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On the "Hierarchy Problem" in Physics

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Abstract

Modern physics describes nature using four fundamental forces: electromagnetism, the strong nuclear force, the weak nuclear force, and gravity. Gravity is weak compared to the forces that govern atoms and particles. This discrepancy is known in physics as the "hierarchy problem." Physics cannot explain why gravity doesn't play any significant role in the fate of elementary particles. This is especially true given that gravity plays a decisive role in the structure of galaxies, stars, planets, and satellites.

Modern astrophysics has plunged stars, planets, and other material bodies into the void. The void is barren; it cannot reveal the mysteries of the universe. The only thing that connects material bodies, separated by vast distances in the void, is gravity. The nature of gravity is unknown. Gravity is the only tool physics uses to answer all the questions that arise as new problems arise in observational astronomy. But nature abhors a vacuum. Stars, planets, and other bodies are surrounded by a continuum of dark matter. It is a unified system of interacting, interpenetrating entities of the universe.

This article demonstrates that in nature, where material bodies coexist with dark matter dark matter, space is material. It contains jets and vortices of dark matter. These streams create gravity and cause stars and planets to gather into stellar and galactic systems. Vortices of dark matter also exist around elementary particles. Between these vortices, forces act that astrophysics has discarded along with the interstellar medium (ether). These forces are known in gas dynamics and hydrodynamics as the Magnus effect. They can significantly exceed gravity in the microcosm. The article presents some results of research based on the recognition of the existence of a dark matter continuum filling all space in the Universe. These studies demonstrate the enormous amount of scientific research that has been overlooked by physicists, astrophysicists, and astronomers.

Keywords: Hierarchy Problem; Dark Matter; Dark Energy; Galactic Rotation; Vortex Dynamics.

Introduction

Modern physics describes nature using four fundamental forces: electromagnetism, the strong nuclear force, the weak nuclear force, and gravity. Gravity is weak compared to the forces that govern atoms and particles. This discrepancy is known in physics as the "hierarchy problem." Physics cannot explain why gravity doesn't play any significant role in the fate of elementary particles. This is especially true given that gravity plays a decisive role in the structure of galaxies, stars, planets, and satellites.

The first and, apparently, the main reason for the inability to explain the "hierarchy problem" is the denial of the existence of a continuum of dark matter (ether) surrounding stars, planets, and other bodies in the universe. Stars, planets, and other bodies seem to be suspended in a void, bound only by gravity. The nature of gravity remains unclear. Gravity differs from known forces that repel objects, always resting on some support, or use the reactive principle, pushing away another mass in the opposite direction. In the surrounding void, there is nothing from which gravity could repel. An attempt was made to determine whether space is empty or filled with ether (gaseous dark matter).

In an attempt to detect the interstellar medium, then known as the "ether," the physicist Michelson performed his famous experiment. The purpose of this experiment was to detect the Earth's motion relative to any gaseous medium (for example, ether or gaseous dark matter) in outer space. It is known that the Earth moves in its orbit at a speed of approximately 30 km/s, participates in the overall

motion of the solar system relative to the center of the galaxy at a speed of 226 km/s, and participates in the motion of the galaxy itself. The main idea of this study was the assumption that in the presence of a stationary ether (dark gaseous matter), the motion of the Earth should lead to the appearance of a noticeable difference in the numerical values of some optical quantities when a beam of light propagates along and across the direction of the Earth's motion. The speed of light was considered a constant value, regardless of the speed of the emitting source and the reflecting surface. Einstein's special theory of relativity is based on this assertion. Rejection of this dogmatic assertion is a "taboo" for physics, astrophysics, astronomy and cosmology. The interferometer played a key role in the experiment. This interferometer and the experimental technique are described in many books.[1,2,4,5,9] It should be noted that Michelson and subsequent researchers did not observe the expected difference. From this result it followed that interstellar space is either empty or that gaseous dark matter (ether) is dragged by the Earth. However, this latter assumption contradicted the results of the phenomenon of stellar aberration.[1,2,4,5,9] To resolve this contradiction, it was decided to recognize space as empty. Moreover, A. Einstein's special theory of relativity was built on this basis.

However, it has now been proven that photons, not light waves, are the carriers of light. Photons possess mass (photons without motion are not observed), meaning photons are material particles. As for all material bodies, the Galilean-Newtonian laws of motion must apply to the motion of photons. In accordance with these laws, the Ritz law states that the speed of light emitted by a source is the sum of the speed C with which photons leave the radiation source (C = 3·108 m/s the speed of light in a vacuum) and the speed of the radiation source itself, V:

If we repeat Michelson's analysis of his own experiment, replacing the concept of the constancy of the speed of light with the Ritz rule, then the experiment should show no difference in the numerical values of certain optical quantities when a beam of light propagates along and across the direction of Earth's motion. Consequently, there was no contradiction between the aberration of light and Michelson's experiment. From this study,[1,2] it follows that both experiments revealed only that the Earth, in its motion, does not entrain the interstellar medium. Therefore, there is no reason to reject the existence of an interstellar medium in the form of gaseous dark matter. The researcher of this problem will be required to justify why the Earth, moving within a continuum of dark matter in orbit around the Sun, does not entrain dark matter in its motion.

Unlike previous concepts of space filled with ether (before the advent of Einstein's special theory of relativity), the continuum of gaseous dark matter suggests active interactions between material bodies and dark matter. Material bodies continuously absorb dark matter, increasing their mass. This in itself implies that the matter of the Universe evolves over time. Furthermore, as material bodies absorb gaseous dark matter, currents of dark matter arise around all material bodies, directed toward the centers of these bodies. These currents are unstable to external influences and therefore curl into vortices around the bodies.

It is known from gas dynamics that vortices interact with each other. This applies to the interaction of galactic vortices of dark matter with each other. Vortices around stars interact with the galactic vortices within which they reside. The Magnus effect is well known in aerodynamics and hydrodynamics. The Magnus effect implies the emergence of a force acting on nearby vortices in the direction of their centers of rotation. Moreover, this force can either bring these vortices together or repel them, depending on whether these vortices rotate in the same direction or in opposite directions. This effect has been implemented in practice with a rotating "Flettner cylinder"; N.E. Zhukovsky's theorem, which allows one to calculate the interaction force between vortices, has been proven.[5,6,8] N.E. Zhukovsky's force It differs from gravity in that it can not only bring vortices together but also repel them from each other, while gravity can only bring material bodies together. Recognizing this means that science gains a tool for a more complete exploration of nature, compared to using gravity alone.

Strictly speaking, it is the dark matter continuum that constitutes material space, fundamentally different from empty (mathematical) space. Material space is turbulent; it is filled with jet streams flowing toward the centers of mass of material bodies and vortex flows around galaxies, stars, and planets. Radial flows directed toward the centers of mass of bodies create gravity. Dark matter vortices gather stars into spiral galaxies, spin stars around their axes, and cause planets to orbit stars, uniting them into solar systems. Vortices around planets spin the planets in the direction of their orbital motion. Assuming that material bodies (stars, planets, etc.) are surrounded by a continuum of invisible, gaseous dark matter, science gains a new direction for studying nature.

The second reason is the dogmatic notion that the speed of light is independent of external influences and that the speed of light is a constant always and everywhere. However, it is clear that the external environment affects the speed of light. It is well known that the speed of light decreases when a beam of light passes through transparent obstacles. This is undeniable, as it has been demonstrated experimentally. However, even here a caveat has been invented, claiming that the speed of light is "constant only in a vacuum." But this very article asserts and proves the absence of absolute emptiness in nature. Large regions of space may be observed devoid of material bodies, but a continuum of gaseous dark matter fills the entire space of the Universe, including these voids.

We have already noted that dark matter interacts with material bodies, which continuously absorb dark matter and increase their mass as a result. To date, it has not been studied how dark matter affects the speed of light during the long journey of photons from distant stars to Earth. Photons are material particles; they possess motional mass. Therefore, all the laws of material nature apply to them. The time it takes for photons to travel from distant stars to Earth is billions of years. This cannot be ignored, as light provides

scientists with the most fundamental information about the Universe. Dark matter can slow down the speed of photons. A photon, leaving a star at the speed of light (C = 3·108 m/s), carries with it a momentum equal to the product of its mass and this velocity. Like any material body, a photon absorbs dark matter and, as a result, increases its mass. Since the "momentum" does not change along the entire path from a distant star to Earth, the speed of a photon of light decreases as it travels. This leads to an increase in the wavelength of light and an increase in redshift. The increase in redshift was mistakenly attributed, according to the Doppler law, to the speed at which all galaxies and distant stars are moving away from Earth. This increase in redshift was later interpreted as an expansion of space in the Universe. This is a cosmological error.

The answer to the question of why the force of gravity is weak compared to the forces that govern atoms and particles can be found in my monograph.[1,2] The monograph shows that the force with which dark matter jets act on bodies is proportional to the jet velocity. The radial velocities of dark matter at the boundaries of atoms and particles are very small (of the order of minus sixth power). Therefore, gravity is weak. However, the peripheral velocities in the vortices surrounding elementary particles reach the speed of light (of the order of plus eighth power). Therefore, the N.E. Zhukovsky force, caused by the interaction of vortices, is very strong. Apparently, this force acts as the "strong nuclear force" governing atoms and particles. For some large massive stars, the radial velocities toward the centers of the bodies are large. For stars such as black holes, quasars, pulsars, and white dwarfs, the peripheral velocities can also reach the speed of light. Therefore, such stars experience the simultaneous effects of gravity and the forces exerted on them by jets of dark matter in the vortices surrounding them. Taking this fact into account allows us to adjust some of our understanding of the interactions between galaxies, dark holes, quasars, pulsars, and other stars.

When examining phenomena occurring in galaxies, between stars, planets, and other cosmic bodies, modern physics relies on only one tool: gravity. This tool, in many cases, proves insufficient to explain the structural and behavioral features of galaxies, star clusters, and other cosmic formations. As a result, fantastical notions arise that contradict the laws of conservation of mass, momentum, and energy.

For example, the Big Bang theory posits that all matter in the universe arose from "nothing," from a mythical elementary particle. Along with matter, space and time emerged. Space expands into "nowhere," since nothing is known about what existed around this particle. Later, due to contradictions in this theory, it was postulated that it wasn't the hypothetical elementary particle of incredibly high density that exploded, but the empty space itself around the stars? As a result of this Big Bang, space began to expand. As space expands, it drags galaxies, stars, planets, and other bodies along with it, as if the stars and other bodies were cemented into empty space?

The Big Bang theory was developed based on astronomer Edward Hubble's discovery of the increasing redshift in the spectra of distant galaxies depending on the distance between Earth and these galaxies. As the distance from Earth to the emitting star increases, the redshift increases linearly. Based on this observation, astronomer Edward Hubble published his famous law, which related the magnitude of the redshift to the distance between Earth and the emitting star. Hubble's law was combined with the Doppler law, establishing that the increase in redshift is related to the speed at which stars or galaxies are moving away from Earth.

The farther a galaxy is from Earth, the faster it moves away from Earth. Knowing the "speed of light in a vacuum" makes it possible to calculate the travel time of photons of light. According to proponents of the Big Bang theory, this is how long ago the Big Bang occurred and the Universe was born. This time was estimated at 13.7 billion years based on signals from the most distant galaxies. It follows that the most distant galaxies were born in the very first moments after the Big Bang and are therefore located near the boundaries of the Universe. If, in accordance with the principle that "everything is relative," we measure the distance not from Earth to a distant star, but from that star to the distant Earth, would that mean Earth was born in the very first moments after the Big Bang? But Earth is about 5 billion years old, the Sun is 15 billion years old, and the Milky Way galaxy is even older. What should we do?

New astronomical observations are increasingly calling into question the Big Bang concept. Newly discovered distant galaxies increasingly defy the idea of newborn galaxies, thanks to their enormous mass, structure, and surrounding stars or rather, their absence. These galaxies are little different from the galaxies closest to Earth. A recent report revealed the discovery of an extremely hot galaxy cluster in regions that existed just 1.4 billion years after the Big Bang. This contradicts current theories and could upend our understanding of the evolution of the early Universe. Does the void have too many properties?

Moreover, the concept of the Big Bang and Hubble's law have not stood the test of time. This concept implied that the expansion of space, according to Hubble's law in combination with the Doppler law, should expand uniformly, proportional to the increasing distances between Earth and distant galaxies and their recession velocities. However, astronomical observations have shown that the expansion of space accelerates more rapidly than predicted by Hubble's law as one approaches the boundaries of the universe. For this discovery, the 2011 Nobel Prize in Physics was awarded to Americans Saul Perlmutter of the University of California, Berkeley (who led the observational project "Supernovae for Cosmology") and Adam Reies of Johns Hopkins University in Baltimore (the project "Search for Supernovae at High Redshifts"). Brian Schmidt of the Australian National University (the project "Search for Supernovae at High Redshifts") was also awarded the Nobel Prize in Physics. Physics hasn't found an answer to why, as we approach the edge of the universe, space begins to expand faster than Hubble's law predicts. To somehow explain this problem, physicists have coined the term "dark energy".

Dark energy, according to physicists, expands the universe faster than Hubble's law predicts. Beyond this, physics has nothing to say about dark energy. This is not surprising. Physicists have only one tool gravity to explain all the peculiarities of nature. If famous artists of the past had painted their pictures with a single color, it's unlikely that people would be admiring those paintings today.

In this regard, it should be noted that dark energy does exist in space. This is not some fictitious dark energy that accounts for the expansion of space, but rather the real energy of the chaotic motion of atoms of gaseous dark energy. Dark matter has a gaseous structure. It consists of very small dark matter atoms in continuous chaotic motion. It is invisible.

What is dark energy? According to the kinetic theory of gases,[5,6,8,10] it is known that any gas has internal energy. This fully applies to gaseous dark matter. The internal energy of the chaotic motion of the atoms of the dark matter continuum is the dark energy of the cosmos. Atoms of gaseous dark matter move chaotically and collide with each other. The collision of such atoms occurs without energy loss, as in the collision of elastic balls. The internal energy per unit mass of an ideal gas is expressed by the formula.

$$\bar{U}_e = \frac{U_e}{m} = \frac{iC_a^2}{2\chi} = 0.9 \cdot C_a^2, \tag{1}$$

where, for a monatomic gas we have $i = 3$ and $\chi = (i+2)/i = 5/3$. The density of gaseous dark matter in SI is $\rho^* = 3{,}54 \cdot 10^{-9}\ \text{kg/m3}\cdot$

According to formula (1) the internal energy of one cubic meter of dark matter gas at rest (volume $W = 1[м^3]$) is very large.

$$E_{1e} = 0.9 \cdot C_a^2 \cdot \rho_e^* \cdot W = 0{,}9 \cdot (3 \cdot 10^8)^2 \cdot 3{,}54 \cdot 10^{-9} \cdot 1 = 2.867 \cdot 10^8 [Дж]. \tag{2}$$

The internal energy of gaseous dark matter filling all space is called dark energy of space. It is truly enormous (it is determined by the energy of the chaotic motion of dark matter atoms). Each cubic meter of space contains approximately three hundred million joules. This energy supports radial flows of gaseous dark matter toward the centers of baryonic particles throughout the Universe. Dark energy is expended on the formation of vortices around the elementary particles of baryonic bodies. This energy also enters and accumulates within material bodies. The space around us is a continuum of virtually inexhaustible dark energy. However, humanity has not yet learned to extract this energy for practical use. Nevertheless, an exchange of energy and mass occurs between the dark matter continuum and material bodies, including stars.

Dark matter, possessing mass and velocity, enters cosmic bodies and contributes kinetic energy to them. The power due to the kinetic energy of dark matter introduced into a body will be written for baryonic matter in SI units as follows:

$$N_{погл.} = \frac{dm}{dt} \cdot \frac{V_r^2}{2} = \frac{f^2 \cdot \frac{\alpha}{k} \cdot m_o^3}{2 \cdot \alpha^2 \cdot r_o^4} \cdot e^{3\frac{\alpha}{k} \cdot t}. \tag{3}$$

Formula (3) is the law for the power of energy entering any baryonic body from the dark matter continuum surrounding these bodies. In this formula, $N_{погл}$ is the gravitational absorption power. Time t is measured from t=0 to the moment of interest. ro is the radius of the body $\frac{dm}{dt} = \frac{\alpha}{k} m$.[1,2] When dark matter is absorbed, the mass of baryonic matter increases. The mass flow rate of absorption, regardless of the chemical nature of the baryonic matter and regardless of its physical state, is proportional to the rate of formation of new mass $\frac{dm_e}{dt} = k\frac{dm}{dt}$, where $k = 3{,}36 \cdot 10^{17}$ is the mass formation rate coefficient[1,2]. This is a constant. Its value does not depend on the chemical composition and physical state of the baryons.

Our calculations further showed that over the long lifetimes of stars, some stars, such as black holes, store significantly more energy than predicted by Einstein's formula $E = m \cdot C^2$.. This formula, according to Einstein's special relativity, does not predict an increase in black hole mass over time. It is believed that stars, once formed from gas and dust clouds and ignited by nuclear reactions, subsequently, for some reason, stop absorbing matter from the surrounding space and begin to dissipate their mass and energy in the form of corpuscular and light radiation. They can also explode and cease to exist. Quasars absorb matter from the surrounding accretion disks. But even in this case, the absorbed matter is expended as light radiation, not as mass growth. Once all sources of internal energy are exhausted, stars turn into lifeless, cold lumps that fly off into "nowhere." The so-called heat death of the Universe occurs.

Dark matter theory[1,2] offers scientists additional tools for theoretically exploring complex problems in the universe. Of course, only experiment and direct (astronomical) observations provide science with reliable data about nature. However, experiment is not omnipotent; observations are limited by technological capabilities and distances from Earth. Without a good, realistic theory, experimental and observational results can be misinterpreted. A good theory is one based on a small number of assumptions. These assumptions allow for the theoretical derivation of scientifically important results. A good theory does not require new assumptions to explain every new phenomenon.

The theory of dark matter[1,2] is based on two main assumptions. First, it is claimed that the entire space of the Universe is filled with gaseous dark matter. Dark matter is the "proto-matter" of which all material objects are composed stars, planets, asteroids, down to molecules, atoms, elementary particles, including photons of light. The properties of dark matter differ somewhat from those of material bodies, but can be expressed in familiar SI units. Gaseous dark matter consists of very small particles atoms of dark matter. It is invisible. It interacts with material bodies. It is precisely this interaction that necessitates the introduction of the second assumption. This assumption consists of the assumption that all material bodies continuously absorb dark matter from the surrounding space, increasing their mass. That's all.

These two assumptions do not contradict human experience on Earth. Birds fly in the air, fish swim in water, and all material bodies are immersed in a continuum of gaseous dark matter. This continuum of dark matter is material space. Special relativity allows for empty space to curve, bend, stretch, compress, and expand at high speeds. Wormholes, time corridors, and singularities through which one can reach other universes supposedly exist in empty space. How all this can happen in empty space, where there is nothing to bend, bend, or expand, is unclear. How can even emptier time corridors exist in empty space? All these fabulous formations can actually be observed in material space filled with dark matter, where currents exist that influence photons of light during their long journey from distant stars to Earth. It is light that brings scientists on Earth the basic information about the Universe.

When draining water from a large container through a drain hole, you can see how the water jets forcefully push debris toward the drain hole. This is very similar to the effect of gravity on any objects on the Earth's surface within the flow of dark matter being absorbed by the Earth. Under certain conditions, the radial flows form a vortex around the drain hole, forcing the debris to flow around the drain hole. This is reminiscent of the solar system.

Based on these two assumptions, researchers studying the problems of the Universe were required to determine the parameters of dark gaseous matter. This required incorporating gas dynamics, aerodynamics, hydrodynamics, classical physics, mechanics, thermodynamics, and mathematics into their research. Using these advances, they were able to obtain the following characteristics of the dark matter continuum:

The parameters of the continuum of gaseous dark gas were determined, namely the values of pressure p_e^*, density ρ_e^* and temperature T_e^*, written in the familiar human concepts of physical units of baryonic matter in the SI system (they were obtained in[1,2]).

$$p_e^* = \frac{\rho_e^* \cdot C_{a0}^2}{\chi} = \frac{3,54 \cdot 10^{-9} \cdot (3 \cdot 10^8)^2}{1,67} = 1.908 \cdot 10^8 [N/m^2].$$

$$\rho_e^* = \rho_e / k = 3.54 \times 10^{-9} [kg/m^3].$$

$$T_e^* = T_e = 2,75[K], \tag{4}$$

Where $\chi = \frac{i+2}{i} = \frac{5}{3} = 1.67$ is the adiabatic index, $i = 3$ is the number of degrees of freedom of an atom of gaseous dark matter, $\alpha = 1 c^{-1}$, $k = 3,36 \cdot 10^{17}$.

Mass of a dark matter atom (possibly a neutrino) $m_н = 0,703 \cdot 10^{-39} kg$.

Radius of a dark matter atom (possibly a neutrino) $r_н = 0,62 \cdot 10^{-25} m$.

Number of dark matter atoms (possibly neutrinos) in one cubic meter of space $n_н = 5,035 \cdot 10^{30}$

The law of growth of masses of material bodies as a result of absorption of dark gaseous matter has been obtained

$$m = m_o \cdot e^{\frac{\alpha \cdot t}{k}}. \tag{5}$$

The value $\frac{\alpha}{k} = 2,97 \cdot 10^{-18} c^{-1}$ is equal to the Hubble constant. Table 1 presents the results of calculations using this formula for the ratio of the mass of a body after a certain period of time to the mass of the body at the initial moment of time.

Time (billions of years)	1	2	3	3,5	5	10	15	20
$m/m_o = e^{\frac{\alpha}{k} \cdot t}$	1,1	1,2	1,33	1,38	1,61	2,59	4,17	6,62

In addition, based on the found values of α and $\rho_э$, the velocities of radial jets of dark matter on the surface of a number of bodies in the Universe were calculated using the formula.[1,2]

$$V_{re} = \frac{f \cdot m}{\alpha \cdot r^2}. \quad (6)$$

The calculation results are summarized in Table 2.

Name of the object	Mass, g	Radius, cm	Speed of dark matter jets, km/s	Speed of dark matter jets, m/s
The star Wolf 457 is a white dwarf.	$1.01 \cdot 10^{33}$	$0.7 \cdot 10^{8}$	136800	$1.36 \cdot 10^{8}$
Van Maanen's star is a white dwarf.	$0.28 \cdot 10^{33}$	$4.90 \cdot 10^{8}$	7800	$0.78 \cdot 10^{7}$
Sirius's companion star is a white dwarf.	$1.70 \cdot 10^{33}$	$0.20 \cdot 10^{10}$	293	$0.29 \cdot 10^{6}$
Sun-star	$2.0 \cdot 10^{33}$	$7.0 \cdot 10^{10}$	0.273	$0.27 \cdot 10^{3}$
Earth-planet	$6.0 \cdot 10^{27}$	$6.40 \cdot 10^{8}$	0.00981	9.81
The Moon is a satellite of the Earth	$0.73 \cdot 10^{26}$	$1.73 \cdot 10^{8}$	0.00163	1.63
The nucleus of a hydrogen atom	$1.66 \cdot 10^{-24}$	$0.5 \cdot 10^{-13}$	$0.43 \cdot 10^{-9}$	$0.43 \cdot 10^{-6}$

The table shows that the radial velocities of dark matter jets on the surfaces of all the bodies considered remain less than the speed of light in a vacuum. However, on the surface of the smallest known white dwarf star, Wolf 457, the velocity was slightly less than half the speed of light. On the surface of the Earth, the radial velocity of dark matter jets is low. It was found to be 9.81 m/s, numerically identical to the acceleration due to gravity. On the surface of the nucleus of a hydrogen atom, the velocity is close to zero.

A formula has been obtained for the force with which dark matter jets act on material bodies in the direction motion of dark matter jets

$$F = \alpha \cdot V_e \cdot m = j \cdot m \quad (7)$$

where $\alpha = 1c^{-1}$, V_e is the velocity of the jets of dark matter, m is the mass of the body, $j = \alpha \cdot V_e$ is the acceleration of the body). If we substitute the value of the radial velocity of the jets of dark gaseous matter from (6) $V_{re} = \frac{f \cdot M}{\alpha \cdot r^2}$ into expression (7), we obtain I. Newton's law of gravity.

$$F = \alpha \cdot V_e \cdot m = f \frac{m \cdot M}{r^2}. \quad (8)$$

The resulting expression shows that gravity is caused by the force exerted by jets of dark matter flowing toward the center of material bodies from the surrounding space. The nature of gravity becomes clear.

It was previously noted that dark matter vortices exist around massive bodies (stars and planets). Using expression (7) and knowing the velocity distribution within the vortex,[5,6,8] we were able to derive a law for the increase in the angular velocity of a massive body located within a gaseous dark matter vortex from time.

$$\omega = \frac{\pi}{4} \alpha \cdot \omega_в \cdot t + \omega_o. \quad (9)$$

Formula (9) can be used to solve the inverse problem, that is, to determine the angular velocity of the core of a vortex of gaseous dark matter wB from the known angular velocity of the central massive body:

$$\omega_в = \frac{4}{\pi} \cdot \frac{\omega - \omega_o}{\alpha \cdot t}. \quad (10)$$

These formulas open up wide possibilities for studying phenomena occurring in galaxies and planetary systems.

Let's apply formula (10) to calculate the angular velocities of gaseous dark matter vortices around the planets of the solar system. The results of calculating the angular velocities of dark gas vortices around the planets of the solar system for the solar system's existence time of t = 4.5 billion years are presented in Table 3. The first column of this table lists the names of the planets, and the subsequent columns give the values of their masses, radii, and angular velocities. The seventh column lists the angular velocities of dark gaseous matter vortices around the planets.

Table 3:

Planets	Weight, g	Radius, cm	Angular velocity of the planet, rad/s	Orbital radius, cm	Orbital velocity, planet cm/s	Angular velocity of vortex, rad/s
Earth	$5,.98\times10^{27}$	$6,.37\times10^{8}$	$7,28\times10^{-5}$	$1,49\times10^{13}$	$2,98\times10^{6}$	$6,53\times10^{-22}$
Mars	$6,57\times10^{26}$	$3,39\times10^{8}$	$5,98\times10^{-5}$	$2,28\times10^{13}$	$2,41\times10^{6}$	$5,37\times10^{-22}$
Jupiter	$1,89\times10^{30}$	$6,.99\times10^{9}$	$1,76\times10^{-4}$	$7,88\times10^{13}$	$1,31\times10^{6}$	$1,579\cdot10^{-21}$
Saturn	$5,68\times10^{29}$	$5,75\times10^{9}$	$1,71\times10^{-4}$	$1,42\times10^{14}$	$0,97\times10^{6}$	$1,534\times10^{-21}$
Uranus	$8,78\times10^{28}$	$2,55\times10^{9}$	$1,63\times10^{-4}$	$2,87\times10^{14}$	$0,68\times10^{6}$	$1,462\times10^{-21}$
Neptune	$1,03\times10^{29}$	$2,50\times10^{9}$	$1,10\times10^{-4}$	$4,60\times10^{14}$	$0,54\times10^{6}$	$0,987\times10^{-21}$

We assume that the vortex surrounding the forced to rotate the Sun from zero to its present angular velocity of rotation $\omega = 2,9\cdot10^{-6}$ rad/s during the Sun's existence as a star, $t = 15$ billion years (at $\omega_o = 0$). In this case, the angular velocity of rotation of the solar vortex of gaseous dark matter was $\omega_{B1} = 0,781\cdot10^{-23}$ rad/s.

The Milky Way is known to be a spiral galaxy. The radius of the core $r_{core} = 9 \times 10^{21} cm$. Our Sun is one of the billions of stars that make up the galaxy. It is located outside the core. Like other stars, it moves around the center of the galaxy with a peripheral velocity $U_C = 220 \div 225\ km/s$ at a distance from the center $r_{orbit} = 10\ kpc = 3 \times 10^{20}\ m$.

The mass of the galaxy $M_{galaxy} = \frac{U_c^2\, r_{orbit}}{G} = 2 \times 10^{41}\ kg$.

In [18,19] it is noted that the rotation periods of all observed galaxies are contained within a relatively narrow range from 30 to 100 million years. This corresponds to the following range of angular velocities of rotation of galactic nuclei: $\omega_{nucleus} = (6.65\ to\ 2) \times 10^{-15}\ rad/s$. As the angular velocity of rotation of the galactic nucleus, we will take the average value from the specified range, namely $\omega_{nucleus} = 5.6 \times 10^{-15}\ rad/s$.

We can model the interaction of the Sun with the core of the Milky Way as if, instead of billions of stars in the core, there were a single star at its center with a mass equal to the mass of the galactic core. This allows us to use the formulas obtained for the vortex around the central star for our analysis. $\omega_{core} = 5.62 \times 10^{-15}\ rad/s$ Using formula (10), we calculate the angular velocity of rotation of the galactic vortex of dark gas in the "Milky Way" for the age of the Galaxy $t_1 = 15$ billion years and the angular velocity of rotation of the core of the Milky Way galaxy $\omega_{core} = 5.62 \times 10^{-15}\ rad/s$.

$$\omega_{\vartheta-gal} = \frac{4\omega_{core}}{\pi\alpha t_1} = 1.515 \times 10^{-32}\ rad/s \tag{11}$$

Over the course of this time, the circumferential velocity of the Sun increased by an amount $\Delta U = \frac{\alpha\omega_{\vartheta-gal}(r_{core})^2\, t}{r_{orbit}} = 226\ km/s$, coinciding with the current speed of the Sun.

The presence of vortices in the dark matter continuum around massive bodies allows us to explore another very important problem of the universe, associated with spiral galaxies. The structure of spiral galaxies has a distinctive feature.[18,19] This feature is that the core of any spiral galaxy, consisting of billions of stars, rotates as a single rigid body. A second feature is that outside the core, the angular displacements of stars located in the spiral arms around the center of the galaxy begin to decrease with distance from the center (Fig. 1, spiral galaxy M51). Observations show[18,19] that spiral galaxies rotate with the ends of their arms backwards. This could not be explained by existing hypotheses of the formation of spiral galaxies (Jeans, Lindblad, and a number of modern authors), but is naturally explained by the theory of gaseous dark matter.

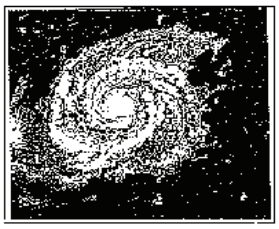

Fig.1

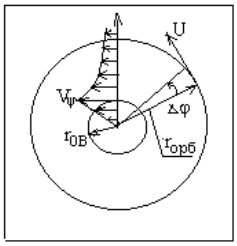

Fig.2

Figure 2 shows a diagram of the velocity distribution along the radius. The forces exerted by the dark gas jets on the stars within the galactic vortex are proportional to the jet velocities (7). Within the vortex core, the dark gas rotates according to the rigid body

law. The dimensions of the galactic core coincide with the dimensions of the galactic vortex core. This causes the observed motion of stars within the galactic core to follow the rigid body law (Fig.2). Outside the core of the galactic dark gas vortex, the peripheral velocity decreases inversely proportional to the radius. This should lead to a lag in the stars located at the ends of the spiral arms of the Galaxy. Over time, the orbital radii of stars located in the spiral arms change, adapting to Kepler's laws.

The examples considered confirm that galactic vortices of dark gas actively shape the structure of spiral galaxies.

A new relationship between stellar parameters has been obtained that determines the transition of a visible star to a black hole. Currently, the concept of a binary mass system is used to define this relationship. One mass is the mass of the star, for example, the mass of the Sun, which is approximately $2 \cdot 10^{30}$ kg, and the second is the mass of a photon, approximately 10^{-35}. Moreover, the Sun emits countless photons in all directions. What kind of binary mass system is this? In fact, photons leaving the star must overcome the oncoming current of dark matter, no matter in which direction the light departs from the star. This is similar to a swimmer swimming against the current in a river. If the swimmer's speed does not exceed the speed of the water, then one can swim indefinitely, but will not advance a single meter relative to the banks. Given these considerations, we believe that the speed of the dark gas flow toward the visible star must nowhere exceed the speed of light $C = 3 \cdot 10^8$ m/s. Otherwise, the star would be invisible.

$$V_{ro} = \frac{f \cdot m_o}{\alpha \cdot r_o^2} < C \cdot \tag{12}$$

Calculations using this relation showed more realistic sizes of black holes compared to the sizes obtained using a binary mass system.

It has been proven that the expansion of space in the Universe does not exist. Astrophysicists mistakenly linked the increase in redshift observed in the spectra of galaxies distant from Earth to the radial velocities of these galaxies' escape from Earth. Astrophysicists, having placed galaxies and stars in a vacuum, lost the opportunity to find an explanation other than the Doppler law for the increase in redshift. A vacuum is sterile. The cause of the increase in redshift lay in the interaction of light photons with the dark matter continuum through which light traveled enormous distances from distant galaxies (stars) to Earth.

Leaving the emitting atom at a speed of $C = 3 \cdot 10^8$ m/s, the photons of a light wave carry with them momentum m_0. This momentum is equal to the product of the photon mass and the speed of light , and it is maintained until it encounters an observer.

$$J = m_o C = m \cdot C' = Const \, . \tag{13}$$

As a light travels from a radiation source to an observer on Earth, the mass of photons, like that of all other baryonic bodies, increases over time due to the absorption of dark matter from the surrounding space, according to the established law (5). As since the momentum remains constant, the mass of photons increases, the speed of light decreases,

$$C' = \frac{m_o C}{m} = \frac{m_o C}{m_o e^{\frac{\alpha}{k} t}} = \frac{C}{e^{\frac{\alpha}{k} t}} \, . \tag{14}$$

Here $C = 3 \cdot 10^8$ *m/s* is the speed of light at the instant t = 0. It is the same as that of light under terrestrial conditions.

This value $\frac{\alpha}{k} = 2{,}97 \cdot 10^{-18} s^{-1}$ is very small. We obtained it from an analysis of changes in the Moon's motion over a long period of observation of this cosmic object.

The number of waves passing the observer's device in one second will be determined by the expression

$$\nu' = \frac{C'}{\lambda} = \frac{C}{e^{\frac{\alpha}{k} t} \cdot \lambda} = \frac{C}{\lambda'} \, . \tag{15}$$

The new wavelength λ' after a period of time will be

$$\lambda' = e^{\frac{\alpha}{k} t} \cdot \lambda \, . \tag{16}$$

The wavelength on the way from the radiation source to the observer on Earth will increase by the amount

$$\Delta\lambda = \lambda' - \lambda = e^{\frac{\alpha}{k} t} \cdot \lambda - \lambda = \lambda(e^{\frac{\alpha}{k} t} - 1) \, . \tag{17}$$

The law of increasing red shift depending on the time of light photons' travel and the distance between the radiation source and the

observer on Earth will be

$$\Delta\lambda / \lambda = e^{\frac{\alpha}{k}t} - 1 = e^{H \cdot t} - 1 = e^{\frac{H}{C} \cdot L} - 1 = e^{H^* \cdot L} - 1.$$

This law more accurately reflects the realities of the world around us than the famous Hubble law.

We note that if we expand expression (18) into a power series, we see that Hubble's law $\frac{\Delta\lambda}{\lambda} = H^* \cdot L$ is the first linear term of this expansion ($H^* = 10^{-26}$ $[1/\mathrm{m}]$ is the Hubble constant. L is the distance from the Earth to the galaxy [*m*]). Law (18) is a nonlinear expression for determining the redshift in the spectra of distant stars and galaxies. This explains why, at very large distances from the Earth, when approaching the edge of the visible Universe, the linear Hubble law leads to an error.

$$\frac{\Delta\lambda}{\lambda} = H^* \cdot L + \frac{1}{2}(H^* \cdot L)^2 + \frac{1}{6}(H^* \cdot L)^3 + ..., \quad \text{Revised Law of Hubble} \tag{19}$$

$$\frac{\Delta\lambda}{\lambda} = H^* \cdot L, \quad \text{Hubble's Law (from observations of galaxies)} \tag{20}$$

where $H^* = 10^{-26}$ $[1/\mathrm{m}]$ is the Hubble redshift constant (Hubble constant). L [*m*] is the distance from the Earth to the galaxy.

Figure 3 shows a comparison of the increases in redshifts (the ratios of the increments of the lengths of light waves to their lengths), obtained in accordance with Hubble's law and law (18) depending on the distances to the radiation sources and the time of light propagation from distant galaxies to the Earth.

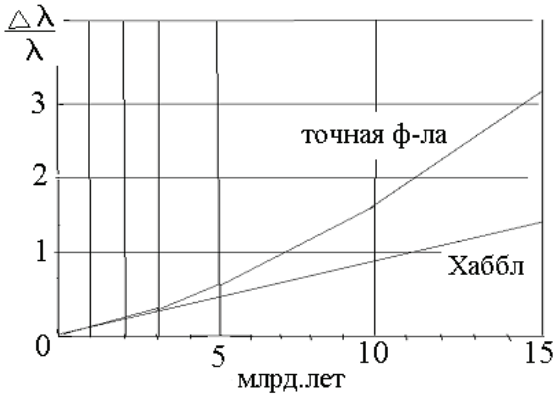

Figure.3

Our more precise expression for determining redshifts in the spectra of distant stars (9) shows that, unlike Hubble's linear law, redshift increases nonlinearly and more rapidly over time. This coincides with the discovery by American astrophysicists of the accelerating expansion of the Universe.

Our research reveals the mechanism by which light photons interact with dark matter, leading to accelerated redshifts in the spectra of distant stars, and demonstrates that there is no expansion of space in nature.

We emphasize that the redshift in the spectra of distant galaxies is caused by the interaction of light photons with dark matter, not by the expansion of space. The Doppler effect, the "Big Bang," or the even more fantastical notion of empty space expanding at every point become unnecessary. In empty space, there is nothing to explode and nothing to expand. According to our research, the longer a light wave travels, the more intensely its wavelength increases. This is explained by the increasing mass of the photons that make up the light wave.

When leaving an atom, photons of light carry with them the momentum $J = m_o \cdot C$ they received at the moment of emission. This momentum remains constant throughout the entire time of travel from a distant galaxy to an observer on Earth $J = m_0 \cdot C' = const.$ As mass increases m, the speed of light C' decreases.

$$C' = \frac{m_o C}{m} = \frac{m_o C}{m_o e^{\frac{\alpha}{k}t}} \approx \frac{C}{1 + \frac{\alpha}{k}t}. \tag{21}$$

Here $C = 3 \cdot 10^8$ *m/s* is the speed of light at the moment.

In 20 billion years, light will have a speed of $C' = 0.453 \cdot 10^8$ *m/s*, which is almost an order of magnitude slower than the speed at which light leaves the radiation source (Fig. 2). It is possible that by this time, photons of light have already ceased to exist, decaying into dark matter atoms. Photons without motion are not observed. This suggests that a photon is born from an atom. An atom is imparting to it a speed of $C = 3 \cdot 10^8$ *m/s* at the moment of birth, and dies, losing speed as it moves through the dark matter continuum. By this point, the photon's speed reaches a minimum, at which point its existence becomes impossible.

Having lost speed, a photon ceases to exist. (Photons without motion are not observable.) The photon decays into dark matter atoms, adding to the mass of the dark matter continuum.[1,2] The photon is not eternal. The speed of a photon in so-called "empty space" is not a constant, unchanging value. Objects located at distances of approximately 25 billion light years from Earth can no longer be seen from Earth, no matter how much telescopes and other star-observing equipment improves, since the photons of light that leave them will no longer exist (Fig. 4).

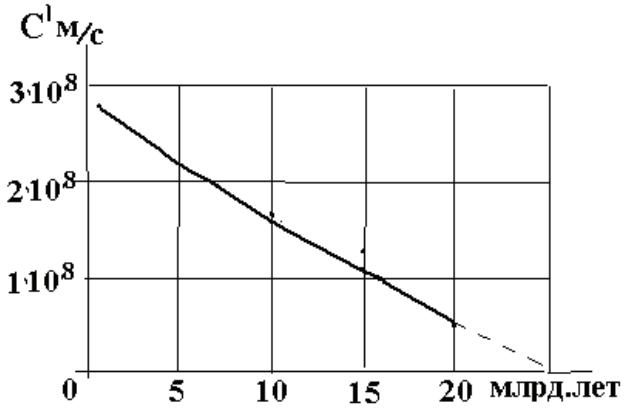

Figure.4

The main conclusion to which the proposed study leads is that the Universe may be infinite, but only a spherical region around the Earth with a radius of about 25 billion years is accessible to humanity (Fig. 4).

We have already noted that all material bodies in the Universe absorb dark matter. Radial flows toward the centers of bodies are unstable and therefore curl into vortices. At the outer boundaries of the atoms of material bodies, the circumferential velocities of dark gas jets reach the speed of light (in a vacuum) $C = 3 \cdot 10^8$ *m/s*. These vortices spin atoms (hydrogen) with a radius $r_0 = 10^{-10}$ *m* of up to an angular velocity of about

$$\omega = \frac{C}{r_0} = \frac{3 \cdot 10^8}{10^{-10}} = 3 \cdot 10^{18} [rad/s].$$

The nuclei of atoms rotate at the same angular velocity.

Liquid dark matter fills the nuclei of atoms over a long period of time. The process of filling the nucleus with liquid dark matter increases the weight, volume, and size of the atom. This increases the centrifugal force acting on the rotating atom. When the centrifugal force exceeds the pressure forces holding the atom together, the nucleus of the atom will be torn apart by centrifugal force.

The collapse of the atomic nucleus is resisted by the pressure forces by the surrounding gaseous dark matter, not by gravity. We previously noted that, according to the "hierarchy problem," gravity at the boundary of the atomic nucleus is very weak and plays no role in the fate of the atom. Calculations have shown that the nucleus of a modern atom cannot currently be torn apart by centrifugal forces. Calculations also show that the present-day mass of the hydrogen atom $m = 1.67 \cdot 10^{-27}$ *kg* accumulated over a period of 15.3 billion years. This time is on the order of the lifetime of the Universe, from its inception to the present day, as assigned to it by astronomy.

This brings us to the updated Big Bang hypothesis. We believe that the "creation of baryonic matter from dark gas" could have occurred simultaneously throughout the entire Universe. Liquid dark matter fills the nuclei of atoms over a long period of time. Over time, the masses and sizes of atoms will increase so much that centrifugal forces everywhere will exceed the forces of pressure. As a result, the atoms will collapse. For all matter in the Universe, or for significant portions of it, this annihilation of matter could occur at the same time (in astronomical terms). It is quite possible that this would be accompanied by a simultaneous explosion. This would be the Big Bang. Of course, this doesn't require the explosion of a single "superdense elementary particle," the structure of which even the most imaginative scientists have been unable to imagine. Nor would it require the explosion of empty space followed by its

subsequent expansion? Calculations have shown that about 32 billion years will pass before the next Big Bang.

In this case, the Big Bang will begin everywhere, as if had triggered by a clockwork mechanism installed in every atom. As a result of this explosion, matter will disintegrate into free atoms of dark gas. The entire field of dark gas will be disturbed by the explosion, and vortex formation will immediately begin, that is, the transformation of dark gas into matter. The process can be repeated an infinite number of times.

Thus, approximately [years] have passed since the previous Big Bang 15.3 billion years, and the next one is still 32 billion years away. It should be noted that this is not a precise calculation, but a rough estimate. The resulting values can be refined. The hypothesis under consideration for the nature of the Big Bang has shown that the explosion occurs simultaneously (by astronomical standards) and everywhere throughout the Universe. In this case, all the atoms of the baryonic matter in the Universe, or a large part of it, explode, disintegrating into atoms of dark matter, as if on a clockwork signal. However, this does not lead to an expansion of space in the Universe. After such an explosion, vortexes of dark matter begin to form everywhere around the surviving baryonic elementary particles. The Universe begins to be reborn. To this day, reports of the birth of new stars in various parts of the Universe are still emerging.

The main idea this article seeks to convey to the reader is that astrophysics has short-sightedly plunged stars, planets, and other bodies into the void, eliminating the invisible interstellar medium (ether, dark matter) from our understanding of the universe. In doing so, science has condemned itself to a limited range of tools for studying nature. In reality, the interstellar medium (dark matter) exists and actively interacts with material bodies. This interaction generates new, unfamiliar forces in addition to gravity, with which dark matter jets act on stars and other bodies, right down to elementary particles, including photons of light. These forces depend on the size and mass of the bodies and therefore act differently on stars, planets, and elementary particles. This is the solution to the "hierarchy problem."

The void into which astrophysics has plunged cosmic bodies is barren; it cannot lift the veil on the mysteries of the universe. The only thing that binds material bodies in the void at great distances is gravity. The nature of gravity is unknown. Gravity is the only tool with which physics attempts to answer all the questions that arise as new problems in observational astronomy arise. But this is not enough. Nature abhors a vacuum.

Stars, planets, and other bodies are surrounded by a continuum of dark matter. The space of the Universe is material, unlike the mathematical empty space that astrophysics currently operates on. It is a unified system of interacting, interpenetrating entities within the Universe. The rash decision to eliminate the dark matter continuum from our understanding of the Universe has led to fairytale notions of the Big Bang, the expansion of empty space, and the like, all of which defy the laws of conservation of mass and energy. This article presents some research results based on the recognition of the existence of a dark matter continuum filling the entire space of the Universe. These studies demonstrate the enormous amount of scientific research that has been overlooked by physicists, astrophysicists, and astronomers.

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