PHYSICAL NATURE OF THE LONG-RANGE ACTION OF I. NEWTON'S LAW OF UNIVERSAL GRAVITATION; EXPERIMENTS OF S. E. SHNOL AND A. N. KOZYREV; EXPLANATION OF RED SHIFTS IN HUBBLE'S LAW AND OF COSMIC MICROWAVE BACKGROUND

A. A. Barenbaum

Oil and Gas Research Institute RAS (OGRI RAS), Moscow, Russia

E-mail: azary@mail.ru

The law of universal gravitation was discovered by I. Newton in 1687, but neither I. Newton himself (1642–1727), nor anyone after him, could explain the physical mechanism of attraction of bodies at a distance. Based on the analysis of macroscopic fluctuations of random processes, which were studied by S. E. Shnol [1], and the experiments of N. A. Kozyrev [2], which revealed the influence of Sun, Moon, Solar System planets and nearby stars (αCMa, αLeo, ηCas, etc.) on the near-Earth gravitational field, we have established [3, 4] that Newton's long-range gravitational mechanism is corpuscular. The carriers of the force of attraction are massless virtual vector bosons – gravitons, which transfer the energy of gravity to bodies directly on the spot. The energy of virtual gravitons is $\sim 10^{-5}$–10^{-4} eV. The gravitational field is described by a tensor in a vector space, the dimension of which is determined by the number of bodies creating this field at each point in space according to Newton's law of gravitation. In many practically important cases, we can limit ourselves to taking into account only the bodies that interest us.

This physical mechanism is applied to the interactions of light photons with gravitational fields in space. The author has constructed theoretical models [5–7] in which gravity explains the red shifts in Hubble's law and the origin of the cosmic microwave background by circulation of baryonic matter in Metagalaxy. It is shown that the processes of formation and death of stars and galaxies are in thermodynamic equilibrium, characterized by a temperature of outer space $T = 2.7$ K, which corresponds to an average concentration of stars in it of $\sim 3\times 10^{-3}$ pc^{-3}, as well as the lifetime of galaxies and the circulation time of baryonic matter in Universe, amounting to $\sim 10^{13}$ years..

References

1. **Barenbaum, A. A.** Discussion of the experiments of S. E. Shnol: Detection of corpuscular properties of gravity [Text] // Proceedings of the All-Russian annual seminar on experimental mineralogy, petrology and geochemistry (VESEMPG-2024). – Moscow : GEOKHI RAS, 2024. – P. 221–226.
2. **Barenbaum, A. A.** Discussion of the experiments of S. E. Shnol: detection of corpuscular properties of gravity, discovery of gravitons and the physical nature of gravity [Text] // Proceedings of the tenth international scientific conference: Physical and mathematical modeling of processes in geoenvironments. – M. : IPMech RAS, 2024. – P. 56–61.
3. **Shnol, S. E.** Cosmophysical factors in random processes [Text]. – Stockholm : Svenska fysikarkivet, 2009. – 388 p.
4. **Kozyrev, N. A.** Selected Works [Text]. – Leningrad. PH : Leningrad Univer. Press, 1991. – P. 363–383.
5. **Barenbaum, A. A.** The Nature of Redshifts in the Spectra of Distant Galaxies [Text] // Engineering Physics. – 2018. – No. 6. – P. 18–23. DOI: 10.25791/infi zik.06.2018.044.
6. **Barenbaum, A. A.** The Origin of Cosmic Microwave Background [Text] // Engineering Physics. – 2019. – No. 1. – P. 39–48. DOI: 10.25791/infi zik.01.2019.392.
7. **Barenbaum, A. A.** Hubble's Law and the Cosmic Microwave Background in the Absence of the Big Bang [Text] // Book: Research Trends and Challenges in Physical Science. – 2021. – Vol. 4. – P. 119–130.