INTERRELATIONSHIPS OF FUNDAMENTAL CHARACTERISTICS OF SYSTEMS OF GRAVITATING BODIES AND THE LAW OF THE SUSTAINED DEVELOPMENT OF THE UNIVERSE

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Ether space model with gravitating bodies is described.

Gravitating bodies in an infinite liquid space are considered as sinks of an ideal liquid of density ρ_{cp}. A weak-compressible fluid medium (ether) flows into growing spherical sinks. Analysis of the motion of this liquid [1] shows the following. Spherical sinks interact with each other according to the law, which exactly coincides with Newton's law of gravitation: by forming masses m_1 and m_2 of the bodies the flow makes them approach to one another with the force F $= -$ G m_1(t) m_2(t)/R^2(t). Gravitation constant G $= 1/4\pi \rho_{cp} t_e^2 = R^3/3m t_e^2$ of such systems contains the quantity $1/\rho_{cp} t_e^2$. Here ρ_{cp} – density of fluid medium, R – the distance between the centers of the bodies, t_e – indicative time of duplications of mass of growing body (sink of fluid medium or ether) [2]. Strictly, without any postulation, the liquid discharge determines the equality of a gravitating and an inert masses. This involves the regularity $t^2 \sim R^3$, where t is the time of the cycle of the body rotation. Time t_e characterizes the rate of growth of mass gravitating bodies of the Universe rather than its age, as supposed by P.Dirac. On the other hand G contains the quantity ($R^3/m t_e^2$), identical to a quantity known in astronomy, where m - a mass of the central body with the motion of its satellites obeying the law (R^3/t^2). In the gravitation law this quantity characterizes the growth of body-sink, and in astronomy it describes the law of motion of a medium in the central body-sink: this will specify the condition of motion of satellites. The sustained development of the Universe is governed by the law of correspondence of rates of growth of body masses to rates of growth of distances between centres of masses in the Universe.

When a liquid (ether) flows into a body of a mass m_i at a velocity C through the sink-bodies surfaces, its energy made up of 1) energy of the ether having entered the body and 2) energy of interaction with another body totals to E =

$m_i C^2$. When the velocity of the compression wave in the ether is equal to C, the internal energy of mass m_i of liquid ether is also equal to $E = m_i C^2$ [1]. This follows from Boyle's law.

The existence condition of a system of gravitating growing masses m_i for an infinitely long time is determined by the low according to which an expanding system remains to be similar to itself with time: $v_r^2 = 3a_r r/4$ or $a_r/v_r = (1/v_r)(dv_r/dt) = const$ and $((1/m_1)dm_1/dt) + (1/m_2)dm_2/dt))/2 = (dR/dt)/R = H_R$, where v_r and a_r are velocity and acceleration, respectively, of linear dimensions of a body. This law of similarity conservation follows from Newton's gravitation law for stable system: $F = - G m_1(t) m_2(t)/R^2(t) = const$. If gravitation is a current of ether into gravitating material sink-bodies, the heavenly bodies are objects with growing masses m_i. Constancy of the Universe during its existence requires constancy of the gravitation power F between mass centers of its objects $(dF/dt = 0)$. Thus we have [3]:

$$\frac{d}{dt}\left(\left(\left(\frac{1}{3m_e}\left(\frac{R_e^3}{t_e^2}\right)\right)\frac{m_i}{R_i^2}\right)m_k\right) = 0 . \qquad (1)$$

From this we have

$$ln\ n\ /Kt = \frac{dR}{Rdt} = H_R , \qquad (2)$$

H_R – "Hubble constant", n – multiple number of the mass growth in time t,

$$K \approx 1.18 \times 10^2 .$$

This is realized under the observed divergence of heavenly bodies from one another. It corresponds to "Hubble's law" at the duplication of masses for ~100 mln. years. This corresponds to the observed growth of rock masses. Simultaneously, radii of heavenly bodies grow. On the Earth's surface this growth corresponds to the known rate of continental displacement.

The known astronomical constant (R^3/mt^2) or $(R/m) \cdot (R/t)^2$ contains a mass m of the central body and law of motion of its satellites (3-d Kepler's law). It points to condition of accommodation of certain energy levels around the central body m: each value (R/m) correspond to certain squares of velocity $v^2 = (R/t)^2$ of motion of ether to the central body. This defines the law of the motion of planets. This points to the physical essence of the phenomena, described by the "Bode-Titius's law".

Let us suppose in this hydrodynamic space model a small object (being both the source and sink of the liquid ether) is discussed and this object travels past a

much larger object. Then we see that the movement of the small object and the action of the vortex (funnel-shaped) flow of the liquid ether into this object are like the movement of the comet round the Sun and the action of the comet tail during this movement [4].

So the known natural phenomena in the real world correspond to this gravitation model and **Law of the sustained development of the Universe (law of geometric and energy resemblance) (1,2).**

Gravitation is the accelerated motion of ether to gravitating bodies, with the atomic nuclei being sinks of ether. Matter exists in two main states: atomic nucleus with known density $\rho_{я} \approx 10^{14}$ g/cm and ether with density $\rho_{э} \approx 10^{-25}$ g/cm [2]. The latter coincides with density of interstellar space. Flow of ether into the surface of nucleus at rate C defines internal rest energy $E_0 = m_0 C^2$ for bodies with rest mass m_0 [5]. Value C is connected with "phase transition" from state of ether to nuclear state. The law of accelerated motion of liquid exactly defines the form of the law of universal gravitation as we said before. Gravitation of macro-body (material with density ρ) is directly proportional to number of atomic nuclei in the volume V of body, i.e. mass of body is (ρ V). Gravitation of atomic nucleus is directly proportional to its surface, since flow of ether into the atomic nucleus is realized through its surface. It is essence of nonequivalence gravitating and inert masses on the micro-level. Under destructive processes with the escape of ether this nonequivalence can reveal itself on macro-level.

With a gravitating body of rest mass m_0 considered as a sink of the ether (an ideal weakly compressible liquid) and the gravity considered as an ether flow toward the body, the body appears to move at the velocity **v** without frontal resistance, the ether being discharged to the corresponding extent. This leads to changing the mass according to $m = m_0 (1 + v/C)$ with C being velocity at which the ether flows into the body [6].

Now in an infinite three-measured Euclid space filled with an ideal liquid two objects (two sorts of the waves) are considered: 1) the compression wave traveling from the spherical liquid sink against the flow of the liquid; 2) a similar compression wave from a second sink of the liquid. The second sink travels relatively to the first one, and swallows up more liquid of the opposite flow than the first sink, so the condition of the absence of the frontal resistance with the relating movement is accomplished. The compression waves emitting from mobile and immobile bodies propagate at different velocities because of different velocities of the liquid ether counter flow toward the body but are described by absolutely identical classic equations coincident, in both cases, with the Maxwell-Herz radiation equations which describe geometrical factors of the vector field. The Maxwell and the Maxwell-Herz equations system describe mutually perpendicular vectors at the wave front. These Maxwell equations are invariable in

Galilei transformations and the Maxwell-Herz equations are invariable in other (non-relative) transformations in the transition from an immobile system to a mobile one [7]. Thus, the classic invariance is shown to exist not only for Maxwell's equations describing a wave from different systems of coordinates, but also for the Maxwell-Herz equations that describe the waves emitting from a source changing its own gravitation field when moving.

The idea on gravitation as a movement of the continuous matter had been developed for many years by a number of scientists independently one of another. First attempts to describe mathematically the world's model based on this idea seemed to be made by Gauss, Weber and Riemann (1853). Working secretly, Riemann was ahead of his competitors but did not end the problem in success, for he made a principal mistake because of his adherence to the Herbart and Fechner philosophy. The Gauss and Weber investigations (and later Thompson) was also fruitless. Yarkovskii (1889), who avoided Riemann's mistake, proposed an extraordinary concept of gravitation as a consequence of the formation of a weighty matter inside bodies. By developing Yarkovskii's idea, Butusov (1991) has received some interesting results. He has shown that as the radiator mass increases in vast radiating systems, a "red shift" is observed without any movement of the light sources [8]. On the other hand, one can hardly agree with his negation of the Universe expansion (in his treating), for in the absence of recession the bodies with time should be approaching one another with acceleration, as their masses grow. This was shown in 1991 (2-nd International Conf. in S-Petersburg) by the author who was ignorant at the time of the existence of the above works.

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