Unipolar Ether — A New Paradigm of the Structure of Space and Matter. Resolution of the 120-Orders-of-Magnitude Paradox

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Abstract.

This paper proposes a paradigm (a physical model) of space filled with a medium consisting of ether particles of a single sign of charge throughout the entire volume of the Universe. In such a medium, all types of interactions (strong, weak, and gravitational) are reduced to a single one: the electromagnetic interaction of ether particles. Moreover, all natural phenomena, from those inherent to the microworld to cosmic-scale processes, as well as all experimental and observational results, are interpreted within the framework of this paradigm. Within this approach, many contradictions and paradoxes of physics are resolved, including the "120 orders of magnitude paradox."

It is generally recognized that theoretical physics is in a state of crisis: it has practically ceased to influence applied physics. As the history of science shows, such a state precedes a change of paradigm. It is becoming increasingly clear that the etherless paradigm of empty space leads to a growing number of paradoxes, forcing physicists to believe in influences from beyond the physical world. It also leads to the introduction of various concepts (weak scalar potential, vector potential, quintessence, and the like), which serve as a "fig leaf" allowing one to avoid the use of the concept of ether.

A return to the ether is psychologically hindered by an incorrect interpretation of the results of Michelson-type experiments (a conventional name for all interferometer experiments, including the most recent ones [1]). Numerous descriptions of technical errors in these experiments (shielding of the ether flow within buildings and instrument enclosures, as well as the entrainment of ether by the planet) create the impression that eliminating these errors (for example, by conducting experiments in space) would allow experimenters to determine definitively the presence or absence of ether. However, this is an illusion: the Michelson experiment is, in principle, incapable of doing so, because the electrical lengths of both arms of the interferometer, when moving in any medium (gas or liquid), are reduced under the action of Bernoulli forces to the same extent in laminar flow (or unpredictably in non-laminar flow). That is, by measuring the difference in the number of wavelengths in each arm (which is precisely how an interferometer operates), we will not observe this difference, since the number of wavelengths in each arm changes by the

same amount; or the difference may be small and unpredictable, as in turbulent flow. This is discussed in more detail in [2].

Taking the Bernoulli effect into account refutes the “proof” of the absence of ether; therefore, ether can and must be an object of scientific research. One only needs to choose its physical model, the one most suitable for an adequate description of all known physical phenomena.

It seems to me that such a model is the unipolar ether (UE), in which all particles throughout the Universe repel one another (they are charged with the same sign). This is the only axiomatic assumption that gives rise to all the properties of such an ether required to explain all physical phenomena [2–5].

Charge of a Material Particle

Within this paradigm, the concept of the charge of a material particle becomes clear. Until now, this concept has been the subject of excessive and unfounded speculation that charge is determined by flows or spiral motion of neutral particles. At the same time, no adequate explanation has been provided as to how these flows arise.

In the UE, charge is an increase or decrease in the density of ether particles relative to the average density within a given volume of space. One may say that a unit volume of space contains a spatial charge $\mathbf{Q=N\cdot q_e/V}$, where $\mathbf{q_e}$ is the charge of an ether particle and **N** is the number of ether particles per unit volume. In this case, the spatial charge is proportional to the ether density.

Then, a compression of ether particles in the same volume is characterized by a positive quantity $\mathbf{+\Delta Q=Q_c-Q}$, where the index **c** denotes compression. Rarefaction is characterized by a negative quantity $\mathbf{Q = Q_r- Q}$, where the index **r** denotes rarefaction.

Thus, charge is measured not as an absolute quantity but relative to the average ether density in our region of space. In other regions, the average ether density may be different, since the number of ether particles per unit volume may differ.

In this way, within a spatial charge of particles of a single sign, both opposite electric charges of material particles arise. By the same principle, positive and negative temperatures on the Celsius scale are defined.

The “zero” level of charge density is not a zero spatial charge (i.e., not a complete absence of ether particles): in practice, any charge is measured relative to a reference level that we

conventionally take as zero. It follows that there are no “near-zero” or “zero” fluctuations in space; rather, there are fluctuations about the aforementioned reference level.

Structure of the Unipolar Ether

Ether particles of the same sign of charge in the Universe will inevitably arrange themselves into a structure with the following properties:

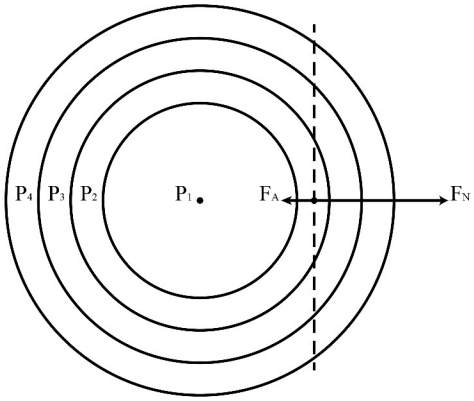


Fig. 1. Distribution of the potential **P** (where **P** simultaneously represents ether density and the magnitude of spatial charge) in the Universe. Here $\mathbf{P_1 > P_2 > P_3 > P_4}$; $\mathbf{F_A}$ is the inward force (the sum of the forces exerted by ether particles located to the right of the intersection point of the dashed and solid lines, where a material particle is located), and $\mathbf{F_N}$ is the outward force (the sum of the forces exerted by ether particles to the left of the intersection point).

• First, in the ideal case, they will form a sphere in which the density of particles is maximal at the center and decreases toward the periphery. This is how any gas or plasma of like charges expands if it is not confined externally. Since ether particles repel one another according to Coulomb’s law and are not confined externally, the sphere will expand (remaining most dense at the center), which is equivalent to a flux of ether particles from the center toward the periphery.

To calculate the dependence of the recession velocity of any material particle from the center of the Universe (in order to compare it with the Hubble constant), it is necessary to know the distribution of ether particle density in this cloud, the magnitude of Coulomb forces for moving charges, and the velocities of the ether particles themselves. It is clear that at present we do not have such data; therefore, we will use the experimentally measured value of the Hubble constant. Moreover, as shown in [2], bodies whose volume is predominantly occupied by atomic nuclei and protons will move toward the periphery of the Universe in a unipolar ether of positively charged particles.

• Second, at any fixed moment in time, the sphere represents a crystalline lattice (the cell shape may vary, as in metals, but is possibly the simplest cubic form). The particles tend to move as far apart as possible, but they cannot disperse “instantaneously” because the outer layers have not yet reached the speed of light: as they move away, they still exert a backward influence on the central particles (this influence cannot be calculated, since Coulomb’s law is formulated only for stationary charges). This is analogous to a compressed spring that has been released: after a billionth of a second, the ends have already moved, while the middle has not yet responded.

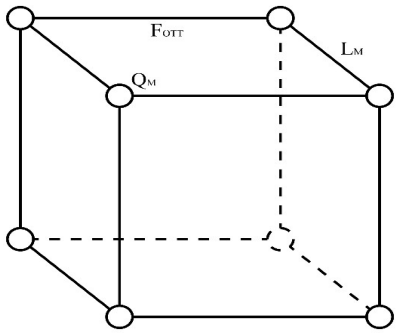


Fig. 2. Possible cell structure of the ether. The circles represent charged ether particles. $\mathbf{Q_M}$ — the charge of an ether particle (same as $\mathbf{q_e}$); $\mathbf{F_{отт}}$ — the repulsive force between ether particles; $\mathbf{L_M}$ — the distances between ether particles.

Adjacent cells shown in Fig. 2 form chains similar to waveguides extending from one end of the Universe to the other (see Fig. 3). The cells may be connected on all sides. These chains, as in metals, are oriented in all directions. Thus, the entire space of the Universe is filled with such cells (although in different regions their sizes may differ), which represent “quanta of space.” According to qualitative estimates [2], $\mathbf{Q_M}$ is apparently less than $\mathbf{10^{-20}}$ of the proton charge (otherwise it is impossible to explain the equality of electron and proton charges in magnitude), and $\mathbf{L_M \sim 10^{-20}\ m}$ (or even smaller).

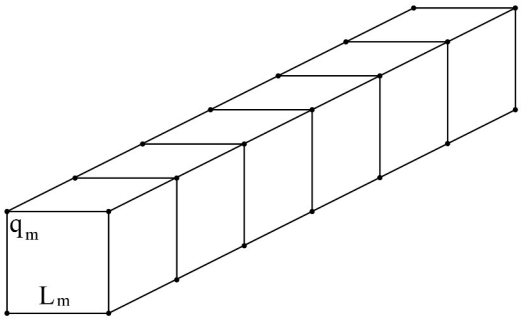


Fig. 3. Lines of the crystalline lattice of the unipolar ether. Due to the strict arrangement of charges, they represent waveguides capable of correlating wave polarization (which is important for the physical interpretation of “quantum entanglement” [6]).

Interaction of the Unipolar Ether with Charged Bodies. Strong Interaction.

Let us temporarily set aside the causes and mechanisms of formation of charged bodies (particles of matter and other material formations) and consider how the unipolar ether interacts with them.

If a body with an electric charge is placed into a uniformly structured crystalline lattice of electrically charged particles, the surrounding ether particles will either approach the body or move away from it, distorting the lattice (decreasing or increasing the distances between particles, thereby changing its density in that region). It is clear that such an effect requires energy, and this process represents polarization of the unipolar ether.

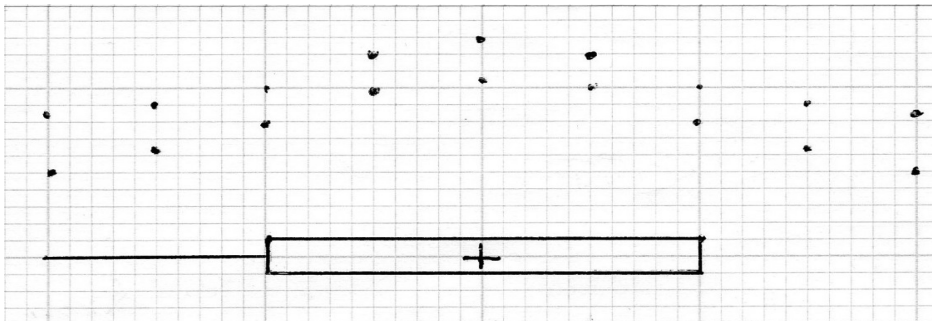


Fig. 4. Influence of an electrode potential on charged ether particles (dots). It is assumed here that the ether particles are positively charged.

From this, the origin of the electric constant $\boldsymbol{\varepsilon_0}$ becomes clear: it is not equal to the hypothetical permittivity of “empty space,” since part of the energy is spent on polarization of the elastic ether, which manifests as displacement of charged ether particles against the action of forces from all other particles.

If an alternating potential is applied to a charged body, the surrounding ether begins to periodically re-polarize. This results in waves of density of charged particles propagating through space. This is the displacement current, which was introduced to explain the passage of alternating current through a capacitor, but whose physical nature was previously unclear.

It is evident that the magnitude of polarization of the unipolar ether depends on the potential of the inserted body. This clarifies the situation in the Aharonov–Bohm experiment: by changing the ether density in certain regions, we control the velocity of

waves and electrons in those regions. Thus, we can change the phase of one of the interfering waves, shifting the interference pattern [2,4].

If we imagine placing two protons with their potentials into the space of the unipolar ether (the process of proton formation is not considered here), their interaction can be described as follows (Fig. 5).

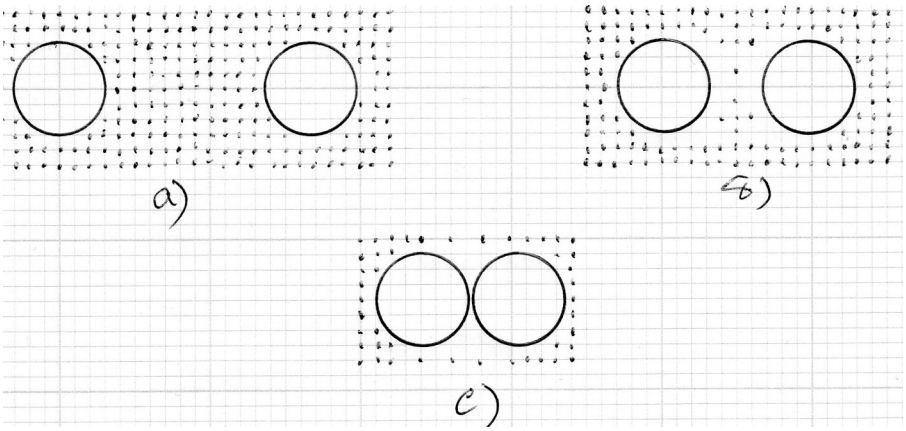


Fig. 5. Distribution of ether charge around matter charges of the same sign.

When two protons (positively charged particles) are sufficiently far apart (Fig. 5a), no matter how they distort the surrounding ether, there is still enough ether between them for the pressure on both sides of each proton to be equal. Only repulsive Coulomb forces act.

As they approach each other (this was called ether polarization), as shown in Fig. 5b (note that such an approach requires energy to displace ether particles between the protons), compressive forces appear that push the protons toward each other, counteracting the Coulomb force.

With further approach (Fig. 5c), due to energy expenditure (binding energy), the ether is completely expelled from between the protons, and the external ether compresses the protons together. This is exactly analogous to “attractive” forces (in reality, compression forces from the external medium) between two smooth surfaces pressed together, or to the Magdeburg hemispheres experiment. It should be noted that only positive ether particles can press positive matter particles together. Thus, the interaction we call the strong interaction is caused by the pressure of the charged ether on adjacent matter particles.

We thus have cosmic expansion and proton compression in nuclei driven by the same forces. Let us compare them.

First and Second Experiments on the Cross-Scale Consistency of the Unipolar Ether Paradigm. “Vacuum Catastrophe.”

According to Steven Weinberg and Lee Smolin (and indeed all theorists are aware of this), the most catastrophic error of theoretical physics is that the theoretically predicted value of the cosmological constant **Λ** in quantum mechanics differs from the value measured within general relativity by 122 orders of magnitude. That is, the average energy density of space leading to accelerated galaxy expansion is of the order of:

$\rho \sim 10^{-9}\ J/m^3$ while summing the energy of oscillatory modes in quantum mechanics gives a value of:

$\rho \sim 10^{113}\ J/m^3$.

The difference between the predictions is 122 orders of magnitude.

We understand that the error can only lie in the completely unfounded, and rather speculative, idea of the quasi-phonon approach used in calculating the energy: if the phonon approach is acceptable for calculating the energy of oscillations in real crystal lattices, then there is no justification for assuming that space contains some fictitious oscillating elements with energy $E=\Sigma 1/2\hbar\omega$ where the sum is taken over all wave numbers. Moreover, this sum must be arbitrarily cut off at the Planck scale $L_p \sim 10^{-35}\ m$, otherwise it would be even larger, in fact diverging to infinity. This is precisely why the problem is called the “vacuum catastrophe.”

In reality, the problem is even deeper, since the necessity of moving beyond a purely formal interpretation of Planck’s constant has not yet been recognized. Since Planck’s time, this number has been treated as some minimal step in measurement, without real physical meaning. However, its physical meaning is in fact evident: **h** is the energy required to change the frequency of radiation by one hertz due to the motion of an electron. This change in frequency is possible due to a change in the kinetic energy (velocity) of the electron with its mass. Therefore, postulating the energy of a single elementary oscillator as $1/2\hbar\omega$, when oscillators are comparable in mass to electrons or larger, as in real crystal structures, may still be acceptable. But in the ether, where particle masses may be many orders of magnitude smaller and frequencies much higher, such an approach is not permissible. This is what the paradox demonstrates.

At first glance, physics appears to face an unsolvable problem, since energy density can be measured astrophysically, but it cannot be measured at the microscopic scale (and yet the density must be the same). That is, it is impossible to reconcile numerical values across different scales. However, this is not the case.

First experiment.

In my very first work devoted to the unipolar ether [3], I presented a calculation showing that the same electrostatic forces both accelerate galaxies toward the periphery of the Universe and compress nucleons in atomic nuclei. In other words, the unipolar ether allows one to establish a physically meaningful correspondence between the velocities of galaxies at the edge of the Universe and the specific binding energy per nucleon. To establish such a correspondence means that, using Coulomb's law and Newton's second law, one can calculate what the galaxy velocities should be if the specific binding energy per nucleon is 12.5 MeV, assuming that our galaxy is located not far from the center of the Universe.

In other words, the unipolar ether allows us to extract additional information from already performed experiments, the existence of which was not previously even assumed. The operations involved are not experiments in the conventional sense, since they do not involve instruments, but rather connect the results of multiple experiments.

I used a binding energy of E≈12.5 MeV, since in most nuclei it is about 8–9 MeV, but to this value one should add 3–4 MeV of Coulomb repulsion at nuclear distances. In any case, this value is close to the real one.

If this proton binding energy is fully converted into kinetic energy and the velocity is calculated, for a proton mass $\mathbf{m = 1.67 \cdot 10^{-27} kg}$, the resulting velocity is $\mathbf{v = 0.17c}$. From Hubble's law $\mathbf{v = H_0 \cdot R}$, with $\mathbf{H_0 \approx 70\ km/s/Mpc}$, at a radius of 14 billion light-years, galaxy velocities lie in the range **(0.5–1)c**. Thus, the difference in values is 2.9–5.9 times, i.e., within one order of magnitude, which is considered acceptable for such large-scale measurements.

The results can be brought even closer based on clear physical considerations: there are two additional factors that should increase the real galaxy velocities. First, as already mentioned when discussing the figure of the Universe, the farther a galaxy is from the center of the Universe (the greater its asymmetry of position), the greater the total potential of its charges accelerating it toward the periphery (force $\mathbf{F_N}$ in Fig. 1), and the smaller the potential accelerating it toward the center **(**$\mathbf{F_A}$ in the same figure). Second, in the calculation we assumed a static Universe; however, the ether charges themselves are not stationary but accelerate outward from the center under the action of Coulomb forces. This additionally accelerates galaxies, similar to a fluid flow in a rotameter lifting a floating element. Thus, the discrepancy may be significantly reduced.

We are facing a very rare situation in science: completely independent experiments—capacitor experiments measuring the electric constant $\boldsymbol{\varepsilon_0}$, accelerator experiments determining nuclear binding energies, and astrophysical measurements of galaxy velocities—when interpreted within the unipolar ether paradigm, show not only qualitative but also quantitative cross-scale agreement. There is no need for invented multiple spaces, each responsible for its own physical law (the fragmentation of physics). Space becomes unified in its physical nature and does not contain vague "constructive" elements such as dark matter particles, virtual particles, vector potentials, or other such chimera: everything is determined by Coulomb's law for charged ether particles. The "vacuum catastrophe" disappears, as does the 122-orders-of-magnitude problem. It also becomes clear that the quasi-phonon approach is not applicable to the description of space.

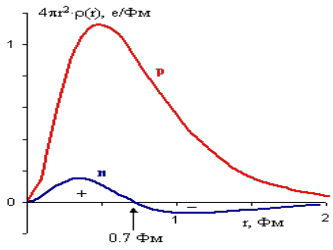
Since the experimentally obtained energy density of space on the order of $\mathbf{10^{-9}\ J/m^3}$ is known, and we have shown that galaxy velocities are comparable to nuclear binding energies, it follows that the resulting relation is close to the true value of the energy density of space.

Second experiment.

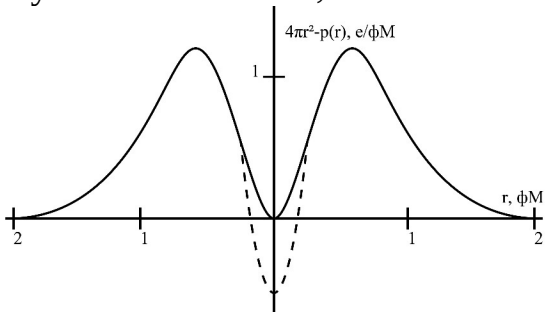
If one does not attempt to evaluate the correspondence of these values from the perspective of a unified electrostatic interaction, one might assume that this is a coincidence. However, there is another group of experiments at different scales confirming that this is not accidental.

It is possible to compare the charge distribution in the proton with the specific binding energy, interpreted as the compressive action of the medium on two protons.

The charge distribution in the proton was obtained at Stanford University. The shape of the curves suggests two charges located along a single diametrical section of the proton. We may therefore assume that these two charges are repelled by the ether inside the proton (between the peaks) and pressed together by the external ether, as shown in Fig. 5.



a)



b)

Fig. 6. Charge distribution in the proton and neutron. Figure (a) corresponds to measurements at Stanford. Figure (b) shows that the proton is symmetric about its center in any diametrical section. The proton is a “hollow” sphere.

The proton is stable in time and space. Stability here means that the proton does not disintegrate under Coulomb forces (the positively charged peaks do not separate). It is often said that it is held together by pressure in the surrounding ether. In our case, this pressure should be understood as the electrostatic action of the unipolar ether on the proton. It is sometimes also said that there is extremely high pressure inside the proton, while forgetting that in this case there must necessarily be external pressure that prevents the proton from disintegrating.

Experimental evaluation of the compressive force of the Universe’s ether can be made possible by the existence of the specific binding energy per nucleon measured in experiments.

It is easy to show that the energy of repulsion between two “humps” in Fig. 6 is comparable to the specific binding energy of protons (taking into account rescaling of charge magnitudes and distances). To do this, one should divide the curves on both sides of the zero radius into columns and normalize the curves under the condition that the maxima of charge density are located at a distance slightly greater than 0.5 fm from the proton center, and the area under each hump can be assumed equal to half of the proton charge.

After this, it is necessary to sum the interaction energies of each column on the left with all columns on the right.

The binding energy is:
$\mathbf{W = \Sigma\, w_{nm}}$, where **n**, **m** are indices of columns on the right and left.

Since the interaction energy of two charges is:
$\mathbf{W = K\, q_1 q_2 / r}$, where $\mathbf{K = 1/(4\pi\epsilon_0)}$ and $\boldsymbol{\epsilon_0}$ is the electric constant of vacuum, and the radius of the maxima of the curves is about **0.55 fm**, the sum will be on the order of **3 MeV**.

If we assume that the specific binding energy per proton is about **8–12 MeV**, then the binding energy of two protons in a nucleus (with inter-proton distances of about **1 fm**) is **16–24 MeV**.

Since the humps in the proton contain half of the proton charge, the interaction between them will be four times smaller, i.e. **4–6 MeV**.

The difference between the energy values obtained in this experiment and in nuclear decay and fusion experiments is only a factor of 1.5–2, which is quite acceptable for measurements in such distant domains of physics.

It appears that the repulsive forces inside the proton are balanced by compressive forces from the rest of the Universe's ether. The stability condition of the proton in this case is automatically maintained: a decrease in compressive forces leads to an increase in distances between charges (and thus a decrease in repulsive forces). An increase in compressive forces leads, for the same reasons, to a decrease in distances and an increase in repulsive forces.

Unlike etherodynamics, which cannot explain how to compress ether with an average density of $\sim 10^{-27}$ kg/m^3 to densities of $\sim 10^{18}$ kg/m^3 characteristic of matter particles, this approach explains everything quantitatively.

Again, experiments performed at different times, in different laboratories, and in different branches of physics (measurement of ε_0, measurements of specific binding energy, measurements of proton charge distribution) show agreement of results regardless of the scale of processes. And this is already the second such result.

Despite the common opinion that experiments cannot prove a theory, the two described experimental correspondences confirm the validity of the unipolar ether paradigm.

From the perspective of proof criteria (empirical grounding, consistency, reproducibility, minimization of assumptions), the following is achieved:

- the problem of mismatch between paradigms is removed;
- a unified physical basis for micro- and macro-worlds is proposed;
- the "proof" does not depend on canonical theories but is based on experimental observations and quantitative calculations.

Weak interaction, microphysical processes, gravity.

Thus, it is shown how particles of matter are formed in the unipolar ether, the origin of strong interaction and cosmic expansion is identified, and quantitative relations between micro-, macro-, and mega-world parameters are established.

However, the concept of unipolar ether gains the status of a paradigm because all other types of interactions, all natural phenomena, and all experimental results within this framework receive a clear physical interpretation.

Since it is impossible within a relatively short article to repeat the material presented in [3,5] and in numerous papers published on the website mirkin.iri-as.org, I will briefly outline some important information.

It is clear that only the positive charge of the space surrounding the neutron (the ether of positively charged particles) is capable of pulling out the negative electron from the neutron, removing it from the proton with acceleration. It should be noted that, as in the cases of cosmic expansion and strong interaction, the weak interaction also requires the presence of a positive charge of ether particles.

The analysis of microphysical experiments described in [5] shows that all obtained results have a simple physical explanation within the framework of the unipolar ether paradigm. This is especially evident in experiments on quantum entanglement of photons and in the Aharonov–Bohm experiments.

It becomes obvious that two photons do not exchange instantaneous information with each other; instead, both are located in a medium possessing anisotropic “waveguide” properties that correlate their polarization. Such properties are attributed to the crystalline structure of the unipolar ether (see Fig. 3).

From Fig. 4 it can be understood that a change in the potential at certain points of space in the unipolar ether (Aharonov–Bohm experiments) leads to a change in the density of its cells, which in turn causes a change in the velocity of both the electron and the wave in the medium. Therefore, the interference of two or more signals propagating along different paths depends on the magnitude of the applied potential.

I will briefly discuss gravity in more detail.

In the unipolar ether model represented as a crystalline lattice (and this is the only possible form of its existence, since charged particles cannot move individually), the mechanism of gravitational emergence is explained through Bernoulli-type forces. A decrease in static pressure in the ether (formation of a static pressure well) during motion of ether particles between matter particles leads to the emergence of inertia of bodies (incidentally, an increase in dynamic pressure would cause an increase in temperature) [2].

It is clear that ether particles in the crystalline lattice can move relative to matter particles in two ways: oscillatory motion around a central position of each particle, and collective translational motion relative to the body. Thus, the total relative velocity is:

$$\mathbf{v}_{total} = \mathbf{v}_{oscillatory} + \mathbf{v}_{translational}$$

It is understood that mass is determined by the square of velocity. It follows that the first term characterizes gravitational mass, while the second characterizes inertial mass.

It is clear that the physical mechanisms of the origin of each type of mass are not identical, and therefore their values are not necessarily equivalent. However, in experiments in which the difference between gravitational and inertial mass is measured, we determine gravitational mass in a situation where the Earth moves at a velocity of 30 km/s.

That is, we cannot stop the Earth—just as we cannot stop the oscillations of the ether in order to measure a “pure” inertial mass.

Since the velocity of the Earth is **30 km/s**, and the velocity of ether particles in their oscillations is of a comparable magnitude, while the velocities of motion in the pendulum systems used to determine mass differences are minimal, then, according to the relation given above, the addition of the pendulum’s velocity is also minimal (especially since velocities enter the expression squared).

Therefore, we do not observe a difference between the two masses in experiments.

Evidence supporting the correctness of this approach is provided by observed effects. It is clear that the magnitude of mass should depend both on the velocity of a body relative to the ether and on the amplitude of oscillation of ether particles. Thus, mass may vary in time and space, since we cannot guarantee that the density of the ether and its “thermal state” (oscillation amplitude) are constant everywhere.

We do observe such variations. This is indicated by the average density of the exoplanet CoRoT-3b, which exceeds the density of osmium [6], and by dinosaur bones that appear to have no safety margin (for example, [7,8]).

Conclusion

The representation of physical space filled with ether, whose particles throughout the entire Universe carry a single (positive) electric charge, allows all types of interactions to be reduced to a single electromagnetic interaction.

Through several examples, the work shows that the unipolar ether approach allows the interpretation of experimental and observational results, many of which have not had adequate explanations in canonical theories.

Within the framework of the unipolar ether, a cross-scale calibration of experimental results in the micro- and mega-worlds becomes possible, which makes it possible to resolve the “120 orders of magnitude paradox.”

References

1. Ch. Eisele, A.Yu. Nevsky, S. Schiller. Test of the isotropy of the speed of light. *Usp. Fiz. Nauk*, No. 10, 2009.
2. Vladislav Mirkin. *Chimeras of Physics and the Struggle Against Them*. website mirkin.iri-as.org
3. Vladislav Mirkin. “Not Dark Energy.” *Chemistry and Life*, No. 5, 2008.
4. Vladislav Mirkin. *Quantum Illusions*. website mirkin.iri-as.org
5. Vladislav Mirkin. *Theory of Absoluteness*. website mirkin.iri-as.org
6. Wikipedia. CoRoT-3b star.
7. Campione, Evans. “A universal scaling relationship between limb bone circumference and body mass in terrestrial tetrapods,” PNAS, 2012.
8. John R. Hutchinson et al. “Biomechanical modelling of giant dinosaurs,” Nature / related publications.