of twistedness of vortex rings of spiral waves of these quarks not strongly obligatory (surplus). That's why we can't exclude the possibility of self-organization of all or only of some types of quarks in the form of simple vortex rings.

The description of antimatter microobjects, which are contained in internal half-space of hollow body, is analogous. Physical notions, shown here, amplify well-known theories of elementary particles very well, but only in the case of inevitable remaking sense of these theories (and possibly – with modernization of some of them).

According to all this, elementary particles and matter, which consists of them, are stable only in external empty space and in external half-layer of the hollow body. On the contrary, antiparticles and antimatter, which consists of them, are stable only in internal empty space and in internal half-layer of the hollow body (see figure).



Curved intrinsic space of the hollow astronomical body



Hollow astronomical body in Euclidean absolute space

And, therefore, median singular surface of hollow body is a natural barrier between matter and antimatter, which preserve them from catastrophic annihilation. Sporadic leakage of matter and antimatter through this barrier is possible in principle (even without bringing in quantum-mechanical notions about motion), because of incompletely mutually coordinating (without this leakage) self-cooling of external and internal parts of not absolutely cold hollow body. This self-cooling disturbs the common equilibrium and thus leads to radial migration of singular surface relatively to matter and antimatter. Due to matter and antimatter annihilation, which is the cause of this leakage, unlimited in time maintaining of radiant emmitance of hollow body with as cold as desired boundary surfaces is possible. In nonrigid and quasirigid intrinsic FRs of self-cooling hollow bodies the value of luminosity radius of median singular surface is continuously decreasing $\left(r_0 \neq const(t)\right)$. All events that coincide in matter intrinsic FR can be brought into accord with every concrete value of this radius (as well as with the value of radius of observer horizon [18, 47]). Because of gradual displacement of median singular surface of self-cooling hollow body in its intrinsic space, the value of velocity of light on this surface (as well as, according to (27), on the singular surfaces of pseudohorizons of past and future [47]) can be as small as desired but nonzero in rigid and quasirigid FRs. This guarantees the possibility of unimpeded one-way overcoming of barrier between matter and antimatter, viz – the possibility of continuous penetration of antimatter to matter (to the external part of hollow body). Thus, continuous course of the process of gradual annihilation of matter and antimatter in hot hollow bodies is guarantied. And, therefore, annihilation of matter and antimatter is the main source of energy of hollow bodies.

It should be noted, that before the moment of discontinuity of mainly hydrogenous continuum of Universe into single gas aggregates there was no antimatter in Universe. Initial self-organization of antimatter could take place only because of the origination of ultrahigh eigenvalues of matter density, pressure and temperature, and, consequently, because of the origination of critical density of energy of thermal electromagnetic bremsstrahlung and origination of space region with unstable spherocylindrical metrics in the center of gigantic gas aggregates. Therefore, formation of initial ("seed") antimatter, which have caused the transformation of unstable uniform spherocylindric metrics at first into topologicaly inhomogeneous metrics and then into extraordinary metrics of its intrinsic space, may took place because of the birth of pairs of particles and antiparticles, which have correspondingly ordinary and extraordinary metrics of intrinsic microsubspaces and, therefore, don't have time for mutual annihilation, in photon gas. Unification of microsubspaces that have extraordinary metrics into space-time continuum have led to localization of singular state of matter only on spherical singular surface, which began to "inflate" (increase its radius) in absolute space. Transformation of originated, as well as of already existed, elementary particles into antiparticles realized as singular surface inflated due to reversal of the wave front of their spiral waves.

Separate gas aggregates have catastrophically self-contracted in intrinsic space, because of origination and rash increase of spherically symmetrical physical macroinhomogeneity of space, which led to nonconservation of linear momentum in space. Self-contraction of gas aggregates have been realized because of the growing of both momentum increment of inward (centripetal) and momentum decrement of outward (centrifugal) virtual photons in the process of Van der Waals electromagnetic interaction between gas molecules. Physical macroinhomogeneity of space (originated only in the process of this and identifiable with gravitational field), of course, have led to polarization of physical microinhomogeneities of space, which are formed by atoms. Therefore, virtual (-mesons and photons, which realized intra-atomic interactions between protons and correspondingly neutrons and electrons [18], also took part in pushing of atoms to the center of gas aggregate. They take part now in production of body free fall and in setting body in motion by any nongravitational forces. And also they are indirectly accounted for atoms inertia because of finiteness of frequency of these interactions.

(Inertia phenomenon is the cause of the possibility of transfer of energy and linear momentum only by small portions (quanta), and also of finiteness of the value of velocity of propagation of particles and quasiparticles, which transfer these quanta of energy and linear momentum. And it can't be connected with Mach principle [34]*.)*

All this has caused the origination of gigantic gas aggregates with hollow topological form in the Universe. Quasars have been originated from the nuclei of the most stable gas aggregates. Because of the large accidental, as well as autowave, fluctuations of thermodynamical characteristics of matter and antimatter inside quasars, rather substantial radial migration of their median singular surface took place. This, together with unequality to zero of the value of velocity of light on this singular surface, was the cause of intensive course of the process of matter and antimatter annihilation, and, therefore, the cause of ultrahigh luminosity of quasars. The process of formation of supernovas from hollow stars is also accompanied by annihilation of matter and antimatter. Short-term ultrahigh luminosity of supernovas is caused exactly by this.

Absolute matter stability is caused by the presence of the phenomenon of scattering of distant objects from observer (Universe expansion). On the contrary, absolute antimatter stability is caused by the presence of the phenomenon of crowding of distant objects on the observer. Therefore, Universe expansion in principle never can turn into its contraction. This expansion is an infinitely long evolutional process. This process is caused, the same as continuous existence of matter in Universe, by continuous gauge-evolutional change of physical vacuum properties (physical vacuum ageing).

Reference list

[1]. Einstein, A., The Meaning of Relativity, Princeton: University Press, 1953

[2]. Ivanenko, D. D., Actuality of Einstein theory of gravitation, in: Einstein Centenarium, ed. H.-J. Treder, Berlin: Akademie Verlag, 1979

[3]. Möller, C, Progress and limitation of Einsteinian theory of relativity and gravitation, in: Astrofisica e Cosmologia Gravitazione Quanti e Relativita, Firenze: Giunti Barbera, 1982

[4]. Möller, C., Are the singularities inevitable in the theory of gravitation?, in: Einstein Centenarium, ed. H.-J. Treder Berlin: Akademie Verlag, 1982

[5]. Hawking, S. W., Path integrals, in: General Relativity, An Einstein Centenary Survey, ed. S. W. Hawking and W. Israel, Cambridge: Cambridge University Press, 1979

[6]. Hawking, S. W., Penrose, R., Proc. Roy. Soc., 1970, v. A314, p. 529

[7]. Hawking, S.W., Ellis, G. F., The large scale structure of spacetime, Cambridge: Cambridge University Press, 1973

[8]. Weyl, H., Phys. Z., 1923, b. 24, s. 230

[9]. Weyl, H., Philos. Mag., 1930, v. 9, p. 936

[10]. Möller, C., The Theory of Relativity, Oxford: Clarendon Press Oxford, 1972

[11]. Utiyama R. What had physics come for? (From the theory of relativity to the theory of gauge fields), Moscow: Znaniye, 1986 (in Russian)

[12]. Dirac, P. A. M., Directions in Physics, New York: J. Willey and Sons, 1978

[13]. Gorelik, G. E., The history of relativistic cosmology and coincidence of large numbers, in: Einsteinian collection, 1982-1983, ed. Kobzarev I.Yu., Moscow: Nauka, 1986, p.302 (in Russian); Hermann Weyl and Large Numbers in Relativistic Cosmology, in: Einstein Studies in Russia. [Einstein Studies, Vol. 10.] Eds. Yu. Balashov, V. Vizgin. Boston: Birkhaeuser, 2002. p. 91-106.

[14]. Lemaitre, G. J., Math. and Phys., 1925, v. 4, p. 188

[15]. Robertson, H. P., Philos. Mag., 1928, v. 5, p. 839

[16]. Danylchenko, P., Pseudoinertial contracting frames of reference, in: The Gauge-evolutional theory of the Creation (space, time, gravitation and the Universe expansion), Ukraine, Vinnytsia, 1994, v.1, p. 22 (in Russian)

[17]. Danylchenko, P., Foundations of the Gauge-evolutional theory of the Creation (space, time, gravitation and the Universe expansion), Ukraine, Vinnytsia, 1994 (in Russian)

[18]. Danylchenko, P., The nature of relativistic length shrinkage, in: Gauge-Evolutional Interpretation of Special and General Relativities, Vinnitsa, O. Vlasuk, 2004, p. 3
(read http://pavlo-danylchenko.narod.ru/docs/Nature_Eng.html,
download http://pavlo-danylchenko.narod.ru/docs/Nature_Eng.rar)

[19]. Danylchenko, P., The gauge foundations of special relativity, in: Gauge-Evolutional Interpretation of Special and General Relativities, Vinnitsa, O. Vlasuk, 2004, p. 15
(read http://pavlo-danylchenko.narod.ru/docs/Foundations_Eng.html,
download http://pavlo-danylchenko.narod.ru/docs/Foundations_Eng.rar)

[20]. Penrose, R., Conformal interpretation of infinity, in: Relativity, Groups and Topology, ed. De Witt C., De Witt B., New York – London, 1964, p.565

[21]. Bondi, H., Cosmology, Cambridge, 2nd Ed., 1960, p. 38, 45
[22]. Linde, A. D., Particle Physics and Inflationary Cosmology, Switzerland, Chur: Harwood Academic Publishers, 1990
[23]. Weyl H. Raum-Zeit-Materie, 3rd edn. 1920; 5th edn. – Berlin 1923; Space, Time and Matter. – Methuen, London, 1922
[24]. Poincaré H. La Science et l'hypothése, Paris, 1902; London: Walter Scott Publishing, 1905
[25]. Sawyer W.W. Poincare Universe in: Prelude to Mathematics, Penguin Books, 1955
[26]. Mostepanenko A. Space and time in macro-, mega- and microworld. Moscow: Politizdat, 1974 (in Russian)
[27]. Fuller, R. W., Wheeler, J. A., Phis. Rev., 1962, v. 128, p. 919
[28]. Wheeler, J. A., Gravitation as geometry (II), in: Gravitation and Relativity, ed. H.-J. Chiu and W. F. Hoffmann, New York – Amsterdam: W.A. Benjamin. Inc., 1964
[29]. Mikhailov, A. S., Foundations of Synergetics I. Distributed Active Systems, 2nd revised edition; Berlin: Springer 1994
[30]. Winfree, A.T., Strogatz, S.H., Physica, 1983, v. 9D, p. 35
[31]. Winfree, A.T., Strogatz, S.H., Physica, 1983, v. 9D, p. 65
[32]. Winfree, A.T., Strogatz, S.H., Physica, 1983, v. 9D, p. 333
[33]. Winfree, A.T., Strogatz, S.H., Physica, 1983, v. 13D, p. 221
[34]. Wheeler, J. A., Mach principle as boundary condition for Einstein equations, in: Gravitation and Relativity, ed. H.-J. Chiu and W. F. Hoffmann, New York – Amsterdam: W.A. Benjamin. Inc., 1964
[35]. Salam, A., Gauge interactions, elementarity and superunification., Preprint IC/81/9, Intern. Theor. Phys.,Trieste, 1981
[36]. Clifford, W.K., Lectures and Essays, eds. Stephen, L., Pollock, F., London: Macmillan, 1879, p. 244, 322
[37]. Clifford, W.K., Mathematical Papers, ed. Tucker, R., London: Macmillan, 1882, p. 21
[38]. Misner, C. W., Thorne, K. S., Wheeler, J. A., Gravitation, ed. Freeman, W.H. and company, San Francisco, 1973
[39]. Wheeler, J.A., Geometrodynamics, New York: Academic Press, 1962
[40]. Bohr, N., Atomi stability and conservation laws, in: Att del Convegno di fisica nucleare della Fondatione A. Volta, 1931, Roma, 1932, p.75
[41]. Gorelik, G. E., The fate of N. Bohr hypothesis about energy nonconservation, in: Nils Bohr and science of XX century, Kiev: Naukova dumka, 1988, p. 83 (in Russian)
[42]. Einstein, A., Podolski B., Rosen N., Philos. Rev., 1935, v. 47, p. 7
[43]. Vigier J.-P., Paper on Einstein-Podolski-Rosen paradox, in Einstein Centenarium, ed. H.-J. Treder, Berlin: Akademie Verlag, 1982
[44]. Heisenberg W., Physics and philosophy, New York: Harper Torchbooks, 1958
[45]. Zelmanov, A.L., Diversity of the material world and the problem of infinity of the Universe, in: Infinity and Universe, Moscow: Mysl', 1969, p. 274 - 324 (in Russian)
[46]. Menger K., The Theory of Relativity and Geometry, in: Albert Einstein: Philosopher-Scientist, p. 474
[47]. Danylchenko, P., Nonrigid frames of references of coordinates and time, which self-contract in Minkowski space-time, in: The Gauge-evolutional theory of the Creation (space, time, gravitation and the Universe expansion), Ukraine, Vinnytsia, 1994, v. 1, p. 52 (in Russian)
[48]. Shirokov Yu. M. Reports of the USSR Academy of Sciences, 1956, III, p. 1123 (in Russian)

* Supplemented and completed version of the article from the collection of articles "Gauge-Evolutional Interpretation of Special and General Relativities", Vinnitsa, O. Vlasuk, 2004