

Physical sciences

ON THE INCOMPRESSIBILITY OF AETHER-LIKE MEDIA

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Abstract

The existing corpuscular models of the material environment suggest the presence of empty space both between bodies and between subatomic and subnuclear particles, and as a result, long-range action, carried out by exchange interaction. It is proved that such a concept of the universe contradicts experience and gives rise to many paralogisms. The wave nature and the infinite divisibility of matter, which ensures the existence of a (continuum) ether-like medium as a field form of matter, are substantiated. Such a medium is incompressible and allows compaction not due to a decrease in volume due to voids, but due to the overflow of the medium, accompanied by a decrease in the length of soliton-like waves arising in it.

Keywords: ether and hidden mass, compression and compaction, particles and waves, photons and solitons, corpuscular and continuum models of the universe.

1. INTRODUCTION

The idea that the space around us was originally filled with some continuous material invisible and intangible superfluid (ether-like) medium, from which all forms of matter in the Universe were formed, came to us from the depths of centuries and was apparently inherited from those whom our ancestors' called "gods". This medium knows no boundaries and therefore is not compressible in the usual sense of this term as a decrease in the volume V of the shell containing the substance. The presence of such an ethereal medium, called "hidden mass", "cosmic vacuum", "dark matter", "dark energy", "quintessence", etc., is confirmed by astrophysical observations, according to which it makes up at least 95% of the mass of the entire Universe, and its density ranges from $\sim 10^{-27}$ g cm $^{-3}$ (in regions free of matter) to $\sim 10^{18}$ g cm $^{-3}$ (in white dwarf-type stars formed from it [1]).

The heterogeneity of this medium follows at least from the fact that otherwise no processes in the Universe would be possible. Indeed, any extensive parameter of the system Θ_i (its mass M , energy E , the number of moles of k -th substances N_k , entropy S , electric charge Q_e , impulse P , its momentum L , etc.) in a continuous medium can be represented by the integral of its local $\rho_i = d\Theta_i/dV$ and average $\bar{\rho}_i = \Theta_i/V$ density by the expression $\Theta_i = \int \rho_i dV = \int \bar{\rho}_i dV$. Consequently,

$$d\Theta_i/dt = \int [(d(\rho_i - \bar{\rho}_i)/dt)]dV = 0. \quad (1)$$

According to (1), the integral vanishes, and the value Θ_i is preserved in two cases: in a homogeneous medium, where the difference $(\rho_i - \bar{\rho}_i)$ vanishes everywhere, i.e., no processes occur in the system, and when the difference $(\rho_i - \bar{\rho}_i)$ has the opposite sign in different volume elements, mutually compensating. The first case considered indicates that no processes are possible in homogeneous systems. This provision is the content of the first of the basic principles of energy dynamics, which is appropriate to call the "principle of non-equilibrium". According to him, an ether-like medium is spatially inhomogeneous if any processes are seen in it [2].

The second of the considered cases corresponds to the opposite direction of the processes occurring in different parts (regions, phases, components) of the system. This position, called in energetics the "principle of counter-direction of processes", can serve as a mathematical expression of the dialectical law of unity and struggle of opposites [3]. According to him, real processes occur only in polarized (in the most general sense of the term) systems. In classical thermodynamics, the impossibility of the occurrence of processes in a homogeneous system is specifically stipulated by the "principle of self-inviolability of equilibrium", according to which a system that has reached a

state of internal equilibrium (homogeneity) cannot be removed from this state without outside influence [4]. This forces us to consider the Universe as an internally non-equilibrium (heterogeneous) system in which the processes of evolution and involution (degradation) occur simultaneously [5].

The heuristic value of these principles becomes obvious if we compare them with the cosmological model of the Universe, in which the birth of the Universe from a singularity, its expansion and acceleration occur simultaneously and unidirectionally in all its regions. This follows both from the Einstein-Hilbert-Friedman "equation of the Universe", written not in the form of an integral (2), but for the Universe as a homogeneous whole [6], and from the postulate of homogeneity and isotropy of space, from which conservation laws are currently derived [7]. Therefore, it is the principles of heterogeneity and counter-direction that are the basis of the new paradigm of the universe, proposed by energy dynamics.

2. WAVV FORMATION IN AETHER-LIKE MEDIA AS A CONSEQUENCE OF THEIR INHOMOGENEITY

Recognition of the inhomogeneity of aether-like media means that its density $\rho \equiv dM/dV$ should be considered as a function of the radius vector of the matter field point r and time t , i.e. $\rho = \rho(r, t)$. In this case, its total differential includes, along with the convective component $(\partial\rho/\partial r)(dr/dt) = (v \cdot \nabla)\rho$, the local component $(\partial\rho/\partial t)_r$:

$$d\rho/dt = v \cdot (\partial\rho/\partial r) + (\partial\rho/\partial t)_r \quad (2)$$

This expression is the so-called "kinematic" equation of the first order wave, in which $d\rho/dt$ plays the role of the wave damping function [8]. Such a wave occurs when at any point in space spontaneously arises at least a slight compaction. Then, at $(\partial\rho/\partial r) < 0$ in an incompressible medium $d\rho/dt = 0$, a local compaction $(\partial\rho/\partial t)_r > 0$ arises due to the influx of an ether-like medium from outside with a velocity v . This compaction process continues up to the singularity, as long as the sign of $\nabla\rho < 0$ is unchanged. In this case, a spherically symmetric structure arises that does not remember

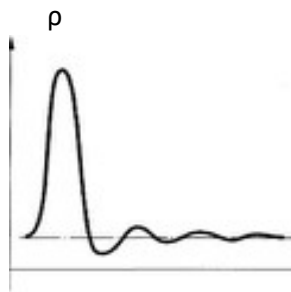


Fig.1. Typical soliton

the soliton (Figure 1). It is characterized by the fact that around the "elevation" wave with the largest amplitude at a distance equal to the wavelength λ , harmonic waves of ever smaller amplitude arise. This is precisely the model of the Schrödinger atom, in which around the nucleus at a distance that is a multiple of the wavelength, elastic shells are formed from the same matter, but not pulsating like the nucleus, at $\rho_i - \bar{\rho}_i > 0$, but oscillating harmonically ($\rho_i - \bar{\rho}_i \approx 0$). Experiments have also led to this conclusion, showing that electrons in an atom behave as if they form elastic multilayer spherical shells around the nucleus [9].

This is how the structuring ("condensation") of an ether-like medium is carried out, leading to the formation of atoms in it with new (mechanical, thermal, chemical, electrical, etc.) properties that depend on the configuration and density of such solitons. These wave structures have boundaries and therefore are compressible, which is expressed in a decrease in the wavelength λ and an increase in the number of "compression" waves per unit volume of space in inverse proportion to the cube of this length. As a result, a compressible substance is born as a kind of matter that has a certain structure and boundaries. This process of "reification" covers all levels of the universe, from nucleosynthesis to the formation of clusters of galaxies.

3. WAVE CONCEPT OF THE UNIVERSE

The wave concept of the structure of matter, which E. Schrödinger adhered to until the end of his life [10], explains all the features of the process of structure formation of matter, without going beyond the firmly established laws of physics.

In particular, the observability of any form of matter in the Universe is explained by the fact that due to the peculiarities of the structure and the unique (individual) spectrum of oscillations, which makes them distinguishable from the background spectrum of oscillations of an ether-like medium.

Further, the extremely high speed of light in an ether-like medium is easily explained. This speed can be found, for example, from the principle of equivalence of mass and energy $E = Mc^2$ or $\varepsilon = \rho c^2$, whence it follows:

$$c^2 = d\varepsilon/d\rho. \quad (3)$$

According to this expression, the rate of perturbation transfer in such media is fundamentally unlimited and tends to infinity as $d\rho \rightarrow 0$. As you can see, the description of the processes of "reification" of aether-like media is facilitated if we go after Schrödinger to the wave concept of the universe, according to which "what we take for particles are actually waves" [10]. This does not contradict the existing paradigm that divides matter into matter and field, if by "physical field" we mean an unstructured ether-like medium, the volume elements of which are adjacent to each other over their entire surface, leaving no space for empty space. The difference from corpuscular models is manifested only in the fact that under the "particle" as a part of something larger, it is understood not the element of mass dM , but the element of volume dV .

The division of matter into structured and unstructured is more specific than into "substance" and "field" (since there are fields in matter), and even more so into "rough" and "thin" or "weighty" (bodily) and "weightless" (spiritual). At the same time, such a classification of matter is more general than our earlier division into baryonic and non-baryonic, or into "substance" and "foreshadowing".

4. FAILURE OF CORPUSCULAR MODELS OF AETHER-LIKE MEDIA

Modern atomic physics, going ahead from the idea of the existence of indivisible "bricks" of the universe, collapsed due to the discovery of several hundred short-lived subatomic and subnuclear particles. This was to lead to the triumph of the concept of the infinite divisibility of matter and the collapse of "atomism". However, the vast majority of physicists still adhere to corpuscular models of the structure of matter at all levels of the universe, which implies the presence of an empty (devoid of mass) space between particles and therefore inevitably conflicts with the concept of "nature does not tolerate emptiness." This also applies to ether-like media, which served as the fundamental basis for the formation of all forms of matter in the Universe. Researchers intuitively do not accept the existence of a particleless all-penetrating medium, the volume elements of which dV are adjacent to each other over their entire surface, leaving no room for empty space. It seems to them that in this case the possibility of compaction of this medium and the occurrence of oscillations in it disappears. This is most clearly manifested in the theory of physical vacuum (PV), which is usually represented as a "non-empty void", consisting of spontaneously arising and disappearing (annihilating) pairs "particle-antiparticle" (electron-positron), living for such a short time that they do not amenable to instrumental research. Regarding the energy of the PV , there are long and unceasing disputes. Some consider PV to be the energetically lowest state of matter. But then it cannot be considered as "prematter" from which all kinds of matter of the Universe arose, possessing a very significant energy $E = Mc^2$. Others, following Wheeler, on the contrary, endow PV with the energy of fluctuations of such density that its quantity in the volume of an ordinary electric light bulb is sufficient to boil the entire world ocean [11]. This energy does not exceed tens of orders of magnitude Mc^2 and is not limited in principle. However, thermodynamics excludes spontaneous unilateral deviation of the system from equilibrium. We have to admit that PV is a space that does not contain either matter or any other material carriers of force fields that would allow it to be detected, i.e. it is a "virtual" object.

There are many attempts to circumvent this difficulty and present PV as consisting of any discrete material formations. A number of vacuum models are known: Dirac, Wheeler, de Sitter, Turner-Wilczek, Akimov, Gerlovin, etc. [11]. One of the first models was the Dirac vacuum, represented by a "sea" of charged particles in the lowest energy state. The Wheeler vacuum consists of geometric cells of Planck dimensions. According to this model, all the properties of the real world and the real world itself is nothing but a manifestation of the geometry of space. The de Sitter vacuum is a multi-component medium in which the existence of negative pressure is postulated to compensate for resistance. It is represented by a set of particles with an integer spin, which are in the lowest energy state. The Turner-Wilczek vacuum is divided into "true" and "false" vacuums, with the former being in a state of energy less than what is currently considered the "lowest energy state". In Akimov's

model, the PV is represented as consisting of nested vortex structures of "phytons" with opposite spins. In I. Gerlovin's model, nine types of vacuums have already been introduced, forming a "mixture". None of these models satisfies all experimental manifestations of aether-like media.

The situation is not the best with the corpuscular models of ether-like media, which endow them with the properties of the substance formed from it, and thereby ignore the fact that we are talking about the form of matter that preceded the appearance of the substance, i.e. about the "foreshadowing", which is not less than 95% of the mass of the universe. If, in accordance with the Standard Model, we assume that aether-like media consist of particles separated by empty space, then we are faced with the same problem of long-range action as in quantum mechanics. If we assume that the interaction of such particles is carried out due to the emission, propagation and absorption of massless particles-carriers of interaction (bosons), as interpreted by the "Standard Model", then the problem of explaining gravity arises, since the momentum of bosons can only create repulsive forces. If, however, the void is replaced by some other substance, then the problem of long-range action is only on it, and the additional problem of finding this substance itself arises.

In addition, in corpuscular models, the problem of corpuscular-wave dualism arises, which has not yet received a satisfactory solution. This problem does not arise from the standpoint of the wave concept of the structure of matter, which raises the question of the particle-like properties of the wave known from experiment, and not of the wave properties of particles [12].

Thus, the point of view expressed by J. Jeans gains an advantage: "There are waves in the world and only waves: closed waves, which we call matter, and open waves, which we call radiation or light" [13].

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