Kulak L.A. (Antoniya Ilyinskaya)

1. QUANTUM MEDIUM. MÖBIUS GEOMETRY. MAGNETIC MONOPOLES.

"When an ever-increasing number of specially invented assumptions have to be introduced into a theory, this clearly echoes the artificial introduction of an ever-increasing number of epicycles and eccentrics into the Ptolemaic picture. Without much concern for the logical rigor of the arguments, the agreement between these special assumptions and the hypothesis is often presented as "facts supporting the theory." Nobel laureate H. Alfvén. [20]

"What is a theory? It strikes the layman... that it is surrounded by a heap of formulas that mean nothing to the uninitiated. But these formulas do not constitute its essence".
Theoretical physicist L. Boltzmann.

"Of all the services that can be rendered to science, the introduction of new ideas is the most important." Nobel laureate Joseph John Thomson

"It is precisely the ethereal matter of space (masked by the obviously inappropriate term "vacuum") that, according to the conviction of truly knowledgeable scientists, should become the basis for bringing all the forces of nature into a single self-consistent picture." [150]

In my author`s monograph "***Substance. Atom. Theory of Everything***" [36] I proposed a self-consistent concept based on the ontology of the **complementarity principle**. The concept is proposed as a **new platform for generalizations** and covers the issues of the structure of the supporting Cosmic Medium, the **basic element of nature** and the **atomic model** based on it, the method of formation of atoms and the actualization of structural interrelations that hold system formations together as a whole, as well as the fractally-identical transfer of the general universal structural scheme to scaling levels. The monograph uses the methodology of Fractal Synthesis and lays the foundations of Linguistic Physics.

Speaking about the ontology of the complementarity principle, it should be noted that this principle has been known since **ancient times**.

For **quantum mechanics**, it was formulated by Nobel laureate **N. Bohr in 1927** and is its most important principle.

Subsequently, the principle of complementarity was generalized in science, which led to the creation of the **concept of complementarity**, which covers not only physics, but also biology, psychology, cultural studies and, in fact, all areas of knowledge in general.

B. Mandelbrot's fractal geometry, discovered **in 1967**, has its roots in the ontology of the principle of complementarity.

The ontology of the complementarity principle also underlies the **holographic principle**, introduced into modern science **in 1993** by theoretical physicist **G. 't Hooft** as a hypothesis about the general property of quantum gravity – a theory that aims to create a quantum description of gravitational interaction and bring theoretical achievements closer to the creation of a general Theory of Everything.

Experience and the accumulation of knowledge show that the comprehensive essence of the complementarity principle implies the existence of its equivalent in everything and is a **universal natural duality**. And the main conclusion is that it is the **original and fundamental**

principle, mediating a unified formula, a unified equation and a unified geometry. And if in all reasoning we start from its original essence, then we can get significant simplifications both in chains of logical reasoning and in mathematical calculations.

A more detailed restatement of the theoretical view proposed in the monograph is grouped by me into four main articles in accordance with current topics of theoretical physics, and several articles published earlier are also added to this. In physics, experiment plays a decisive role in the construction of theories. Therefore, in the format of the proposed concept, not only a number of basic questions of theoretical physics are considered, but also the results of existing theoretical proposals and experiments are included, confirming both the correctness of the chosen starting point of the concept and the conclusions made on its basis, which can be classified as a **fundamental work**.

"The fundamental nature of the theory is determined by the degree of penetration into the secrets of nature and is determined not by the cumbersomeness of its mathematical apparatus, but by the degree of connection with materialistic philosophy and proximity to the boundaries of the knowable." Kuligin V.A. [128]

At this point, it is important to emphasize that the existing paradigm of particles still has its place due to the fact that at the stages of cognition, scientific thinking creates a vector of dividing a single spatial structure into separate fragments, peculiar puzzles, which are much easier to learn and describe by the apparatus of algebra separately.

Nevertheless, the fullness of time comes when differentiation has already exhausted itself, the fragments are known and a feeling of a dead end and a state of crisis arises. It is then that the stage of integration and synthesis of already acquired knowledge into the overall picture begins, the picture which is most clearly visible at the current stage of cognition. This picture forms a new fundamental theory, which requires both a new platform of generalizations and new mathematics.

Experimental results applied to the theoretical field of the new concept proposed by me increase the weight of the arguments in favor of the conclusions made, and are also the evidence link that is extremely necessary for the theoretical view to acquire the status of reflecting the reality of natural phenomena. And in this regard, the experiment is the fact that supports and confirms the theory.

"*In physics, it is the experiment that plays the decisive role in constructing a theory*." Academician of the Russian Academy of Natural Sciences G.I. Shipov [167]

For the theoretical presentation I used a **geometric approach**, which, as is known, helps to make quite significant simplifications and often leads to the goal faster than the path laid out by the apparatus of algebra. Also, the geometric approach contributes to visualization and the creation of figurative pictures, which theoretical physics experienced an acute shortage in the period of the creation of quantum mechanics, and is also experiencing also experiences the same deficit at the current stage of development.

The foundation of the geometric approach in the new proposed concept is the **geometric analogue of the principle of complementarity**. As a geometric analogue, the **Mobius strip** or Mobius ring is considered. The basis for this is the correspondence of this geometry and its properties to the ontological content of the principle of complementarity as a universal duality mediating the dynamics and forms of movement, as well as to the pictorial display in ancient symbolism.

The representation of a physical point in space in the form of a Mobius ring and its consideration as a magnetoelectric circuit provides the key to the analysis of the processes of Cosmogenesis, which can bring many theoretical views to a common denominator. In this regard, the universalism of the principle of complementarity as a **natural duality**, presented in the format of Mobius Geometry, can be laid down as the basis for creating the Unified Theory of Everything and, in all likelihood, is the most effective way to achieve this goal.

The author's monograph and articles also note hypothetical assumptions and elements of theoretical proposals in which scientists in the history of science, at the level of guesses or partial conclusions, touched upon the method of explaining a number of theoretical aspects using the geometry of the Mobius strip.

However, to date, no scientist has considered the properties of Möbius geometry in application to the fundamental and intractable questions of physics so broadly as to obtain their resulting or comprehensive explanation, as well as to link the scaling levels into a unified paradigm on this basis and to show the universality of the interrelations that mediate interactions and determine the forces in them, that is, to create a Unified Theory of Everything. A number of questions of theoretical physics in electrodynamics and quantum mechanics still have no explanation. The proposed geometric format demonstrates how these difficult questions can be resolved.

A more detailed presentation of the questions of physics in the theoretical view I propose in the format of Möbius Geometry is grouped into four articles:
"1. Quantum Medium. Möbius Geometry. Magnetic Monopole."
"2. Quantum Entanglement. Möbius Geometry. «Yin-Yang» Symbol. Phases of Fibration".
"3. The Basic Element of Nature. Mobius Geometry. Gravity. Model of the Atom".
"4. Hydromagnetic Dynamo. Mobius Geometry. The Method of Formation of the Atom".

To these four articles several articles published earlier are attached:
5. "Experiments of Thomson and Rutherford", ("Time out") [146]
6. "Clifford`s parallels", [142]
7. "Fibration of the Mobius Pattern. Formation of the Atom" [141]

In the field of this article, in the proposed new format, the issues of theoretical physics related to the structure of the space medium are covered, simultaneously connected with theoretical assumptions and proposals of predecessors and contemporaries. And, as indicated above, the presented issues are united by me into a self-consistent concept based on the ontology of the Fundamental Principle of Complementarity (**FPC**) with the application of **its geometric analogue – the Mobius strip – to the explanation of natural phenomena.**

The choice of this geometric analogue is due to the fact that the geometric figure of the Mobius strip is the most characteristic geometric structure that reflects both the essence of the **FPC** and can demonstrate the phases of geometric transformations that occur according to the laws of hydrodynamics in a wave medium.

I would like to immediately note that the geometric shape of the Mobius strip has attracted the attention of mathematicians since its mathematical discovery. It also became one of the first objects of study in topology. However, for physics and other sciences, in particular chemistry and biology, a rapid increase in interest has begun over the past couple of decades. A series of experiments based on the shape of the Mobius strip, as well as the production of

materials with new properties on the same basis, demonstrate both analogies with natural phenomena and new, not yet studied properties, and scientists are increasingly interested in the properties of this geometry, since it helps to reveal the secrets of Nature and the world order to consciousness. This is the subject of my work “Mobius Geometry on the Podium of Science.” [177]

It should be emphasized that publications on the topic of the Mobius strip in the media of recent decades focus on the fact that it was the very fact of the mathematical discovery of Mobius Geometry that **gave physics a guide to a new way of studying the world around us.**

"The study of topology continues to produce stunning results. For example, last year [2017], topology led scientists to discover strange new states of matter. This [2018] year’s Fields Medal, the highest honor in mathematics, was awarded to Akshay Venkatesh, a mathematician who helped integrate topology with other fields such as number theory." [84]

One of a series of publications regarding the study of the properties of the Möbius strip is the publication in the journal *NATURE MATERIALS* "***The shape of a Möbius strip***" [83], in which the authors aim their research to gain new insights into **energy localization** phenomena that may help to understand the interrelation between the geometry and physical properties of the nano- and microscopic structures formed by the Möbius strip.

Simplicity of understanding arises most often on the basis of analogies and geometric representations. If we turn to the works of scientists of those decades that preceded the era of Quantum Physics, we can note that they turned to earthly analogies much more often than our contemporaries of the last century. At some stage in the development of physics, which is the science of Nature, scientists began to turn more often to mathematical formalism and so practically fundamental Physics went into the servants of the apparatus of Algebra, and figurative thinking, supported by analogies and geometric constructions, was gradually lost.

Even if there were objective reasons for this, the fact remains that as a result of this, the development of QED went along the path of stating the fact that the laws of the micro-world of particles obviously exceed ordinary human understanding, but at the same time they are correctly described by the fundamental mathematical equations of quantum physics. And in quantum mechanics, unlike other sciences, there have been practically no attempts for a long time to correlate its fundamental axioms with our physical basis, that is, with the knowledge and experience that a person draws directly from observing pictures of nature.

The following facts are known in the history of science in the creation of QED: “Avoiding the construction of any visual kinematic models, V. Pauli introduced a doubled Hilbert space H2⊗H (space of wave functions), the vectors of which are two-component spinors. And the theoretical compromise in understanding spin was expressed by Pauli as follows: “After a short period of ideological confusion and disagreement caused by the temporary limitation of “visuality”, a general agreement was reached on replacing concrete images with abstract mathematical symbols.” [117]

Replacing concrete images with abstract mathematical symbols has still not helped to ensure that the understanding of spin is clear and concrete. The opinion of a number of physicists is that the absence of a picture of representation plays a dominant role in this, and among the opinions there are quite harsh ones, calling such a state “intellectual debauchery” (P. Langevin, French physicist).

The concept of "***spin***" was introduced by W. Pauli in 1925, when explaining the doublet structure of the spectrum of alkali metals using a unique, classically indescribable ambiguity of the quantum-theoretical properties of the radiating electron, understood at that time as a particle

of an atom. The proton and electron were understood as entities independent of each other. Such a figurative representation essentially misled both classical physics and did not give quantum physics the keys to the development of figurative pictures of the micro-world. All these incidents and the search for a way out prompted the corresponding mathematical abstract substitutions.

I cover in detail the issues related to the discovery of the electron and a different interpretation of the experiment of J. J. Thomson in my work [146].

The concept of "***spin***" is inextricably linked with the mathematical object of spinor.

"The remarkable thing that the Dirac equations brought to physics is spinors, generating the Minkowski geometry, which in the language of spinors can be represented as the simplest Mobius geometry!

Spinors gave birth to a new class of reference systems (observation systems) in physics – spin reference systems. In these systems, infinitely distant points in space are observable on a par with finite ones! Perhaps this is the physical meaning of the Einstein-Podolsky-Rosen quantum entanglement, in which it is the spin that plays the decisive role." [*Academician of the Russian Academy of Natural Sciences, Shipov G.I. (from personal correspondence)]*.

The algebraic definition of a spinor is considered in mathematics. If you delve into this definition, then for a figurative representation it is quite complicated and, given the fact that Nature acts quite simply, most likely this entire sophisticated algebraic paradigm needs constructive simplification.

"Michael Atiyah once said: "Nobody fully understands spinors. Their algebra is formally understandable, but their geometric meaning is mysterious." [117]

The mystery initially lies both in the physical understanding of spin and in the geometric representation of spinors. These representations are inextricably linked.

The concepts of "spin" and "spinor" come from the root word "spin", form of PIE root ***(s)*pen-** "**to draw, stretch, spin**, **rotate**" with the meaning of "***rotation***". [151]

This is the character of rotation that has a **two-cycle period of revolution**, sets the spatio-temporal characteristics and constitutes the **energy content** of the spatial fabric.

The algebraic binding of the concept of spin and the lack of a specific picture of its representation prompted W. Pauli to the following statement in his scientific dialogue with Kroning: "Van der Waerden notes that the ambiguity of the electron, which defies classical description, is now called spin. As is well known, all attempts at a classical (mechanical) description of the electron spin, beginning with the work of Uhlenbeck and Goudsmit, were unsuccessful. In his memoirs, Yu. B. Rumer writes that at one time Pauli told Kronig that the spin theory was nonsense, because a mathematical point cannot rotate around itself." [117]

It is difficult to disagree – yes, indeed, a mathematical point cannot. It simply does not have any mechanism for this. Being carried away by the harmony of mathematical charms, and also against the background of the fact that the space in the field of scientific thought in that period turned out to be empty, the scientist lost sight of the fact that it is necessary to talk about a **physical point** in space, which, no matter how small it is, has its own **geometric representation** and **mechanics of motion**. Its spin, as noted above in the meaning of the root word, has not only the dynamics of two-cycle rotation, but also the property of stretching, which is just characteristic of topology as rubber geometry. And also, according to the meaning of the root word, this physical point is able to draw in physical space the **form of a quantum-mechanical phenomenon.**

The reason why the **ambiguity of the electron** did not lend itself to classical description was precisely the lack of a picture of the representation of this ambiguity, as well as a

representation of the essence of the electron, which, even at the time of the birth of quantum mechanics, did not have that clear picture in the atomic model that would correspond to the classical laws of electrodynamics.

"Quantum physics urgently needs new images and ideas that can only arise with a deep revision of the principles underlying it."

Nobel laureate Louis de Broglie.

It is the geometric component of mathematics that is the mediator between those constructions that are created by algebra and what is observed in reality. And the mechanics of motion is comprehended through observations that suggest that all physical objects of cosmic space perform a universal type of motion associated with the simultaneous execution of a two-cycle rotation – rotations around their inner axis and rotations around the external center. All physical objects are fed simultaneously from their internal and external sources. This is where fractal-holographic analogies are built.

Did the fathers of quantum mechanics at that time have guesses that could give the corresponding pictures of the representation for understanding the spin and the geometric representation of spinors, which are directly related to the implementation of two-cycle revolutions and energy? Of course they did.

One of the well-known guesses in the history of QM is the "***Dirac belt***". Being an engineer by education and work experience, P. Dirac was the only one who used the image of a twice-twisted trouser belt to explain the spin (of electron), which is equivalent to the Mobius strip with two turns, in other words, the Magnetic Möbius Dipole. Although this image was proposed, but, obviously, it alone for electron was not enough. The problem had to be solved in a complex and exactly as V. Heisenberg outlined it – it was necessary to create a "***unified theory for the physics of the electron and proton together***", which, although it was outlined at that time, but has not yet been created.

And here the keys to the riddle of spin and spinors were found in W. Pauli. He had a specific image of the Mobius strip first. Then good known the "***Pauli square***", in the geometry of which the change of phases of the oscillations of a four-point function, grouped "***two by two***", is shown. And also in his famous enigmatic phrase "***Bifurcation and reduction of symmetry! That's where Faust's poodle is buried!***" there was that property of the Mobius strip to double its InfoGenome at each bifurcation, which was extremely necessary for the development of a figurative representation, without which QED still moves blindfolded.

What stood behind this phrase, W. Pauli did not have time to leave in any form. Therefore, to this day, this phrase of his undergoes repeated attempts to reveal its secret.

Following the format of the new concept based on Mobius Geometry (MG), I have proposed a variant of revealing this secret of bifurcation in the method of fibration of the Mobius Magnetic Monopole and its geometric representation based on the Mobius strip, since this coincides with the facts both in the biography of W. Pauli (the Mobius strip repeatedly surfaced in the field of his thinking and he shared this in letters to K. Jung), and in the biography of P. Dirac (the hypothetically predicted ***magnetic monopole*** plus the "***Dirac belt***").

The representation of a **magnetic monopole based on the Mobius strip**, as well as its filamentary bifurcation/fibration, makes it possible to explain both the quantization of charges and the multiplicity of the minimum, and to see the geometric construction of the basic element of Nature and the possibility of creating on this basis a ***"unified theory for the physics of the***

"proton-electron" together", which was designated by Nobel laureate W. Heisenberg in the analysis of the relativistic equation of P. Dirac.

I believe that the premature death of W. Pauli left unrealized the opportunity to bring together **three elements** that pulsated in the field of his thoughts: the Mobius strip, the principle of bifurcation and the change of oscillations, displayed in his square ("***Pauli square***"). If this had happened, then through the bifurcation/fibration of the Mobius strip, displaying the geometry of the original Magnetic Monopole, he could have geometrically obtained a Magnetic Dipole element, in which the same change of oscillation phases occurs as in the "***Pauli square***" and mass is manifested. These same elements are reflected algebraically in the equation of P. Dirac. That is, the designated bifurcation with simultaneous doubling was the key to the method of forming a system of atomic elements according to the doubling scheme: spinors, bi-spinors, twistors and hypertwistors. And it was precisely this doubling of the original Magnetic Monopole InfoGenome that provides the necessary explanation for how what is called charge quantization occurs.

It should also be noted that in the history of quantum physics, at its birth, the concept of the presence of a supporting cosmic medium, which was already sufficiently developed at that time, was not connected to its theoretical field, and mathematical formalism turned out to be dominant in its creation. This did not allow combining QM with classical concepts in the description of the mechanics of motion of quantum objects. Spins, spinors, bi-spinors, twistors and hyper-twistors hung in empty space as mathematical entities without their connection to the feeding etheric mtdium generating these geometric transformations. And the opinion of Nobel laureate R. Penrose that energy is primarily associated with spin, left only a hint, but did not help to solve the impending problem. [14], [81], [82], [144], [145].

Mechanics begins with a description of the process of motion. And Quantum Mechanics, including, must have its origins in the description of both the form of a quantum phenomenon and the process of motion. And it is very difficult to disagree with the fact that any motion occurs in a supporting medium and with support from the medium. If there is no supporting medium, then how can motion in its essence be carried out. A clearer understanding of how movement and self-movement occur is needed.

Geometry is also of great importance in this, which helps to understand the forms of motion and teaches their use, as Isaac Newton noted in his works:

"The very drawing of lines and circles, which serves as the basis of geometry, essentially relates to mechanics. Geometry shows how, with the help of drawing these lines, questions and problems are solved. In itself, drawing a straight line and a circle is a problem, but not a geometrical one. The solution to this problem is borrowed from mechanics; geometry teaches only the use of these solutions. Geometry is glorified for this reason, that, having borrowed so few principles from outside, it achieves so much. Geometry is based on mechanical practice and is nothing else than that part of general mechanics in which the art of exact measurement is expounded and demonstrated." ***Isaac Newton, "Mathematical Principles of Natural Philosophy***." [153]

It is necessary to emphasize that Quantum Mechanics is not some kind of exception to the general rules of Nature, and QED (quantum electrodynamics) is not something particularly exceptional that does not obey the Universal Laws of interaction. The holographic principle, introduced into the field of theoretical thought by Nobel laureate G. t' Hooft, along with the principle of fractality, asserts the unity and uniformity of all that exists.

Observation of the macrocosm demonstrates the fact that almost all bodies, with few exceptions, simultaneously perform two interconnected types of motion in the supporting cosmic medium – this is rotation around its internal center (around its axis) and simultaneous orbital rotation around the external center. And this **geometry of rotation is universal** (UNI-VERSE) and is inherent in all levels of the world order based on the holographic principle and the principle of fractality, according to which every fragment of the whole reproduces the essence of the whole, but only with fewer details.

At each level of universal scaling, this general universal scheme will have only its own individual specificity of execution.

Consequently, moving from the directly observable cosmic macro-world to the difficult to observe micro-world, we can confidently assert that this type of movement has its defining place in it too.

The principle of this general scheme of two-cycle movement is quite clearly illustrated by the dynamics of the torsion of the Mobius ring. If we take into account its inverse turn, then its two-cycle circulation is the rotation of the inverse turn around the center of the line of curvature and at the same time its revolutions relative to the conventional external center inside the ring. This view of the geometry of the Mobius strip speaks in favor of the fact that this geometry has a direct relation to the structure of the world order and its fundamental principles, and I propose to consider these principles in this format – the ontology of the **FPC** with the application of its geometric analogue – **MG** (Möbius Geometry).

Since the above-mentioned double cyclic circulation of objects occurs in the cosmic medium, and the objects themselves are the products of this midium, then according to the holographic principle and the observed comprehensiveness of the FPC, the logical conclusion will be that the medium itself has a complementary structure, and its filling will be magnetism. Magnetism is the **physical embodiment of the FPC**, and its complementary structure is expressed by the presence of opposite polarities that are inseparable and which can have the following phases: **monopolarity** (monopole), **bipolarity** (dipole), **quadrupolarity** as a system of dipoles and other, if such is observed.

Also, the complementarity of magnetism in the fibration phases is expressed through its dual magneto-electric essence, which in the current paradigm of physics is divided into two components – a magnetic field and an electric field, which is convenient for calculations, but in essence remains one integral phenomenon.

It should also be emphasized that polarities are not separate entities, but are essentially the ends of the direction vectors of the magnetic lines of an object and they are considered as inseparable components of one single Whole.

The intermediate summation will be as follows:

1. In the history of science after the discovery of the mathematical figure "Mobius strip" there were facts when the creators of quantum mechanics made attempts to explain their theoretical proposals on the basis of the apparatus of algebra, connecting both the elements and the full image of the Mobius strip.

2. The Mobius strip is a geometric analogue of the Fundamental Principle of Complementarity and displays its essence - the connection in one whole of two opposite, but complementary to one whole, antiphase components.

3. The Mobius strip includes in its geometry the display of the mechanics of the simultaneous execution of a two-cycle revolution, which is observed in space as a universal type of torsion.

4. The Mobius strip is directly related to the concept of "spin" and reflects its geometry, provides a visualization of the four-point function, showing its dynamics..

Universal complementary duality in the context of its physical implementation in magnetism and its polarities has two main phases: the monopolarity phase (monopole) and the bipolarity phase (dipole). The monopolarity phase is characterized by an internal hidden polarity inherent in magnetic monopoles, while the bipolarity phase is characterized by polarity and a magnetic field expressed externally.

The monopolarity phase as a phase of unmanifested matter is inherent in the matrix structure of the supporting Cosmic Medium**, the bipolarity phase** is inherent in the manifested baryon matter. The bipolarity phase mediates gravity and mass, which become manifest during the transition of magnetic ring from the monopole phase to the dipole phase.

If we dwell in more detail on what should be understood by the terms "***monopolarity***" and "***bipolarity***" in the context of the proposed MG (Möbius Geometry) format, the following explanations can be given.

Mono-polarity is a state of magnetism that does not have its external manifestation like a bar magnet, i.e. bi-polarity. This state can be called an unmanifest or hidden state of magnetism. And the entire so-called hidden mass of matter, which in the current scientific view has received the names "***dark matter***" and "***dark energy***", which, according to scientific data, accounts for 25% and 95% of matter, is in a state of mono-polarity and is not recorded by equipment.

The concept of "**mono-polarity**" does not mean **unipolarity**. Mono-polarity is a phase state of duality of magnetism, when its polarities are not manifested outward in the form of bi-polarity or quadru-polarity, but represent an internal character of closure without manifestation of the magnetic field outward for interactions. That is, **monopole** is a **complementary duality** "two in one".

In this regard, the search for the hypothetically predicted magnetic "***Dirac monopole***" as its interpretation as a unipolar unit is the misconception that has been inherited and is still spreading within the Standard Model and in active attempts to detect this unipolar unit in experiments over the past 10-15 years.

The presence of the ethereal substance in a state of monopole ensures its **neutrality**, which essentially works as a principle of "non-interference" in interactions between dipole objects.

Bi-polarity or dipole is a state of magnetism that has an external manifestation similar to a bar magnet, the ends of which demonstrate different polarities. This state can be called an externally manifested state of magnetism. That is, the bipolarity phase is the phase of transition of magnetism from the monopolarity phase to the dipole phase, limited by the poles. All baryon (manifested) matter is in a state of dipole (bi-polarity).

The states of **monopole** and **dipole** can be illustrated quite clearly using the geometric analogue of the FPC – the Mobius strip – and show geometrically what the meaning of these two phases of the same phenomenon is. This illustration is presented in the work "*2.* ***Quantum Entanglement. The Yin-Yang Symbol. Mobius Geometry. Fibration Phases***" as it follows the logic of applying the MG-format to physics issues.

H. Alfvén, a Nobel Prize laureate in physics for 1970, is the founder of a new scientific field, magnetohydrodynamics, and the author of truly innovative ideas about the nature of

cosmic magnetism, as well as one of the pioneers of research into cosmic physical plasma. [19], [20], [21] [22].

First of all, H. Alfvén spoke about the universality of magnetism back at the time when the second refusal in the theoretical field of science from the presence of a supporting etheric medium occurred and space was considered empty.

In the article by S. Clarke "Our Magnetic Universe: The Forgotten Force That Shapes the Cosmos" the author notes that "H. Alfvén pointed out that the vast majority of all matter in the universe is in the state of physical plasma, similar to a kind of gas consisting of magnetic particles. Based on this, Alfvén assumed that the forces acting on plasma due to magnetism should be at least comparable in their effect to gravity. So, in general, according to his arguments, magnetic fields should play an important, and perhaps even dominant, role in the formation of the cosmos." [23]

As can be seen from the citation, H. Alfvén attached great importance to issues related to magnetism and its dominant role, physical cosmic plasma and its magnetohydrodynamics. These questions in the current period of development of cosmology with the receipt of new observational results with the help of SOFIA (Stratospheric Observatory for Infrared Astronomy) and SALSA (Survey of extragalactric magnetism with the Stratospheric Observatory for Infrared Astronomy) have already entered the mainstream of science not only as a recognition of the importance of physical plasma and magnetohydrodynamics in cosmology, but also as a confirmation of Alfven's idea of filamentary (fiber-like) and cellular structures of space and these facts clearly confirm astronomical observations. [41], [23]

And the fact that H. Alfven called the Cosmic Medium "living plasma" can be considered not some kind of aphorism, but a fairly strict scientific terminology.

"Living", by definition, is that which first of all carries out the process of breathing – "inhale-exhale", that is, the process of mutual exchange with the environment. Translated into the language of physics, breathing is a type of **oscillatory process** with opposite phases, in other words, **oscillations**. That is, according to the definition of H. Alfven, the etheric filling of space should be considered as living cosmic plasma, consisting of a certain kind of magnetic units that perform oscillating phases of breathing.

In this case, the phases of breathing "inhale-exhale" should be understood as the process of "radiation-absorption" of quanta, performed by these magnetic units as physical points in space. That is, these units are in a state of continuous and unceasing quantum activity, and therefore the supporting cosmic environment, permeated with the magnetism of these units, is **active living etheric matter**. Function of breathing is NOT the prerogative of biological organisms. Breathing is a reciprocal process of exchange with the environment, which is carried out by biological organisms, along with EVERYTHING that exists in all planes of existence.

It is the question of the "biology of the Universe" and the quantum symbiosis of all objects with the supporting ether medium that is currently becoming the most pressing scientific question that can resolve the crisis state of theoretical physics in understanding natural phenomena and their comprehensive interrelation.

In the author's monograph [36], the sub-micro-small magnetic unit of the etheric medium is presented with the abbreviation MMEP – Magneto-Mobius Energy Packet (Pattern). That is, geometrically, this unit is a magnetic ring, closed by definition complementarily through an inverse turn. And the medium of such magnetic units of MMEP is called **magneto-plasma** (by me). It is precisely such magnetic units that, according to their magnetic nature, can perform

internal self-movements (spinning) and be sources of continuous and unceasing oscillations. The nature of the oscillating breath of such units of the supporting medium is transmitted by the method of self-copying InfoGenetically to all objects generated by the cosmic ether medium, together with all the basic properties.

The principle of complementarity, embodied physically in magnetism that generates forms, remains in them an unchanging basic information essence, mediating the oscillating nature of internal movements as continuous and unceasing ***quantum breathing***.

The idea of the cosmic support medium as a dynamic physical magneto-plasma of magnetic units also corresponds to the description of the etheric medium given by another Nobel laureate F. Wilczek in his book "***The Lightness of Being: Mass, Ether, and the Unification of Forces***":

"*There is a certain primary ingredient of physical reality that fills space-time and from which everything else is formed.*

Every fragment or element of space-time has the same basic properties, the same as any other fragment.

And this primary ingredient of reality is alive, because it is constantly filled with quantum activity.

This is what makes space a multilayer superconductor (or, in other words, a superfluid fluid with a whole spectrum of different properties).” [18]

In F. Wilczek's book, facts and arguments are presented in detail, substantiating his strong statements about the primary role and properties of the Ether from a fairly solid position of mainstream science as of the early 2000s.

“The most important lesson that has been learned in physics thanks to quantum chromodynamics [Wilczek was awarded the Nobel Prize for his success in research in this area] is the following. What we perceive as “empty space” is in fact a powerful medium, the activity of which forms this world. It is equally important that progress in other areas of modern physics in every way strengthens and enriches this – the main – lesson.

It is precisely this concept of “empty” space as a rich and dynamic medium that now constantly fuels the dreams and ideas of science regarding how to achieve the unification of the forces of nature.” [149]

The above descriptions are also in tune with the idea formulated by the scientist V. Tatur:

“... the essence of the unity of the world should be sought in a special form of self-motion of matter, in a special structure of this self-motion, from which all other features of the world necessarily grow. This special form of self-motion, having generated all other forms of motion of matter, exists together with them, simultaneously constituting their essence.” [39]

And this same idea is expressed by the professor of the University of St. Petersburg, Doctor of Technical Sciences Rubashkin V.Sh.:

“... the world medium has a gigantic, even by the scale of the energy of the micro-world, internal energy. This energy is not something brought in from outside – it is a way of existence of the world medium. And this is completely consistent with the previously formulated ontological postulate all being is movement.

From general ontological considerations it follows that under some specific conditions the internal energy of the world environment (medium) can be transmitted to elementary particles and generate them. From this follows the conclusion about the existence of a

practically infinite ocean of energy, some part of which can be extracted to the level of observable phenomena...". [42]

The same emphasis is made in my author's monograph [36] when describing the characteristics of the etheric medium, where it is emphasized that at the current stage of the acquired knowledge, the ether can act not only with vortex characteristics by analogy with the air and liquid environment, but also with an understanding of its basic properties, which are transmitted InfoGenetically to all generated objects, constituting their substantial essence, namely:

- its **magneto-electric properties** together with its quantum nature as a **material component** and the basis of etheric activity, respectively
- **self-motion** of its matrix units as continuous and **unceasing oscillations** creating a **vibrational background**, and consequently
- its **energy content** – discrete sub-micro-radiations-absorptions of etheric magneto-plasma in the process of spinning, in other words, in the process of ***quantum breathing*** of etheric magneto-plasma. [36]

From the above, a **fundamental conclusion** logically follows: the principle of complementarity, embodied physically in magnetism, in the process of generation of forms remains in them an unchanging **informational-material essence**, mediating the oscillating nature of internal self-motions as continuous and unceasing quantum breathing. It is this universal template that constitutes the **substantial essence** underlying the World Order.

"In the nature of the cosmos there is a law of life that is common to all: every subsequent action occurs according to the memory of previous actions, and in this case a new structural form of memory is formed, into which the first one enters as an integral part and does not change due to the continuous reproduction of itself in an exact copy in the rhythmically changing magnetic environment of the habitat." [176]

The ontological essence of the principle of complementarity generates the topology of space in the form of ***Clifford parallels*** (the geometry of the **Mobius strip**), which endow the spatial fabric with geometric and magnetic properties, substantiating the universal type of torsion.

The conclusions drawn are in agreement with the opinions and citations of Nobel laureates H. Alfven and F. Wilczek, as well as with a number of other scientists whose logical conclusions are made on the basis of the presence of the ethereal Cosmic Medium.

For further conclusions according to the proposed format based on the FPC and its geometric analogue, it is necessary to make a **brief historical review** of issues related to the etheric Cosmic Medium and its presence in the history of modern science, which is considered to begin with the times of R. Descartes and his idea of the vortex structure of etheric space.

The idea of vortex etheric space was originally proposed by R. Descartes in the 1600-s and later developed by his followers: I. Bernoulli, W. Hicks, J. Fitzgerald, P. Tait, G. Helmholtz, W. Clifford, W. Thomson (Lord Kelvin), J. Maxwell, K. Bjoknes and others. Despite the effective development of the theory of the structure of the ether based on the use of analogies with the laws of hydrodynamics, the history of modern science includes two periods of theoretical views with the rejection of the concept of the existence of the ether medium as such – this is the period of I. Newton and the period of the proposal of the General Relativity by A. Einstein.

And, as is already known, the Copenhagen interpretation, which won the philosophical debates, interpreted quantum physics, preferring Heisenberg's formal matrix tables, and reducing the wave nature of particles to statistical probabilities that have a wave-like behavior. This dominant direction categorically rejected the concept of the ether medium, as well as any attempts at interpretation based on natural analogies from hydrodynamics.

In fact, all of de Broglie's ideas, except for matter waves, were rejected in quantum theory as unnecessary and forgotten for a long time. Nevertheless, by 2005, these ideas had to be returned to again.

In 1951, after the second period of rejection of the concept of the existence of an etheric cosmic medium, Paul Dirac in his article "***Is there an Aether?***"**,** already based on considerations of quantum field theory, demonstrated that "as we now see, we may well have such an ether that is consistent with quantum mechanics and corresponds to the theory of relativity." [5]

He provided detailed ideological and mathematical arguments convincing us that the involvement of ether is of decisive importance for the development of new physics. And that ether – as a very light and subtle form of matter-fluid – can exist in quantum mechanics "in complete harmony with the principles of relativity." Moreover, if we accept the quantum-mechanical model of ether (that is, not as a separate stationary frame of reference, rejected in the theory of relativity, but as another form of matter with the corresponding dynamics and distribution of particles by speed), then other previously rejected things naturally return to physics, in particular, the ideas of absolute time and the absolute simultaneity of events". [5]

Regarding A. Einstein's approach to the issues of ether, in his work "*On the Electrodynamics of Moving Bodies*" of **1905** there is the following statement about this: "The introduction of the "luminiferous ether" will turn out to be superfluous, since the proposed theory does not introduce "absolutely resting space" endowed with special properties." [3]

M. Jammer also gives this quote in his preface to L. Kostro's book "***Einstein and the Ether.***" [2]

"As Kostro notes, what Einstein considered unnecessary was the idea of the ether, which Maxwell and his followers postulated and Poincaré used as a medium to explain the propagation of electromagnetic waves in space." [2]

It should be noted that in the above quotation, Einstein speaks of the ether as an "***absolutely resting space***," which apparently could not fit into the logic of the theory he proposed, and in this case it was easiest to distance oneself from it. The theory of the ether as an "absolutely resting space" was the dominant theory at the time Einstein wrote this article. It was based on the hypothesis of H. Lorentz and, as was subsequently proven, was an erroneous view. The errors made by H. Lorentz in deriving the formulas were corrected by Poincaré in the same year 1905, when Einstein's article was published, however, history turns in such a way that it always takes time for an erroneous view to be completely eradicated and then removed from the theoretical field of science.

The book by physics professor Ludvic Kostro "***Einstein and the Ether***" tells in sufficient detail how the most advanced science on the planet declared space to be an empty vacuum, but at the same time gave it physical properties. [2].

The fact that the preface to this book was written by the prominent scientist M. Jammer turned out to be a symbolic fact, since in **1954** the preface to the first of M. Jammer's monographs "***The Concept of Space***" was written by Albert Einstein, impressed by the work of his young colleague. [4]

In his preface, M. Jammer points out that L. Kostro's book "challenges the widespread opinion that Einstein, in his theory of relativity, once and for all excluded the concept of ether from modern physical theory.

Six months after his general theory of relativity was constructed, Einstein again accepted the idea of ether. Thus, in a letter to Lorentz, an ardent defender of this concept, Einstein wrote in June 1916: "... the general theory of relativity is closer to the hypothesis of ether than the special theory of relativity. But this new ether does not violate the principle of relativity, because its state is not the state of a rigid body in independent motion, but a state of motion that is a function of the position determined by material processes." [2]

“For similar reasons, Hermann Weyl, in the German edition of his treatise on relativity theory Raum-Zeit-Materie (Space-Time-Matter, 1919), put forward the proposal that since the coefficients of the fundamental metric tensor determine how certain points in space interact with others, or otherwise form a Wirkungszusammenhang (interrelation effect), the term ‘gravitational field’ should be replaced by ‘ether’.” [2]

"The term "ether" is unique in the history of physics not only because of the many different meanings in which it has been used, but also because it is the only term that was first excluded and then reinstated, albeit with a different connotation, by the same physicist.

L. Kostro's book with its careful exposition of Einstein's arguments in favor of reviving the concept of ether as "relativistic ether" or "total ether" is a useful contribution to the history of the ontological status of space-time in modern physics." [2]

Why is the uniqueness of the term "***ether***" defended in favor of its ontological status and in the context of the cited citation?

In my monograph [36] I have studied the original etymology of this term, that is, the meaning of its letter`s formula. The content of the root word "ether" includes the concepts of fire, light that burns and shines, hearth, one building with no division.

"Let's summarize the plan of the word's content. **Ether** is the “upper” (upper, top, verse - rotating), “air”, in other words, a rotating pure and unadulterated substrate that rhythmically flares up with flame, shines, burns and has an analogy with a mono-structure as a place with a HEARTH, Flame, FIRE, but a holy, temple fire that BUILDs, conducts construction, erects, establishes the Universe, ultimately sets the Universal space, creates the ENVIRONMENT and objects in it.

It is precisely the property of establishing the Universe and setting the Universal space, creating objects in it that is the sought-after frame-matrix generating substance." [36]

Translating into modern theoretical language, – this is a spin network of topologically closed units that perform continuous, non-stop oscillations with the release of magneto-plasma quanta.

It is precisely this physics of ether that I have revealed as a result of a linguistic analysis of the meaning of the root word "ETHER" and it is precisely this physics of ether that I have developed in the proposed conceptual framework, including four works I pointed above.

Continuing with this theme and in tune with L. Kostro's book, it is worth citing the opinion of Nobel Prize winner R. Laughlin regarding A. Einstein's attitude to the question of the existence of an etheric medium. In his book "***A Different Universe: Reinventing Physics from the Bottom Down***", published in 2005, R. Laughlin notes the following:

"The irony is that Einstein's most creative work, his general theory of relativity, ultimately necessarily comes down to the concept of space as a physical medium. While Einstein initially proceeded from the assertion that no such medium exists...

The idea that space can be a kind of material substance is actually very ancient, traced back to the ancient Greek Stoics, who gave it the name – "ether".

... Einstein, on the contrary, categorically rejected the idea of ether and, on the basis of this "non-existence", deduced that the equations of electromagnetism must be relative. But then the same thought process eventually led Einstein to the very ether he had initially rejected. ... The modern concept of the vacuum of space, daily confirmed by experiments, is the relativistic ether. But we do not call it what it is. Because it is taboo." [1]

Whatever the taboo, the scientific community of theoretical physicists is nevertheless forced to return to the concept of the existence of a supporting Cosmic Medium, called ether in ancient times.

"The etheric medium serves as an arena for phase transformations in the act of reproducing the Genome and creating material energy sources for it." [78]

In the **second half of the 1980-s**, the groundbreaking work of the Indian-American theorist Abhay Ashtekar appeared. The main result of A. Ashtekar's discovery should be considered the birth of the so-called "Loop Quantum Gravity" (LQG) – a theory that proposed a new view of the structure of space-time. [9], [10]. [18, [AA]]

In the late 1980-s, relying on the formalism of A. Ashtekar, two young researchers at that time, Carlo Rovelli and Lee Smolin, decided to study in more depth whether Einstein's gravity equations, rewritten in a new form, could say something about the microstructure of space. As a result of their calculations, the scientists discovered that the minimum areas and volumes of regions allocated in space cannot be arbitrarily small. And the smallest value of the linear size, dictating the limits of reducing the area and volume, turns out to be directly related to the main constants of the universe - the speed of light, the gravitational constant, the Planck constant – and is called the "Planck length" (10^{-35} meters). [11], [12], [13], [18, [CRLSK]]

In passing, it can be noted that the entire course of constructing the LQG theory, even if not quite explicitly, nevertheless recreates the features of the vortex microstructure of space. The term "***loop***" in the name of the theory refers to the lines of force of the field, which closes into microscopic loops. If we operate not with abstract fields, but with more realistic vortex movements in the fabric of space, then the sub-microscopic loops of the smallest size turn out to be the same vortex granules that form the vortex sponge of space. Thus, at a new stage and from other starting points in the theoretical field of physics, the ideas of J. Maxwell, K. Bernoulli and W. Thomson (Lord Kelvin) are again present.

The "micro-vortex" physics of the LQG theory became even more clearly defined when K. Rovelli and L. Smolin began to look for a formalism that would provide a simpler and clearer picture. Soon such an option was indeed found, and, as it turned out, this design called "***spin networks***" was developed in the **1960s** by the British mathematician and physicist Roger Penrose. [14].

At one time, Penrose also tried to develop formal-discrete approaches to space-time physics, operating only with connections between quantum characteristics of particles. The most important such characteristic, according to Penrose's intuitive feeling, should be considered the spin of particles, which is related to both the energy and the spatial orientation of the object. This is also true for the description of the physics of granules in a **vortex sponge**.

In the early 1990s, **Gerard 't Hooft** first introduced a powerful idea into the theoretical field of physics and put forward the concept of the **holographic principle** as an alternative to string theory.

The key points of Gerard 't Hooft's calculations are that the basis of the Universe is the same surface, **folded in a topologically non-trivial way**. Since the principle of complementarity underlies the property of holography, Gerard ‘t Hooft thereby pointed out the logic of the interrelation between the holographic principle, the principle of complementarity and the geometry of topology, namely, the basis of the Universe, folded in a topologically non-trivial way, is based on the principle of complementarity and each of its fragments, regardless of the dimension, will be a fragment of the general universal hologram only with less detail, down to the minimum. Based on this, the conclusion follows that the smallest etheric unit of the universal hologram is structured complementarily and folded in the same way.

It is this geometric image that is not an abstraction of algebra, but the ontology and geometry that is embedded in the structure of space and represents the Two antiphase Principles of Cosmogenesis, which are complementarily (topologically) related for the dynamics of motion and the processes of reproduction.

The Gerard 't Hooft's concept of the holographic principle was subsequently supported by H. Maldacena and L. Susskind. [33], [34], [62].

In the late 1990s, Juan Maldacena was the one who, based on string theory, discovered the AdS/CFT correspondence, which later became the most important theoretical argument in support of the holographic principle. [34]

In 1998, Edward Witten spectacularly integrated the holographic principle into string/brane theory and did so based on Juan Maldacena's AdS/CFT correspondence. [35]

In 2002-2003, Xiaogang Weng of MIT and his former graduate student Michael Levin proposed a version of the new theory called ***String-net***. [15], [16], [17]

Despite the similar name, this theoretical model has nothing in common with the well-known theory of microscopic superstrings.

Exploring the mathematics of their theory, S. Weng and M. Levin found that in the state of a string-net fluid, the motion or deformation of the string-nets corresponds to a wave that behaves according to a set of equations of the electromagnetic field of J. Maxwell. According to S. Van, this result can be interpreted as a rediscovery of ether by science, but at a deeper theoretical level as a "***quantum ether***".

Of course, this is not a complete list of theoretical contributions, but these are the steps according to which, almost one hundred and fifty years after J. Maxwell wrote down his equations based on the concept of the presence of ether as a supporting medium and its magneto-electric properties, the fact of the presence of this etheric medium, which generates these patterns, was revealed in a different mathematical way.

The most important consequence of the rediscovery of ether and the return to its concept is the physical (material) basis for such things that are traditionally called "immaterial". In essence, there is no any immateriality separated from the physical carrier. At any level, even the most Planckian, a unit of the medium is information placed on a material carrier. That is, the **minimal information** in its numerical expression "0" and "1" is the structure of the **minimized material carrier**. Everything else is idealized ideas and not fully thought out philosophy.

Maxwell's theory of electromagnetism was essentially based on the concept of ether as a material medium with a cellular structure and providing vortex-flows-waves of interactions. With the help of a mechanical model based on “vortex-wheels” connecting magnetic fields and

electric currents, Maxwell was able to obtain the most important equations of his theory and build a formally consistent picture in which magnetic energy is the kinetic energy of the medium occupying all space, and electrical energy is the tension energy of this same medium.

J. Maxwell's main merit is that he linked the idea of ether with electromagnetic properties. That is, Maxwell is also the source of the idea that vortex-wheels are magnetoelectric formations and electromagnetic processes underlie the continuous and unceasing oscillations that etheric sub-mico-vortex-wheels and all objects of the cosmic medium generated by these single seed magnetoelectric vortex etheric elementals perform. This is the main argument in favor of the fact that the source of the nature of electromagnetism is, first of all, the supporting Quantum Medium itself. Everything else is a consequence of its structure.

"Maxwell's equations admit curious solutions characterized by the property that all electric and magnetic lines of force are closed contours, and any two electric or (magnetic) lines are connected. These little-known solutions, constructed by Ranada, are based on the Hopf fibering." [26], [27]

These vortex-wheels were spoken of as **magnetic particles** by Nobel laureate H. Alfven, and they are also present as a **primary ingredient** in the works of Nobel laureate F. Wilczek, and they also make up the **spin network** in the modern theories cited.

To the description of these vortex-wheels I add their geometric characteristics – this is the configurability of **magnetic rings** in the **form of a Mobius strip** with one 180-degree turn, their initial phase state in the form of **monopoles** and their magneto-electric **oscillating activity** in performing the quantum breathing “emission-absorption” of portions of magneto-plasma or so-called electricity.

Maxwell’s vortex-wheels are the prototypes of all subsequent proposals on the structure of units of the etheric medium. It is precisely this spinning vortex “wheel” that is the Magneto-Mobius Energy Pattern – MMEP – in the form of the original Mobius strip with one turn, considered in the form of a **magneto-electric circuit** and a **quantum-mechanical unit** of the etheric Quantum Medium in the author's monograph. [36]

Nobel laureate H. Alfvén, in order to explain the magnetic property of cosmic plasma, which he called “living”, points to the following parallel in the abstract to his article "***Electric Current in Cosmic Plasma***": "A useful method of studying many of these phenomena [of cosmic plasma] is to draw an electric circuit in which a current flows and study its properties. A number of simple circuits are analyzed in this way." [22]

In this regard, I would like to emphasize that by representing a unit of the etheric medium as a magneto-electric Mobius ring circuit, I use the same analogy with a ring current to explain processes occurring at another scaling level, namely, at the level of the substrate of the etheric medium.

Mobius spinning is not the rotation like a toy top, it is the simultaneous execution of a **two-cycle revolution**, which, with a simultaneous combination of symmetry and asymmetry, also generates **precession** and **nutation**.

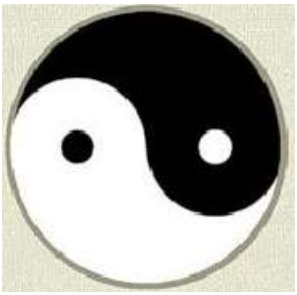
For greater persuasiveness and in favor of the fact that the vortex modes of the etheric medium can be geometrically represented as a Mobius ring, a simple paper experiment can be carried out that will demonstrate that the wave oscillatory process expressed by a sinusoid is the equivalent of oscillations according to the Mobius template. And the dynamic ether, structurally resembling a "vortex sponge", in its initial phase state can represent wave energy quanta, closed through inversion into a ring and acting as a semblance of elementals of matter – quasi-elementals.

The closure of waves into rings is a hydrodynamic property observed in liquids and plasma. The super fluid liquid of the supporting Cosmic Medium, which I called magneto-plasma, also has this property. Hydro-magnetic properties have been studied quite well and, as analogies, they can be translated into the format of hydrodynamics of the etheric Quantum Medium. [74]

To visualize vortex quasi-elementals using a paper experiment, it is necessary to draw a strip in the form of a sinusoidal wave, cut it out and glue the ends together without turning anything over. As the paper experiment demonstrates, a closed sinusoid forms a ring in the form of a Mobius pattern.



Sinusoid. When the ends are brought together – Mobius Pattern. [140]

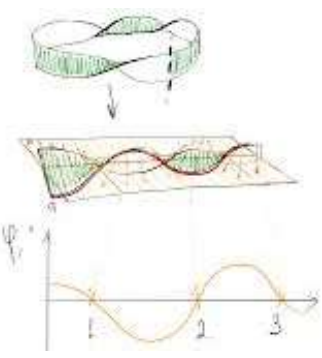
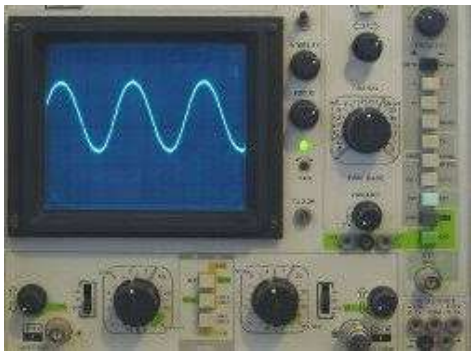

Yin-Yang symbol.

The conclusion follows from this – the front of the sinusoidal wave harmonic closes into a ring-shaped wave Mobius Energy Packet, and the movement displayed by the sinusoid is a ***phase portrait*** of the movement along the Mobius Pattern.

This simple paper experiment with the geometry of the sinusoid helps to build a sequence of ideas and logical conclusions regarding the geometric configuration of unit formations of the etheric Cosmic Medium. The sinusoid and the Mobius ring display the same wave magneto-electric process, which is a geometric reflection of the principle of complementarity in the plane of magneto-electric oscillations and the structure of the vortex ether.

Based on this logic, it is the Mobius configurability of sub-micro-units of the etheric medium that mediates the vortex nature of their spinning, magnetic reconnections and, accordingly, continuous and non-stop oscillations accompanied by the emission-absorption of magneto-plasma quanta.

The illustrations below demonstrate the fact that if the oscilloscope visualizes a sinusoidal form of electric current flow, this means that the structure of the atom is based on the Möbius configurability.

According to the latest data from the most advanced theoretical studies, the Planck quantum of energy is a "space-time deformation in the form of a vortex ring".

It should be emphasized that in the history of science there is no clear understanding and explanation of the reason why all cosmic objects of the micro- and macro-cosm perform such oscillations. As illustrated and described above, this explanation can be obtained in the format of the geometry of the Mobius strip, considering the Mobius ring as a magneto-electric circuit, as Nobel laureate H. Alfvén pointed out when explaining the magnetic properties of cosmic plasma. [22]

The natural essence of the topological interrelation in the original Möbius Pattern with one turn (inversion) and its curved geometric curvature generates a spatial difference in levels, a kind of **gradient of potential difference**, respectively a torque with magnetic properties and a directed energy flow, followed by continuous and **non-stop oscillations** with the formation of vortex and wave-like movements.

In this regard, it is also necessary to cite a number of scientific facts that are the links in the chain of logical reasoning of the concept I proposed, which also strengthen its position.

In 1989, Antonio Fernández-Rañada, relying on Hopf bundles, found closed solutions to Maxwell's equations [26].

In 2008, physicists William Irvine and Dirk Bouwmeester showed that among the closed solutions there are also stable ones [28].

In 2014, in a joint paper by A.F. Rañada and A. Tiemblo [27] it was noted: " The purpose of this paper is to continue the development of a model of topological electromagnetism, proposed by one of us in three papers in the years 1989-1992 [1]-[3] and based on several curious and intriguing similarities between some topological ideas of the German mathematician H. Hopf [4] and of ordinary Maxwell's electromagnetism. In addition to these previous works, a paper published in Nature Physics in 2008 by W. T. Irvine and D. Bouwmeester attracted the attention of some mathematical physicists towards the topological aspects of classical electromagnetism [5]. They stated in the first lines of their paper: "Maxwell's equations allow for curious solutions characterized by the property that all electric and magnetic field lines are closed loops with any two electric or (magnetic) lines are linked. These little known solutions, constructed by Ra˜nada, are based on the Hopf fibration"(see also [6]-[10]). [27]

The authors emphasize that their "ideas refer to a branch of mathematics, the topology, that most probably will play a major role in the future of fundamental physics. As the renowned mathematician M. Atiyah stated "Both quantum physics and topology lead from the continuous to the discrete"[13, 14]. Strictly speaking this is nothing new, think if not of Dirac's monopole, the Aharonov-Bohm effect, superconductivity, superfluidity, etc, but there is a novelty now in the growing number of physicists that work on the role of topology in classical electromagnetism [5, 11],[26], [15]-[31], [26], [46], often in a way related to fluid mechanics [32]-[38] and with support from mathematicians [13, 14, 16], [39, 42, 27]." [27]

In a concluding comment, the authors note that "there exist topological solutions of the electromagnetic field with basis in Hopf fibrations. Although they are classical, these solutions have a discrete nature. In the same way that General Relativity extended the dynamics to include the Geometry, changing thus the perspective of physics, the time is ripe to explore the resources of the topology." [27]

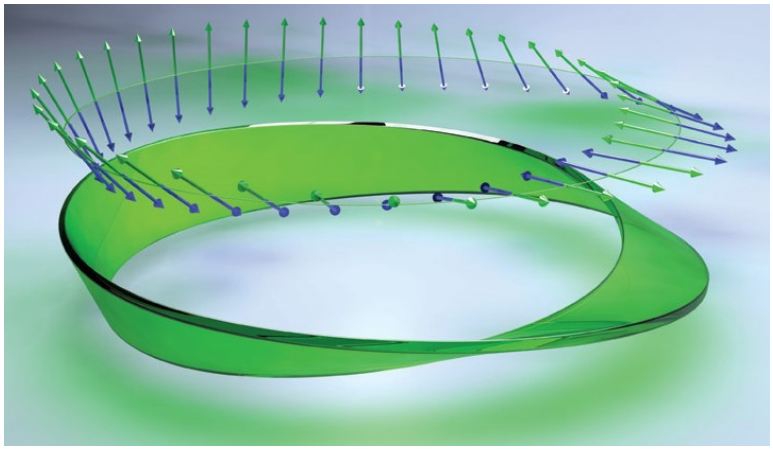
In 2005, **Isaac Freund** of Bar-Ilan University in Israel proposed that the polarization of light could be twisted. [66]

Freund published a series of papers **between 2005 and 2020** on the configurability of polarized light, which has different degrees of twist in the form of a Möbius strip. [64]-[70], [71].

In 2015, **Peter Banzer** of the Max Planck Institute for the Science of Light in Erlangen, Germany, tested Freund's hypothesis that light could be twisted. According to Catherine Corney, writing in New Scientist, "Banzer's team scattered two [polarized] green laser beams off a gold bead that was smaller than the wavelength of the light. The resulting output produced a polarization pattern with three or five twists, giving it a Möbius-like structure." [71]

In January 2015, a collaboration between researchers in Canada, Europe, and the United States experimentally created Möbius strips from the polarization of light, confirming the theoretical prediction that light as an electromagnetic wave can take on this unusual shape. [119]

A popular summary of this experiment, titled "***Generating Möbius strips of light***," can be found at [120].



The Möbius strips, as the one represented here, were created by the researchers from the polarization of light. *Photo courtesy of Peter Banzer/Max Planck Institute for the Science of Light.* [120]

The author of the paper on this experiment quotes Robert W. Boyd, professor of optics and physics at the University of Rochester and the Canada Research Chair in Quantum Nonlinear Optics at the University of Ottawa, as saying that "this is one of the few known examples of a Möbius structure occurring in nature." [120]

I believe that such a statement can be made only because and at a time when the occurrence of the Möbius structure in natural phenomena is not yet sufficiently revealed. Over time, new experimental data will show that all **natural phenomena are based on the universalism of the Möbius pattern**, since it is a reflection of the universalism of the Fundamental Principle of Complementarity (FPC).

The article notes that "Demonstrating that a Möbius strip can be made of polarization states of light is interesting not only for improving the fundamental understanding of optical polarization but also because it could be used to generate complex structures at micro and nanoscales."

And if this is exactly so, then the logical conclusion suggests itself that it would be simply unforgivable for Nature itself not to use this same construction in both its sub-micro and macro- constructions.

In fact, science is very close to seeing that almost all natural phenomena are based on the structure of Mobius Geometry (MG) and it is the turning key for fulfilling the cherished desire to create a general Theory of Everything.

The intermediate summation here will be as follows:

1. The space-time fabric, in other words, the ethereal cosmic medium is a matrix consisting of quantum-mechanical units, which are closed vortex magnetoelectric circuits in the form of a Mobius ring with one turn. In the open state, such a ring is identical to a sinusoid.

2. Due to the internal closure of polarities through inversion, such magnetoelectric circuits perform non-stop vortex self-motion with the emission-absorption of magnetoplasma quanta.

3. The Cosmic Medium as a matrix of such topological units is a granular dynamic superconducting **magnetoplasmic liquid** and is indirectly turbulent, giving rise to the phenomenon of **hydromagnetic dynamo** in which the process of transformation of ether monopoles into baryonic matter takes place, which in which the process of transformation of ether monopoles into baryonic matter takes place, which at the current stage has received the name **thermonuclear fusion**.

In cosmology, issues related to the phenomenon of a hydromagnetic dynamo, which operates in planetary bodies, stars and galaxies, are studied. This topic is covered in detail in the work ***"4. Hydromagnetic Dynamo. Möbius Geometry. The Method of Formation of an Atom".***

In the logical chain regarding the issues of the structure of the etheric supporting Cosmic Medium, it is appropriate to cite the data of a theoretical study and modeling, the results of which were published **in 2008** under the title "***Dynamo action in Möbius flow***" [43], also **in 2014** «***Dynamos: from an astrophysical model to laboratory experiments***».

«We demonstrate that flows of conducting fluid along a Möbius strip and related surfaces are hydromagnetic dynamos, i.e., they can produce an exponentially growing magnetic field from an infinitesimal seed. The critical magnetic Reynolds number in one of our models is as low as about 16. Together with other attractive features, this makes this flow an interesting candidate for a laboratory dynamo experiment. We suggest that a flow of conducting fluid in a channel that envelopes the Möbius strip or a similar surface is a dynamo with a relatively low value of Rm * suitable for a laboratory realization. A shell filled with rotating liquid sodium, as in the Perm dynamo experiment». [43]

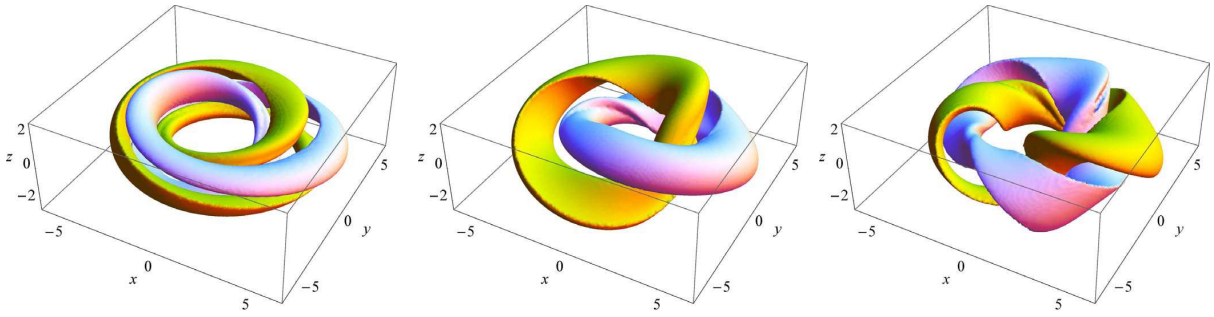
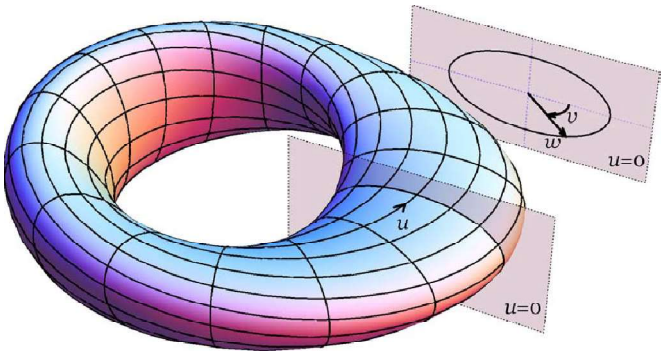


FIG. 3. _Color online_ Upper panels: snapshots of the isosurfaces of $B2$, where B is 1/3 of its maximum value, for a growing magnetic field generated by the Möbius flow in _a_ run 1, _b_ run 3, and _c_ run 8 of Table I. Color indicates the general field direction along each isosurface

magnetic lines are not necessarily confined to the isosurfaces: red-blue _yellow-green_ colors indicate magnetic field with *Bu*_0 _*Bu*_0_ _cf. **Fig. 1.** [43]

FIG. 1. (lower)_Color online_ AMöbius channel _*n*=1/2_ with elliptical cross section, as given by Eq. _3_ with *R*/*b*=4, *a*/*b*=2. The coordinate lines of *u* and *v* are shown solid, the former being the streamlines. The inset shows the cross section, as indicated, with the definitions of *v* and *w* illustrated. The surface shown is *w*=1. [43]



As the authors note: «We suggest that a flow of conducting fluid in a channel that envelopes the Möbius strip _or a similar surface_ is a dynamo with a relatively low value of *R*m* suitable for a laboratory realization. A shell filled with rotating liquid sodium, as in the Perm dynamo experiment _4_, can be suitable for such an experiment. The flow geometry in our case is rendered not by diverters or propellers, but by the shape of the channel. It is surprising that this idea has not been explored earlier». [43]

In my opinion, what is important in this study is that the geometry of the flow of conducting fluid for the origin of a gydromagnetic dynamo (GMD) from sub-micro-small plasma nuclei is determined by the geometric configuration of the stellarator`s channel, which is proposed to be created in the form of a Mobius strip. That is, the creation of the necessary geometry of the channel itself is the guiding geometry for the plasma flow and the cause of the emergence of a GMD in the plasma.

If we carry the results of this study to the scale of macro-cosmic space, the conclusion suggests itself that if hydromagnetic dynamos exist and function in it, then the guiding channel for creating the necessary conditions for its emergence is the geometry of the spatial fabric itself, which is made up of magnetic flows of superconducting magneto-plasma in the form of a Mobius strip and surfaces associated with it, similar in their configuration to ***Clifford parallels***. That is, the geometry of spatial magnetism as a physical embodiment of the principle of complementarity determines the geometry of the flows in it and, accordingly, all generations and transformations.

Thus, according to the holographic principle and the principle of fractality, the geometry of the spatial cosmic fabric is mediated by the topology of its complementary structure as a macro-object as a whole, as well as the complementary structure of its individual formations – topologically closed Mobius Magnetic Monopoles because, according to the principle of holography, a fragment of the whole reproduces the essence of the whole, but only with fewer details.

In this regard, my findings are consistent with the key points of Nobel laureate Gerard 't Hooft's concept of the holographic principle, which is that the basis of the Universe is the same

surface, folded in a **topologically non-trivial way**. Consequently, even its most **minimal units** have the **same basis as the object as a whole**.

This conclusion can be considered **fundamental** and it is precisely this geometric image that is not a mathematical abstraction, but the ontology and geometry that is embedded in the structure of space.

It can be said that the 2008 theoretical study "***Dynamo action in Möbius flow***" with a proposal for laboratory experiments for laboratory experiments on creating thermonuclear fusion on stellarators increases the weight of the arguments in favor of my conclusions about the structure and properties of the units of the etheric Quantum Medium, and also confirms the self-consistent theoretical view I put forward based on the Fundamentality of the Complementarity Principle (FPC) and its visualization in the geometry of the Möbius strip. Accordingly, the conclusions about the structure of the atom will also be correct.

Based on the above, the conclusion that the matrix of the etheric Quantum Medium consists of vortex units – Möbius Magnetic Monopoles (MMM), can be considered a **fundamental conclusion**, since it concerns the structure of cosmic space, in which all energy transformations and geometric transformations occur. Magnetic Mobius Monopoles of the Ethereal Quantum Medium are precisely those sub-micro-embryos and quasi-elementals that create collective flows of conducting quantum fluid (magneto-plasma) and generate the effect of a hydromagnetic dynamo based on the operating laws of hydrodynamics.

The model of the hydromagnetic dynamo proposed by me is described in the work "***4. Hydromagnetic Dynamo. Geometry of Mobius. Method of Formation of the Atom***".

Continuing to highlight the theoretical view I propose based on GM, it should be said that the representation of etheric oscillating modes in the form of inversely closed (Mobius) ring magneto-electric circuits, as already shown above, has its theoretical **prototype** – this is the vortex structure of the ether of R. Descartes and the "***vortex-wheels***" of J. Maxwell.

It is worth repeating that Maxwell's great merit was precisely that he linked the idea of the vortex cellular structure of the ether with **magneto-electric properties**. That is, from this follows the logical conclusion that the medium itself is the source of all-encompassing MAGNETISM, which in turn is the physical embodiment of the fundamental principle of complementarity. This is perhaps one of the most important moments in understanding that theoretical physicists have overlooked one of the fundamental aspects that combines the sinusoidal geometry of the oscillatory process and the geometry of the vortex unit of the Quantum Medium, reflected in the configuration of the Mobius ring, considered at the same time as a **closed magneto-electric circuit**. It is for this reason that an explanation of the source and cause of the continuous oscillations performed by all objects in space is still missing.

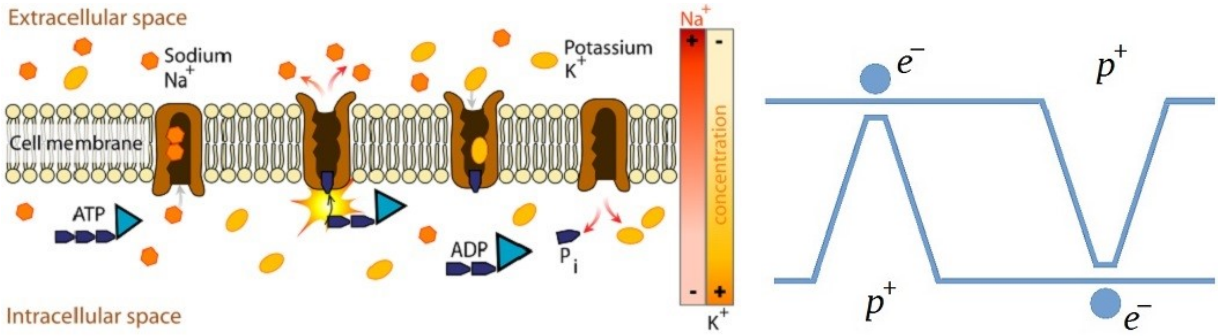
Until today, **living matter** was understood as a large number of active elements or "agents", each of which individually consumes and dissipates energy in order to move independently and exhibit mechanical forces. And typical examples of living matter in science were of biological origin.

For several previous centuries, physics essentially did not notice and did not study the system of active matter as living (breathing, oscillating). The situation began to change when it was established that in formally "inanimate" nature such systems are encountered in abundance. Their activity in the manifestation of collective properties resembles large clusters of biological cells, schools of fish or flocks of birds.

In terms of mathematical description, the behavior of these systems turns out to be identical to biological ones, and one of the most representative classes of active non-biological matter, especially popular with experimental physicists, is the system of regularly **shaken liquids and granular materials.**

These systems are of particular interest because the basic elements of this active matter are entirely within the realm of classical physics, but at the same time their combined activity on a macro-scale demonstrates various phenomena of quantum micro-physics. And in its original essence, the Universe as a whole is a single system, possessing a full set of properties, with the help of which our science defines the concept of "life" and with which Life itself, including all existing environment, is endowed in its essence, if we mean its holographic Unity – according to one Single Image and Likeness.

The phases of sub-micro-currents of units of the active etheric medium, caused by the inverse turn, are those phases of oscillations that create the vibrational background of the supporting feeding medium, its energy-quantum filling and provide in it all exchange processes at the quantum level, which are not particularly different from exchange biological processes. Both occur according to a one general scheme, which is similar to the biological one, given below.



In the illustration:
On the left is the structure of a two-layer cell membrane with "sodium-potassium bridges" that provide energy exchange for the cell's metabolic processes.
On the right is the structure of a two-layer membrane of the space of the universe, where pairs of «proton-electron» act as channel-bridges. [129]

In the same way, objects of the etheric Medium exchange with it through their membranes, and in particular the atom, producing radiation and absorption of magneto-plasma energy quanta.

In this regard, the following conclusion will be fundamental: each object of the etheric medium, performing its individual phases of "***quantum breathing***", is in "***quantum energy symbiosis***" with it.

Understanding the surrounding space and its objects as active living matter feeds new ideas not only to physics and mathematics itself, but also to other areas, such as computer science, biology, informatics, psychology and consciousness (individual and social). In this regard, now at the intersection of a number of disciplines, a whole scientific direction has been born – ***quantum biology***.

Taking into account the property of magneto-electric "breathing" of the etheric Cosmic Medium and each of its objects, which is accompanied by the emission-absorption of portions of

magneto-plasma, I introduced the term etheric "***Quantum Medium***" or "***Quantum Environment***". [141]

The term I have formulated corresponds to the analogies of "***air environment***" and "***water environment***" and is in a single conceptual field with them, since it is a conceptual (eidetic) prototype of the name of these environments. All environments exist in a single Image and Likeness – these are continuous environments that have penetrating ability and ensure the process of life activity.

The new term, being in the same conceptual field with its earthly analogs, does not contradict those terms that have already been used in various theoretical proposals: "***fabric of space***" [61], "***fabric of the Universe***", "***physical vacuum***" [167]-[174], "***spin network***" [11]-[13], "***ether***", "***quantum ether***", but is in agreement with them, reflecting their characteristics in aggregate.

Every unit of the supporting Quantum Medium, regardless of complexity and scale, is in quantum symbiosis with it. Taking into account the theoretical developments of previous theoretical views regarding the vortex structure of the ether and the achievements of modern ones, as well as adding the above logic of the application of Mobius Geometry, the etheric Quantum Medium can be characterized as a spin dynamic network of granules-nodes in the form of sub-micro-dispersed oscillating magneto-electric vortex mono-formations – initial MOD (modes). The mechanism of quantum breathing of such mono-units is due to the Mobius inversion. Also, in such a magneto-electric mono-unit, its magnetic polarity is not manifested in the form of dipole or quadru-polarity, but it represents a topologically closed duality and has magneto-electric characteristics.

Let us return to the concept of "vortex-wheels" of J. Maxwell, which connect magnetic fields and electric currents. They are considered by Maxwell as one phenomenon. Considering these vortices in the geometry of the Mobius Magnetic Monopole, it should be noted that in such a monopole configuration of the magnetic loop, both the conventional magnetic lines and the trajectory of the energy current will be sinusoids that have a phase shift of one quarter of the period, in other words, by 90 degrees, that is, mutually perpendicular, and are always within this shift, which makes it possible to display them as conventional lines at the same distance from each other.

This is exactly how W. Clifford considered the geometry of space in the history of science, noting that, in essence, EVERYTHING that happens in nature comes down to dynamic changes in the geometry of space. Consequently, he believed that it is natural and convenient to study and describe this dynamics, relying on the geometric methods of mathematics. Along with everything else that this talented scientist contributed, the "Clifford parallels" remained as a legacy in science. [142]

In the scientific plans of W. Clifford (1845-1879), ideas for creating a common platform for combining research from different fields of science are clearly visible, and in particular, the scientist emphasizes gravity, which, in his opinion, connects very different phenomena together, and the ether provides a bridge between these phenomena. [123], [124], [125].

"This explains the laws of electric and magnetic attraction/repulsion, the action of electric currents on magnets and on each other, the laws of induction, the derivation of the velocity of charges and the polarization of light, the rotation of the plane of polarization by a magnetic field. All these things must be derived from the knowledge of the geometric forms of atoms and their interelations with the ether, which thus indicates the interrelation between the kinetic theory [of particles] and the wave theory [of the ether]." [123]

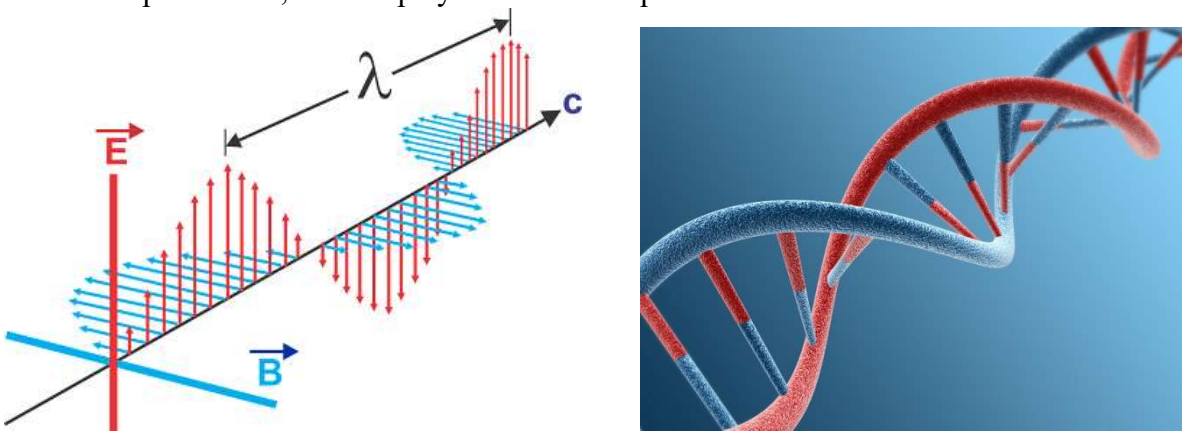
I would also like to emphasize that W. Clifford's dominant thought is precisely the **geometry of space** and, as a consequence of it, the geometric forms of atoms and their **interrelations with the ether**. As this will be further developed and shown in work "*3.**The Basic Element of Nature. Mobius Geometry. Gravity. Model of the Atom***", the geometry of the atom determines its quantum symbiosis with the etheric Quantum Medium.

The Mobius strip can be considered as Clifford's closed parallels. The physical realization of these parallels at the level of cell biology is DNA. Therefore, the process of DNA replication in the method of bifurcation into two strands is the key to the universal method of copying through fibration into fibers.



Clifford`s parallels in the Mobius strip, in DNA, and in topological memory braids.

Usually the combination of magnetic and electric components of a light electromagnetic wave is displayed in a coordinate system as originating simultaneously from the zero point and having intersections at points on the axis. Taking into account what was said above about Clifford`s parallels and their projection mapping both into the geometry of space and into cell biology, the mutual arrangement of the magnetic and electric components will have the above-mentioned phase shift, as is displayed in the example of DNA strands.



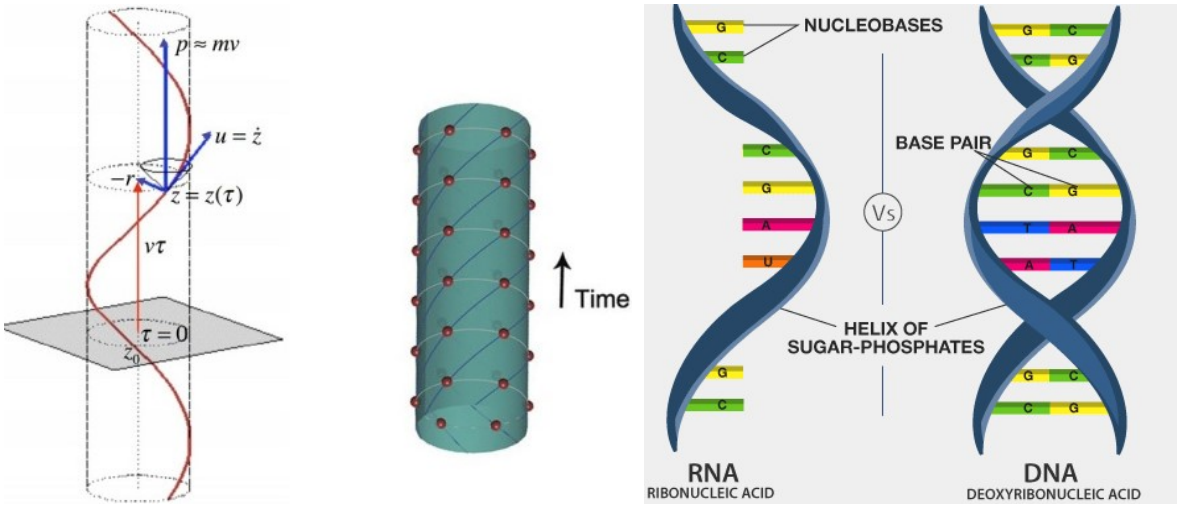
Clifford's parallels in the phenomenon of electromagnetism and DNA.

If this shift is present in the picture (like strands of DNA), and also if the ends of the blue (B) and red (E) vectors are connected by a solid line, the graph will have exactly the appearance that is identical to DNA and most likely corresponds to the real picture of the mutual spatial arrangement of the lines of magnetic and electric fields, conditionally separated for the convenience of calculations, but being one single phenomenon of Nature.

In February 2008, the works of mathematician D. Hestens [86], [87] were published. For a long time, D. Hestens had been introducing the apparatus of geometric Clifford algebras

into physics. D. Hestens' new work [87] showed that the analysis of P. Dirac's equation by the methods of Clifford algebras allows one to identify new geometric structures in these relations. In P. Dirac's equation, a structure was discovered in which the phenomenon of particle spin is inextricably linked with the orbital rotation of the particle around the time axis, as a result of which the particle's trajectory in space-time looks like a cylindrical periodic spiral. The parameters of this spiral are related to the physical properties of the particle, such as its natural oscillation frequency, mass, and so on.

In October 2012, Nobel laureate F. Wilczek published his work on his new discovery [88], as well as in co-authorship [89], on time crystals. The illustration below shows that F. Wilczek has the same structural configuration as D. Hestens, as a kind of materialization of the particle's trajectory in space-time in the form of a one-dimensional crystal, twisted into a periodic cylindrical spiral.



In the illustration: on the left is the particle's spiral trajectory in time, according to the Dirac equation and Hestens' calculations, in the middle is the spiral of the time crystal for a system of particles, according to Wilczek's calculations (Illustrations are taken from the source [129]).

It is impossible not to notice that the shape of the spiral of the time crystal for F. Wilczek's system of particles, which essentially includes the spiral trajectory for one particle of D. Hestens, is identical to the shape of DNA. In this regard, it is worth noting again that according to the **holographic principle**, the already studied DNA structure is the key to fractally identically understanding processes at the quantum level and not only how the memory of particles about their past states (Akasha chronicles) is fixed in nature, but also how the universal method of generating matter from the inside out is carried out through the bifurcation of the original magnetic loop with subsequent doubling of its magnetic flux.

Thus, Clifford's parallels, the Mobius strip, DNA and the spirals of time for the trajectories of the "particles" of Hestens and Wilczek essentially display the same basic geometry.

The same geometry is proposed to be constructed theoretically in the theory of knots and links with a proposal to consider hierarchically periodic braids and make prototypes.

In May 2022, a theoretical paper entitled "***High capacity topological coding based on nested vortex knots and links***" [164] was published, which noted:

«In this work, we theoretically propose and experimentally create the nested vortex knots in light fields to construct a topological coding scheme with high capacity. In particular, the so-called nested vortex knots refer to the layer-by-layer structures with fractal-like geometries. Based on the nested vortex knot, we can break through the number limitation of topological invariants to reach a high-capacity coding scheme. Specifically, we establish the theoretical framework of nested knotted and linked topological structures. Then, the topological coding scheme based on these structures is proposed. Furthermore, we have designed and fabricated the metasurface holograms to generate topological light fields with nested vortex links, and experimentally verified the feasibility of a topological coding scheme with a high capacity.

The theory of knot and link has been extensively studied in the past century. It has shown that the abstract function with knotted or linked zeroes could be constructed by devising complex functions on a periodic braid embedded in a cylinder10,35. In this braid representation, braids are composed of twined strands. The most typical products are the Hopf link, trefoil knot, figure-8 knot, and cinquefoil knot10,12,20,21. Now, we consider hierarchically periodic braids. They are layer-by-layer structures, which are called nested structures. As an example, a nested three-strand braid twisted three times is shown in Fig. 1a. It contains three strands marked by green, red and blue. In order to show it more clearly, an enlarged view of the starting end plane is shown in Fig. 1b. The braid with a radius of is called the first-generation braid. Then, each strand with a radius of contains a sub-braid (called the second-generation braid, which is composed of three twined sub-strands). Similarly, each sub-strand with a radius of contains a sub-sub-braid (the third-generation braid, composed of three twined sub-sub-strands). Keep going in this way, we can finally construct a general nested braid structure with a fractal-like geometry». [164]

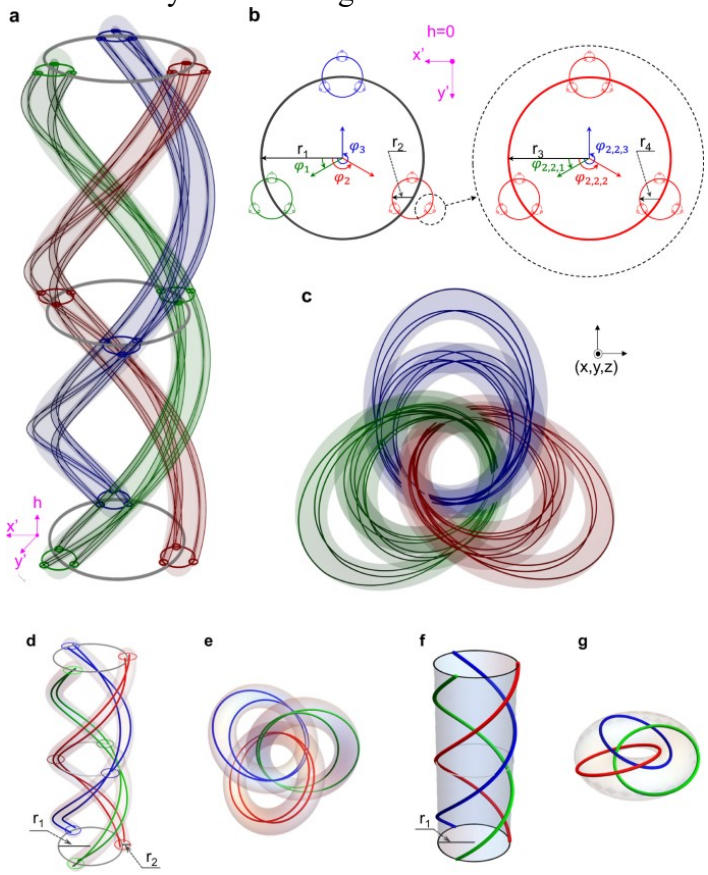


Fig. 1: Theoretical construction of nested vortex knots and links. [164]

This is an example of an experiment of artificially obtained samples of topological braids of interlacings. The secret of its natural production is in the universal method, which is projected and embodied in DNA.

As illustrated below, the same torsion principle is technically used in the fabrication of QA coils in the design of a compact stellarator-tokamak hybrid for fusion, creating a magnetic field of appropriate configuration to control the plasma flow. [175]

This further supports the conclusion that the structural geometry of space is of decisive importance and mediates the vector of theoretical considerations.

"Tokamaks and stellarators are the leading two magnetic confinement devices for producing fusion energy, begging the question of whether the strengths of the two could be merged into a single concept. To meet this challenge, we propose a first-of-its kind optimized stellarator-tokamak hybrid. Compared to a typical tokamak coil set, only a single simple type of stellarator coil has to be added which leads to a compact, volume- and transport-preserving magnetic field, with an added rotational transform that reaches levels thought to enhance stability." [175]

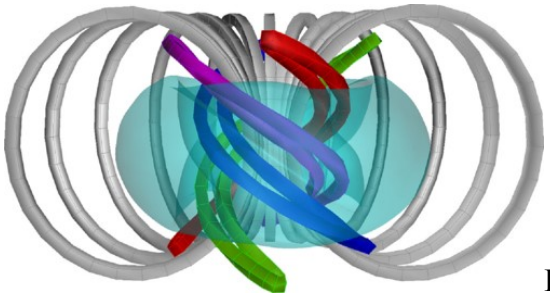


Fig. 1. The plasma boundary (cyan) encompassing four identical QA ("banana") coils (red, green, blue, and purple) all contained within toroidal field coils (gray; half of them shown). The four identical QA ("banana") coils – the only coils needed in addition to the standard tokamak coils. [175]

Considering that this geometry mediates the universal type of rotational motion, then it is also present in the relativistic equation of P. Dirac as a spin, as well as a spinor, which is essentially a **magnetic dipole – basic element of Nature**.

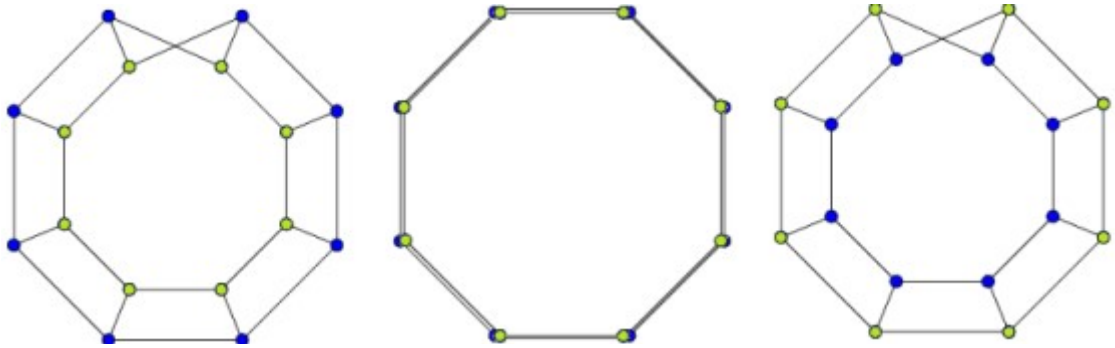
The operator, which was discovered by P. Dirac and is the basis of his relativistic equation, was also rediscovered by M. Atiyah when he and his colleague I. Singer made one of his most famous works in the **1960s – the index theorem**. The search for proofs for this theorem led the authors to common roots for many areas of mathematics that were considered different. Subsequently, this led M. Atiyah to search for connections between sciences and to build interdisciplinary bridges. [126], [85]

Visualization of the fact that the topologically closed duality of J. Maxwell's etheric vortex-wheels can be represented in the geometry of a Mobius strip with one turn, that is, in the geometry of Clifford's closed parallels, is another argument in favor of the stated assertion that such mono-units should be considered Mobius Magnetic Monopoles. In the current view of physics, the concept of "***monopole***" is associated with a unit that has only one pole. This view contradicts the universalism of the principle of complementarity, which assumes **universal duality in everything**. Based on this, the presence of one pole contradicts the very concept of "magnetism". The concept of "***monopole***" must be associated with a certain type of magnetic

closure and the corresponding state of magnetism, which does not manifest itself outwardly as dipole.

Based on what is already known in mathematics, it can be possible to show geometrically one of the sides of how the Magnetic Monopole, which contains the Mobius inversion, performs the breathing phases "INHALING-EXHALING-INHALING" in the process of its rotation around a conditional internal center and circulation around a conditional external one. In this case, a change of phases occurs – conditional sides that are reduced to one topological surface through a turn.

If we paint the edges of the Mobius strip in different colors before gluing it together and represent it mathematically as a Mobius ***ladder graph***, this experiment will provide a clear visualization of how the outer membrane of such a dynamic granule changes from one color to another during respiration.

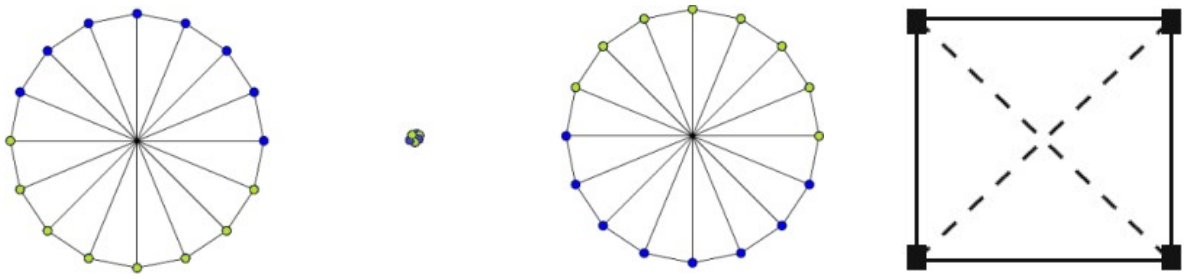


Phase "INHALATION". Phase "EXHALATION". Phase "INHALATION". [93]

Each phase of inhalation and exhalation turns the figure inside out and vice versa.

The process of breathing is by definition a series of always nonequilibrium states in an open system, constantly fed with energy from the environment due to the opposite phases of "inhalation" and "exhalation". The features of its living mechanics allow us to take a significantly new look at several unsolved problems in the fundamentals of the physics of the micro-world. This is also a very important observation of analogies in different planes of being, which can help interpret the experiments with quasi-monopoles that have been conducted over the past decade and a half from 2008 to the current 2024. [94] – [116]

Also, these phases of quantum breathing can be displayed using another representation of the same graph "***Mobius ladder***", thanks to the "rubber" capabilities of topology, which allows us to expand the figurative representation of the change of mutually inverse phases of oscillations in the dynamics of the Mobius rotation. The same change in the phases of oscillations is displayed geometrically in the famous ***Pauli square***.



Phases: ***"Inhalation" – "Exhalation" – "Inhalation"***. [93] "***Pauli square***".

Each phase of "exhalation" during compression (shrinkage) turns the figure by 180 degrees or, if we can say, turns it inside out or, in other words, produces a **topological revolution.** I believe that the phases of quantum breathing of Mobius Monopoles, depicted in the form of such graphs, can create an imaginary **illusion of the unipolarity of such units**.

It can be argued that the presence of such an illusion could be the reason for the hypothetical assumption of a magnetic monopole as a unipolar structure, which in its essence contradicts reality, since a mono-structure as a single whole for the implementation of the dynamics of internal movement-spinning must have a complementary (antiphase) breakdown "two in one". Without this breakdown, which gives it the mechanism of non-stop movement, it simply cannot exist.

It is the change of phases of the oscillations of the etheric Magnetic Monopole with its Mobius configurability, expressed as shown above, that creates the illusion that the Magnetic Monopole is a unipolar structure that can exist in the nature of things in two separate forms – with one radial pole or another. At the beginning of quantum mechanics, P. Dirac imagined a magnetic monopole in exactly this form, and he also imagined magnetic charges by analogy with electric charges, which were and are still imagined by academic science as separate entities.

A **geometric solution** to this issue based on the Mobius strip shows that the idea of a single unipolarity is a kind of delusion.

In the configurability of the Mobius ring, polarities are topologically closed in a wave packet and, oscillating, the magnetic monopole essentially demonstrates polar vibration – now with one pole, then with the other outward, and with the opposite – inside.

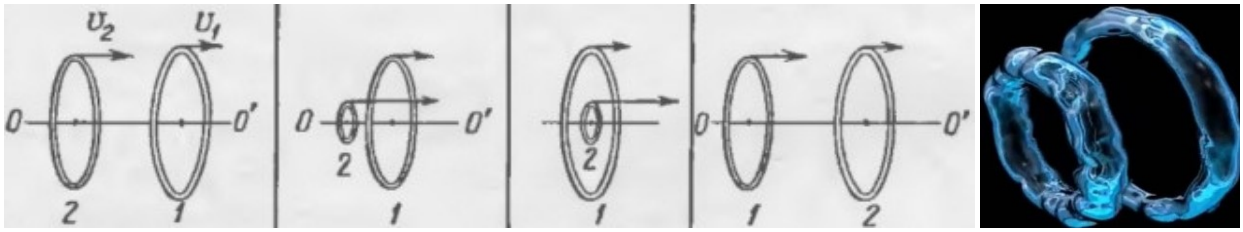
There are two illustrations below – **(1)** and **(2)** – that I made from two-color paper, one side of which is **white** and the other is **black**. In illustration **(1)** the Mobius strip is turned inside out with only the white color, and in illustration **(2)** the same Mobius strip is turned inside out only with the black color. Each of these ***black-white phases of oscillations*** creates the illusion of unicolorous or unipolarity. It would also be appropriate to say that these two color states are analogous to the elements of binary logic, namely, "0" and "1". That is, the spinning of the Mobius Pattern with its eversion and change of "color" is essentially the physical basis of binary coding in the spatial matrix fabric of the Quantum Medium.

(1)  **(2)** 

Polarity itself is associated with the vector of the direction of magnetic lines, which are closed with inversion. And polarities are not objects of the quantum world in the form of separate magnetic charges by analogy with how electric charges are represented today. If we take a strip magnet as an example, its ends can be considered polar, but we cannot assume that they are two different entities and can be separated. This is the beginning of the vector and its end, and these visual limitations are a piece of matter – a strip magnet.

Magnetism exists as a natural duality, mediated by the FPC, which manifests itself differently in different variants, but at the same time preserves the original **InfoGen of duality**, closed in antiphase.

As this is illustrated by the geometric solution, the illusion of unipolarity created by the dynamics of monopole spinning is nothing more than the result of the reciprocity of the phases of magnetic oscillations. And in essence, the change of phases of magnetic monopole oscillations demonstrates practically the same effect as the change of phases of neutrino-antineutrino oscillations, when the dynamics of oscillations shows a turning "*from face to inside out*" and "*from inside out to face*". In the case of neutrinos, this occurs by analogy with the leapfrog of smoke rings, indicated in the experiments of G. Helmholtz. [133]



Smoke ring hodgepodge [133] and neutrino oscillations [131], [132], [118].

Similar revolutions are made by the magnetic monopole, with the only difference being that its oscillations include the Mobius mirror-asymmetric reversal.

The original natural duality, expressed by the complementary interrelation of two components, is present in everything, regardless of scale and affiliation. Therefore, the very idea of the existence of a unipolar monopole, no matter who puts it forward, is by definition inconsistent with reality.

P. Dirac hypothetically assumed the existence of a magnetic monopole as such and as the initial unit, which is the correct train of thought, since he believed that the presence of a magnetic monopole in nature causes the observed quantization of charges. But the assumption of its unipolarity, as well as the existence of magnetic charges similar to electric charges, cannot yet be assessed as the correct train of thought, since all these concepts in physics have not yet been fully defined. A fairly logical resolution of this issue is presented in more detail in subsequent works in the FPC format and Mobius geometry.

I have analyzed a number of published experiments and theoretical proposals for the **period 2008-2024**, which are aimed at detecting and describing magnetic monopoles, if such are identified. Most of the experiments are conducted in a class of crystalline materials cooled almost to absolute zero and called spin ice. This is a category of condensed matter in which collective effects are manifested and some areas can behave as macro-quanta and in particular, as the experimenters claim, as **quasi-monopoles**. On this, the properties of such macro-quanta are studied in order to understand that if a natural magnetic monopole exists, then what can it be in its manifestation in the Cosmic space at extremely low temperatures.

A direct parallel can be drawn between the condensed matter intensively studied in the current period and the ethereal Quantum Medium, since the characteristics of condensed matter directly indicate the characteristics of the ethereal Quantum Medium in the Cosmic space at extremely low temperatures. A condensed medium is a medium consisting of a large array of identical particles, the laws of interaction between which must be strong enough and also identical. To some extent, the particles must be in such a close influence relative to each other that it can be defined as "*interfering with each other*". The degree of condensation of the medium can be determined by the degree of convergence of its matrix components. In the classical sense, liquids and solids can be considered condensed.

If we extend the logic of the experiments conducted with condensed media and their properties to the proposed here structure of the supporting Cosmic Medium and draw an analogy, then, since the etheric Quantum Medium consists of uniform monopoles-units, tightly fused, as shown above, into hexagons, and at the same time represents a kind of quantum superfluid granular liquid – magneto-plasma, then accordingly it can be classified as a condensed finely dispersed (fine-grained) medium and, accordingly, the collective effects in it can be infinitely diverse by analogy with the experimentally studied condensed media.

The diversity of phenomena in condensed media arises spontaneously and precisely as a result of collective effects.

Collective effects in condensed matter occur at fairly low temperatures. Accordingly and by analogy, the matrix units of the etheric Quantum Medium, being in such a quantum state in the presence of a very low temperature regime in open space, behave as a single-merged quantum object, the areas of which can act as wave packets or macro-quanta with a common wave function. In essence, air and water environments behave in exactly the same way.

In this sense, any condensed medium "speaks" in the language of synchronous collective movements, and not individual particles, in other words, there is a huge number of **texts** in such environments. Drawing fractal parallels and applying analogies, it can be argued that the etheric cosmic medium, like any other condensed medium, "speaks" not with a scattering of individual units (etheric elementals as individual letters of the text), but with a set of "words" connected to each other, that is, textual semantic phrases, and the medium conveys the thought in the form of a "collective effect" – a package of a kind of letter text in the universal language of binary coding.

In this regard, not only the characteristics of the ethereal Quantum Medium as a living and breathing magneto-plasma become clearer, but also its characteristics as a rational medium capable of forming semantic texts with its oscillations, transmitting them in the language of binary logic, and also perceiving them.

The word "OSCILLATION" comes from the primary root ***os- "mouth"**. And from the word "*mouth*", in Slavic languages "**rot**", comes the word "**rotor**", "**rotation**" or voice **rotational vibration**.

In this regard, the entire living world has not only a direct and reverse energy-quantum connection with the feeding medium, but also a semantic textual connection with its memory braids (Akasha chronicles), which are organized on the magneto-electric properties of its matrix units – magnetic monopoles.

The Nobel Prize in Physics 2016 was awarded to M. Kosterlitz, D. Thouless, and D. Haldane "for their theoretical discoveries of topological phase transitions and topological phases of matter." The prize was awarded not for one specific discovery, but for a whole list of

pioneering works that stimulated the development of a new direction in condensed matter physics **in the 1970s and 1980s**. [73], [72]

The **2016 Nobel Prize** recognizes the work of theorists in deciphering another "language" that condensed matter can "speak." This is the language of topologically nontrivial excitations.

In condensed matter physics, an excitation is a collective deviation from a stationary state, that is, from a state with the lowest energy. Excitations can be caused by an impact, or they can arise spontaneously due to a non-zero temperature.

The Ethereal Quantum Medium behaves as condensed at very low temperatures. In different temperature regimes of its regions, it reduces the processes of utilization and generation to one physical point – a vortex magnetic torsion pattern. The Mobius vortex pattern is the physical point at which the act of transformation of the decayed and used into the generated new occurs. Moreover, the process of utilization occurs in the low-temperature mode of transition of the used into magneto-plasmic condensed liquid, and the process of creation of the new occurs in the "hot spots" of the hydromagnetic dynamo in stars and the cores of planetary bodies in the process of bifurcation and doubling of magnetic loops of monopoles, that is, the synthesis of baryonic matter occurs..

These energy transformations are carried out by the screw mechanism of magnetic Mobius units of the ethereal medium as a kind of closed Archimedes screw. And in general, if we keep in mind the extremely low temperatures of outer space, the ethereal magneto-plasma behaves as a single mega-object.

The search for magnetic monopoles, and precisely those with the same structure as was predicted and described by P. Dirac, is currently being conducted in condensed media.

In an experiment published in **January 2008**, "***Magnetic monopoles in spin ice***" [94], it is reported that observations of atoms located in crystals at the corners of tetrahedrons show that cooled atoms, each of which behaves like a rod magnet, line up, creating regions of north or south magnetic charge separated by a chain of aligned atoms.

The experimenters claim that the detected "magnetic charge" (the large red and blue spheres) is not attached to any physical object, but behaves like a monopole.

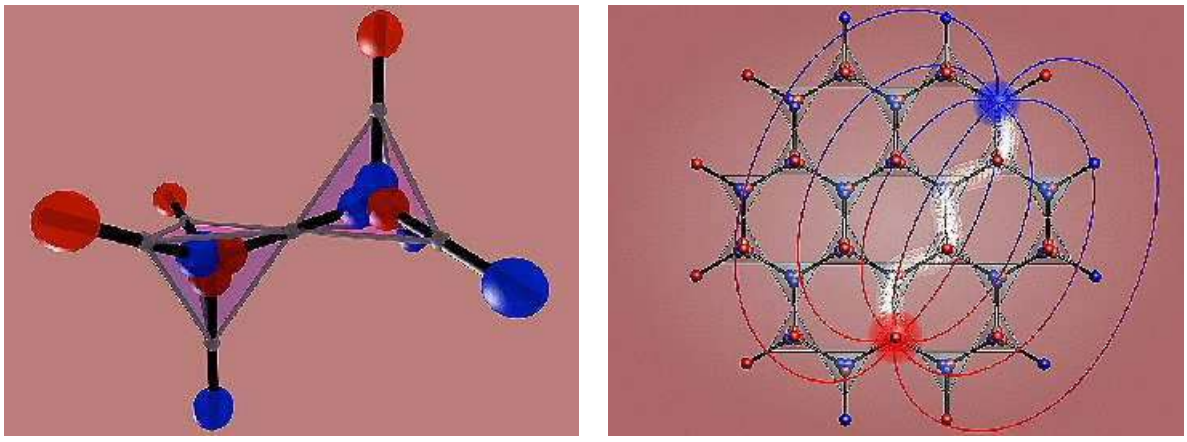
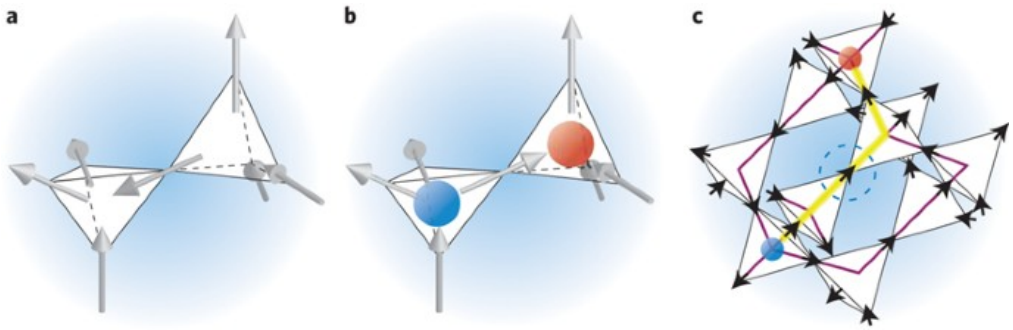


FIG. 2: **Large panel (**Right)**:** A pair or separated monopoles (large red and blue spheres). A chain of inverted dipoles (`Dirac string') between them is highlighted, and the magnetic field lines are sketched. [94]

Materials published in April 2009, «***Monopoles on the move***» [95], report that «magnetic materials provide a new context for observing magnetic monopoles. Numerical simulations now

establish an experimentally measurable signature of their dynamics – one that has in fact already been seen in a spin-ice compound».



[95].

In a **July 2009** publication, "***Creation of Dirac Monopoles in Spinor Bose-Einstein Condensates***" [96], the authors report that they theoretically demonstrate that it is possible to impose point topological defects on the spin texture of a dilute Bose-Einstein condensate using external magnetic fields. Symmetries of the order parameter of the condensate result in this topological defect being accompanied by a vortex filament. The vorticity in the condensate coincides with the magnetic field of the magnetic monopole, providing an ideal analogue of the monopole hypothetically predicted by P. Dirac.

Thus, the authors calculate that in principle, Dirac monopoles can be observed in the spin structure of a Bose-Einstein condensate. If this theoretical proposal can be realized experimentally, the researchers will have a test bed to study how monopoles form, how long they last, and whether Dirac monopoles can be found in the wild. Experimental confirmation of the existence of monopoles would provide long-awaited evidence for a number of ideas, since "the existence of magnetic monopoles implies that the electric charge must be quantized (i.e., it can only appear as an integer multiple of the elementary charge)." The authors also emphasize that "our work does not imply the existence of magnetic monopoles in an electromagnetic field." [96]

In their **August 2009** publication "***Observation of magnetic monopoles in spin ice***" [97], the authors of the experiment report that "excitations from a strongly frustrated system, the kagome ice state of the spin ice Dy2Ti2O7 under magnetic fields along a [111] direction, have been studied. They are theoretically proposed to be regarded as magnetic monopoles. Neutron scattering measurements of spin correlations show that close to the critical point the monopoles are fluctuating between high- and low-density states, supporting that the magnetic Coulomb force acts between them. Specific heat measurements show that monopole-pair creation obeys an Arrhenius law, indicating that the density of monopoles can be controlled by temperature and magnetic field".

As the authors of the experiment emphasize, the results they obtained are not the monopole particles predicted by Dirac, but they behave like monopoles in all respects. Studying spin ice will allow scientists to test certain predictions about monopoles.

In **a September 2009** publication, "***Dirac Strings and Magnetic Monopoles in the Spin Ice Dy2Ti2O7***," [98] the authors noted that, despite the elusiveness of magnetic monopoles, their properties can be studied in matter in a condensed state, where the formation of quasiparticles resembling monopoles is observed.

As a result of the experiment, the authors demonstrated the presence of Dirac strings in spin ice. According to them, the defects obtained in the region of the ends of the strings look like magnetic monopoles. [98]

In **October 2009**, the authors of the publication "***Measurement of the charge and current of magnetic monopoles in spin ice***" [99] reported that they address the question of whether such magnetic charges and their associated currents—'magnetricity'—can be measured directly in experiment, without recourse to any material-specific theory.

"By mapping the problem onto Onsager's theory of electrolytes4, we show that this is indeed possible, and devise an appropriate method for the measurement of magnetic charges and their dynamics. Our experimental measurements prove that magnetic charges exist in this material, interact via a Coulomb potential, and have measurable currents. We further characterize deviations from Ohm's law, and determine the elementary unit of magnetic charge to be 5 μ_B Å^{-1}, which is equal to that recently predicted using the microscopic theory of spin ice3. Our measurement of magnetic charge and magnetic current establishes an instance of a perfect symmetry between electricity and magnetism." [99]

In **September 2011**, in the publication "***High pressure route to generate magnetic monopole dimers in spin ice***" [100], a group of experimentalists published results that show how to tune the monopole chemical potential in spin ice using high-pressure synthesis and how to access the diverse collective properties of magnetic monopoles. [100]

In **October 2011**, in the publication "***Ground-State Dirac Monopole***" [115], the authors reported their theoretical results that show that a monopole defect analogous to the magnetic Dirac monopole can exist as the ground state of a dilute spin-1 Bose-Einstein condensate.

"The ground-state monopole is not attached to a single semi-infinite Dirac string but forms a point where the circulation of a single vortex line is reversed. Furthermore, the three-dimensional dynamics of this monopole defect is studied after the magnetic field pinning the monopole is removed and the emergence of antimonopoles is observed. Our scheme is realizable with the current experimental facilities." [115]

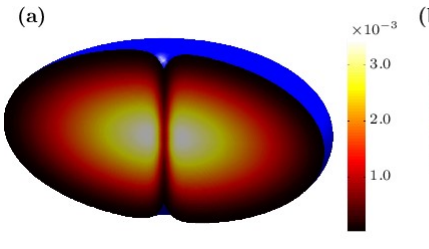


Рис.2 a), b)

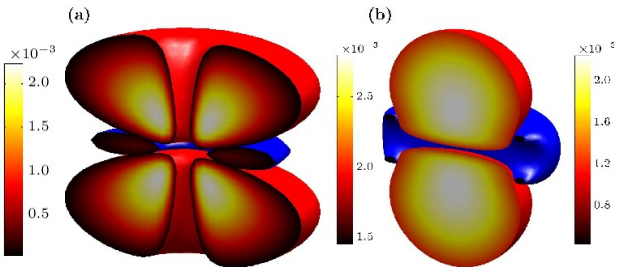


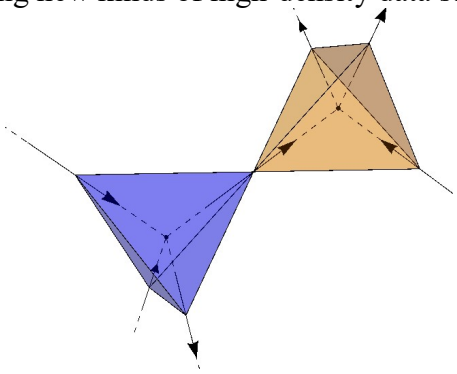
Рис.3 a), b) [115]

In August 2012, in a paper titled "***Universal monopole scaling near transitions from the Coulomb phase***" [101], Steven Powell, a scientist at the Joint Quantum Institute (JQI) and the University of Maryland, proposed a theoretical framework for how monopoles might work.

"He is the first to prescribe the phase transition from the monopole phase (also called the Coulomb phase since the monopoles feel the same inverse-square force effect as electric charges) into the pole-confined phase". [116]

The paper noted that in recent years, monopoles, at least in the form of “quasiparticles” consisting of collective excitations among many atoms, have been predicted and demonstrated in the laboratory.

“Steady flows of magnetic monopoles are apparently impossible," Powell said, "but transient currents have been demonstrated, and one could imagine creating an alternating current, the magnetic equivalent of AC electricity." This so-called 'magnetricity' might be exploited for designing new kinds of high-density data storage. [116]



The unit cell for "spin ice" materials consists of two tetrahedrons. The arrows show the orientation of the magnetic atoms within the material Credit: Stephen Powell. [116]

Also, Stephen Powell's opinion regarding the explanation of the laws of electromagnetism is as follows:

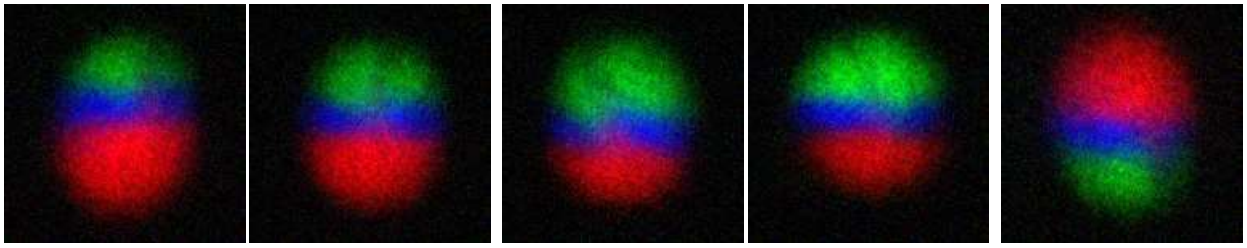
«The laws of electromagnetism predict a great symmetry between electric and magnetic forces. This equality does not extend, however, to isolated magnetic "charges." Isolated electric charges, in the form of electrons, are of course quite common. Such charges attract or repel each other with a force inversely proportional to the square of the distance between the charges. A positive charge and a negative charge can team up to form a neutral electric dipole. The situation in magnetism seems different: dipoles yes, monopoles no». [116]

Without detailed comments, I would like to point out here that modern physics has a definite answer to the question of how opposite electric charges can unite and create an electric dipole. This answer is – free "particles" (or rather formed quanta) with opposite charges annihilate. Also, the experience of creating positronium from an «electron» and a «positron» was not successful in creating a stable particle.

Mobius geometry gives a definite answer to the question of how and on what basis opposite charges combine into a dipole, as well as to the question of how the transition from the monopole state to limited poles is carried out. This answer is proposed by me in the works "***2. Quantum Entanglement. The Yin-Yang Symbol. Mobius Geometry. Phases of Fibration***" and "***3. The Basic Element of Nature. Mobius Geometry. Gravity. Model of the Atom***".

In January 2014, the authors of the publication "***Observation of Dirac monopoles in a synthetic magnetic field***" [102] noted the fact that, although analogs of magnetic monopoles have been discovered in exotic spin ices and other systems, there has been no direct experimental observation of Dirac monopoles in a medium described by a quantum field, such as superfluid helium-3.

«Here we demonstrate the controlled creation14 of Dirac monopoles in the synthetic magnetic field produced by a spinor Bose–Einstein condensate. Monopoles are identified, in both experiments and matching numerical simulations, at the termini of vortex lines within the condensate. By directly imaging such a vortex line, the presence of a monopole may be discerned from the experimental data alone. These real-space images provide conclusive and long-awaited experimental evidence of the existence of Dirac monopoles. Our result provides an unprecedented opportunity to observe and manipulate these quantum mechanical entities in a controlled environment». [102]



a) b) c) d) e)

Extended Data Figure 2 j Additional representative images of Dirac monopoles. [102]

With regard to the data obtained from this experiment, an analogy should be drawn between the images obtained and the above-mentioned "***Mobius ladder***" graph and its dual representation, which displays the process of ***quantum breathing***.

In January 2014, the author of the publication "***Quantum cloud simulates magnetic monopole***" [103] tells the following about this experiment:

"Möttönen, who is a co-author on the latest paper, says that the monopole in the new study is closest to the real deal because the structure is identical to that of a Dirac magnetic monopole. Not all physicists agree. "In some ways this is closer to what a real monopole would look like, but in some ways it's further," says Arttu Rajantie, a theoretical physicist at Imperial College London.

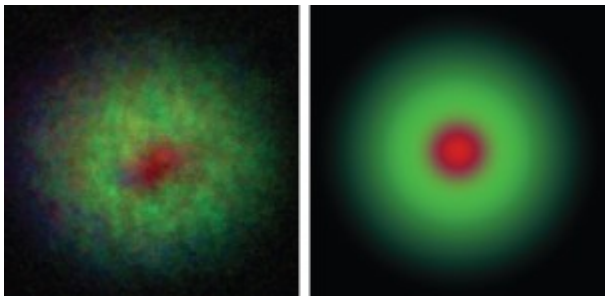
Steven Bramwell, a physicist at University College London who pioneered work on monopoles in spin ices, says that the experiment is impressive, but that what it observed is not a Dirac monopole in the way many people might understand it. "There's a mathematical analogy here, a neat and beautiful one. But they're not magnetic monopoles," Bramwell says. "You have to do a sideways jump – a bit of lateral thinking in your mind – to project these onto magnetic monopoles," he adds.

Dirac famously said that he would be "surprised" if nature had made no use of such an elegant idea as the magnetic monopole. Physicists are still looking for natural monopoles, including in rocks and lunar samples, and in experiments using particle accelerators. Simulated monopoles provide a stronger foundation for these searches, says Möttönen. "You could ask, is this structure Dirac predicted actually possible? Now we have seen that it is possible, there's one more reason why the magnetic monopole as a fundamental particle should exist." [103]

In February 2014, in the publication "***Quasi-Dirac monopoles***" [154], the author of article reports:

"Since the publication of Dirac's classical paper in 1931, the search for a new fundamental particle, the magnetic monopole, with non-zero magnetic monopole charge, has

grasped the attention of many. The existence of magnetic monopoles is now not only supported by the work of Dirac, but by both the grand unified theory and string theory. Physicists started to explore approaches to obtain such particles using condensed-matter systems. Now, Ray and co-workers report the latest observation of a Dirac monopole quasiparticle (pictured), this time in a spinor Bose–Einstein condensate. This magnetic monopole quasiparticle is in fact not a magnetic monopole fundamental particle, but a quasiparticle equivalent, and is a source of a 'synthetic magnetic field' that violates the zero-divergence law. Even though this system only resembles a true magnetic monopole, this is the first time such a quasiparticle has been detected within a system governed by quantum field theory, the framework behind subatomic particle physics". [154]

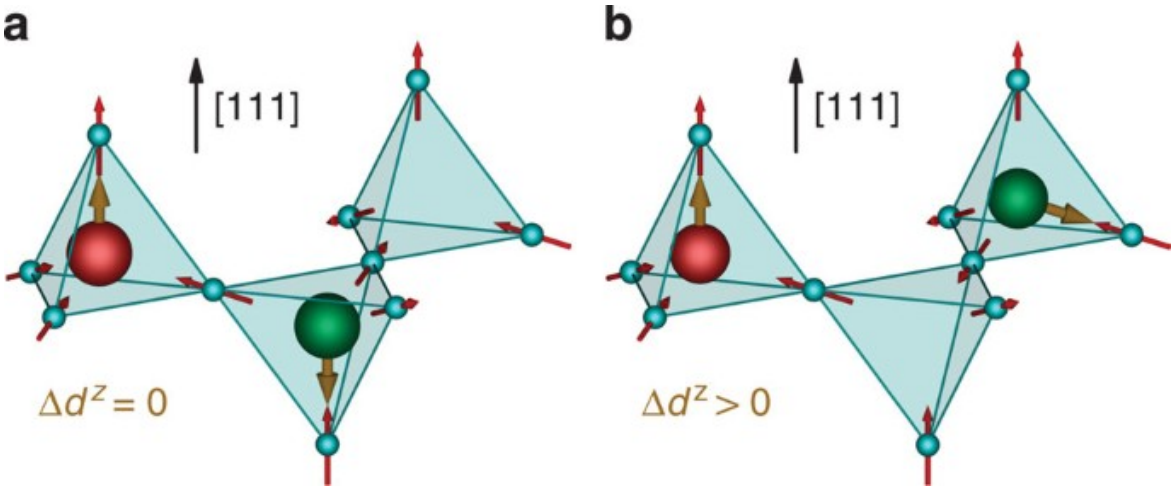


[154]

In September 2014, the publication «***Critical speeding-up in the magnetoelectric response of spin-ice near its monopole liquid–gas transition***» [104] reported the following:

«Competing interactions in the so-called spin-ice compounds stabilize a frustrated ground state with finite zero-point entropy and, interestingly, emergent magnetic monopole excitations. The properties of these monopoles are at the focus of recent research with particular emphasis on their quantum dynamics. It is predicted that each monopole also possesses an electric dipole moment, which allows to investigate their dynamics via the dielectric function $\varepsilon(\nu)$. Besides demonstrating the magnetoelectric character of the emergent monopole excitations, our results corroborate the unique critical dynamics near the monopole condensation transition». [104]

Figure 1: Electric dipoles on magnetic monopoles.



In September 2014, in the publication "***Magnetic monopoles and unusual dynamics of magnetoelectrics***" [105], it was suggested that «in solids with the linear magnetoelectric effect there should exist, close to electric charges, magnetic textures of magnetic monopole type».

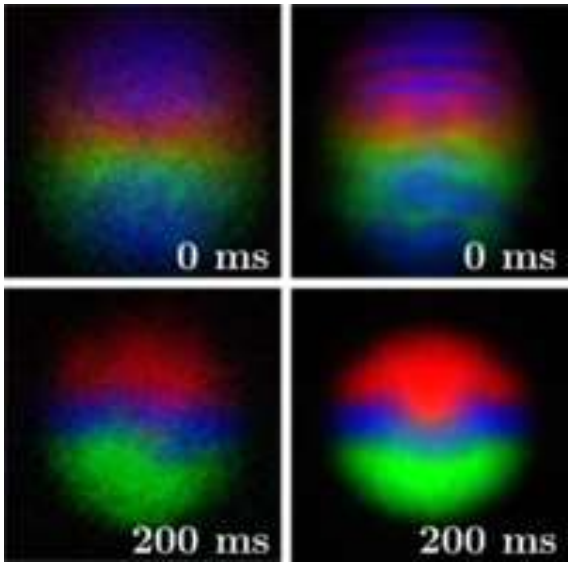
«Summarizing, I propose that nontrivial local magnetic objects, such as magnetic monopoles or magnetic toroics, should exist in magnetoelectric media in the bulk, associated with electrons or with charged impurities. Their presence can have unusual manifestations, such as an 'electric Hall effect' or a magnetophotovoltaic effect—effects that could be observable experimentally. Thus, the ME media can provide yet another possibility of modelling of magnetic monopoles in solids, more general and more easily detectable than, for example, in frustrated magnets». [105]

In May 2017, a group of experimentalists reported in the publication "***Experimental Realization of a Dirac Monopole through the Decay of an Isolated Monopole***" [106] the following:

«Our new experiments in the condensate show that a quantum monopole decays into a Dirac monopole.

We create the quantum monopole by subjecting a Bose-Einstein condensate of rubidium atoms to a slowly varying magnetic field, which imprints magnetic order onto the condensate. We then record the resulting dynamics. The initially nonmagnetized phase of the condensate evolves into a magnetized, or ferromagnetic, phase. Consequently, the quantum monopole is destroyed and replaced by a Dirac monopole. A vortex line of vanishing particle density, akin to a tiny tornado, spontaneously appears in the new phase, closely agreeing with Dirac's early theoretical work. We subsequently study the Dirac monopole in detail, providing, for the first time, experimental information on its full three-dimensional magnetic structure.

Our work provides the first experimental results on the stability of quantum monopoles and new evidence concerning the properties of Dirac monopoles in condensates. These findings establish fertile conditions for future studies of monopole dynamics in quantum matter». [106]



[106]

The May 2017 publication "***Physicists Experimentally Observe Decay of Quantum Monopole***" [107] notes the following facts about the experiment [106]:

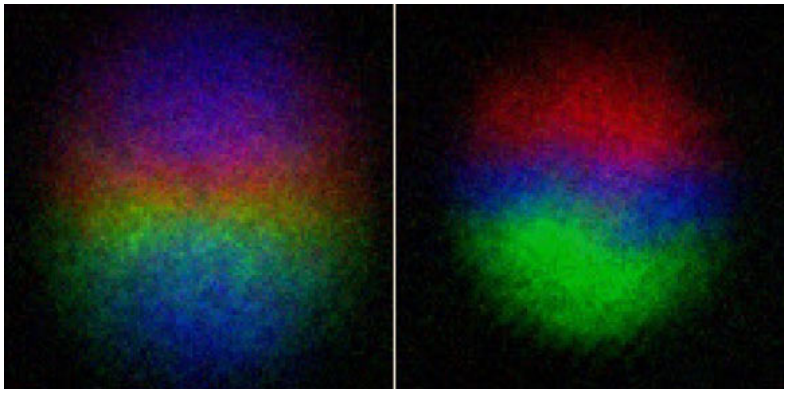
«“In 2014, we experimentally realized a Dirac monopole, that is, Paul Dirac’s 80-year-old theory where he originally considered charged quantum particles interacting with a magnetic monopole,” said co-lead author David Hall, professor of physics at Amherst College.

“And in 2015, we created real quantum monopoles,” added co-lead author Dr. Mikko Möttönen, professor of quantum computing at the University of Jyväskylä and senior scientist in the Department of Applied Physics at Aalto University.

“Whereas the Dirac monopole experiment simulates the motion of a charged particle in the vicinity of a monopolar magnetic field, the quantum monopole has a point-like structure in its own field resembling that of the magnetic monopole particle itself.”

Now the team has produced an observation of how one of these unique magnetic monopole analogues spontaneously turns into another in less than a second.

“Sounds easy but we actually had to improve the apparatus to make it happen,” said study first author Tuomas Ollikainen, a doctoral candidate at Aalto University». [107]



Left: experimental side image of the quantum monopole.
Right: after 0.2 seconds, the quantum monopole has decayed into the Dirac monopole. The different colors represent the direction of the internal magnetic state of the atoms and the brightness corresponds to particle density. Image credit: Tuomas Ollikainen. [107]

In May 2018, the authors of the publication “***Photonic Dirac Monopole: Spin-1 Quantization***” [108] reported their theoretical innovations regarding the issues of the magnetic Dirac monopole.

«We introduce the concept of a photonic Dirac monopole, appropriate for photonic crystals and metamaterials, by utilizing the Dirac-Maxwell correspondence. We show that even in vacuum, the reciprocal momentum space of both Maxwell's equations and the massless Dirac equation (Weyl equation) possess a magnetic monopole. The critical distinction is the nature of magnetic monopole charges, which are integer valued for photons but half-integer for electrons. We prove that this inherent difference is directly tied to the spin and ultimately connects to the bosonic or fermionic behavior. We also show the presence of photonic Dirac strings, which are line singularities in the underlying Berry gauge potential. Our work sheds light on the recently proposed spin-1 bosonic phase of matter and the fundamental role of photon spin quantization in topological bosonic phases». [108]

In March 2020, a group of authors presented the results of their observations in the publication “***Two-dimensional magnetic monopole gas in an oxide heterostructure***” [109].

Summarizing the previous results, the authors note that magnetic monopoles were proposed as emerging quasiparticles in pyrochlore spin ice compounds.

«However, unlike semiconductors and two-dimensional electron gases where the charge degree of freedom can be actively controlled by chemical doping, interface modulation, and electrostatic gating, there is as of yet no analogue of these effects for emergent magnetic monopoles. Our proposal is based on Monte Carlo simulations of the thermodynamic and transport properties. This proposed 2DMG should enable experiments and devices which can be performed on magnetic monopoles, akin to two-dimensional electron gases in semiconductor heterostructures». [109]

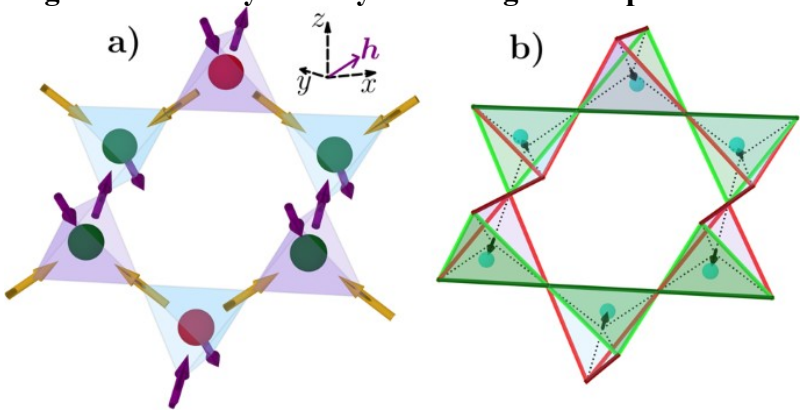
In February 2021, in the publication "***Quantum magnetic monopole condensate***" [110], the authors emphasize the following: "Despite decades-long efforts, magnetic monopoles were never found as elementary particles. Monopoles and associated currents were directly measured in experiments and identified as topological quasiparticle excitations in emergent condensed matter systems. These monopoles and the related electric-magnetic symmetry were restricted to classical electrodynamics, with monopoles behaving as classical particles. Here we show that the electric-magnetic symmetry is most fundamental and extends to full quantum behavior. We demonstrate that at low temperatures magnetic monopoles can form a quantum Bose condensate dual to the charge Cooper pair condensate in superconductors. The monopole Bose condensate manifests as a superinsulating state with infinite resistance, dual to superconductivity." [110]

In March 2021, in the publication "***Monopole matter from magnetoelastic coupling in the Ising pyrochlore***" [111], the authors emphasize that there has been a long search for a model in which monopoles would spontaneously become building blocks of new ground states. The authors believe that their proposed extension of the Hamiltonian of the magnetically stable spin ice MeSI is such a model.

"In spite of its simplicity and classical approach, it describes the double-layered monopole crystal observed in $Tb_2Ti_2O_7$. Additionally, the dipolar electric moment of single monopoles emerges as a probe for magnetism. As an example we show that some Coulomb phases could, in principle, be detected through pinch points associated with O^{-2}-ion displacements.

We show that in the strong coupling limit, lattice distortions transform single monopoles (excitations of spin ice materials) into actual building blocks of new ground states with maximum magnetic charge density."[111]

«Fig. 4: Double-layered crystal of single monopoles.



a) Spins (drawn as arrows) and the resulting single monopole configuration (green and red spheres, indicating positive and negative charge). This magnetic structure has been measured under a moderate magnetic field **h**||[110] in $Tb_2Ti_2O_7$25. The spin lattice can be divided in: *i*-$\alpha-$ spins (painted purple) polarised by **h**; *ii*-$\beta-$ spins (yellow) perpendicular to **h** and building up antiferromagnetic $\beta-$ chains (in-in/out-out). Monopoles linked by β-spins alternate in sign, forming β_Q- chains of charge. $\alpha-$ spins decouple consecutive β_Q- chains but, as proposed here, an effective nearest-neighbours attraction between like monopoles (Eq. (6) with $\gamma < 0$) can favour order such that the charge in two tetrahedra linked by an $\alpha-$ spin is the same. The main question our model is able to answer concerns the nature of the force that stabilises the single monopoles occupying each tetrahedron when the field increases from zero.
b) Structural configuration for the O^{-2}-ion near the centre of each tetrahedra. Through the magnetoelastic coupling, monopoles are stabilised by the displacement of the central oxygen (small cyan spheres) along ⟨111⟩ directions». [111]

In May 2021, the publication «***Electrical activity during magnetic moment fragmentation in spin ice***» [158] attracted attention with the observations:

«Spin ice systems display a variety of very nontrivial properties, the most striking being the existence in them of magnetic monopoles. Such monopole states can also have nontrivial electric properties: there exist electric dipoles attached to each monopole. A novel situation is encountered in the moment fragmentation (MF) state, in which monopoles and antimonopoles are perfectly ordered, whereas spins themselves remain disordered. We also consider modifications in dipole and current patterns in magnetic textures (domain walls, local defects) and at excitations with nontrivial dynamics in a MF state, which show very rich behaviour and which could in principle allow to control them by electric field». [158]

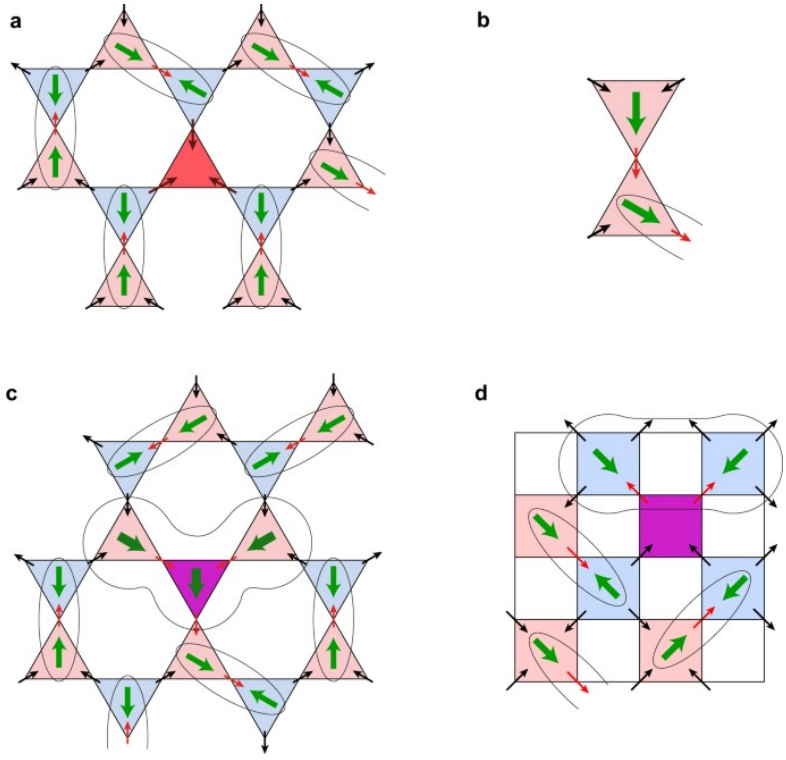
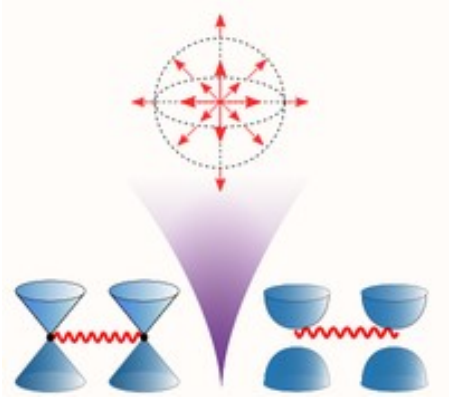


Fig. 3: ***Dipole structure at defects and monopole textures in kagome moment fragmentation state.***
a) Triangle with (3-in) state ('tri-pole'). Reconnection of free spins allows to create such defect without free dipoles.
b) Typical situation with the monopole at the 'wrong' place, at the antimonopole sublattice, demonstrating the appearance of unpaired dipoles. Note that the common spin is the 'normal' in-spin for one triangle, but it is a 'special' out-spin for the other triangle. Consequently the dipole moment at the second, upper triangle would point to this 'special' spin and would be definitely unpaired.
c) Monopole in place of an antimonopole (magenta triangle). One sees that it inevitably leads to the creation of three unpaired dipoles: on the defect triangle itself and on two (out of three) of its neighbours.
d) The appearance of (two) unpaired dipoles next to (2-in)--(2-out) tetrahedron (magenta) in pyrochlore with moment fragmentation. [158]

In July 2022, in a popular presentation of their observations in the publication "***Anomalous Dimensions of Monopole Operators at the Transitions between Dirac and Topological Spin Liquids***" [112], the authors note the following:

«Quantum spin liquids are phases of matter where strong quantum fluctuations destroy magnetic order and lead to the emergence of exotic particles. These particles can be thought of as fractions of regular particles that interact with each other via emergent photons. The photons admit strange topological textures called monopoles, which are notoriously difficult to study but are of fundamental importance in the understanding of spin liquids. Here, we determine to unprecedented accuracy how these monopoles behave at quantum phase transitions between different types of spin liquids. In addition, our findings convincingly support a mathematical duality that connects seemingly unrelated quantum phase transitions. Our methods can be applied to numerous other quantum spin liquids and their phase transitions, such as the transition from a Dirac spin liquid to a conventional magnetic phase». [112]



[112]

In August 2023, a new publication "***Observation of an Alice ring in a Bose–Einstein condensate***" [113] by a group that participated in [102], [106] suggested further research on monopoles.

In the abstract, the authors note that "monopoles and vortices are fundamental topological excitations that appear in physical systems spanning enormous scales of size and energy, from the vastness of the early universe to tiny laboratory droplets of nematic liquid crystals and

ultracold gases. Although the topologies of vortices and monopoles are distinct from one another, under certain circumstances a monopole can spontaneously and continuously deform into a vortex ring with the curious property that monopoles passing through it are converted into anti-monopoles. However, the observation of such Alice rings has remained a major challenge, due to the scarcity of experimentally accessible monopoles in continuous fields.

Here, we present experimental evidence of an Alice ring resulting from the decay of a topological monopole defect in a dilute gaseous ^{87}Rb Bose–Einstein condensate. Our results, in agreement with detailed first-principles simulations, provide an unprecedented opportunity to explore the unique features of a composite excitation that combines the topological features of both a monopole and a vortex ring." [113]

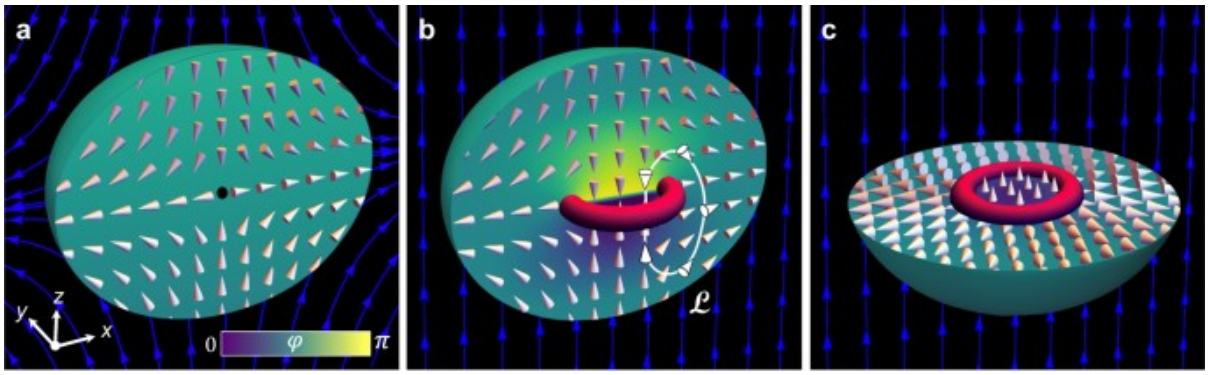


Fig. 1: ***Schematic illustration of a topological monopole defect and its decay product, an Alice ring, in a polar-phase Bose–Einstein condensate.***
a). Topological monopole with a zero-density core (black dot) and the corresponding polar order parameter field represented by the director $\hat{d}$ (white cones) and the scalar phase φ (background colour). Such a monopole can be created by adiabatically bringing the zero point of the quadrupole magnetic field (blue connected arrows) into the centre of the spheroidal condensate. For clarity, the condensate is shown in section for $y > 0$.

b), **c).** Order parameter field after the monopole has dynamically decayed into an Alice ring filled with the ferromagnetic phase (red ring). The polar condensate is shown in section for $y > 0$ (**b**) and $z < 0$ (**c**). [113]

In May 2024, in the publication "***Theory of Collective Excitations in the Quadruple-Q Magnetic Hedgehog Lattices***" [114], Japanese authors noted the interesting facts that the "hedgehog" and "anti-hedgehog" spin textures in magnets behave as emergent monopoles and anti-monopoles, which lead to surprising transport and electromagnetic phenomena.

"Using the Kondo-lattice model in three dimensions, we theoretically study collective spin-wave excitation modes of magnetic hedgehog lattices which have recently been discovered in itinerant magnets such as $MnSi_{1-x}Ge_x$ and $SrFeO_3$. It is revealed that the spin-wave modes, which appear in the subterahertz regime, have dominant amplitudes localized at Dirac strings connecting hedgehog-antihedgehog pairs and are characterized by their translational oscillations. It is found that their spectral features sensitively depend on the number and configuration of the Dirac strings and, thus, can be exploited for identifying the topological phase transitions associated with the monopole-antimonopole pair annihilations". [114]

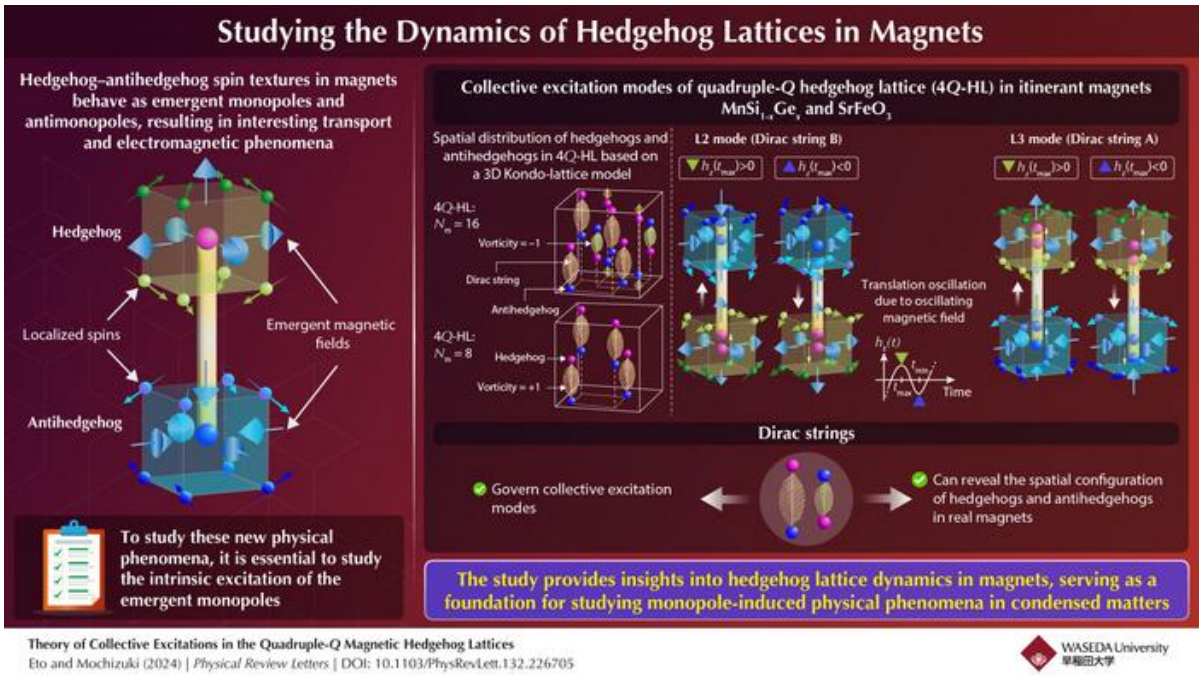


Image: the collective excitation modes of hedgehog lattices are governed by oscillation of dirac strings, connecting a hedgehog and an antihedgehog, which can be used to study their spatial configuration in magnets. [114]

If we summarize the experiments for the **period 2008-2024** regarding the detection of monopoles and their characteristics, then we should focus on the following facts:

1. Magnetic monopoles have attracted continuous research interest since the first proposal of the physicist P. Dirac in 1931. However, real magnetic monopoles have not yet been observed, and their existence remains an open question.

2. The vision of what a magnetic monopole can be is within the framework of the hypothetical proposal of P. Dirac, which is an authoritative opinion, but we should also take into account the facts in science that an authoritative opinion can be incorrect and contain partial erroneous judgments, which should always be admitted.

3. The fact that the hypothetically predicted magnetic monopoles are described as objects with an isolated north or south poles of the magnet is not yet a fact that the magnetic monopole has only one pole, that it is unipolar. The correct formulation of the question would be as follows: where is the second pole of the magnetic monopole while one of them demonstrates the illusion of unipolarity?

By its definition, magnetism cannot be unipolar. Considering it unipolar is a scientific misunderstanding. Magnetism is a physical embodiment of the FPC and indirectly contains **polar duality**, which is inseparable, but can take various phase forms. Polarity is poles limited by the dimensions of an object, but not separate entities. Taking them for separate entities is a fallacy of figurative representation.

4. A parallel transfer of the concept of “electric charges” to the concept of “magnetic charges” in the same sense that is currently put into the concept of “electric charges” by academic physics cannot be carried out with a transfer from theoretical assumptions to reality,

since it is necessary first of all to understand what charges are as a physical entity and how to represent them.

5. The right path lies in understanding the unity of the magneto-electric phenomenon and its manifestation as what we today call electric current and magnetic field. In essence, this is one phenomenon, since it is the process of rotation in a magnetic field that causes the directed current of magneto-plasma, which we call electricity. That is, electricity as a directed current of magneto-plasma is nothing more than a manifestation of magnetism itself.

6. Real magnetic monopoles have not yet been observed and their existence remains an open question. On the other hand, scientists have discovered quasi-particles that behave mathematically as magnetic monopoles in condensed matter systems, which leads to interesting phenomena.

However, the wording "mathematically behave" as magnetic monopoles suggests that the main focus of the experiments is to confirm mathematical calculations and, possibly, the assumptions made at the time by P. Dirac about magnetic charges by analogy with electric charges. P. Dirac's theory of electromagnetism includes both electric and magnetic charges. However, it should be noted that not all assumptions may be correct, since the rejection of the ether at the time of these assumptions introduced its distortions into theoretical approaches and ideas. Mathematical descriptions of algebra require geometric agreements and visualizations.

In his scientific path P. Dirac was never able to offer visualization of a magnetic monopole, the existence of which in nature he made a hypothetical assumption. Also, having intuitively created his relativistic equation, P. Dirac was never able to find its final application to the phenomena of the micro-world due to the lack of specific experimental results, their correct interpretation and the lack of visualization.

Taking into account the speed parameters at which current experimental images are recorded, computer processing of images, etc. is carried out, it cannot be ruled out that it is always possible to see what has already been modeled in the mind and what one wants to see, and to direct the processing of the results precisely to this previously assumed model. (It is precisely this vision that I emphasize in my work [146] regarding the interpretations of previous experiments in the history of science).

Be that as it may, the results of the experiments themselves can be of interest and contribute to the further development of thoughts in this direction and either confirm the hypothetical assumptions of P. Dirac, or show what the true state of affairs is and what the sought-after magnetic monopole looks like.

The discovery by researchers that the material called manganese germanide (MnGe) has a unique periodic structure formed by special magnetic configurations of "***hedgehog***" and "***anti-hedgehog***" involuntarily suggests the idea of a change in the phases of oscillations.

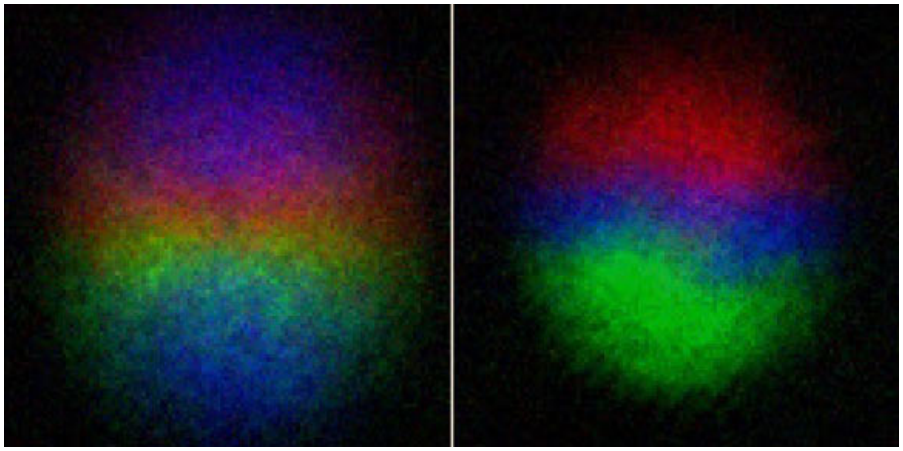
In special configurations called magnetic hedgehog lattices, the magnetic moments are directed radially outward (hedgehog) or inward (anti-hedgehog), resembling the needles of a hedgehog. Experimenters believe that these hedgehogs and anti-hedgehogs act as magnetic monopoles and anti-monopoles, acting as sources or sinks of emerging magnetic fields.

In my opinion, the situation with "hedgehogs" and "anti-hedgehogs" is most likely an analogy to the situation with neutrino-antineutrinos, which today are already understood as different phases of oscillation of **one micro-object**. And if one object looks like a "hedgehog" and the other like an "anti-hedgehog", then it is logical to assume that the opposite pole is simply in a "shrunken" state. When observing such objects at low temperatures the lattice acquires a

different phase state and demonstrates an effect in which duality acquires a phase in which one of the poles of duality simply "shrinks", that is, similar to how in nature a hedgehog curls up with its needles outward. The process of "shrinking" sounds much more real than the imaginary unipolarity in the absence of the second pole.

The "hedgehog-anti-hedgehog" structure is an interesting finding that can suggest that the monopole structure has its own phases of opposite oscillations, during the execution of which such a process of "shrinking" is observed, when the monopole demonstrates outwardly only one of its poles, and, turning inside out, the second.

In my opinion, the indicated turning of the monopole inside out, similar to the phase transformations of neutrinos into antineutrinos, is quite clearly demonstrated in the experiment [106] – what was the internal part becomes the external and vice versa.


[106]

Indeed, and P. Dirac spoke about this, the idea of a magnetic monopole is too elegant not to be used by Nature itself. The question is in the **form of this elegance**. I believe that the form of the wave curvature of the Mobius strip can fully satisfy the criterion of both physical and mathematical elegance. This geometric form combines both natural symmetry and mirror asymmetry.

The fathers of quantum mechanics were looking for this combination of symmetry and asymmetry. Also, based on this geometric form, one can illustrate the form of a quantum phenomenon, explain charges and charge quantization, show the formation of an atom, the basic interrelations in it, and give many other explanations, among other things. These questions and related to them are considered in more detail in the work "***3. Basic Element of Nature. Mobius Geometry. Gravity. Model of the Atom***".

After analyzing the experiments, we will continue to consider the magnetic monopole in the proposed format of the Mobius ring. It is possible to express confidence that the representation of the initial magnetic loop, in other words, the magnetic monopole in the geometry of the Mobius ring with one inversion gives quantum electrodynamics that missing image, which helps to explain a number of phenomena, and can also provide a significant simplification of algebraic calculations.

I believe that the arguments I have presented regarding the presence of a magnetic monopole in nature as a fundamental substantial unit, its structure as a universal template for the generation of baryonic matter, its consideration as the initial magnetoelectric circuit, its property of preserving its infogenetics in the process of transformation and the method of generating

matter through the bifurcation and doubling of the InfoGenome, are those arguments that open up those horizons for scientific thinking that, for a number of objective reasons, were out of sight.

The shape of the Mobius magnetic ring essentially determines the **shape of the quantum phenomenon**. The quantum emitted in the process of reconnecting such a magnetic loop is a single discrete portion of radiation, repeating the shape of the emitter, i.e. closed through inversion and obeying the laws of hydrodynamics. Transformations based on such a quantum unit in the etheric medium will be its phase transformations, which in the process of fibration create **topological knots**.

The geometric shape of the Mobius inversion is a blade-like curvature, which in the process of cycle rotation forms a screw path capable of capturing and ejecting portions of magneto-plasma – energy quanta. Also, such a geometric wave form can be connected with the concept of a topological soliton.

In 1974, Gerard 't Hooft and Alexander Polyakov independently discovered that the existence of a magnetic monopole is not only possible, as hypothetically predicted by Dirac, but also obligatory in a certain class of field theories.

In theoretical physics, the **'t Hooft–Polyakov monopole** is a ***topological soliton*** similar to the Dirac monopole but without the Dirac string. It arises in the case of Yang–Mills theory with a gauge group associated with the Higgs field, which spontaneously splits it into a smaller group via the Higgs mechanism. It was first independently discovered by Gerard 't Hooft and Alexander Polyakov.[159], [160] Unlike the **Dirac monopole**, the 't Hooft–Polyakov monopole is a smooth solution with finite total energy.

In this undoubtedly important achievement of theoretical thought and the mathematical apparatus of algebra, the **magnetic monopole** appears in a certain case of the Yang-Mills theory as a **mathematical virtual entity**. Its physical visualization is associated with a topological soliton. In turn, the term "***topological soliton***" (a soliton with a non-trivial topological characteristic – a topological charge) is commonly used to denote topologically non-trivial solutions with finite dynamic characteristics in field theory (kinks, monopoles, instantons, skyrmions, etc.), and for the model description of stable inhomogeneous states (localized structures) in condensed media: vortices, dislocations, disclinations, domain walls, point defects, etc.

Topological charge, in turn, is a formal characteristic of a dynamic system in essentially nonlinear models describing extended localized structures (kinks, monopoles, vortices, solitons, instantons, etc.) in theories of elementary particles, condensed media, magnets, and others.

And if we give one of the examples of “a visual illustration of the kink of the sine-Gordon equation using an elastic strip laid along the X-axis and characterized at each point of the axis by the twist angle (deviation from the equilibrium position of the edge of the strip) j(x) (**Fig. 2**, a), then if we define the function j(x) continuously in the case of a strip of finite length 0<=x<=l and impose periodic boundary conditions $\varphi(0)=\varphi(l)=\varphi_0 (\mathrm{mod}\, 2\pi)$, i.e. identify the ends of the strip with an accuracy of up to 2p-fold rotation, then as a result we obtain a closed strip.

If, before identifying the ends of the strip, we rotate one of them by an angle of 2p relative to the X-axis (for example, clockwise), then after closing the strip will contain a "twist" - a kink that cannot be eliminated without breaking the strip, i.e. it will be preserved throughout the subsequent evolution of the strip (**Fig. 2**, b). To create a 2-kink state in a strip, one of its ends (before identification) should be rotated by an angle of 4p (**Fig. 2**, c), etc.

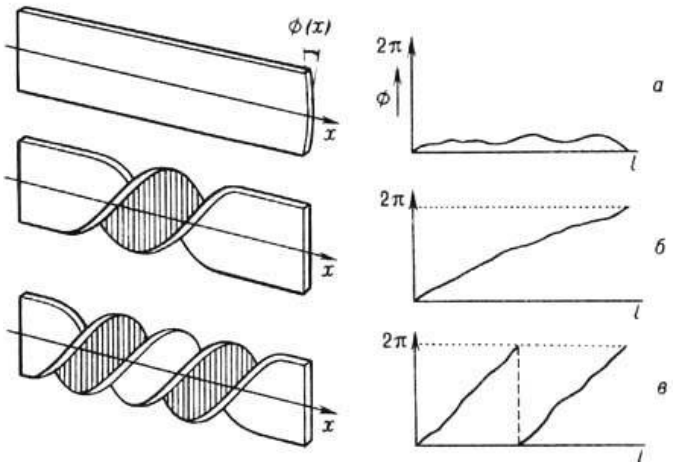


Fig. 2. States of a strip and the corresponding changes in the function f(x):
a – a topologically trivial strip with small deviations from the equilibrium position;
b – a strip containing a 2p-"twist" kink;
c – a strip containing a 4p-"twist" – a 2-kink." [161]

This mathematical example is given to show that the chain of mathematical concepts of "***topological charge***" and "***topological soliton***", with which the concept of "***magnetic monopole***" is associated, steadily lead to **Mobius torsion**, as illustrated in **Fig. 2** [161].

The above once again demonstrates that the format of Mobius Geometry, starting from the original Mobius strip, is a guiding thread in reasoning about natural phenomena and the key to understanding and formulating physical concepts and laws.

I believe that the logic of the Mobius Geometry format and the accompanying illustrations will clarify many difficulties in questions of theoretical physics and lead to significant simplifications.

In this regard, it is worth recalling the fact from the life of B. Mandelbrot that he even solved algebraic problems using a geometric method. And sometimes the geometric solution has the simplicity that is necessary for algebra.

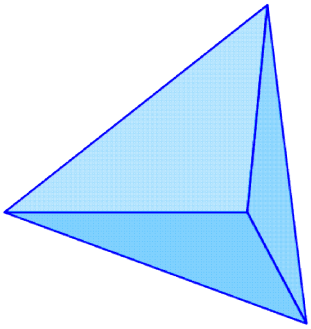
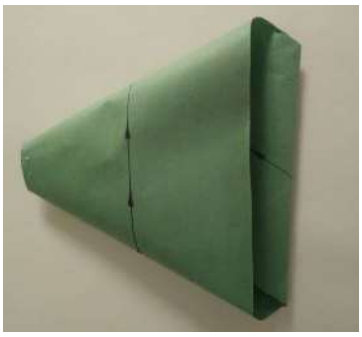
Let us note the significant fact that all conclusions regarding the magnetic monopole are made on the basis of the apparatus of algebra. To date, I have not come across a single theoretical proposal that would offer a geometric solution for representing a magnetic monopole and thereby visualize its structure.

Thus, the proposal of a magnetic monopole in the format of Möbius geometry **geometrizes** its representation, and, as a consequence, gives a description of its **quantum mechanics** and **magnetoelectric properties**.

The illustration below shows a contracted Mobius strip **(1)**. Its configuration in the language of electromagnetic phenomena is **a topologically closed single (solitary) magnetic wave**, preserving its shape due to its magnetic nature. Its streamlined wave form, caused by inversion, is in some way close in its configuration to a geometric figure – a **tetrahedron (2)**.

Also, if it is flattened, then the geometry of three interconnected triangles is formed **(3)**, which was once studied by P.A. Florensky and connected with electrical engineering. [147]

The geometry of these triangles also has direct relevance to the theoretical question of **quarks**.

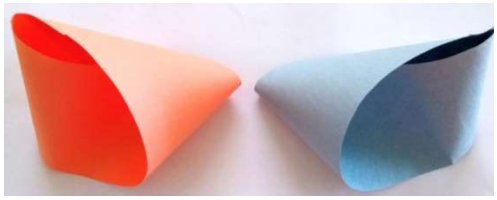
(1) ; (2) ; (3) 

As already mentioned above, the Magnetic Monopole, represented by such a Mobius strip, is the **original** form of the **quantum phenomenon**, which mediates **discreteness**.

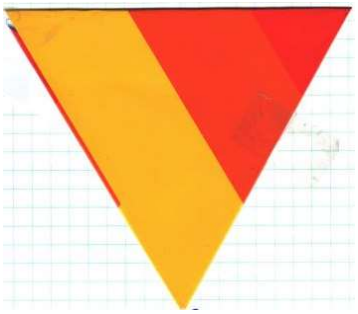
The natural essence of the topological interrelation in the original Mobius Pattern with one turn (inversion) and its curved geometry generates a spatial difference in levels, a kind of gradient of potential difference, a torque with the formation of a magnetic property and a directed energy flow, followed by continuous and non-stop oscillations and the formation of vortex and wave-like movements. Vortex motions in combination with symmetry and mirror asymmetry will generate a number of associated phenomena such as precession, nutation and turbulence.

The combination of symmetry and mirror asymmetry in the geometry of the Mobius Magnetic Monopole is the natural duality that determines energy conversion when the law of conservation of energy is fulfilled, as well as energy convection. Being the basis of the atomic structure, such duality is the key to using both the energy of the atom and the use of geometric forms of magnetic materials to obtain a directed magneto-plasma current.

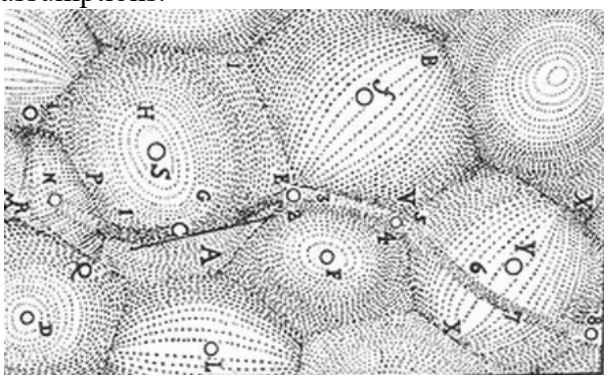
As can be visualized geometrically, such Magnetic Monopoles can be of right and left twist or right and left **helicity** (**chirality**).



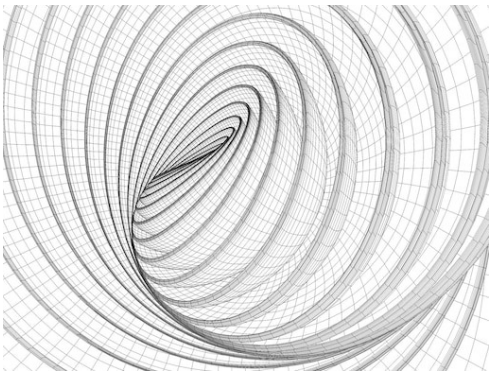
As can be seen below, the contracted Mobius strip is also a kind of **cone**. In a flattened state, such a **cone**, formed by a Möbius strip with a minimum aspect ratio, takes the form of three folded equilateral **triangles**. Geometrically, such conical cell formations in the form of wave-like triangles are laid out in regular **hexagons**. The illustrations below visualize this.

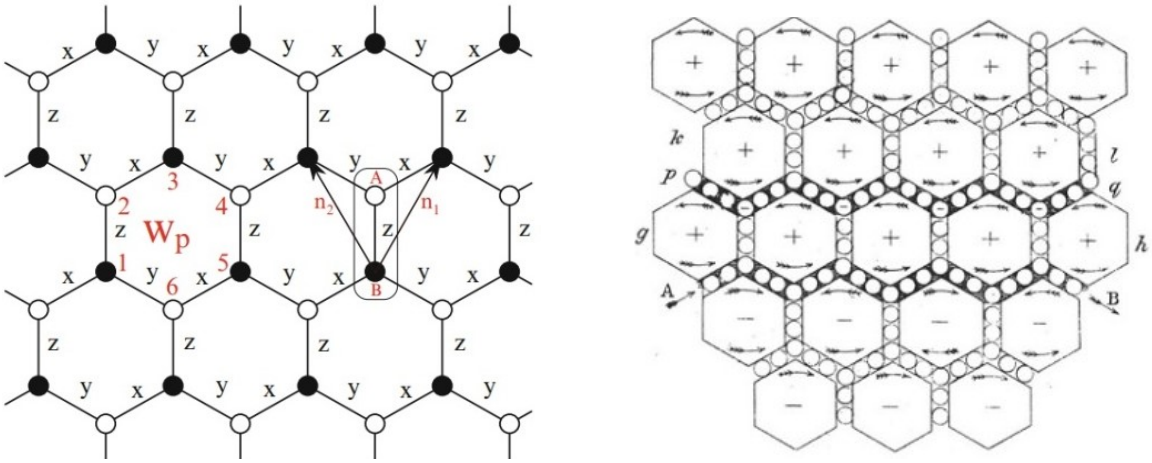

This can explain the fact that, when creating their models of ether, R. Descartes, J. Maxwell and our contemporary A. Kitaev modeled hexagonal structures in their theoretical assumptions.



Vortex structure of space according to Descartes.

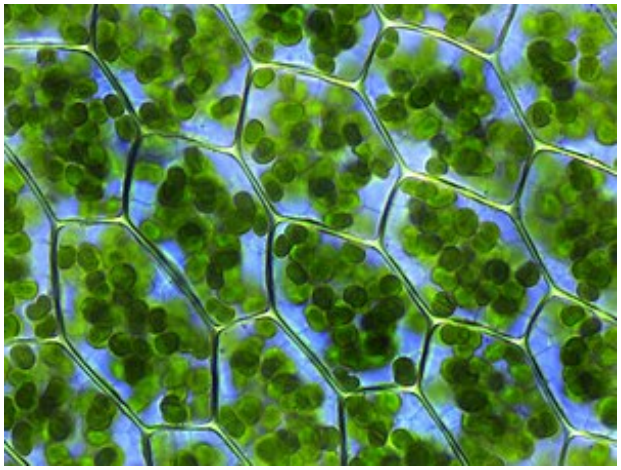


Vortex Mobius pattern.

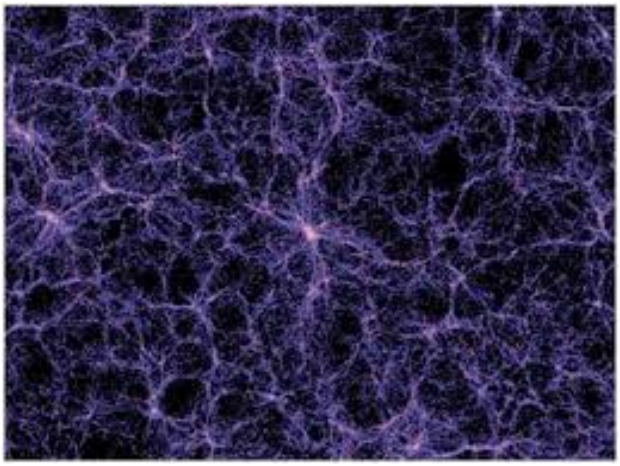


Scheme of the structure of ether by A. Kitaev and J. Maxwell.

As modern research data shows, biological cells and the Universe itself are laid out in hexagonal structures. All these structures are fractally identical.



Plant cells.



The structure of the Universe.

It is necessary to make some **summaries**:

1. Vortex-like movements are carried out in the language of the Mobius template, which is the source of continuous and non-stop oscillations based on magnetoelectric processes.

2. Due to the presence of non-stop oscillations/vibrations, the active etheric Quantum Medium, as confirmed by recent studies with granular materials, will have the property of a specific granular "***quantum liquid***", which is characterized by constant dynamics of vortex movements and is never in a state of motionless equilibrium. All processes in such a "***quantum liquid***" will obey the laws of hydrodynamics and will be similar to processes in water and air environments. Based on this, a dynamic medium with such properties and in accordance with the laws of hydrodynamics will constantly generate vortex ring structures that retain helicity.

If we draw an analogy between a vortex granule of the ethereal Quantum Medium and a vortex in a liquid, then the vortex clearly shows how deformation in the geometry of the medium can acquire its own identity, demonstrating stability and a number of properties that make the vortex formation a kind of "***quasiparticle***". The domain wall of the vortex ring, by its physical nature, provides a clear demonstration of the generation of a **separating membrane.**

3. By their nature, these dynamic vortex structures are sub-micro-carriers of magnetism, and the peculiar superfluid "quantum liquid" created by them, as noted above, will be etheric magneto-plasma.

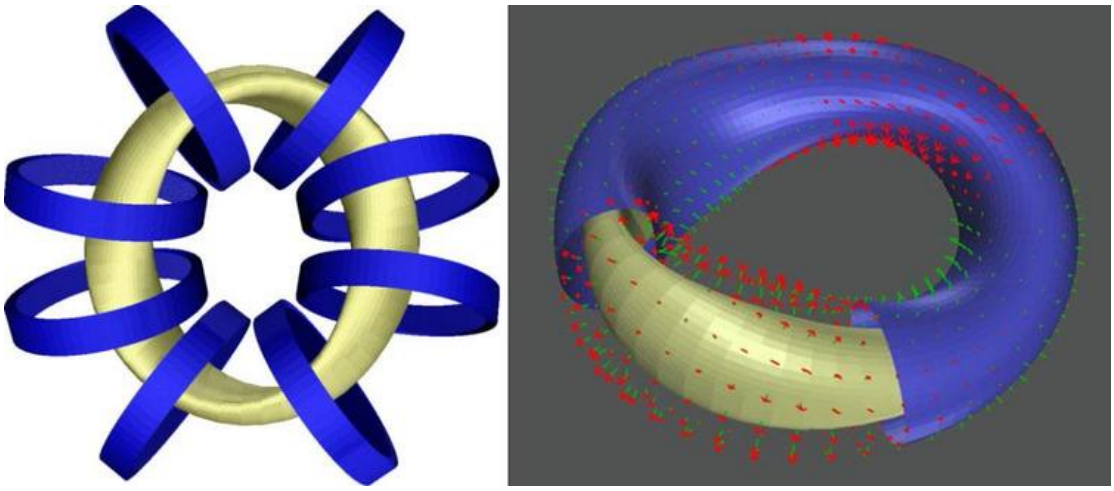
4. All outer space is permeated with living (breathing, oscillating) etheric magneto-plasma, which is a nutrient medium, and each object of the etheric Cosmic Medium, regardless of its level, starting from the micro-world of the atom, is in quantum energy-symbiosis with the etheric Medium, absorbing and emitting portions of magnetoplasmic quantum liquid. And in essence, each atom as a product of the eather is the converter of magneto-plasma, which transforms it according to its individual **quantum formula** of generation, initially embedded in it. Such different quantum atomic formulas create different states of matter and, accordingly, its properties depending on the algorithm of bifurcation/fibration.

For greater confidence in the correctness of the chosen vector of reasoning regarding the structure of the granules of the etheric Quantum Medium, as well as the structure of the ether as a whole, it is worth turning to experiments with magnetically confined plasma on stellarators and to theoretical proposals for their improvement.

Despite the fact that there are problems that hinder controlled fusion, such as imperfect magnetic confinement and associated plasma instabilities, stellarator experiments continue to improve in understanding the fusion process itself and its organization.

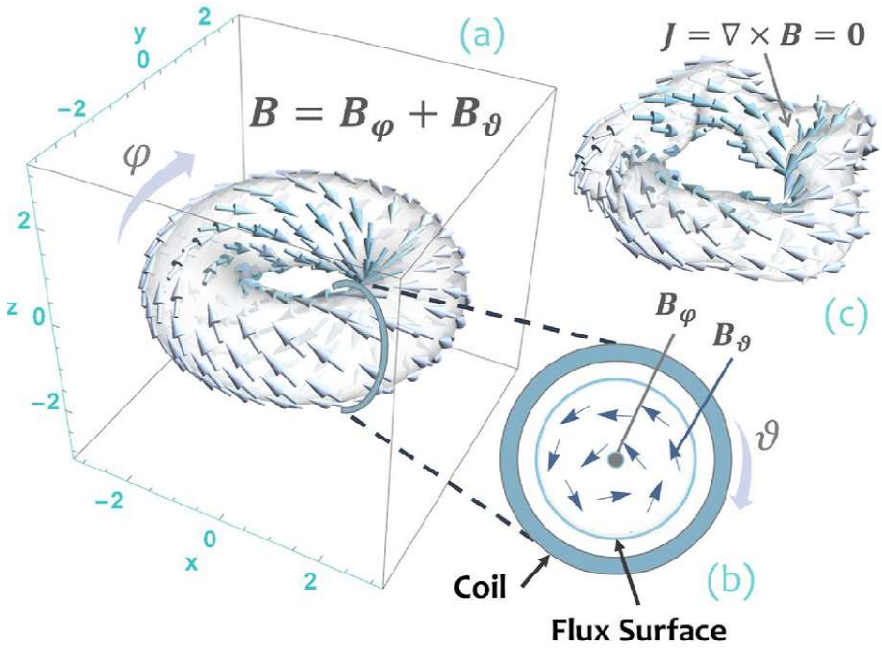
In March 2020, in their publication "***Stellarators with Permanent Magnets***" [137], the authors from the Max-Planck Princenton Center reported «that the magnetic-field coils of a stellarator can, at least in principle, be substantially simplified by the use of permanent magnets. Such magnets cannot create toroidal magnetic flux, but they can be used to shape the plasma and thus to create poloidal flux and rotational transform, thereby easing the requirements on the magnetic-field coils. As an example, a quasiaxisymmetric stellarator configuration is constructed with only 8 circular coils (all identical) and permanent magnets". [137]

A simple set of circular electromagnets, shown on left. The shaping magnetic field is produced by an array of permanent magnets. Each magnet creates a dipole field, which is represented by an arrow. The total magnetic field created is designed for optimal plasma confinement. (*Image courtesy of P. Helander, M. Drevlak, M. Zarnstorff, and S. C. Cowley, Phys. Rev. Lett. 124, 095001 (2020)* [137], Highlight publication available here]


[136]

In July 2022, in his publication "***Existence of weakly quasisymmetric magnetic fields without rotational transform in asymmetric toroidal domains***", Naoki Sato reported his theoretical proposals for the operation of stellarators based on quasisymmetric flows.

"A quasisymmetry is a special symmetry that enhances the ability of a magnetic field to trap charged particles. Quasisymmetric magnetic fields may allow the realization of next generation fusion reactors (stellarators) with superior performance when compared with tokamak design". [134]



(a) and (**b**): magnetic field configuration in an axially symmetric tokamak.
(**c**): Schematic representation of a stellarator: the confining magnetic field is asymmetric and entirely produced by external coils, implying that the associated electric current vanishes in the confinement region, JJ=∇×BB=00.
Figure created using Wolfram Mathematica 12.2 (www.wolfram.com/mathematica). [134]

Author underlines that the existence of such magnetic configurations lacks mathematical proof due to the complexity of the governing equations.

"We prove the existence of weakly quasisymmetric magnetic fields by constructing explicit examples. This result is achieved by a tailored parametrization of both magnetic field and hosting toroidal domain, which are optimized to fulfill quasisymmetry". [134]

"The goal of the present paper is to establish the existence of weakly quasisymmetric magnetic fields in toroidal domains by constructing explicit examples. The quasisymmetric magnetic fields reported in the present paper hold within asymmetric toroidal volumes, are smooth, have nested flux surfaces, are not invariant under continuous Euclidean isometries, and can be regarded as quilibria of ideal anisotropic magnetohydrodynamics". [134]

In February 2024, the authors of the publication "***Complete and robust magnetic field confinement by superconductors in fusion magnets***" [135] theoretically demonstrated how to create a fully confined magnetic field with the exact three-dimensional shape required by fusion theory. Due to the properties of the superconductor, the system will tend to maintain an optimal field distribution in response to instabilities in the plasma.

"We demonstrate how a fully-confined magnetic field with the three-dimensional spatial distribution required in two of the most advanced stellarators, Large Helical Device and Wendelstein 7-X, can be exactly generated, using simple round coils as magnetic sources. We argue that state-of-the-art high-temperature superconductors already have the necessary properties to be employed to construct the bulk superconducting toroid. The present strategy can lead to optimized robust magnetic confinement and largely simplified configurations in future fusion experiments". [135]

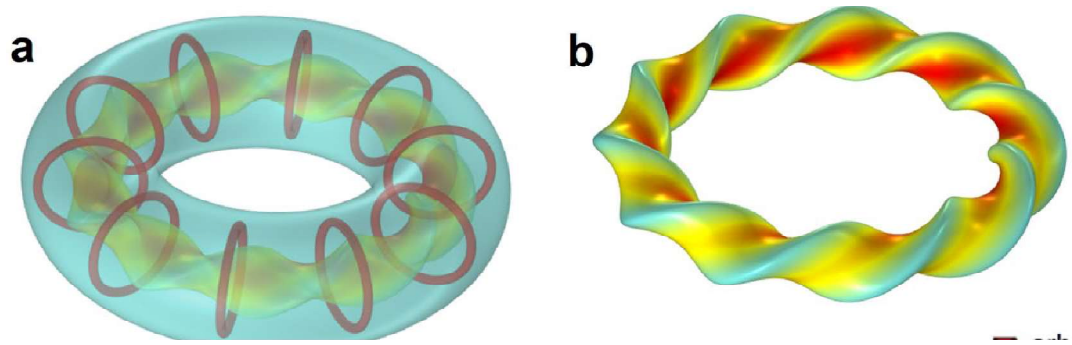


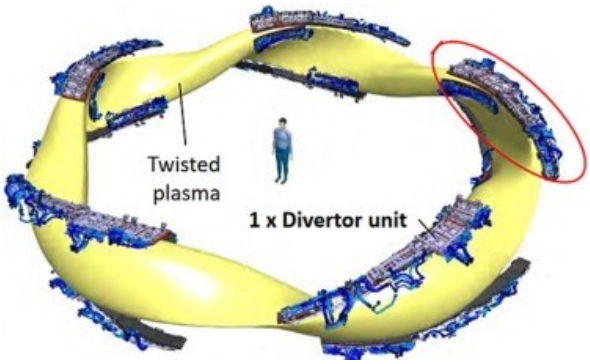
Figure 3. ***Generating magnetic flux surfaces like those in LHD experiment.***

(**a**) Finite-element simulations of the 3D color map of the magnetic-field strength created by a superconducting toroid with a toroidal cavity and 10 circular loops immersed in the superconductor, corresponding to the scheme of the LHD experiment.
(**b**) Created magnetic flux surface at the superconducting-air boundary in the cavity.

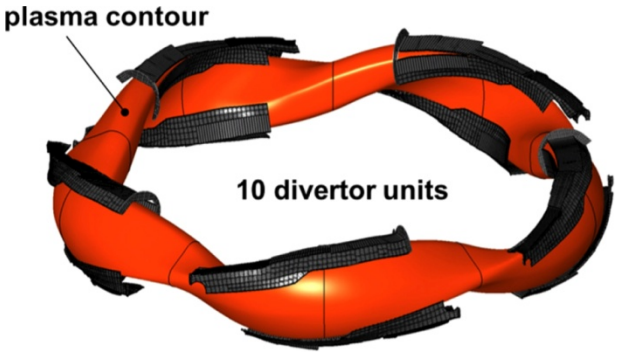
I have presented these three results of theoretical proposals in order to show that in order to hold plasma in stellarators using magnetic coils, its flows are formed in the form of a twisted "ribbon", i.e. according to the geometry of the Mobius strip. Such a geometric configuration allows using an external magnetic field in a continuous mode. Its lines of force undergo a

rotational transformation, as a result of which they repeatedly go around the surface of the torus of the equipment and form a system of closed and nested toroidal magnetic surfaces, which allows holding the plasma and maintaining its stability.

If we now compare these results with the proposed explanatory paradigm of the structure of the etheric Quantum Medium and its units with one twisted blade (Mobius strip), then the fractally identical parallel becomes obvious – this blade provides the same effect of holding magnetoplasma within the helical vibration. Thus, on stellarators the scientific and engineering community essentially reaches the same structures that Nature itself uses. Illustrations of theoretical proposals, in which plasma flows are depicted as Mobius twists, as well as their practical implementation using stellarator equipment, speak for themselves.



[138]

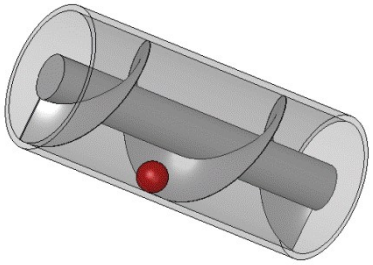


[139]

In my works, speaking about the configurability of loops of etheric magneto-plasma based on the Mobius toric loop and the principle of their torsion, I give as examples those parallels where this same principle is used in technical embodiments, in order, firstly, to demonstrate clarity, and secondly, to point out the fact that this principle has long been known and is used in technoGenetics for various purposes.



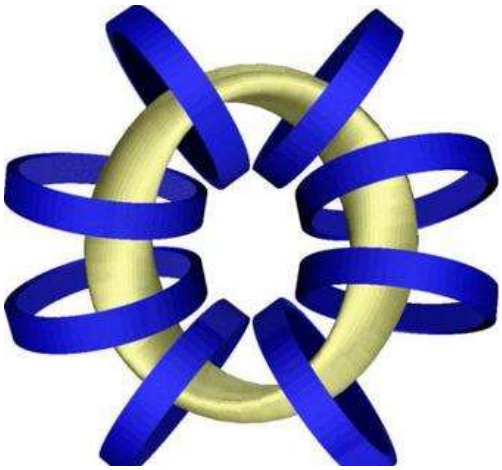




The use of the same principle on stellarators speaks in favor of the fact that, no matter how you twist your mind, we draw ideas from the Ether by twisting thoughts and come out man-made to the same structures that have already been used in the Natural basis of the structure of the World Order. And there is nothing else. We are given to know them and implement them in life.

I would also like to offer two illustrations for comparison. One of them (1) is made by hand and taken from the source [140], and the second (2), already given above, is taken from the source [136], [137].

(1). 

(2). 

The author of the illustration (1) is an independent researcher who studies the Mobius loop and its application in electrical engineering. In his illustration, he depicted ring magnetic lines around a sinusoidal energy current inside them.

The authors of the illustration (2) study plasma and stellarator operation at the Max-Planck Princenton Center. In the illustration, the magnetic coils are blue and the sinusoidally wrapped plasma flow is yellow.

The illustrations demonstrate complete identity. This should emphasize that, independently of each other and researching in different directions, the researchers came to identical structures. These structures originate in the configuration and properties of the unit of the Ethereal Quantum Medium discussed in this work and which is a Mobius Magnetic Monopole.

If we understand the properties of such a natural Magnetic Monopole and understand how Nature synthesizes atomic elements from it, then new solutions for stellarators and tokamaks will be found. The revelation of secret of this synthesis begins with the revelation of the secret of W. Pauli's phrase: "***Bifurcation and reduction of symmetry***!"

The process of bifurcation/fibration of the magnetic loop is discussed in detail in subsequent works, indicated in the list at the beginning of this work (**2, 3, 4**).

Here we continue about Mobius Magnetic Monopole (MMM), because if its physical essence and properties are understood, then from this will come the understanding of the physical essence of everything else, including the synthesis of atoms.

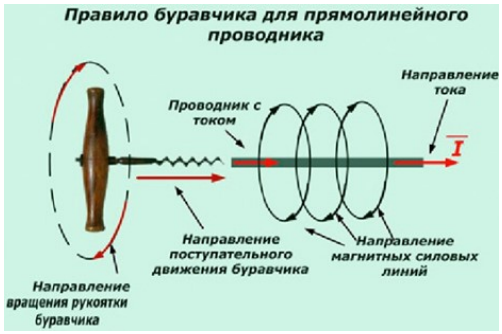
The magnetic field of the Mobius Magnetic Monopole is NOT radial. And the magnetic monopole cannot be represented as a **unipolar unit** or as a separate pole.

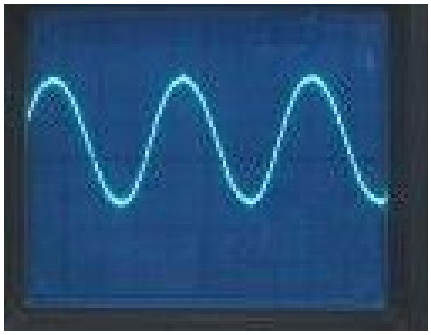
The very concept of "***polarity***" as the embodiment of the principle of complementarity in magnetism contains **undivided duality** – "two in one".

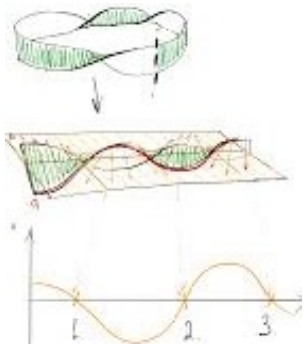
The magnetic lines of the Mobius Magnetic Monopole are directed in a spiral around the line of the Mobius Curvature, which with its sinusoidal bends with a change in the phases of oscillations indicates the direction of movement of the energy current inside the spirals of the magnetic lines. That is, both the magnetic lines and the energy current inside them have a sinusoidal or, in other words, a spiral configuration.

And on each small segment of the curvature line, which can be conditionally taken as a straight line, neglecting the curvature, the "corkscrew rule" is fulfilled as a mutually perpendicular interrelation between the direction of the magnetic lines and the energy current. In

this case, the "corkscrew", indicating the rectilinear vector of the direction of the energy current, has a sinusoidal Mobius curvature as the nature of the movement of the magnetoplasm flow.







The Mobius Curvature Line reflects inverse phases, which are expressed on the plane by a sinusoid.

The "***corkscrew rule***" indicates the interrelation between the direction of magnetic lines and the direction of the energy flow. Their directions are mutually perpendicular. But both magnetic lines and energy flow follow a sinusoid (helically) and their configuration interrelation corresponds to the geometry of "***Clifford parallels***".

The geometric interrelation of magnetic lines and energy flow represents one single phenomenon that underlies the universal mode of movement that.

“The driving force of the evolution of the Universe is sex, represented in general by two Principles – Magnetic and Electric, and in biology by the Female and Male sexes. The magnetic and electric fields are completely identical to the Female and Male Beginnings. The connecting link between the two Beginnings is the space Medium.” [162]

Based on the logic of the aspects covered, I have concluded that the vortex modes described by me in the form of a Mobius ring and as a sub-micro-form of the microcosm precede the microparticles that we call ATOMS. And, as has already been shown, by their nature these sub-micro-forms are magnetoelectric monopoles, in which magnetic duality has an exclusively internal property, creating a process of internal self-motion-oscillations (spinning).

Let us summarize the main provisions put forward.

Mono-polarity means a certain geometric form of closure of polarities in antiphase inside a complementary mono-structure, which is **dual** in its internal essence.

The geometry of closure through an inverse turn mediates the vortex and twisting nature of motion, and also determines precession, nutation and the presence of turbulence. Polarity closed in antiphase creates a mode of constant magnetic reconnection with the generation of quanta, which in the current paradigm are usually called electricity. In the current period, one can get acquainted with the results of a series of experiments on the study of magnetic reconnection processes in plasma. [45], [46].

Topologically closed vortex magnetic monopoles, although they are essentially sources of magnetism, remain externally magnetoelectrically neutral. The monopole state of etheric granules can be considered the state of matter whose magnetic field can be classified as not having multi-manifestation, concentrated inside and identically equal to zero outside.

This shows that the so-called "***dark matter***" in the current paradigm of physics is an etheric "invisible" monopole state of matter that does not enter into magnetoelectric interactions and is not accessible for observation and recording by technically manufactured equipment.

All particles in nature are magnetic dipoles, i.e. they have magnetic bipolarity. The unit of the etheric medium – the magnetic monopole – is not a particle characterizing the property of matter. It is a monopole basis for the generation of matter, in other words, a **sub-micro-seed element of magnetism**.

The concept of "**Magnetic Monopole**" is the most important in matters of the formation of an atom and the functioning of its mechanism. And in its essence, it is a fundamental question underlying EVERYTHING.

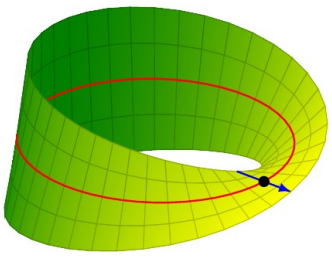
As a result, it is shown that the etheric magnetic monopole in the geometry of the Mobius strip (**MMM** or **MMEP**) described in the author's monograph [36] is the sought-after natural monopole unit, on the basis of which it is possible to explain quite clearly continuous oscillations, the minimum charge, geometrically illustrate the quantization of the charge, its multiplicity to the minimum calculated one, as well as the structure of the basic element of nature as a derivative of a monopole in the **universal method of self-copying** – **fibration**. In turn, the basic element acts as a "unified theory for the physics of the "proton-electron" together", as it was once designated by Nobel laureate W. Heisenberg.

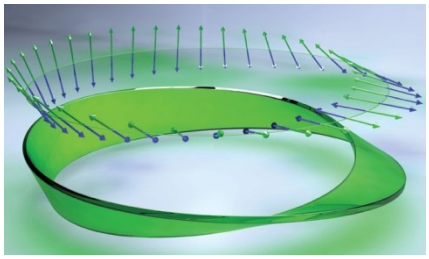
These issues are covered in more detail in work "***3. The Basic Element of Nature. Mobius Geometry. Gravity. Model of the Atom***".

It is the representation of the magnetic loop in the geometry of the Mobius ring that gives quantum electrodynamics the missing image that helps to explain, and then simplify or correct the results of interpretations obtained on the basis of algebra.

Visualization of the unit of the etheric Quantum Medium using the Mobius strip allows us to draw a conclusion regarding the **vector potential of the magnetic field**, which was originally introduced by J. Maxwell as an abstraction that makes it convenient to solve equations. Once again, it is worth recalling the prototypes of etheric units – the dynamic "vortex-wheels" of J. Maxwell and his model of ether.

The unit of the etheric Quantum Medium in the form of a dynamic topologically closed magnetic loop (Mobius strip) shows that it is not a mathematical abstraction of the vector potential, but, as can be seen from the illustrations below, the vector potential of the magnetic field in such an element takes the form of a specific physical content and becomes a material entity that determines the vortex nature of magnetic fields and the ability to interact with the current structures of magneto-plasma.


[182]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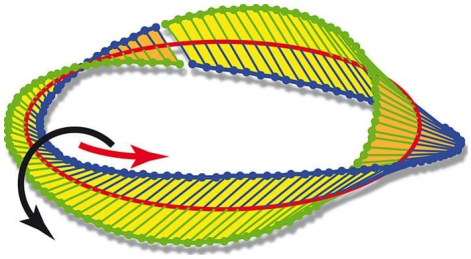
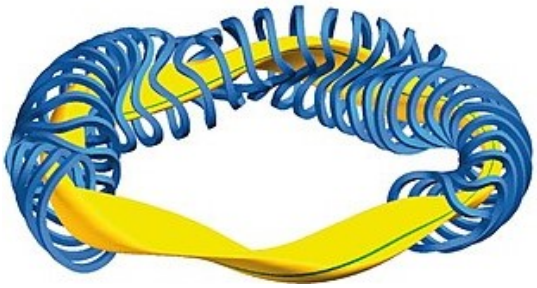
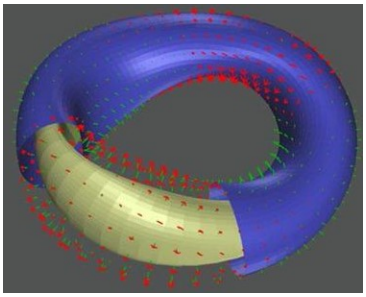

[183]

The vortex nature of the magnetic field is represented by a Mobius spiral, and the shape of the currents inside such a spiral has the configuration of a wrapped sinusoid. The fractal

parallel of this visualization is presented quite well below in the illustrations from publications devoted to stellarators.

 [Wikipedia],  [137]

I will cite from works on the coverage of issues of the vector potential of the magnetic field [184] and [185].

"The lack of a method for measuring the magnitude of the vector potential and the uncertainty of its connection with the work produced by the magnetic field have given rise to a wary attitude towards it in electrical engineering and radio engineering, which avoids the use of this concept. Meanwhile, it is precisely this potential that determines the force interaction of current-carrying systems. Moreover, it was introduced in his time by Ampere precisely on the basis of observing the force interaction in such systems. This potential is a consequence of the presence of additional degrees of freedom in the current-carrying system and is associated with the vortex nature of the magnetic field." [184]

"If we consider the covers of living objects of animal and plant origin as membranes that form gradients of the VP [vector potential], then we can assert that all living objects of the Earth are tuned (sharpened) to resonant interaction with the energy flow of the VP MEF [vector potential of the magnetic and electric field], penetrating the surrounding Space. The key ones are electric fields and their potentials." [185]

Thus, the original magnetic loop in the form of a Mobius strip or the Mobius Magnetic Monopole (**MMM** or **MMEP**) is a **quantum-mechanical unit** of the supporting etheric Quantum Medium, the initial magnetoelectric properties of which mediate all types of transformations and interrelations in them.

"... nature has found a way out in the organization of the living process – it is enough to construct one module, and then replicate it strictly according to the program stored in the genome." [79]

Based on the citation and everything said above, the Ethereal Quantum Medium is a self-reproducing structure based on the principle of complementarity, which mediates the universal method and dynamics of movement, as well as the universal method of generation through self-copying, which is the process of bifurcation/fibration.

One of the clear examples of the replication of this module into the plane of biology is the circulatory system and the heart itself. The illustrations given below allow visualization of the organization of the dynamics of the functioning of the cardiac muscle based on the reciprocity of the phases of the Mobius template.

Fig. LM 10 and **Fig. LM 11** show the same Mobius template in a flat and volumetric version.

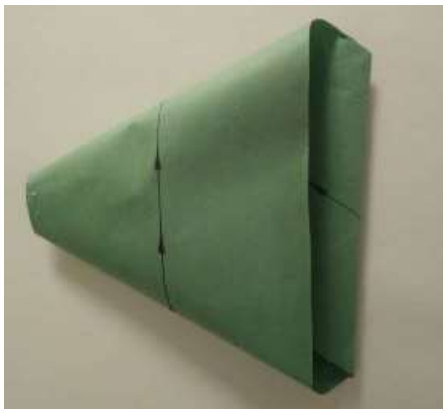


Fig. LM 10

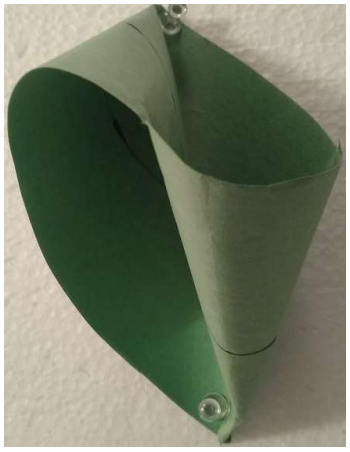


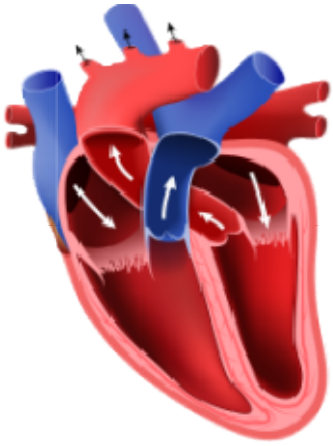
Fig. LM 11

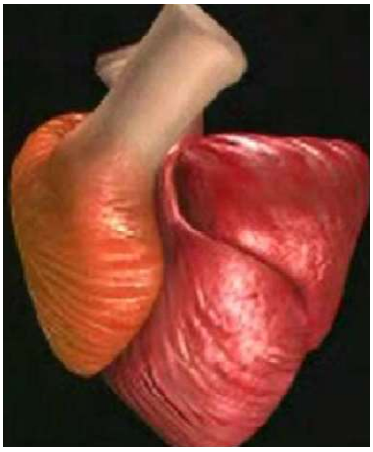
In **Fig. LM 11** it is easy to see the analogy of the MMM with the shape and structure of the heart, and also to understand how the basic principle of energy conversion is embodied in the cardiovascular system and how the heart muscle functions on the principle of the Mobius pattern.

For clarity, three illustrations are brought together below. The third (on the right) is taken from the developments of the leading researcher of the Federal Scientific Clinical Center for Sports Medicine and Rehabilitation of the Federal Medical and Biological Agency of Russia, Arutyunov Yu.A., who deals with medical issues and the mathematics of the Mobius strip. [178]

Arutyunov showed that the myocardium of the heart unfolds into a "thick curved-twisted" Mobius strip. He also described the application of the results of a study of transverse and longitudinal cutting of the Mobius strip in cardiac surgery and made a topological description of the cardiovascular system and a topological representation of the heart as a duplex sphere. The results of these studies have practical cardiac surgical significance.

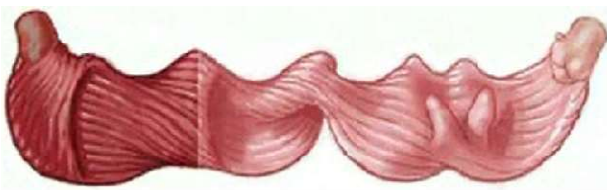


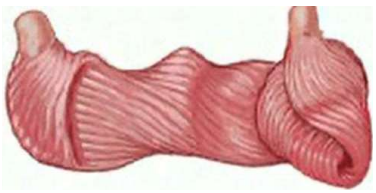


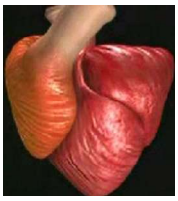


[178].

The photographs below illustrate the stages of unfolding of the heart muscle and its folding through the Mobius inversion. [178], [177]







This rather vivid example is given to show how the original InfoGen of complementarity is projected into the planes of being – in this case, into biology and the structure of the heart. The same mutually inverse circulation that occurs in the cardiovascular system in the process of biological respiration and blood circulation takes place in the process of quantum respiration of the MM Monopole in its symbiosis with the ethereal Quantum Medium. And the Quantum Medium is a matrix of such endlessly beating magnetoelectric “hearts”, both in a single sub-micro-variant and in a mega-collective variant, which function (beat) on the effect of antiphase reconnection with the release and absorption of quanta. [36], [177]

I place special emphasis on the fact that the Möbius inversion mediates the presence of two mutually inverse antiphase processes in one essential unit, which causes the simultaneous execution of the act of quantum absorption and quantum emission. In explanatory approaches using the "particle" format, this effect can have a corresponding explanatory description using the terminology of "particles", but this does not change the essence of the described mutually inverse process. The paragraph below from the work of Nobel laureate G. 't Hooft is quite indicative in this regard.

«One finds that space and time have exciting features. It was discovered that in-going particles exchange position operators with momentum operators, to turn into out-going particles.

Particles that enter the interior region, arranged in partial waves of energy and momentum, immediately re-emerge, with positions and momenta interchanged, as well as a switch in the arrow of time, while, most importantly, their quantum states remain pure, both for the inside observer as for the outside observer. The different partial waves do not mix». [25]

Since in the application of Mobius Geometry to the issue of the Quantum Medium the unit of the ether matrix – the monopole – is presented as a contracted Mobius strip with one turn and a minimum ratio of its length and width, I have paid more detailed attention to this geometry, which is essentially the original one.

I have proposed a method for the practical solution of the geometric problem of the minimum ratio of the length and width of a paper strip that can be folded into a Mobius strip. I have called this proposed method the "**origami twist" method**. It is quite simple and I propose to consider it, since the geometry and dynamics of the spinning of a monopole with its quantum breathing phases are of decisive importance both for the further logic of reasoning and for subsequent geometric constructions.

For a practical paper experiment, I took a strip of soft napkin 10 cm wide, without determining its length with a final numerical value. By folding it into a Mobius pattern, I achieved the degree of tightness so that all the lines coincided and there were no free spaces left. Then I secured this state with adhesive tape and flattened it, outlining the fold lines with a marker. I cut off the excess length of the tape and then unfolded the tape again into a strip, but of a finite length. The colored lines demonstrated the geometric constructions that need to be made to obtain its desired minimum length.

I suggest a sequence of these constructions. The best option for conducting an experiment is to take a paper tape 10 cm wide. **Fig. LM 1**

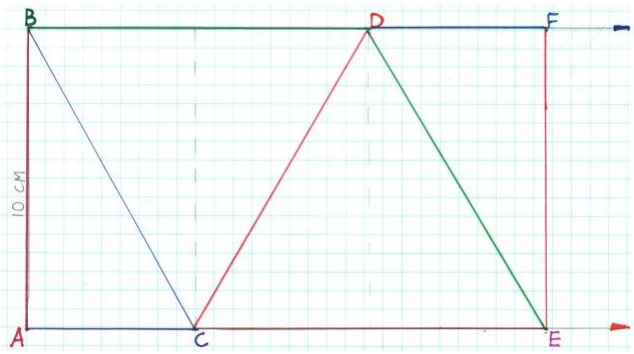


Fig. LM 1

Initially, there are no designated lines and dots on the strip of paper. It is just a strip of paper. I have applied these lines and dots as reference points, and they can also be used to give a clearer description of this method. But everyone can conduct their own "clean" experiment, starting with a clean sheet of paper. To get the Mobius strip, you need to turn it around and align point A with point F, and point B with point E.

Step 1. It is necessary to direct the angle with point E towards the angle with point B and at the same time the angle with point A towards side BF so that AC is aligned with CD and get the alignment of points AA` and BE`. **Fig. LM 2**

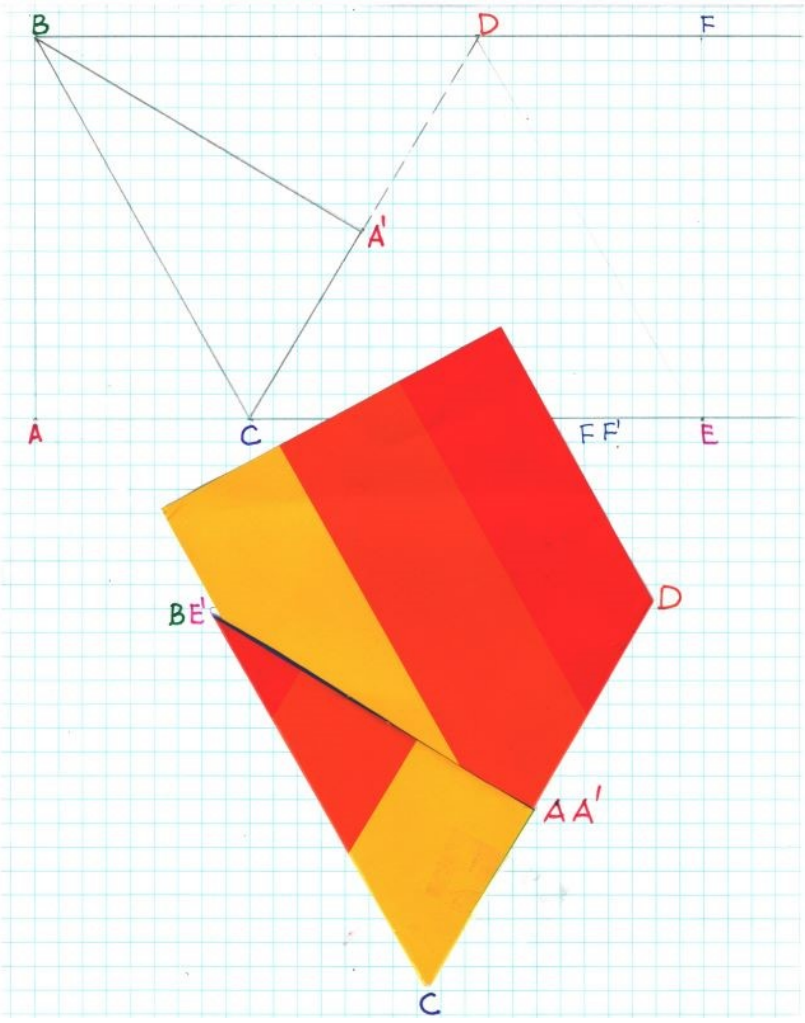


Fig. LM 2

Step 2. It is necessary to make a fold along the line (BE`)D and turn it over to the reverse side for convenience of the following actions. **Fig. LM 3** – fold, **Fig. LM 4** – turn.

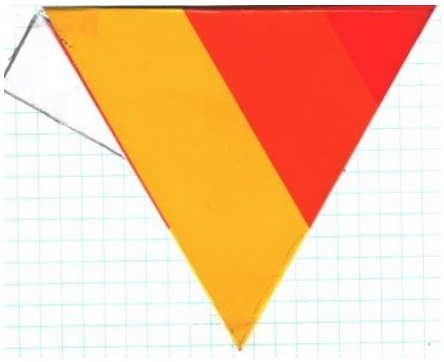


Fig. LM 3

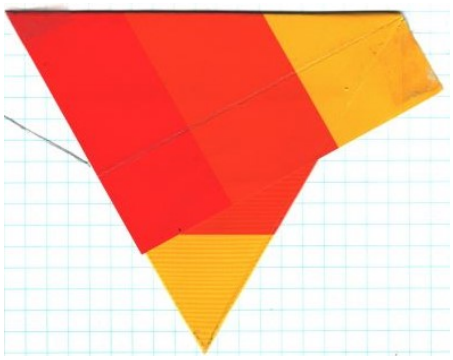


Fig. LM 4

Step 3. Fold the excess length as shown in **Fig. LM 5** and cut off. The result is three stacked equilateral triangles **Fig. LM 6.**

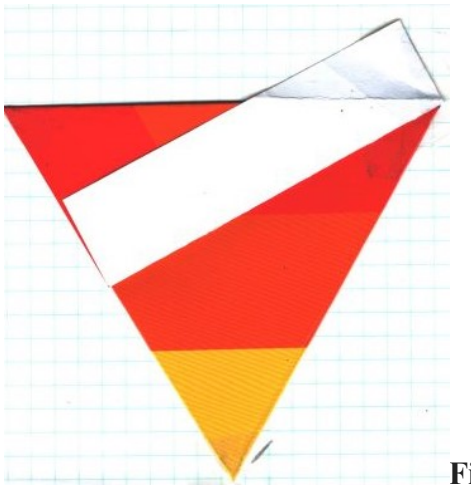


Fig. LM 5

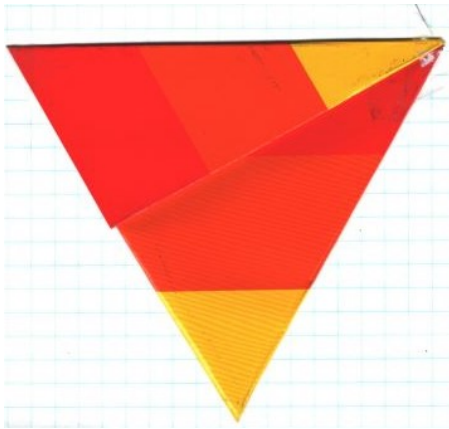


Fig. LM 6

Step 4. The resulting figure can be unfolded and re-folded as shown in **Fig. LM 7**, and then folded along the fold line CD. Three combined equilateral triangles are obtained **Fig. LM 8**.

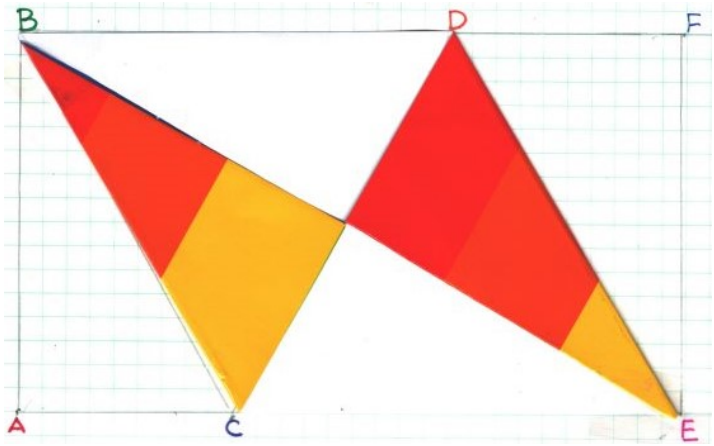


Fig. LM 7

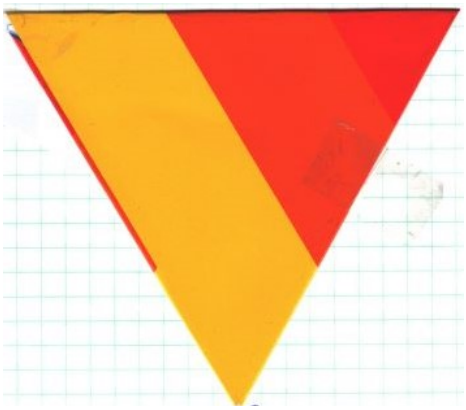


Fig. LM 8

Thus, the experiment demonstrates that the contracted Mobius strip folds into three equilateral triangles superposed on each other.

Algebraic calculations on the ratio of the sides of these triangles are simple. To do this, let us return to **Fig. LM 1** and consider its rearranged version **Fig. LM 9.**

Let's denote the side of the obtained equilateral triangles by a. BD=BC=CD=CE=DE= **a**. Let's denote the height BF`=EF` by **h**.

At the point of coincidence (A`F`) BE is perpendicular to CD and divides CD in half DF`= CA`= **a/2**,

BA`= EF`= h, h =AB=FE

According to the Pythagorean theorem, the square of h is equal to the square of a minus a/2 squared, which after calculations gives the value h = **a√3/2**.

AB=FE= h= a√3/2, AE=BF= a/2 + a = 3a/2

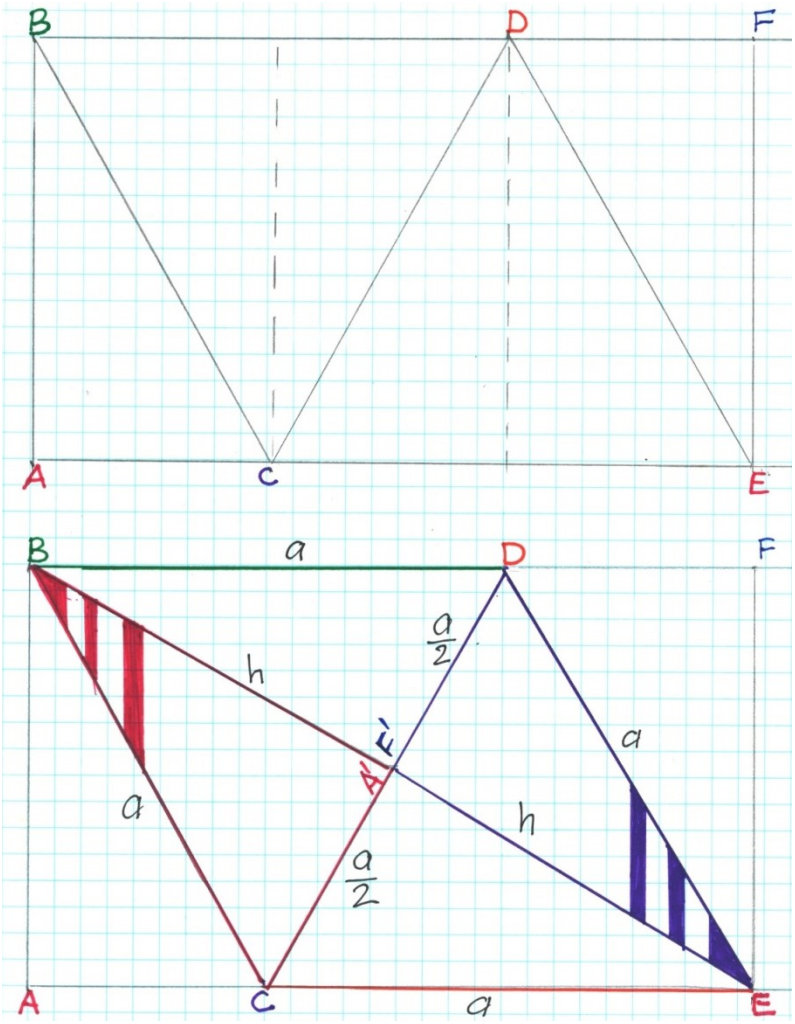


Fig. LM 9.

Hence AE/AB = 3a/2 : a√3/2 = √3 = **1.732**, which is the minimum aspect ratio of a paper strip (plane) that can be folded into a Möbius strip.

In the example shown, if the width of the strip is 10 cm, then its length must be 1.732 times greater than the width, that is, it must be 17.32 cm.

The problem of the minimum aspect ratio of a strip that can be folded into a Möbius strip was recently solved algebraically by mathematician Richard Schwartz, who claims that it must be greater than √3, or approximately 1.73. [121]. In the abstract, the author notes that he has proven the Halpern-Weaver conjecture.

«In this paper we prove that a smooth embedded paper Moebius band must have aspect ratio greater than 3–√. We also prove that any sequence of smooth embedded paper Moebius bands whose aspect ratio converges to 3–√ must converge, up to isometry, to the famous triangular Moebius band. These results answer the minimum aspect ratio question discussed by W. Wunderlich in 1962 and prove the more specific conjecture of B Halpern and C. Weaver from 1977». [121]

This was reported in *SIENTIFIC AMERICAN* **on September 12, 2023** [122], as well as in other sources.

"Until recently, researchers were faced with what seemed like a simple question: what is the minimum length of a strip of paper needed to create a Möbius strip without self-intersecting? The question was posed in 1977 by mathematicians Charles Sidney Weaver and Benjamin Rigler Halpern. Despite their conjectures, the scientists could not prove their theory.

Researcher Richard Evan Schwartz of Brown University solved the question by proving the so-called Halpern-Weaver conjecture. In his work, Schwartz showed that Möbius strips without self-intersections can only be created with an aspect ratio greater than √3 (approximately 1.73)." [122].

This is the same result as the practical **«origami twist» method** I used.

A paper experiment demonstrated a variant of ideal symmetry of folding the LM into three equilateral triangles. Now let us move this paper experiment to the plane of electromagnetism and return to the configurability of the Magnetic Monopole in the form of a contracted Möbius strip.

The Magnetic Monopole is considered as a magnetoelectric circuit. In this case, the combination of opposite sides is an analogy of bringing together opposite ends of a conductor through which an energy current flows. At some minimum distance of convergence (gap), a short circuit occurs in the form of an electric discharge, that is, magnetoplasma is released.

By analogy, we can say that in the Mobius magnetoelectric circuit, when antiphase flows approach each other, a reconnection of magnetic lines occurs and a quantum of magnetoplasm is released, after which the process begins anew. That is, in such a circuit, there is no final closure of its antiphase flows. Due to non-stop internal reconnections, the Magnetic Monopole carries out its continuous oscillations with a certain vibration level, in other words, it carries out the phases of its quantum breathing in a self-oscillatory mode. Perhaps this description is related to what Maxwell tried to describe in the **displacement current**.

If we return again to the paper experiment on the minimum aspect ratio, then we can say that this gap simply shortens the length of the tape and at some length, less than 1.732 (in the case of a single centimeter length), a gap remains and the process takes on a reciprocal character. What is the shortened length of the tape in this case and what is the gap left?

In this regard, I have made specific assumptions and proposed calculations. Let us return to the experiment of complete symmetry, which demonstrates the closure of the sides of the strip on the lines CD and BE, which is illustrated in **Fig. LM 7**.

Dynamics in nature is provided by asymmetry, which is observed everywhere in the form of the **golden section proportion**.

In the simplest mathematical example of a straight line segment, its symmetrical division assumes its division exactly in half. Its asymmetrical division is the division of the segment according to the golden section proportion.

The golden section is the ratio, the presence of which is observed and well studied in the structure of the animal and plant world, construction, architecture, painting. This is very clearly shown by the proportions of the human body – face, hands, ratios of limb sizes and others. The golden section can only take its source in the source InfoGenetics.

Therefore, for the formation of a self-oscillating mode in the magnetoelectric circuit of the MMM, the ratio of its parameters will contain the golden ratio according to the number **φ = 1.618**. In a paper experiment, this can be shown by constructing the golden section inside the geometry of the Mobius strip.

The difference between the abstract mathematical solution and how Nature acts to organize the self-sustaining dynamics of the process of generation and the Spiral of Life is **1.732 – 1.618 = 0.114**. Obviously, this difference determines the size of the supposed gap of non-closure. In the drawing according to the proposed geometry of **"origami twist** " it can look as shown in **Fig. LM 14**.

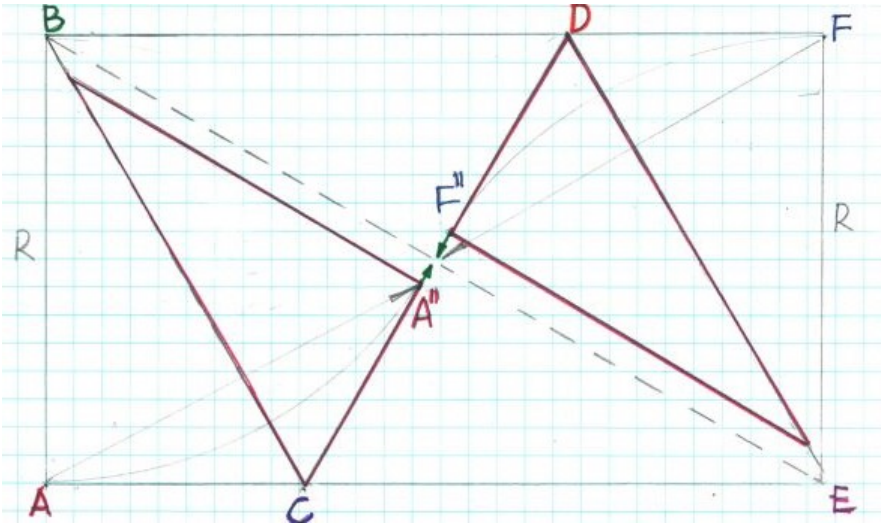


Fig. LM 14

Although this is a fairly abstract form of representation, nevertheless it helps to create a visual representation.

The golden ratio has not yet been specifically applied to the micro-world, however, the logic of reasoning suggests that in accordance with the **holographic principle** (G. t`Hooft), which lays the foundation of universalism in science, this source originates from the minimum physical unit of the universal hologram – the **magnetic monopole and its geometry** – and is then realized at each level.

I have made a construction that shows how the golden ratio within the Mobius Pattern connects symmetry and asymmetry through parametric relationships close to the values of known constants **π = 3.14**, **φ = 1.618** and the base of the natural logarithm **e = 2.71828**.

Inside the same paper strip base on which all previous geometric constructions were made, that is, on the basis of an unfolded Mobius strip with a minimum aspect ratio of 1.732, we will construct the golden section, as shown in **Fig. LM 15.**

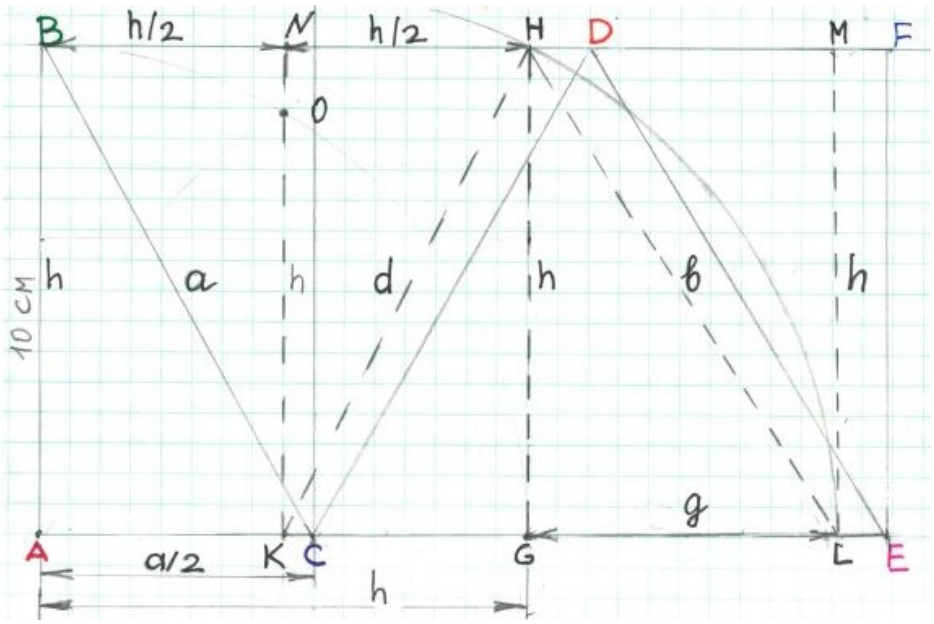


Fig. LM 15

Let's construct segments on the side AE, divided according to the proportion of the golden section.

Step 1. Based on the side AB = **h**, construct the **square ABHG**. Transfer the length of the side AB to AE using the compass solution. We get point G. Restore the perpendicular from point G and get point H.

Step 2. Divide AG in half, using the same compass solution and intersecting the arcs from points A and G at point O. Draw a dash-dot line perpendicular to AG and connecting points N, O, K. We have divided the resulting square ABHG into two equal parts.

Step 3. Draw a diagonal KH = **d** in half of the square and, placing the leg of the compass at point K, draw an arc from point H to the intersection with AE, getting point L.
KH = KL.

This method is known as the method of constructing the **golden section**.

The side **AL** is divided by the point G into two segments AG and GL, while the golden proportion **AL/AG = AG/GL = 1.618** is observed.

Let's connect the points H and L with a dash-dotted line, obtaining **HL = b.**

Thus, inside the unfolded Mobius strip with the minimum ratio of its sides √3 = 1.732, the golden section and the right triangle **HGL** with the ratio of its legs **h** and **g** equal to the number **φ = 1.618** are constructed.

As can be seen from the constructions **AE – AL = EL**.

The segment **EL** is the segment of non-closure and the "gap" that determines the process of quantum "***inhalation and exhalation***".

Let's consider the right triangle HLG with sides
HG=**h**, GL=**g**, HL=**b**.
Since we are constructing based on the previous ones, then
AB=FE= h= **a√3 /2**.
To simplify the calculations, we can take a = 1, then
h= **√3 /2**.

KL = KH= **d** by construction.
The square of the hypotenuse d of the triangle KNH is equal to the sum of the squares of the legs h/2 and h.
After summation and root extraction, we obtain
$d = h\sqrt{5}/2$
The value **$g = d - h/2 = h\sqrt{5}/2 - h/2 = h(\sqrt{5} - 1)/2$**
In the triangle **GHL**, the side HL= **b** is calculated using the Pythagorean theorem: the square of the hypotenuse b is equal to the sum of the squares of the legs **h** and **g**.
The entire sequence of calculations is shown in the illustration **Fig. JIM 16**.

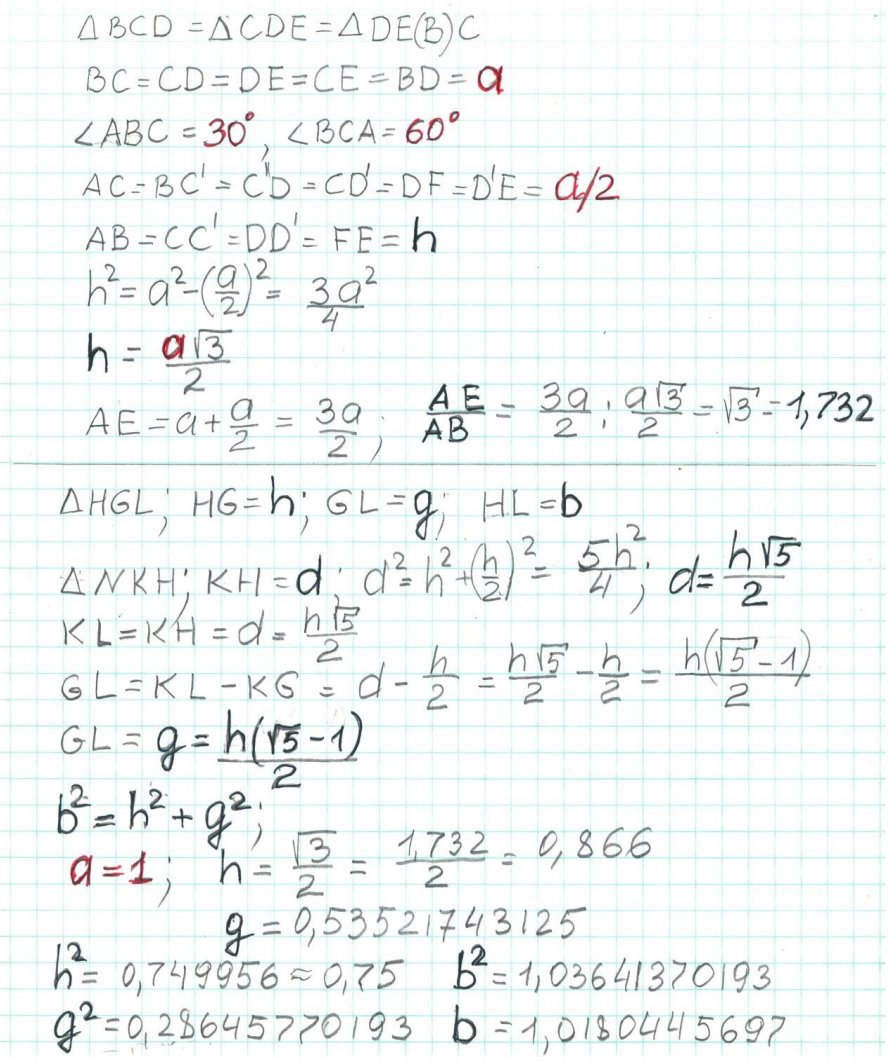


Fig. JIM 16

The sacredness of the triangle HGL, constructed on the golden section, lies in the fact that from a certain combination of the ratios of its sides **h, g, b**, quantities are calculated whose numerical values practically correspond to the constants: constants **$\pi = 3.14$**, **$\varphi = 1.618$** and the base of the natural logarithm **$e = 2.71828$.** The calculations are shown in **Fig. LM 17 (a,b)**.

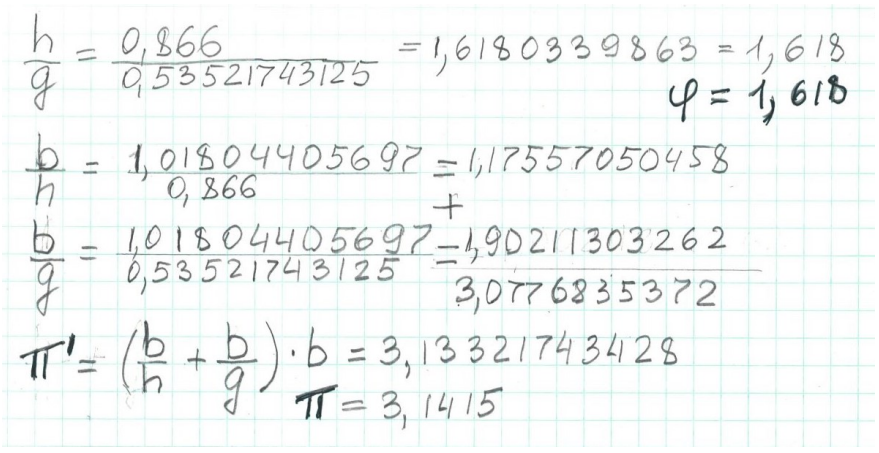


Fig. LM 17 (a)

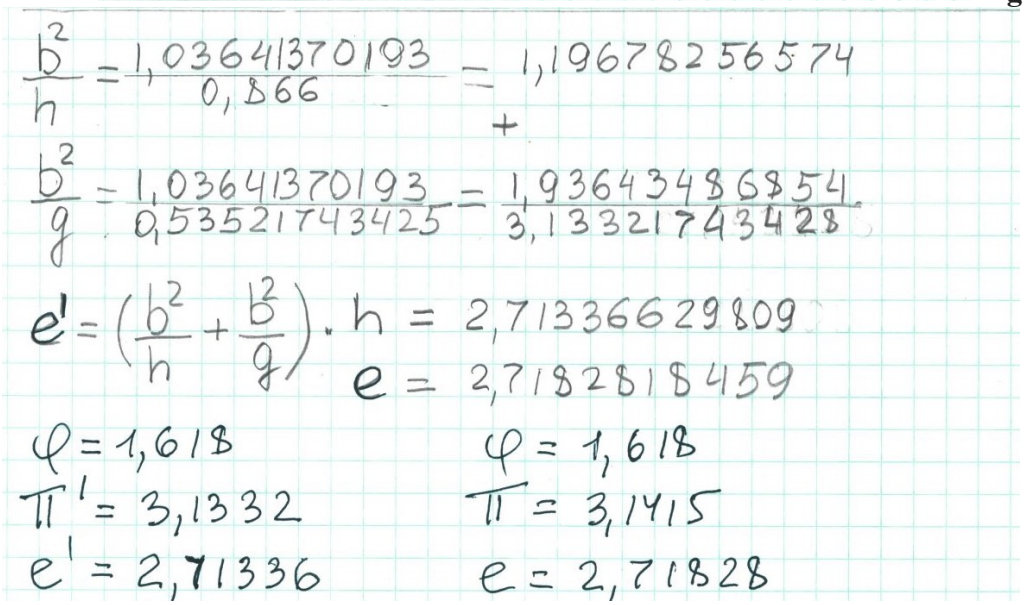


Fig. LM 17 (b)

In **Fig. LM 17(b)**, the calculated values are shown at the bottom left, and the well-known values of the constants are shown on the right.

I believe that there may be another combination of formulaic relationships of the sides of the HGL triangle that can yield more accurate results.

My task is to show, using simple mathematical calculations, that such exist and in a certain way connect the golden section, constructed within the geometry of the Mobius strip, with the dynamics of its quantum breathing and numerical values close to the value of the constants.

Each of the already known constants is associated with a specific geometry, reflects the interrelations in it and is calculated using a specific method. But there is a geometry that determines their mutual physical interrelation, creating a universal torsion dynamics.

Also on the illustration **Fig. LM 18** provides some comparisons to highlight the facts that the numerical values of the **minimum charge** and the **fine structure** constant without power factors have values close enough to the numerical values of the constants, which may indicate that their formation occurs “inside” the geometry of the MMM, due to a combination of symmetry, mirror asymmetry and the golden ratio.

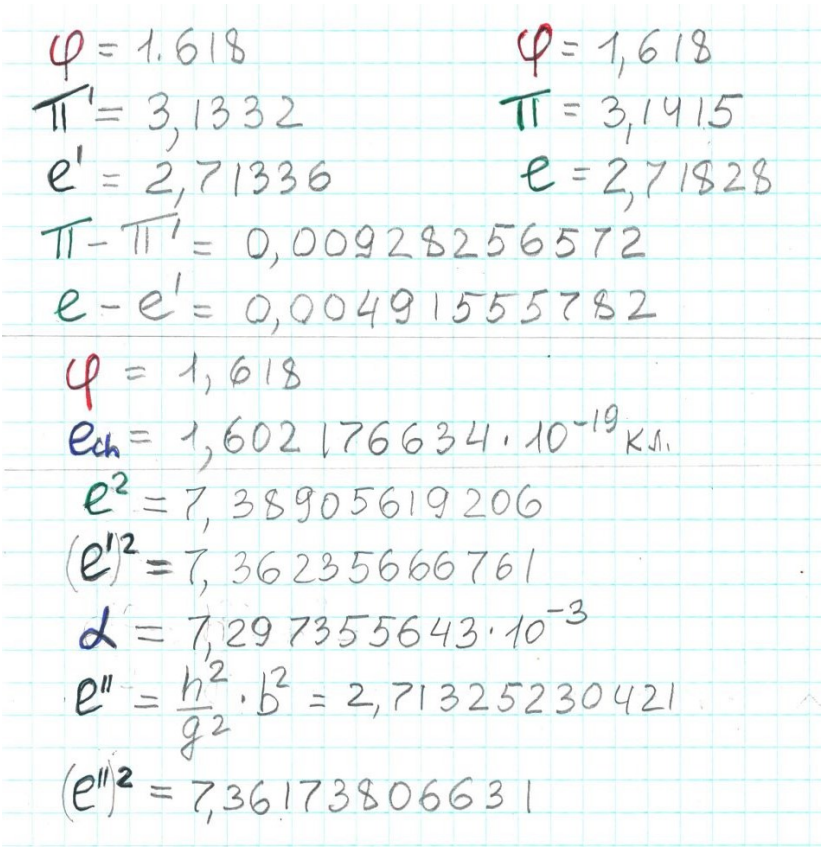


Fig. LM 18

In physics, the minimum value of the elementary charge is associated with the hypothetically predicted magnetic monopole and it is believed that based on its physical essence, one can obtain an explanation of the quantization of charges. Consequently, the value of the minimum charge is directly related to the structure and metric parameters of the magnetic monopole MMM. Based on this logic, if the parameters of the dynamics of the magnetic monopole are related to the golden ratio, then this ratio has a direct relation to the minimum portion (quantum) observed in nature. That is, the number φ = **1.618**, as shown in the construction of the golden section inside the Mobius template, plays a direct role in the formation of the quantitative value of the numerical value of the minimum charge.

And if the internal parameters of the Mobius Monopole include the number φ = **1.618**, then it will be relevant to the determination of the numerical value of the elementary electric charge – a fundamental physical constant as a minimal portion (emitted quantum) observed in nature, even if its exact value, which is **1,602 176 634·10^{-19}** C, was calculated exactly without including its relationship with the golden ratio. But if the charge quantization is determined by the proposed MMM metric, then the number φ is involved accordingly and this is a **fundamental law**.

The dynamics of movement are determined by the presence of the golden ratio in the organization of Nature. Such a ratio enables complications, which forms a fan-shaped structure of diversity in the method of multiplication and growth, which is observed at all levels of nature constructions. Such a combination has the property of ensuring the growth process. And it is the fan-shaped structure of the periodic table of chemical elements and the corresponding

multiplicity of the charge of each element to the minimum value observed in nature that indicates that the basis is a basic parametric interrelation, which is implicit in everything.

Thus, based on Mobius Geometry, the fact is logically deduced that the value of the minimum charge is associated with the proportion of the golden section, which is present in the parameters of the original magnetic monopole.

The property of chargeability itself is actualized and manifested in the process of bifurcation (fibration) of the Magnetic Monopole and doubling of its InfoGenome during its phase transition and geometric transformation into a Magnetic Dipole, while its hidden mono-polarity is transformed into manifested bi-polarity.

The aspect of charge and its quantization is covered in more detail in work "***3. Basic Element of Nature. Mobius Geometry. Gravity. Model of the Atom***".

Considering the geometry of the paper experiment, demonstrated by the "**origami twist**" method, it makes sense to show how this geometry is reflected through ancient symbolism. Below in the illustration **Fig. LM 12** is shown the same strip as in the illustration Fig. LM 1, Fig. LM 7, Fig. LM 9. Circles are drawn with a radius equal in size to the side of each equilateral triangle. As the constructions show, this geometry corresponds to the geometry of the well-known ancient symbol "Flower of Life", and the arcs along the line CD are the center of "Vesica Piscis".

In the symmetrical version of equilateral triangles, if the centers of the circles lie at the ends of the radii, the internal space of "Vesica Piscis" is not divided in the proportion of the golden section, as it is erroneously indicated in the book of D. Melchizedek "***The Ancient Secret of the Flower of Life Vol. 1***". [181] Nevertheless, the idea is correct in that this proportion is present somewhere in this scheme, which is discussed above.

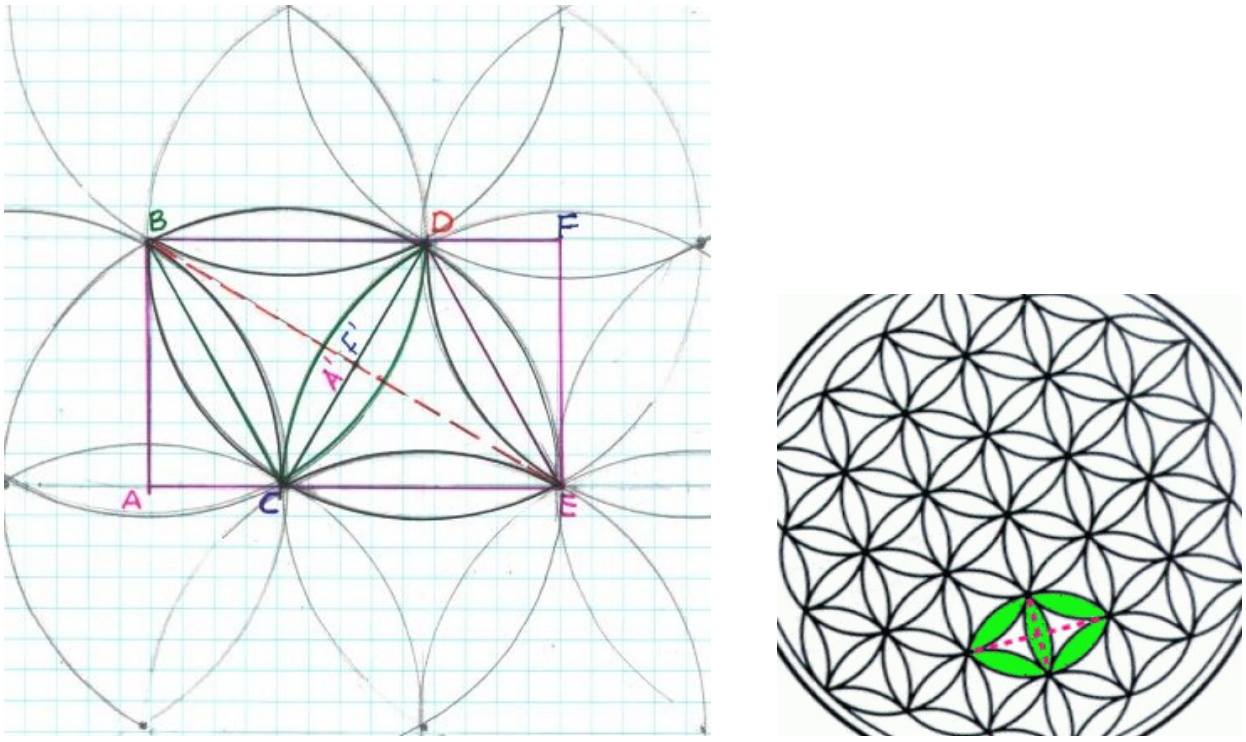


Fig. LM 12 Vesica Piscis in the Mobius strip. Vesica Piscis in the «Flower of Life» symbol.

The center of the CD line, as indicated above, is the area of reconnection and release of magneto-plasma quanta. According to ancient sources, the "Vesica Piscis" in the "Flower of Life" figure is that secret or that sacred place where the process of generation (“fish bladder”) occurs. In the considered application of MMM as a magnetoelectric circuit, it can be said that in the "Vesica Piscis" the generation of magneto-plasma occurs, which is that maternal quantum "milk" that feeds all objects in space and constitutes the matrix of the etheric Quantum Medium.

It can be confidently stated that the ancient symbol "Flower of Life" is a general schematic representation of the matrix of MMM reconnection zones.

In the illustration **Fig. LM 13**, based on the **ABDFEC** band and its mirror-asymmetric reflections, shows in more detail what appears in esoteric sources – this is the formation of all Platonic solids, as well as the well-known symbols "Star of David", "Tree of Life", "Fruit of Life", "Metatron's Cube" and others. In the illustration, only a few of them are shown as an example.

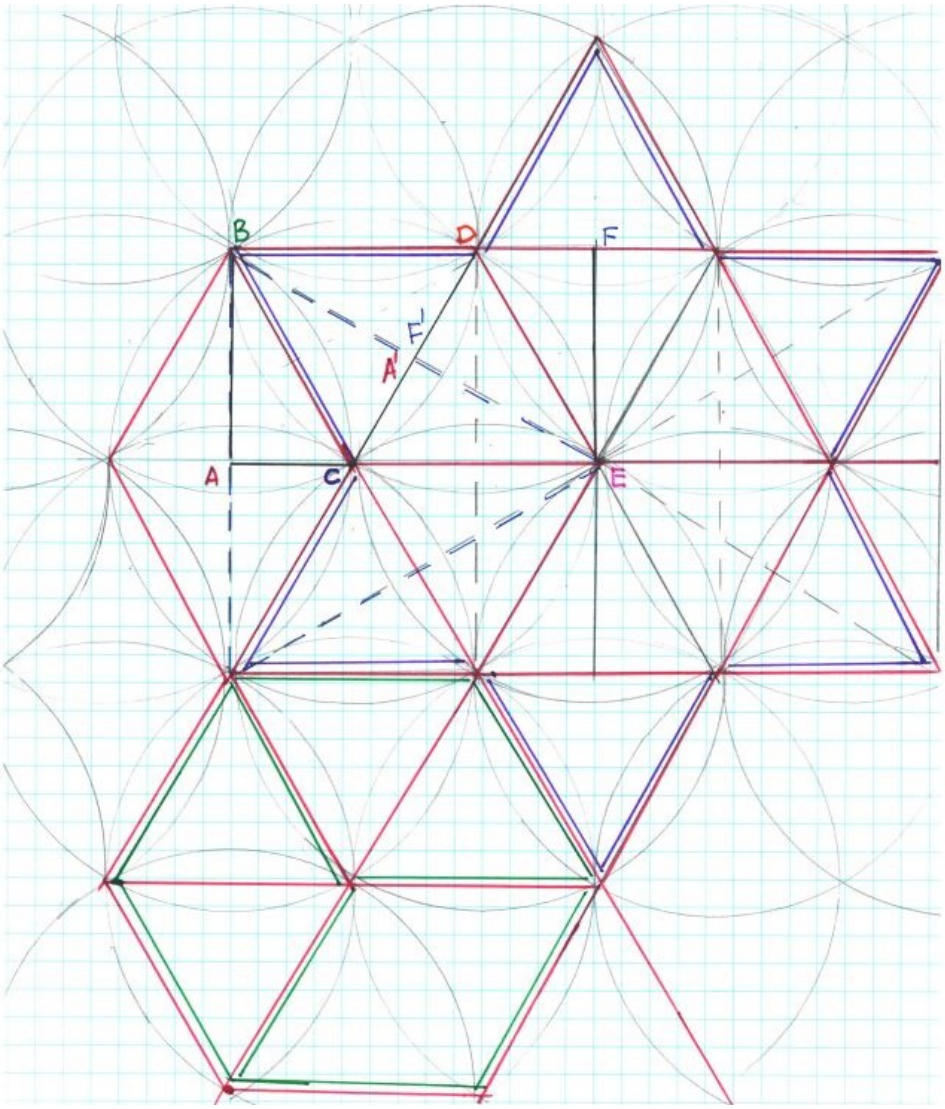
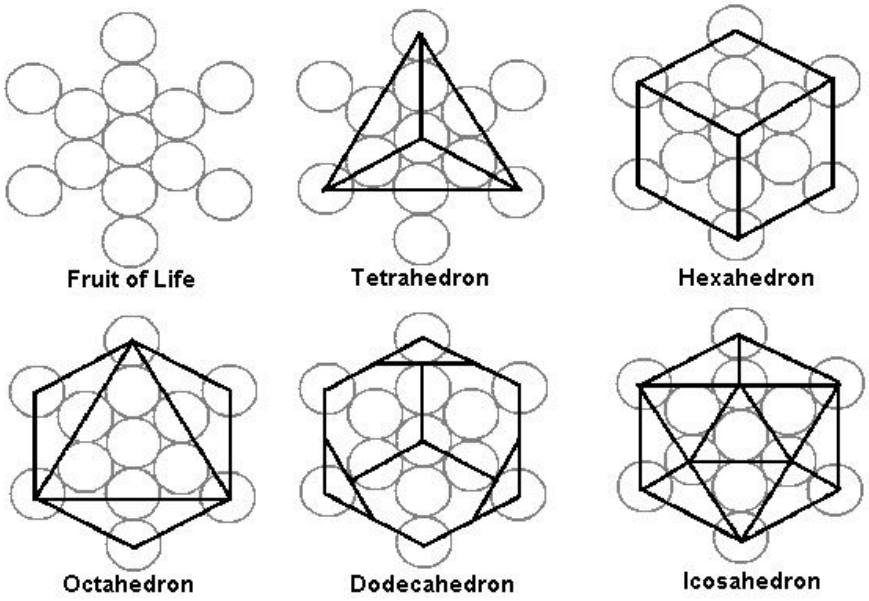


Fig. LM 13

Also below are given as examples the well-known constructions of the Platonic solids.



According to opinions and including the opinion of Rylov Yu. A. "**The geometrization** of physics is the process of constructing **a monistic concept**, where the only fundamental concept is the **world function** of the geometry of space-time (this is **half the square of the distance**)." [180]

Here, distance is understood as the distance between two interacting points (objects). In this regard, I propose to look at this issue in the format of the proposed view based on the geometry of Mobius. To do this, I return attention to the illustration LM 15, where the golden section is constructed inside the expanded Mobius strip with a minimum ratio of sides, and consider the square **ABHG**, the diagonal of half of which **КН** in the projection on AE (**КН=KL)** divides it in the ratio of the proportion of the golden section **AL/AG = AG/GL = 1.618**.

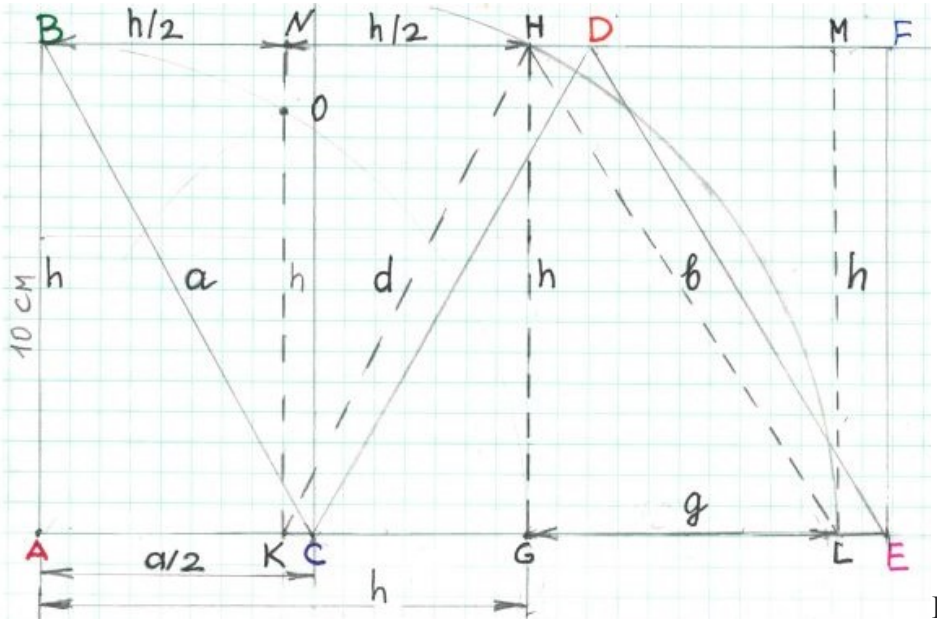
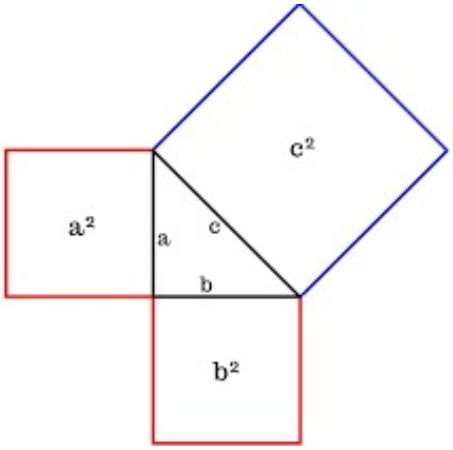


Fig. LM 15.

The logic of reasoning must begin with the fact that the indicated ***world function*** is equal to half the square of the distance. The metric power square indicates that we are talking about the area of a spatial region whose geometry is **a rectangle** with equal sides, that is, in fact, this is the area of a square.

This geometric approach (through the area of the square) was used to prove the Pythagorean theorem – in a right triangle **the square of the hypotenuse is equal to the sum of the squares of the legs**.



For better visualization it is necessary also to make that geometric modification in the expanded Mobius strip with the minimum aspect ratio, which is shown below in the illustration **Fig. LM 15`**. The geometric modification consists of a mirror-asymmetric transfer of the triangle **HLM**, equal to the triangle **HGL**, obtained as a result of constructing the golden section inside the Möbius strip. The transfer is carried out by combining point **M with point A** and point **L with point B.** That is, this mirror-asymmetric transfer illustrates the rotation of the edge of the sheet by 180 degrees.

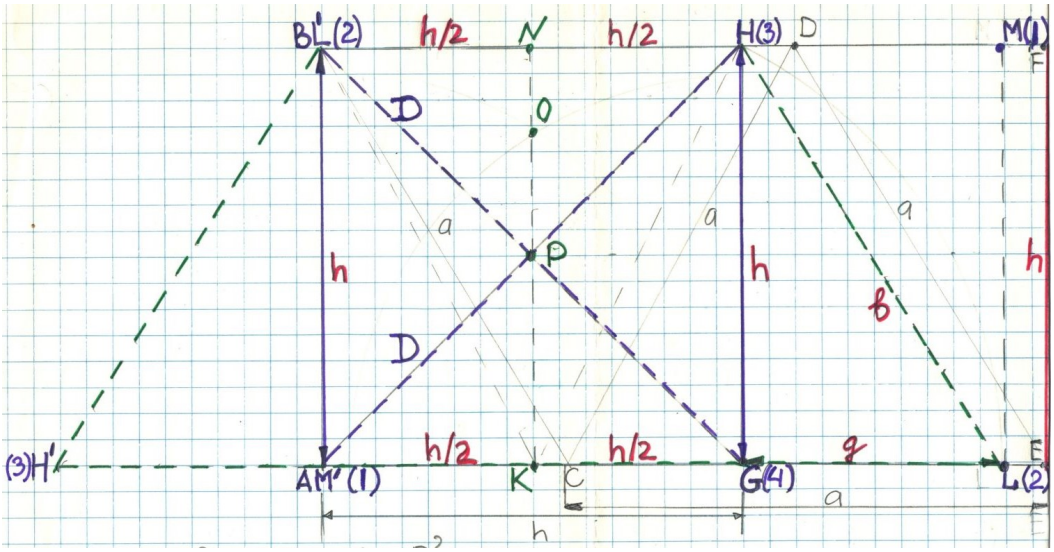


Fig. LM 15`

In the resulting trapezoid **H`B(L`)HL**, we consider the inner square **A(M`)B(L`)HG** along the center of the trapezoid. This same square has the designation (**1,2,3,4**), indicated in brackets to match it with the auxiliary illustration below – **LM15``** and the "***Pauli square***" (the "dance" of interaction shown Pauli in his night dream).

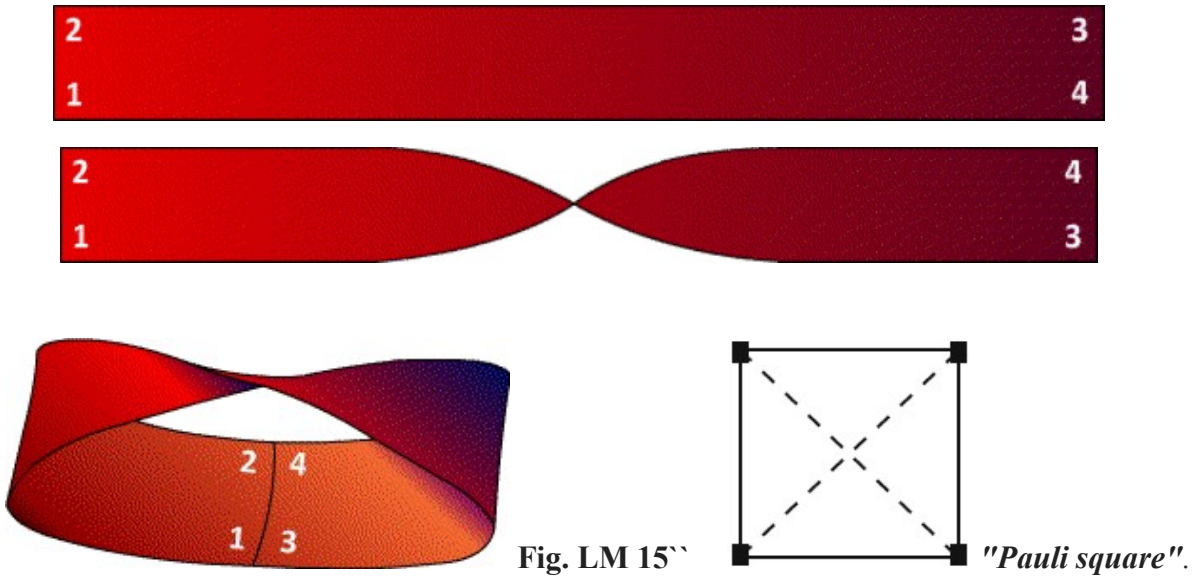


Fig. LM 15`` ***"Pauli square"***.

Considering that the indicated construction belongs to the Mobius strip, the interacting points are the points: **B(L`)(2)** and **G(4)**, **A(M`)(1)** and **H(3)**, which interact diagonally. It is precisely such interaction of diagonally opposite points that is reflected in the "***Pauli square***".

Thus, from the geometric construction it follows that the world function acts in the region of space of the vortex formation in the form of a Möbius strip and describes the diagonal interaction of conditional edge points.

Now let us consider the metric of the square **A(M`)B(L`)HG**. As given above, the **world function is equal to half the square of the distance between the interacting points**. The square of the distance indicates that the area of the region of space is considered, which is **geometrically a square**. And this area is equal to the product of the sides of the square, that is, the side **h** squared – $\mathbf{h^2}$.

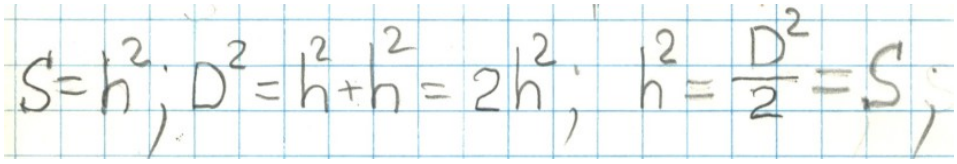
The diagonal **D** of this square is the distance between the diagonally interacting points and divides it into two equal right triangles, being their hypotenuse.

D = A(M`)H = B(L`)G.

According to the Pythagorean theorem, the square of the hypotenuse **D** is equal to the sum of the squares of the legs, which are designated **h,** $\mathbf{D^2 = h^2 + h^2 = 2h^2}$**.** Hence $\mathbf{h^2 = D^2/2}$.

The area **S** of the square (**1-2-3-4**) with a side **h**, $\mathbf{S = h^2}$**,** is the space of events and interactions of the diagonal points of this square. As can be seen, the same area of the square **S** can be expressed through the square of the distance $\mathbf{D^2}$ between the diagonally interacting points (**1-3**), (**2-4**), divided by two: $\mathbf{S = h^2 = D^2/2}$.

Based on this, the area of the square under consideration or the area of the space in which the given dynamics of the diagonal interactions of the four-point function occurs will be expressed through the square of the diagonal **D**, divided in half.

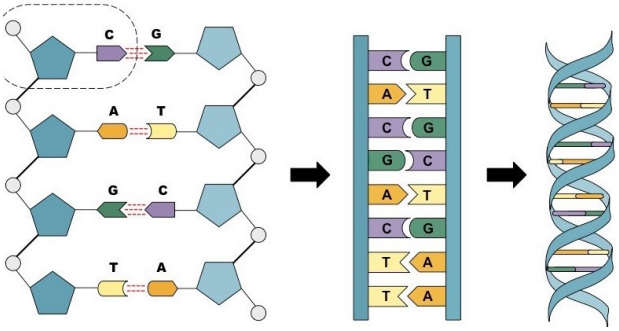


Thus, if the ***world function*** **is equal to half the square of the distance between interacting points**, then the world function should be considered as a physical region of the space of the vortex unit. The space of events in the vortex unit will be the area of the internal square, in which the energy dynamics of the process of Mobius spinning (torsion) will occur through the diagonal interaction of the four-point function, mediated by the properties of the magnetic loop closed through inversion.

If the **interaction is diagonal**, then there is a torsion and corresponding curvature, reflected by a sinusoid. Two pairs of interacting points give a geometry reflected by two sinusoids that are intertwined crosswise with a phase shift, but never intersect. In the energy dynamics of this spin torsion, the diagonal interaction forms a sinusoidal trajectory of "***Clifford parallels***" [142], intertwined in a kind of braid and leaving a spatial "***trace***".

It is precisely this crossed interweaving of the four-point interaction that is realized in the projection of this function into the plane of cell biology and is reflected in the structure of DNA. Another example of crossed interaction is the control of our walking: the right hemisphere of the brain controls the left side, and the left hemisphere controls the right.





DNA

This is the answer of Mobius Geometry to questions related to the ***world function*** and the distance between interacting points grouped "***two by two***".

As it is shown with sufficient clarity, the formulaic definition of ***the world function*** takes its source in the geometry of the Mobius strip and the diagonal interaction of its ***four-point function***. Also from there take the source of the matrix of V. Pauli 4x4, the recording of the wave function as four-component (**A**) and the matrix wave equation of P. Dirac, which is equivalent to a system of four interconnected equations (**B**).

$$\psi(x,y,z,t)=\begin{pmatrix}\psi_1(x,y,z,t)\\ \psi_2(x,y,z,t)\\ \psi_3(x,y,z,t)\\ \psi_4(x,y,z,t)\end{pmatrix}. \quad \textbf{(A)};$$

$$\begin{aligned}(E-mc^2)\psi_1-c(p_x-ip_y)\psi_4-cp_z\psi_3&=0\\ (E-mc^2)\psi_2-c(p_x+ip_y)\psi_3+cp_z\psi_4&=0\\ (E+mc^2)\psi_3-c(p_x-ip_y)\psi_2-cp_z\psi_1&=0\\ (E+mc^2)\psi_4-c(p_x+ip_y)\psi_1+cp_z\psi_2&=0\end{aligned} \quad \textbf{(B)}.$$

And if the minimum pixel of the matrix structure of the etheric Medium is a region of space with the above-mentioned geometry, dimensionality and physical properties, and not a conditionally selected abstract mathematical point with free parameters, which cannot rotate according to the words of V. Pauli (with which it is impossible not to agree), then we must talk about a mathematical description of the geometry of this region of the space of events and the energy dynamics occurring in it.

The given examples of the embodiment of the diagonally crossed interaction of the four-point function in the structure of DNA, in the functioning of the heart muscle, in the organization of the walking process, as well as the work of the hemispheres of the brain, which are capable of self-reading and describing the four-point function in mathematical language, demonstrate with sufficient conviction how in us, as in the compendium of the Universe, the basic four-point function of the principle of complementarity is embodied fractally many times and, in essence, everything is built on its energy dynamics.

Elements of this dynamics sound in various descriptive approaches of mathematicians based on algebra and is reflected in their pictorial illustrations. More about this in the work "***3. Basic Element of Nature. Mobius Geometry. Gravity. Model of the Atom***".

In the application of the Mobius strip to the unit of the matrix of the etheric Quantum Medium, when considering it as a magnetoelectric circuit, it can be said that the diagonal interaction of four Mobius points occurs throughout the entire cyclorotation of the Mobius strip in the mode of magnetic reconnections, which are the shift of switching "sides" (opposites) with the release of magneto-plasma quanta. The dynamics of the release of portions of electricity occurs in the gap formed by the difference in the geometry of symmetric and asymmetric construction.

As can be seen from the constructions and illustrations, all the characteristics of space and time follow from the complementary duality and the dynamics of the internal motion of a single granule of the etheric Quantum Medium.

The antiphase and internal magnetic reconnection of the etheric granule produce a non-stop process of continuous oscillations, accompanied by the act of emission-absorption of sub-micro-portions of magneto-plasma, in other words, in the etheric Quantum Medium there is continuous energy convection and energy conversion by analogy with the mechanism of the Archimedes screw. This is the basis, is quite clearly understood and clearly explained by the Law of Conservation of Energy.

As the practice of experiments with laboratory plasma [45], [46] and observations of astrophysical plasma shows, magnetic reconnection converts magnetic energy into thermal and kinetic energy of plasma. That is, in the magnetoplasmic etheric environment, only transformations of one type of energy into another occur.

In essence, the Mobius strip format reduces oscillating processes to a single dynamic and geometry, displaying complementary unity in antiphase.

Considering the ether as both a continuous medium and a medium consisting of individual nodes/granules do not contradict each other. When analyzing the macro-movements of ether flows that exhibit collective effects, the ether behaves as a **continuous medium**. In micro-processes, it behaves as **quasi-particles.** These properties of the Ethereal Quantum Medium are combined in the same way as the same properties can be combined and demonstrated by water and air environments.

We can also talk about the aggregate states of the ether. Under the conditions of various temperature regimes of outer space, ether behaves like condensed medium, in which phase transitions occur with changes in the state of the medium. Also, a sub-finely dispersed ether suspension can behave, depending on the conditions, as a superconducting liquid, as a solid, and as a gas.

It is precisely due to the presence of non-stop magnetoelectric oscillations that such a magneto-plasma granular medium (as confirmed by recent studies of granular materials), depending on the conditions, can have the properties of a solid, liquid and gaseous body, and also has the property of a specific granular "***quantum liquid***", which is distinguished by the constant dynamics of vortex torsional movements, is never in a state of motionless equilibrium, mediates turbulence and has a vibrational background, which, in all likelihood, is the so-called "Craig Hogan noise". [54], [55].

In 2008-2010, a series of publications by **K. Hogan** appeared [51], [52], [53].

The publication [52] "***Holographic Geometry and Noise in Matrix Theory***" deals with the demonstration of a new observable phenomenon, holographic noise, with a phenomenology similar to that previously derived on the basis of quasi-monochromatic wave theory.

The publication [53] "***Indeterminacy of Holographic Quantum Geometry***" shows that "the spectrum of holographic noise is estimated for the GEO600 interferometric gravitational-wave detector and is shown to approximately account for the currently unexplained noise between 300 and 1400 Hz. In the holographic world, this result directly and accurately measures the fundamental minimum time interval."

It is also necessary to note a very important characteristic feature or property of the etheric Quantum Medium. The living (breathing) magneto-plasma of the Quantum Medium is that active physical matter in which the **energy supply occurs from within** and is strictly individual – at the level of each separate vortex unit.

Each active vortex unit/granule of magneto-plasma in the process of its magnetic breathing itself consumes and dissipates energy, passing through internal exchange cycles, which generally lead to oscillating vortex self-motion (**spinning)**.

This is one of the fundamental questions in understanding the complementary structure of the etheric Quantum Medium, the magnetoelectric essence of its unit and all its derivatives – an atom, a cell, a bioorganism, space systems.

All derivative objects from a unit of the etheric Quantum Medium must simultaneously fulfill two conditions for their existence in it:

- Rotate around two centers – internal and external;
- Be powered by two sources – internal and external.

According to the hologram principle, the fulfillment of these conditions is equally inherent in all objects at all scaling levels. And first of all, these conditions are fulfilled by sub-micro-units that make up the fabric of space.

The basis of the phenomenon of holography as such, as well as the holographic structure of the world order, is precisely the fundamental nature of the complementary principle, which in the universal method of generation through self-copying preserves its InfoGenetics and transmits it to all generations. Therefore, if we try to divide a topologically closed Universe into smaller parts, then ultimately, according to the properties of the hologram, we get its minimum pixel – a magnetic loop, topologically closed into a Mobius strip, – a magnetic monopole.

As shown above, a magnetic monopole is a radiating object. But, since the radiation of such monopoles is of a non-co-directional nature and their external magnetic field is not

manifested in the form of bi-polarity, then the ether is that sub-micro-dispersed substrate that is practically impossible to observe with the help of equipment, since it creates the effect of magnetoelectric "invisibility". Nevertheless, it is that supporting medium that propagates waves of any nature, including light, due to the instantaneous effect of co-directional re-reflection. The effect of such re-reflection is well understood and presented on the basis of the simplest experiment proposed at one time by **Manly Palm Hall** in his book "***Occult Anatomy***". [77]

M. P. Hall suggested using a room with mirrored walls as not a solid mirror surface but a matrix of very small mirrors. In this case, if you place a light source in the center of the room, for example, a candle, it will be reflected simultaneously and instantly in each tiny cell of the mirror wall matrix, regardless of the distance from the light source to the mirror wall.

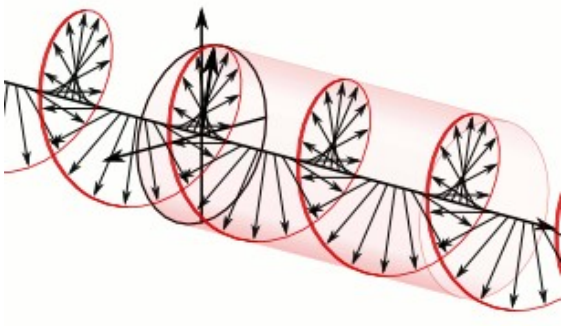
Based on this analogy, we can imagine the process of light propagation from any source in a finely dispersed substrate of monopoles of the etheric Quantum Medium, each of which contains an inverse mirror-asymmetric turn and instantly "re-reflects" the light quantum together with the rest of the array of "mirrors" of magnetic monopoles.

The effect of "re-reflection" consists of co-directional monopole discrete-continuous radiation of magneto-plasma quanta by sub-micro-cells of the Medium and the creation of a light "path", in other words, the creation of a chain of links of vortex monopole radiation, which demonstrates the visual effect of a traveling wave. In the current view of physics, these links are massless photons, since mass characterizes baryonic matter.

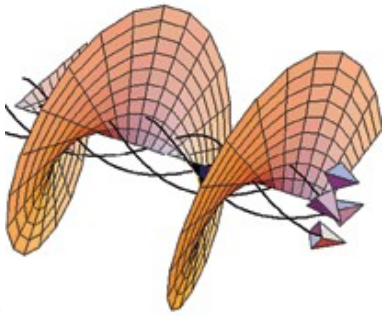
Co-directionally “re-reflected” quanta are links of twisted Mobius spirals that create a path of a continuously propagating electromagnetic wave, the links of which, according to the presence of inversion, will have a spiral structure with an inverse eversion, similar to that illustrated in Figure **b)** below. [163]

“There is a famous picture (знаменитая картинка) in which a light wave is depicted as such a spinning spiral: **a)**. This picture does not depict the distribution of the electric field in real space, but only conditionally shows the vector of this field along the axis of the wave. This picture does not change with a shift in the transverse direction, since in a plane wave there is no dependence of the fields on the transverse coordinates. That is, in reality such a wave (if we were to draw the phase of the wave, and not the vector of the electric field) simply runs forward, one plane after another.

In the picture **b)** with a twisted wave (a scalar wave, i.e. a wave without any polarization), the helical surface is a surface of constant phase in real space. Such a wave actually runs forward, simultaneously twisting around the axis." [163]



a)



b) [163]

The fundamental conclusion will be that if the fabric of space has a matrix structure, and the matrix units are magnetoelectric circuits in which the effect of magnetoplasm reconnection occurs and, in accordance with this, magneto-plasma light quanta are released, then

the so-called "propagation of light from the source (star)" will be a link path of co-directional magneto-plasma quanta, emitted by the matrix units of the medium itself. This path arises in the medium at one moment when its matrix is affected by those processes that take place in the stellar matter. In this case, the Medium comes into a disturbed state and creates a co-directional chain effect of its own radiation, in other words, a photon path. This path is perceived as a traveling electromagnetic wave, each link of which essentially belongs to a matrix unit, and the star is a factor influencing the Medium.

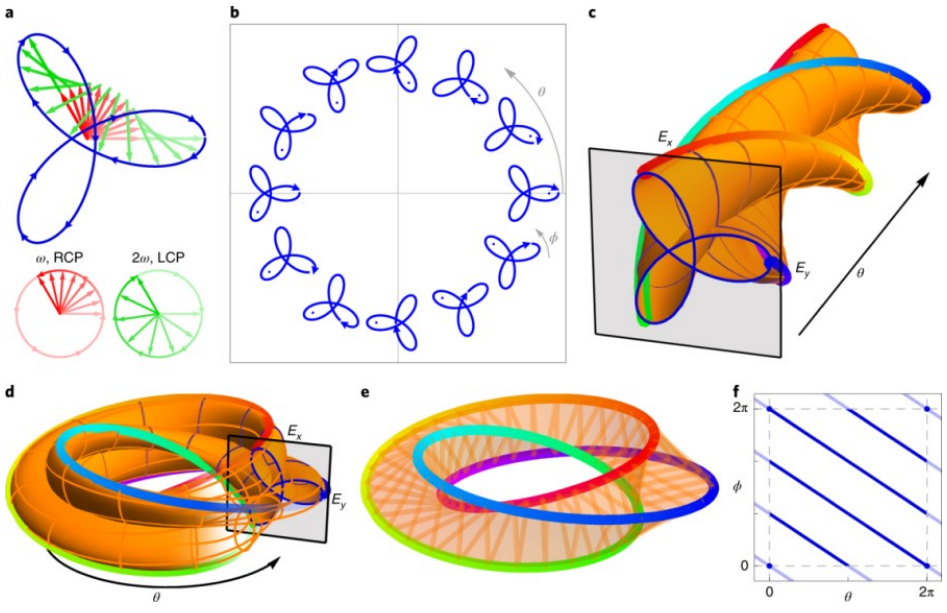
This tracing effect is called in science an electromagnetic light wave, which has a corpuscular-wave nature due to the fact that it is created by discrete units of the Quantum Medium, which are arranged into continuous light threads, forming a spiral light current. Thus, the conclusion is that light is nothing more than a disturbed state of the ethereal Quantum Medium. Exactly the same route is represented by an electric (magnetoplasmic) current in a conducting material.

Thus, in the GM format, a representation of the collective co-directional action of the disturbed mono-pixels of the Quantum Medium is compiled, which creates a visual effect of the propagation of a running wave (like a running text line on an advertising board), what gives the illusion of "running photons" from a light source.

In essence, such re-reflection actually has an **instantaneous** character, since each sub-micro-element of the matrix of the Quantum Medium re-reflects quanta simultaneously with each other, without requiring a transfer link between them, as shown in the experiment of M. P. Hall. All of them act according to the collective effect in the condensed space of the ethereal Quantum Medium, where discreteness is determined by the nature of the Mobius torsion.

Based on the above, we can assume that the "twist" that a light beam with orbital angular momentum has is a characteristic that is due to the structure of the Medium itself and, in particular, the unit of its matrix (magnetic monopole), which is structured according to the complementary principle, that is, according to the geometry of Mobius.

In addition to the question of the phenomenon of light wave and its propagation in the Medium, the **June 2019** publication "***Knotting fractional-order knots with the polarization state of light***" [165] may be of interest.



[165]

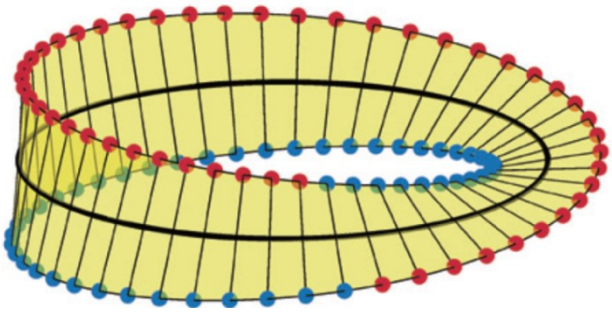
«The fundamental polarization singularities of monochromatic light are normally associated with invariance under coordinated rotations: symmetry operations that rotate the spatial dependence of an electromagnetic field by an angle θ and its polarization by a multiple γθ of that angle. These symmetries are generated by mixed angular momenta of the form $J\gamma = L + \gamma S$, and **they generally induce Möbius-strip topologies**, with the coordination parameter γ restricted to integer and half-integer values. In this work we construct beams of light that are invariant under coordinated rotations for arbitrary rational γ, by exploiting the higher internal symmetry of 'bicircular' superpositions of counter-rotating circularly polarized beams at different frequencies. We show that these beams have the topology of a torus knot, which reflects the subgroup generated by the torus-knot angular momentum Jγ, and we characterize the resulting optical polarization singularity using third- and higher-order field moment tensors, which we experimentally observe using nonlinear polarization tomography». [165]

The spin trajectory of monopoles represents the dynamics of the execution of a simultaneous two-cycle rotation. And this spinning provides that geometry of twisting of the continuous-discrete trace of magneto-plasma quanta, which are emitted by each monopole. This trace arises when the radiation of a star affects the matrix units of the etheric Medium. In this case, the monopoles collectively come to a perturbed state of co-directional re-reflection and create that continuous-discrete trace of magneto-plasma quanta, which we call a light electromagnetic wave.

Since the "re-reflection" effect occurs simultaneously in all units of the Quantum Medium, it is not possible to talk about some object-photon that covers the distance from, for example, the Sun to the planet with some finite speed, and the term "speed of light propagation" loses its original meaning. The finiteness of the speed of light occurs in the presence of the braking effect, which occurs when tracing light in the planetary layers of the atmosphere and slows down the tracing effect by tens of times.

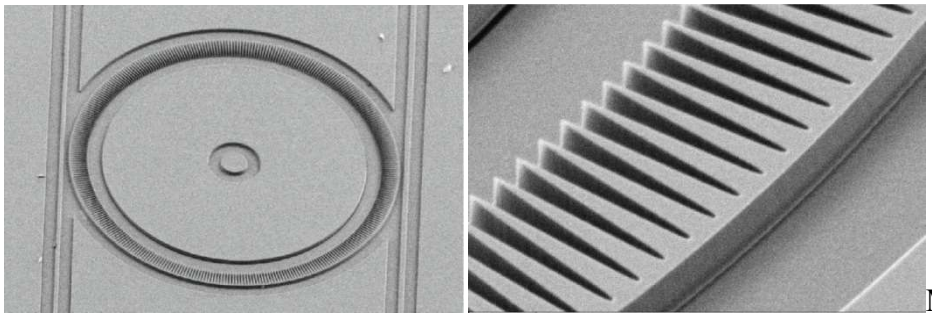
In October 2022, a group of experimenters published the results of experiments on tracing light and controlling its speed and orientation in photonic crystal microring resonators in Physical Review Letters, "***Fractional optical angular momentum and multi-defect-mediated mode renormalization and orientation control in photonic crystal microring resonators***." [75]

Researchers led by Xiyuan Lu of the National Institute of Standards and Technology in Maryland have now demonstrated, it's possible to generate more exotic waves having fractional angular momentum [**1**]. This can be done by slightly altering the structure of the ring that carries the light. A wave can be forced to make more than one loop before returning to the same field configuration that it started with. "For the first time, we're generating light in a fashion of the Möbius strip," says Lu.



M. Wang *et al.* [75], [76]

This experiment, as well as the previous one, show that it is technically possible to slow down the speed of light. “In previous work, Lu and colleagues fabricated a so-called photonic crystal microring by etching a precise sequence of microscopic notches into the inner edge of a small ring of silicon nitride, a semiconducting material. The periodic modulation of the inner surface alters the optical properties of the material, resulting in a tenfold reduction in the speed of the light as it moves around the ring. In calculations, simulations, and experiments, the researchers have now also shown that this periodic modulation allows the material to carry light waves with unusual properties”. [75], [76]


M.Wang *et al.* [75], [76]

If we keep in mind the above-mentioned mental-visual experiment of Manly Palm Hall, and at the same time examine in more detail the composition of the experiment [75] and draw a parallel in the structure of the etheric Quantum Medium based on Mobius vortex pixels, we can see a direct analogy with the way in which the etheric Quantum Medium can transport light, creating a mirror path for its transmission by its array of Mobius sub-micro-ring resonators-monopoles, the plasma radiation of which becomes co-directional in effect of the propagation of light.

It turns out that, acting as a condensed liquid magnetoplasmic medium consisting of a dense packing of sub-fine-dispersed vortex monopoles, the etheric Quantum Medium propagates light through resonant re-reflection almost instantly.

The slowing down of the speed of light and its limit value, known to date, can be justified by additional factors of influence, since the Observer measuring this speed is located within the planetary boundaries, surrounded by an additional mixed medium of air and water vapor. The planet's atmosphere is a nonlinear optical lens consisting of atomic pixels, each of which is based on a Mobius Geometry configuration in the form of a topological Knot of Mobius Dipoles, due to which the speed of light can slow down.

It can be assumed that it is this factor that most likely contributes to the measurement process, creating a slowing down of this speed, since the composition of the atomic elements of the air environment with an admixture of water vapor can create the same effect of periodic modulation and change the optical properties by analogy with the experiment, which ultimately leads to a tenfold decrease in the speed of light when it moves along molecular rings, which have a Mobius configuration as the basis of the structure of atoms.

It should be emphasized here that all early and subsequent laboratory measurements of the speed of light were carried out on the Earth. Based on this, the speed of light has the final result that is accepted today. But this result may be relevant to the question of how long it takes for light to travel through the Earth's atmosphere and to what final value its propagation speed slows down. Obviously, no one has ever taken this factor into account, since the picture of the

representation of the propagation of light had an established character, that photons "fly away" from the Sun and reach the Earth, and the speed of this run can be measured. How then is the physics of such a "flight" carried out? Doesn't it look more logical when the Medium itself has such a structure that allows massless photons not to "fly", but to create their path by the own method of their emission?

In terms of the speed of light propagation, Galileo and Hooke considered it finite. The concept of the structure of the etheric Quantum Medium proposed by me is in greater agreement with the opinion of Descartes and Kepler and Fermat, as well as ancient scientists who continued to defend the position of the **infinity** of the speed of light.

My agreement is expressed with the amendment that the term "***infinite***" in relation to the speed of light is understood as its infinitely large value, which is to some extent synonymous with the concept of "***instantaneous***", since the concepts of "***instantaneous***" and "***infinite***" themselves are not analogies or equivalents. In addition, as it logically follows from the proposed format of the structure of the etheric Quantum Medium, it is necessary to keep in mind not the speed of light as a certain value of the progressive passage of the path per unit of time, but the process of light propagation in the medium, which is not characterized by the progressive movement of something in something, but is characterized by the disturbance of the medium and the way it reacts to the impact exerted by the stellar body.

The concept of "***instantaneous***" suggests that when we look at a very distant star, we see it here and now, while the speed of light limit established in science states that we see its light in the past, and in fact the star may no longer exist. But then the question remains as to whether we can study space objects in real time. Perhaps the issue of the speed of light needs to be addressed again and the picture of the presentation of this phenomenon needs to be revised, and then its understanding. Established dogmas always hinder the forward movement of thought.

Let us return to the question of the supporting Medium itself and its composition.

Today, theoretical physics has introduced the hypothetical concepts of "***dark matter***" and "***dark energy***", which apparently exist as a modern alternative to the physical primordial matter of space.

Dark matter, as applied to astrology and cosmology, is a hypothetical form of matter that does not participate in electromagnetic interaction and, therefore, is not accessible to direct observation. But for now, these are just mathematical propositions, according to which it is assumed that the share of dark matter is 25% of the total mass of the Universe.

Dark energy in the current paradigm of physics is defined as uniformly distributed energy that does not gather into clumps, and its gravitational properties are very different from the properties of other forms of energy.

And, as is known today, ***dark energy*** is also still a hypothetical form of energy, introduced into the mathematical model of the Universe to explain its expansion with acceleration, and nothing more. Its share is considered to be equal to 74% of the composition of the Universe.

In April 2013, the journal Physics Letter B published an article entitled "***Anapole dark matter***" by two theorists from Vanderbilt University (USA), Robert Scherrer and Chu Man Ho, who proposed a new candidate for the main component of "***dark matter***" (DM) [32]

"We consider a DM particle that interacts with ordinary matter entirely through an electromagnetic anapole moment. For Majorana fermions, the anapole is the only allowed

electromagnetic form factor, making it particularly interesting. Anapole dark matter coupling to a dark photon was previously considered by Fitzpatrick and Zurek [18], but our model differs from theirs in that we have direct coupling to the Standard Model (SM) photons". [32]

Theorists have noted that "although most of the interest in electromagnetic form factors has been concentrated on the electric and magnetic dipole moments, Pospelov and ter Veldhuis [1] considered several other possible forms of electromagnetic coupling to the dark matter, including the electric quadrupole moment and the anapole moment. It is the latter which we consider in more detail here. The anapole moment was first proposed by Zel'dovich [15].

Unlike the electric and magnetic dipole moments, the anapole moment has no classical analog, as it does not correspond to a multipolar distribution. It is related to the toroidal dipole moment, which corresponds to a solenoid with the ends joined into a torus, producing an azimuthal magnetic field (for an explanation of the difference between the anapole moment and the toroidal dipole moment, see, e.g., Ref. [16]). The first experimental measurement of an anapole moment in atomic nuclei was noted by Woods et al. [17].

We find that, unlike the case of the electric or magnetic dipole, anapole dark matter with an arbitrary mass can provide the correct thermal relic abundance for dark matter and evade current direct detection limits. Our results are discussed in Sec. V." [32]

Scherrer and **Ho** conducted a detailed theoretical analysis of this hypothetical or almost hypothetical particle and came to the paradoxical conclusion that although it does not interact with the electromagnetic field, it is fully endowed with electromagnetic properties. Physicists proved that it is an ***anapole***. Also, the calculations of Scherrer and Ho showed that the Majorana anapole is ideally suited to the role of a carrier of dark energy.

The anapole particle was first proposed and described by **Ya. Zeldovich** in his work "***Electromagnetic interaction under parity violation***". [30]

Ya. Zeldovich predicted the existence of a "particle" with a magnetic field identically equal to zero, and called it "***anapole***". In the indicated work, Ya. Zeldovich describes the anapole in the torus configuration as follows:

"From the point of view of the classification of the magnetic properties of a particle, there is an interaction that does not correspond to any magnetic multipole (dipole, quadrupole). Let's call it anapole. An anapole interacts only with the current that flows at the point where the particle itself is located. Therefore, the external field of an anapole is identically equal to zero. In this respect, an anapole is similar to a spherical capacitor, in which the field differs from zero only inside the capacitor. The difference from a capacitor is due to the fact that an anapole is a vector and has a certain direction, whereas a spherical capacitor is characterized by a scalar quantity.

A classical anapole can be represented as a wire spiral (solenoid), bent into a ring (torus). The current flowing along the spiral creates a magnetic field only inside the torus. If the torus is rigid, then no magnetic fields created by external currents act on the torus as a whole." [30]

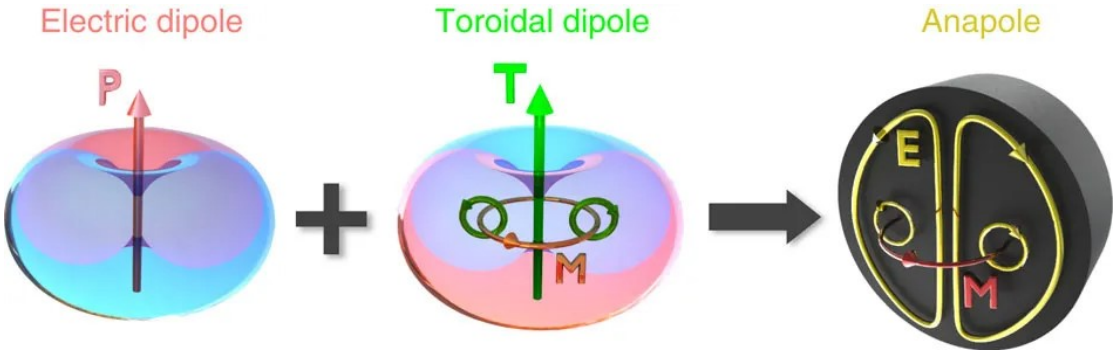
It should also be noted that in the current period of practical application of the theoretical heritage of Ya. Zeldovich and on the basis of his anapole, new materials have been created that have previously unknown properties of magnetoelectric invisibility. [166], [56], [57].

In April 2020, the journal «Science and Technology» published an article entitled "***What is anapole? A new material for stealth coatings.***" [57]

"The new metamaterial is completely transparent to electromagnetic waves due to the excitation of "***anapoles***" in them. Russian and Italian scientists have developed a technology for

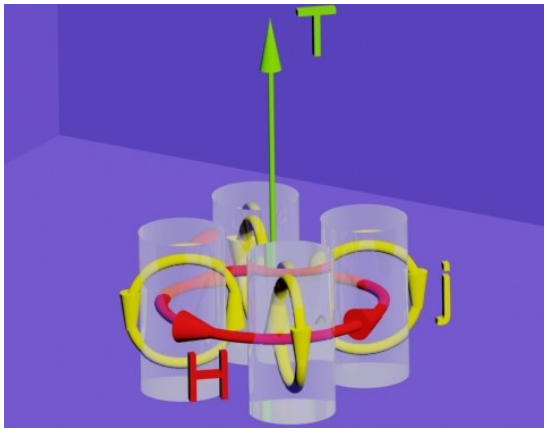
camouflaging military equipment. The metamaterial has an artificially created periodic structure. Using the idea of dipole moments, it was possible to develop a generalized invisibility theorem and turn it into a mathematical model.

Anapole (from the Greek ***an-*** – negative particle and ***polos*** – pole) is a non-radiating source or scatterer that is capable of emitting vector potentials in the absence of radiated electromagnetic fields, as well as scattering vector potentials in the absence of fields. Thanks to this, it is possible to get a unique opportunity to hide various objects, more precisely, shield them from electromagnetic fields and create devices for covert data transmission.



The toroidal dipole moment is associated with a circulating magnetic field M, accompanied by an electric poloidal current distribution. Since the symmetry of the directivity patterns of the electric P and toroidal T dipole modes is the same, they can have a destructive effect on the complete suppression of scattering in the far field with non-zero excitation in the near field. [57]

In this case, data transmission is possible due to the modulation of the vector potential, and the usual propagation of electromagnetic waves in the system will be absent. Modern stealth camouflage methods are aimed at ensuring that the wave reflected from the object is absorbed by the camouflage coating, minimizing the response for the radar. However, the coating alone is not capable of reducing this response to zero due to a combination of factors: surface geometry, high speed of movement, advanced highly sensitive location methods, and the inefficiency of the absorption of the stealth coating.



"***Excitation of a toroidal moment in a dielectric metamolecule***." [57]

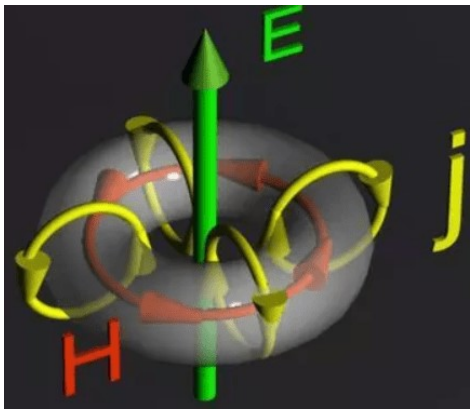
An international team of scientists from NUST MISIS and the Polytechnic University of Turin (Italy), as part of their collaboration on the ANASTASIA project, have proposed a fundamentally new version of stealth camouflage that will allow a radar signal directed at an object not to be reflected or absorbed, but simply to pass through as if there is no object. This camouflage method is based not on creating a camouflage coating, but on changing the configuration of the entire object system. [57]

Publication 09.14.2022. "***About anapole – a state that has no visible field.***" [166]

"Russian physicists have created unique materials. They are "invisible" to modern electromagnetic radiation detectors. These are metamaterials – artificial materials with properties that are not found in nature. Nanoparticles-meta-atoms are introduced into the periodic structure of the metamaterial, modifying the properties of the material. Meta-atoms allow waves to pass unchanged through objects to which metamaterials are applied [RIA Novosti, 6.09.2022, V. Strekopytov].

This technology differs from modern stealth technology, based on the absorption or scattering of electromagnetic waves of a certain length.

New metamaterials collect the radiation falling on them into a point and then transmit it further in the same form. At the same time, very strong near fields can be concentrated in the object itself. Scientists took the hypothesis of the Soviet physicist Yakov Zeldovich about the "***anapol***e", proposed in 1957, as the basis for the mathematical model of invisible metamaterials. Zeldovich suggested that in addition to the usual configurations of currents, there are toroidal ones. If a current is passed through a torus-shaped coil, the magnetic field will propagate inside, and the electric field will twist around it. Fields in antiphase will cancel each other out and the object will not be observable. This configuration is called anapole – a state that has no visible field (the electromagnetic field is concentrated inside and does not radiate energy into the surrounding space)**».** [166]



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«Zeldovich anapole».[166]

“Scientists from the University of MISiS have substantiated the possibility of creating metamaterials whose cells will act as anapoles, and then proved this experimentally. The development of such metamaterials opens up unprecedented prospects for the creation of innovative technologies, including an “invisible” qubit for a quantum computer.

“Invisibility” here ensures the insensitivity of qubits to external influences to extend their service life. At the same time, they can interact with each other due to the interference of electric and toroidal dipoles. In addition, it is possible to create objects invisible in the optical range and develop sensors that do not violate the parameters of the environment around them. Also, based on this theory, it is possible to see the invisible.

There is a hypothesis that particles of ***dark matter***, which account for about 25% of the matter in the Universe (scientists cite different figures, since this area is little studied), are also non-radiating anapoles." [166], [56].

According to the cited sources: [32] (Scherrer and Ho), as well as [166], [56], [57], it is suggested that the particles of “dark matter” are non-radiating anapoles. Making such a statement or denying it requires some comparisons.

I have compared the ***Zeldovich anapole***, proposed as a candidate for dark matter, with the ***Magnetic Mobius Monopole*** (MMEP), proposed by me as matrix units of the etheric Quantum Medium and the seed basis for the formation of ***baryonic matter.***

Both the Zeldovich anapole and the Mobius Monopole are units that do not have an external magnetic field, manifested as a dipole or other multi-manifestation, but are fully endowed with magnetic properties. But, as noted above, Zeldovich's anapole described as a non-radiating object.

Unlike the anapole, the Mobius Magnetic Monopole (**MMM**) is a magnetoelectric circuit and an active dynamic unit that carries out the spinning process, during which magnetic reconnection occurs as an act of ***quantum breathing*** with the emission-absorption of magneto-plasma quanta, in other words, its transformation occurs. An array of ether units with MMM characteristics in its collective manifestation forms active matter in a monopole state and in the form of a matrix, granular, turbulent medium, which is in a state of continuous and unceasing oscillations, phase transitions and transformations. Such a Cosmic support Medium creates a constant vibrational background, and in the Medium, which has the listed characteristics, there is a self-exciting hydromagnetic dynamo, in the act of which space objects from atoms to galaxies are generated.

Thus, the difference between the electromagnetic unit “anapole”, described by Ya. Zeldovich, and the unit “Mobius Magnetic Monopole”, described in the author’s monograph, is that the properties of MMM include the process of “***quantum breathing***”, which characterizes the quantum activity of matter in its mutually inverse exchange processes with the etheric Quantum Medium, which can be characterized as ***quantum symbiosis***.

Since the ***anapole*** is not described as exhibiting such quantum activity, it therefore remains debatable whether it can be classified as a unit of living cosmic etheric magnetic plasma – magnetoplasma – which is characterized by self-generation, respectively self-renewal, and which represents a nutrient cosmic medium. In this regard, considering the anapole as a candidate for unmanifested “***dark matter***” only by the criterion of its magnetoelectric invisibility will be insufficient.

MMM (MMEP) is an active radiating magnetoelectric vortex unit of the etheric Quantum Medium, the sub-micro-radiations of which constitute the energy filling of the spatial fabric, which plays the role of the feeding Cosmic Medium. As a result, all matter generated by the etheric Quantum Medium, without exception, inherits the InfoGen of ***complementary duality*** and is active matter, performing the same act of radiation-absorption in the form of **oscillating quantum breathing**.

Since continuous and unceasing oscillations of the MMEP of the etheric units of the Quantum Medium create a vibrational background, then in such a medium the background principle acts in exactly the same way as in terrestrial environments.

The Mobius Magnetic Monopole is a magnetoelectric structure in which, due to the presence of the Mobius inversion, the components, differing from each other by their antiphase direction, are constantly in the process of **magnetic reconnections**. This is what leads to the release of quanta (energy), which are ***monopole radiation***. Here it is worth remembering that Nobel laureate R. Penrose linked the concept of energy with spin, which is essentially an exceptionally correct train of thought, which is confirmed by the consideration of this issue in the format of Mobius Geometry.

As is already known from observations and experiments with laboratory, space and astrophysical plasma, **magnetic reconnection** transforms magnetic energy into thermal and kinetic energy of plasma. In this regard, a series of magnetic reconnection experiments conducted in the period 2022–2024 may be of interest [45], [46].

As experiments show, magnetic reconnection can occur when two plasmas with antiparallel magnetic field components collide with each other. In the plane of reconnection, the antiparallel field components annihilate, and its energy is released in the plasma.

By analogy with the experimental results, one of the important conclusions can be made that the processes observed in laboratory conditions are similar to the sub-micro-processes occurring in the etheric units of the Quantum Medium.

The Moebius Magnetic Monopole (**MMEP**) is a **quantum-mechanical unit** of the supporting etheric Medium, the initial magnetoelectric properties of which mediate all types of transformations and interrelations in them. And this is the etheric **seed element**, on the basis of which the process of generating baryonic matter is launched by the method of bifidation/fibration with doubling of the magnetic flux. All this is a universal way of generating materiality from the inside out with the actualization of universal interrelations (gravity and quantum entaglement) that hold system formations within a single whole.

"... the manifestation of Matter occurs "from the inside out." [31]

"It is believed that all matter, regardless of where it is located – on our Earth or in space - always takes part in the incessant processes of mutual transformations and phase transitions. Based on this, we can make an important conclusion that the forces that **determine movement and changes originate not outside the chemical elements, but inside them.**" [29]

Thus, in the context of the proposed GM format and its logic, I emphasize that if we propose Zeldovich's anapole, as noted in [32], as a candidate for DM (dark matter), from which, as is assumed, the manifestation of visible matter occurs, then, in addition to the criterion of "invisibility" of the anapole, it is necessary to fulfill the criterion in explaining how "invisibility" turns into "visibility", in other words, what is the secret of Nature in order to make unmanifested (anapole) matter manifest (dipole). That is, it is necessary to answer the question of how dark matter becomes visible baryonic matter.

To formulate it differently, it is necessary to substantiate and show what transformation transfers unmanifested matter into manifested matter. And then it is necessary to get an answer to the question of how the concentrated retention of generated matter within the framework of a united whole in atoms, cells, organisms, planets, stars and cosmic systems occurs.

And if we consider two candidates for the description of unmanifested dark matter, then in comparison with Zeldovich's anapole, the descriptive paradigm of the Mobius Magnetic

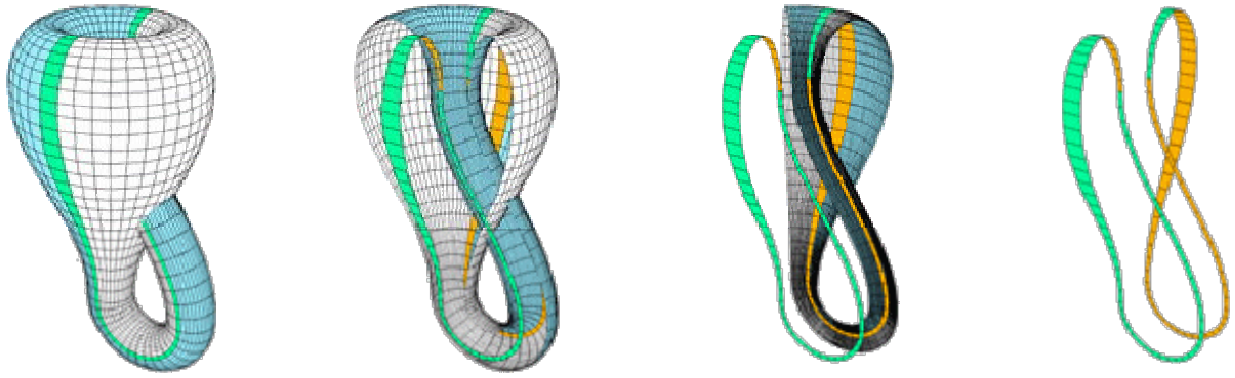
Monopole will correspond to the maximum number of fulfilled criteria according to the set of all its properties designated in the field of this article.

As is known, all manifested matter is matter in a state of dipole. Its manifestation is carried out by a universal method of fibration (filamentary stratification) of "***seed elements***", which can be either generative units of the etheric Quantum Medium – MMEP, or entire spatial areas in which the **collective effects** of such units are manifested by analogy with the collective effects observed in condensed media.

The role of such a spatial ***macro-quantum*** or ***mega-quantum*** can also be played by the so-called "***black hole***", in which at a certain stage the process of hydromagnetic dynamo with the generation of visible matter can be launched. And in essence, in the fabric of the ethereal Quantum Medium, a dual oscillatory process occurs between its complementarily connected areas through the ***gravitational tensor of tension and balancing***, mediated by the principle of complementarity. It gives a clear idea of how the principle of complementarity is realized physically. In one of the macro-regions the etheric substrate contracts, and in the other, dually connected to it, it stretches, generating objects according to the CosmoGenesis algorithm. [36]

It should be noted that the interpreted "expansion of the Universe with acceleration" does not give a complete picture for many physicists at the current stage. The complete picture can be visualized using the development of the Mobius strip in the form of a ***Klein bottle***, which clearly demonstrates that the complete process is a combination of two mutually dependent and interconnected complementary processes – expansion and contraction. Such a interrelation operates according to the law of conservation of energy and assumes only mutually inverse transformations. [36]

KLEIN BOTTLE – TWO MOBIUS STRIPS.



In 1997, Juan Maldacena published his famous work «***The Large N Limit of Superconformal field theories and supergravity***» on the AdS/CFT correspondence. Thanks to this, science received two essentially different descriptions for the physics of the same system – one description in the language of gravity, the other in the language of quantum theory. [34]

The AdS/CFT model has two completely different theories. J. Maldacena demonstrated that both theories are dually and exactly corresponding to each other and describe the same thing in different languages. That is, **quantum interactions** of objects on the shell can be equivalently described using **gravity in the space** that the shell surrounds. And, accordingly, vice versa.

Scientists have not yet been able to combine these two main theories without contradictions, but thanks to AdS/CFT it became clear that this is certainly possible, since in fact

these theories study different ways of representing a single physics. During the same period, Maldacena prepared another important work, "***Eternal black holes in anti-de Sitter***" [33], which in his characteristic innovative style and on the basis of AdS/CFT solved the well-known Hawking information paradox for black holes. In addition, here a significantly different scenario was given for the evolution of the universe, where **there is no Big Bang**, but there are endless cycles of mutual transformations for a couple of giant black holes of cosmological scale.

According to this scenario, the matter of the world appears from one such hole, called "white", and evolves and gradually shifts as a shell-partition to the "black" hole, into which at the end of the cycle everything that appeared is absorbed to begin a new large cycle. And such a cycle occurs in endless mutually inverse oscillations. [33]

J. Maldacena considered these stages of the development of the world, conditionally divided into two halves, using a **variant of two Möbius strips**, linked along their line of curvature into a one-sided surface – a ***Klein bottle***. In this visualization, he demonstrated the cosmological evolution of a structure based on a double black hole, where all particles first fall into one – "black" – neck of the universe, and then emerge from the other neck, the "white hole", but already in a changed state.

That is, this variant clearly demonstrates that instead of the beginning of the world from the "***Big Bang***", which is implied by the scientific consensus, something completely different is observed here, about which J. Maldacena wrote at the very end of his article: "***Interpreted as a cosmology, the universe gets to start over and over again and the initial conditions change slightly every time***." [33]

If we delve into the meaning of this phrase according to the **holographic principle** introduced into the field of physics by Nobel laureate G 't Hooft and which mediates the Universal Law of Analogy and Unity, then in essence, in obtaining the "***beginning again and again***" lies the cycle of phases of matter by analogy with the cycle of water in nature. The main phases of matter are its **monopole phase** in the form of etheric matter, unmanifested in the variant of multipolarity, the **dipole phase** with the external manifestation of the magnetic field and the **atomic phase** of structural matter.

Despite the fact that J. Maldacena himself notes the dissimilarity of such a Universe to ours, it can be noted that this may simply be a fact of insufficient knowledge about our Universe or of incorrect interpretations of already received and further received knowledge due to the fact that the theoretical basis of ideas that has been created to date may contain certain kinds of misconceptions and hinder the correct interpretation of new information.

In my author's monograph [36] the theme of the "oscillating swing of the Universe" is covered in the section "The Word "ENTROPY", where, based on the tools of Linguistic Physics, I conclude that "the Universe gets its beginning again and again", but without transforming as a whole at the same time, and its renewal process is similar to the renewal of any organism. The vision of this picture is shown exclusively on the basis of the meaning of the root word of the concept of "***entropy***". Generally, this aspect is derived by me independently of anyone's conclusions, and the concept of "***entropy***" in the format of the application of Mobius Geometry acquires a completely different meaning.

I believe that the time has come for the scientific community to reconsider the understanding that is put into the concept of "***entropy***" (and not only) in the current paradigm, and this must be done by connecting the physics of the word formula along with new research data and theoretical achievements, which will help to avoid mistakes in revealing the true nature

of this phenomenon and others, since at the current stage the understanding of many things looks incomplete and is interpreted one-sidedly.

The above-mentioned work of J. Maldacena was initially essentially ignored by the scientific community. Colleagues in science began to take an interest in it and develop its results **in the 2010s**. First of all, they turned to the interrelation between quantum entanglement and space-time geometry identified by J. Maldacena. The most illustrative example of this series of studies was the story around the work of **Mark Van Raamsdonk**. [63]

Continuation of the topic of **quantum entanglement** is in the following work "***2. Quantum Entanglement. The Yin-Yang Symbol. Mobius Geometry. Phases of fibrations***".

The 2016 Nobel Prize winner Gerard 't Hooft's article "***Black hole unitarity and antipodal entanglement***" [25] is one of those rare publications where an authoritative scientist clearly states and demonstrates that the two branes at the core of the structure of our Universe are not actually two surfaces at all, but one and the same surface folded in a **topologically non-trivial way**. Therefore, the author does not use the term "branes" at all.

In 't Hooft's calculations, the role of black holes is shown in a significantly new way, both as stitching the fabric of space into a united whole and as being at the core of the phenomenon of **quantum entanglement**.

A pair of entangled units, according to 't Hooft's calculations, is necessarily **asymmetric**. This can also be seen as an important step in science towards understanding the "single but bifurcated" nature of the asymmetric "***electron-proton***" pair. This theme is developed by me in my work "***3. The Basic Element of Nature. Mobius Geometry. Gravity. Model of the Atom***".

All calculations and arguments of 't Hooft are made by the author within the framework of generally accepted **standards of theoretical physics**, that is, based on purely orthodox approaches of quantum mechanics and general relativity and without using additional dimensions, strings and supersymmetries. This means that here we are not talking not so much about mathematical abstractions, but results that are directly related to the structure of the world around us. [25]

It is especially worth emphasizing that the key points of Gerard 't Hooft's calculations are that the basis of the Universe is the same surface, folded in a topologically non-trivial way. It is precisely this geometric image that is not a mathematical abstraction, but the ontology and geometry that is embedded in the structure of space and presents Two antiphase Beginnings of Cosmogenesis, which are complementarily interconnected for the dynamics of motion and processes of reproduction.

Such a surface is illustrated by the Mobius strip and its transformations-modifications. In the author's monograph and other works it is shown that what appears in the theoretical field of modern theories as "two branes" is also nothing more than a representation of the basic dipole construction in the configurativity of the Mobius pseudo-ring. In this regard, the concept of "two branes" can be transfered into the language of a topologically folded surface in a dipole state.

In this regard, the well-known two-brane model of **Randall-Sundrum** [130] lacks the most important thing – the transfer of this idea into the format of the FPC and the Mobius strip. Then it will become clear that the outwardly different Weak Brane and Gravity Brane are one and the same brane, non-trivially laid in the configuration of the Mobius Dipole. And every "point" with a large mass (star) on one (Gravity) brane has its "***asymmetrical mirror image***" on the other (Weak) brane, where small masses are distributed over a large area. The same is true for the "***proton-electron***" dipole asymmetrical interrelation.

As for the reaction to **G. 't Hooft's 2016 article** in the press and on the Internet, as far as one can judge by its absence, the same story is happening with its complete ignoring by the scientific community, which took place in the described case with the work of H. Maldacena in 1998. After publication, it waited for its time for a decade. Perhaps now, more than eight years later, its finest hour is coming.

As it is already becoming clear, Mobius Geometry mediates **substantial universalism** and, accordingly, is the instrument of knowledge that makes it possible to take the path of bringing theoretical views to a **common denominator**, and not only in the field of theoretical physics, but also uniting all spheres of science together, since the only way out of the crisis can be the recognition that **all surrounding matter is oscillating and alive**, generated by etheric magneto-plasma and is characterized by the same processes that are now considered by biology for the most part – **breathing, metabolism, symbiosis**.

And if progressive scientists are already now connecting aspects of living and breathing magneto-plasma to the field of thoughts, starting the countdown in theories from the supporting Quantum Medium, as well as from the symbiosis of all objects with it, then the way out of the crisis situation of theoretical physics is seen in considering the **general biology of the Universe** as a universalism of the existence of active matter, regardless of the level of scaling and scope of application.

The existing so-called emergent phenomena of quantum physics, which appear as a result of various effects of collective behavior of the elements of the system and which by definition are not derived from the already existing first principles of physics, but are associated with the effects of interactions of waves and vortices of hydrodynamics, actually have clear analogies among fundamentally important processes in biology.

One of such phenomena is the hydrodynamic property of division of a twisted vortex. In biology, this analogy is the twisted DNA spiral. During its filamentary division, a new cell is formed. This unique visual analogy demonstrates the fact that during the process jf division/bifurcation/fibration, the InfoGenome is doubled and a new cell is formed. The mathematical paradox is that here we observe the following **1:2 = 2**, and then the following doublings follow, and each of the resulting cells during its division produces two, that is, already four.

The same tendency, as noted above, is observed in the descriptive content of quantum mechanics during the formation of spinors, bi-spinors, twistors and hypertwistors, i.e. during the formation of the periodic system of atomic elements. This suggests that processes at different levels occur fractally identically and on the basis of the holographic principle, and such an effect is provided by the initial complementary duality, the geometry of which contains an inversion, which in the method of fibration has the **property of doubling its essence**.

Based on the given analogy and as already indicated in the initial part of this work, the way out of the crisis of physics is seen in the consideration of the general biology of the Universe and the processes in it based on their universalism. In this regard, a new paradigm is needed for describing processes in the format of a **single monistic concept**, which is realized by Nature in the form of universal twisting – UNI-VERSE – and which should become the basis of physics as a science in the cognition of the universal world order.

Let us turn to the quote of Nobel laureate H. Alfvén:

"Scientific progress depends on the development of new instruments. The transition from Ptolemaic to Copernican cosmology was largely due to the advent of telescopes. Similarly,

modern space research has so radically changed the possibilities of science in studying our large-scale environment that a thorough rethinking of the entire physics of space is currently underway.

We have now learned to generalize the results of plasma research from one small scale to regions of much larger size.

Taken together, all this leads or has already led to such a revision of our concept of cosmic plasma that in many respects it **allows us to speak of a complete paradigm shift**." [20]

While agreeing that a complete paradigm shift based on new data and with the help of new tools is necessary, I would like to note the following psychological tendency, which is inexorably repeated in the history of science and which H. Alfven himself went through when he proposed new ideas regarding **living cosmic plasma**.

New aspects or phenomena discovered by science in the nature of things and especially in experiments are usually interpreted as confirmation or deepening of our understanding of already mastered truths or first principles.

If new facts are not derived from first principles or even contradict these principles, is even worse, then the following happens: the importance of new discoveries is either denied, or they are distorted and downplayed, adapting them to the foundations of an already created authoritative foundation. Or reliable and therefore especially important knowledge is simply ignored in favor of maintaining the appearance of consistency and non-contradiction in the basic postulates. It must be said that such a tendency is very clearly expressed not only in theoretical calculations, but also in experiments, where observation is often directed only at compliance with the basic postulates or the picture of the representation that has already taken shape or was submitted at one time by an authoritative scientific figure, but needs correction. Anything that does not correspond to this disappears from view and remains “behind the scenes” of the focus of attention.

This creates a powerful brake. Nevertheless, there is K. Gödel's incompleteness theorem and it says the following. In any theory built on the basis of first principles, it is always possible for such statements and facts to appear that are not derived from them, but which are of fundamental importance. That is, any fundamental theory will always be incomplete, no matter how many facts and statements are added to it. This must always be kept in mind and expected.

Regarding the above-mentioned opinions of Nobel laureates that in understanding the supporting Cosmic Medium and its properties it is necessary to return to the original concept of "ETHER", I would like to note that in the author's monograph, where I laid the foundations of Linguistic Physics and the methodology of Fractal Synthesis, all the main characteristics of the ethereal Quantum Medium were initially revealed exclusively through the semantic content of the root of the word "ETHER". [36]

This shows that not only a mathematical formula provides access to understanding the laws of the World Order and is a tool for studying it. The world order can be studied no less successfully through the formula of a word, which, with its degree of figurative accuracy, is capable of providing an explanation of the phenomenon that is named by this word. And if, by combining mathematical physics with the physics of the word and geometric representation plus experimental data, we obtain equivalent and adequate pictures of the description of the world, then we can conclude that we have comprehended the true World Order. The **importance of geometry** as a basis for figurative representation is undeniable.

"***That is why geometry exists, so that knowledge is not separated from spatial contemplation***."
P.A. Florensky

Exactly "Geometry is that area of knowledge that is, as it were, between abstract mathemFatics and reality. It is the mediator that resolves the contradiction between knowledge and error. But if it is completely algebraized, then such geometry takes a person beyond the spatial perception of concrete reality and immerses him in an abstract-virtual reality in which literally everything is possible, including what is impossible in reality." Sergienko P.Ya. [38]

To this I add my author's opinion. ***Geometry is the basis of figurative and model representation, and the geometry of the Mobius connection is Ariadne's thread in matters of the structure of the World Order.***

"For many years I have been observing the stagnation of physical thought in theoretical physics, which has led to the flourishing of mathematical physics (this is not bad), but is accompanied by marking time due to the lack of imaginative thinking. What you do in your works using Mobius geometry has a beneficial effect on the minds of theorists who know a lot formally, but do not realize the essential things that formal calculations bring with them." Academician of the Russian Academy of Natural Sciences G.I. Shipov (From personal correspondence. On Wednesday, April 3, 2024 at 11:45:56 AM EDT, Gennady Shipov <warpdrive09@gmail.com>)

"The correct conclusion is that the basic equations are incorrect. They need to be significantly changed so that infinities do not arise in the theory at all, and so that the equations are solved exactly, according to the usual rules, without any difficulties. This condition will require some very serious changes: small changes will not give anything." Dirac P. [143]

In this paper, when considering the issues of the structure of the etheric Quantum Medium as a physical support medium of outer space, the following conclusions are proposed:

1. The main driving mechanism mediating the method of universal torsion (UNI-VERCE) is INVERSION (mirror asymmetry), enclosed in the topology of the geometry of the Mobius strip. This inversion mediates the interrelation between complementary components and determines the universal law of the dynamics of their interaction.
2. The supporting **Cosmic Medium** is a **physical medium** and represents the initial state of matter – **the primordial matter** – in the form of a dynamic cellular (matrix) structure of vortex magnetoelectric nodes, closed according to the complementary principle, which mediates the phenomenon of magnetism as such and oscillating self-motion – **spinning**.
3. **Magnetism** is the physical embodiment of the comprehensive principle of complementarity, which determines its universality and generality of manifestation.
4. **The matrix structure** gives the supporting etheric medium the property of granularity and, according to fractal similarity, it is characterized by effects occurring in granular materials.
5. **The magnetic field** of the matrix nodes of the Medium is not externally manifested as bipolarity, since their polarity has a closure in **one topology**, and is in a monopolar (monopole) state – **two in one**, closed in **antiphase**. The nodes of etheric matter are magnetic monopoles. Such an initial physical state of matter is magnetoelectrically "invisible" or unmanifested. It represents a monopole hidden duality. A **monopole does**

not mean unipolar, but has an internal closure of the polarities of magnetism. It represents a **monopole hidden complementary duality**.

6. It is proposed that the **geometric visualization** of such a magnetic monopole be considered to be a Möbius strip with a minimum aspect ratio of a plane closed through an inverse 180-degree turn.
   The **Mobius Magnetic Monopole** (**MMM**) contains a natural **antiphase duality**, as well as the **duality of symmetry and mirror asymmetry**, combining them into one whole. In essence, this is the original **form of a quantum phenomenon**, which determines discreteness. The InfoGen of the original antiphase duality and the symmetry-asymmetry duality is transmitted to all subsequent generations in a universal copying method. **Magnetism as a physical embodiment of this duality has the property of transmitting its InfoGen to all subsequent generations.**
7. In the state of closure through inversion and due to the internal **magnetic reconnection**, the etheric monopoles perform continuous and non-stop **oscillations**, which are an act of their internal spinning in the form of Mobius torsion, which is the simultaneous execution of two cyclorotations:
   - rotation of inversion around a conditional internal center along the middle of the Mobius curvature line and
   - cyclorotations of inversion around a conditional external center located inside the Mobius ring.
   This double type of cyclo-turnover is transmitted InfoGenetically to all system formations generated by the etheric Quantum Medium, and is a universal type of torsion UNI-VERSE, as evidenced by the entire cosmos and the names of the Universe in English, as well as Russian. [36]
8. The **Mobius Magnetic Monopole** (**MMM**) is a **fundamental spinning quantum-mechanical unit** that performs continuous and non-stop oscillations and produces sub-micro-**monopole radiation**, as well as the absorption of portions of magneto-plasma as a phase of **quantum breathing**.
   The **geometric shape, metrics and dynamics** of the MMM cycle rotation contain a relationship with numerical values close to three constants: **φ = 1.618, π = 3.1415 and *e* = 2.718281828459.**
9. According to the description, such a vortex matrix of the supporting Cosmic Medium will create **turbulence effects** and, accordingly, a hydromagnetic dynamo will spontaneously be generated in it.
10. **Magnetoelectric oscillations** of magnetic etheric monopoles are a reciprocal quantum process of "radiation-absorption", in other words, a process of oscillating **quantum breathing** of the etheric Medium, which is also transmitted InfoGenetically to all the creatures of the environment from small to large as a process of breathing of life and at each level of scaling and in each plane of being has its own way of expression. This breathing of life is performed by both sub-micro-units of the etheric Quantum Medium, and atoms, bioorganisms, stellar-planetary systems, galaxies and the Universe as a whole.
11. The process of quantum breathing of the supporting Medium creates a sub-micro-vibrational background and is that high-vibrational carrier mediating all processes of interactions in the supporting Medium, the transfer of information and the implementation of the background principle.

12. The spinning substrate of the etheric Quantum Medium is an etheric **magneto-plasma** – a kind of **superfluid plasma liquid** from sub-micro-monopole radiations-absorptions, that is, **active living matter**.
13. At ultra-low temperatures of outer space, the etheric magneto-plasma is a special kind of condensed medium, a kind of **mega-quantum** object, in which a variety of collective effects are observed both of the entire object as a whole and of its individual areas interacting as a whole. Such a medium is characterized by the movement of arrays of "text phrases", and not individual "letter units" of **universal binary coding**.
14. The processes occurring in the superfluid etheric-plasma medium will obey the **laws of hydrodynamics** similar to the processes occurring in water and air environments.
15. According to the laws of hydrodynamics:
    - In a hydrodynamic environment, any arc discharge, whether occurring in technological power plants or in natural conditions, can curl up into an electron vortex.
    - As a result of external influences, a vortex ring can decrease the toroidal velocity and increase the annular velocity, turning either into a vortex disk or a cylindrical vortex (thick or thin). The opposite transformation is also possible. A vortex ring in the form of a Hill vortex can form a vortex funnel in the form of a cone (jet).
    - Individual electron streams can separate from the surface of the vortex, quickly disintegrating into sparks.
    - A vortex ring can deform, passing through small holes, and restore its shape after deformation.
    - Vortex objects can divide spontaneously or under sudden external influence. The surface of an electron vortex can spontaneously delaminate into parallel electron beams.
    - Dynamic interaction is possible between vortex objects – they play leapfrog, dance in a circle, merge together, etc.
    - Vortices can form Karman paths. [74]
16. In accordance with the law of hydrodynamics on the spontaneous division of a vortex object or its division under a sharp external influence, it is proposed to further consider the phases of the process of bifurcation/fibration of a vortex monopole formation closed through an inverse turn, which geometrically represents the original Mobius strip as a special case of **Clifford parallels**.

The phases of fibrations and the actualization of the structural interrelations of the system formations of the supporting Quantum Medium are considered in the following work "***2. Quantum Entanglement. The Yin-Yang Symbol. Mobius Geometry. Phases of Fibration***", as well as in the work".

As a result of this work, if we return to the citation of P. Dirac at the very beginning regarding his opinion on the return of the ETHER to the field of theoretical physics, then we can add to this his opinion on the interrelation between physics and mathematics, which he expressed in his lecture given by him in 1939. [90]

"We can say that a mathematician plays a game in which he himself invents the rules, while a physicist plays a game whose rules are offered by Nature.

As time goes on, however, it becomes increasingly clear that the rules that the mathematician finds interesting coincide with those chosen by Nature."

"If we do not understand the limits of applicability of models, then we obtain such abstractions that not only do not lead to the truth, but lead away from it." V. Tatur, scientist. [40]

As it is shown and will be developed in the next three articles, a monistic description of the geometry of both the micro-world and simultaneously a parallel transfer of common structures to the macro- and mega- is proposed, which can help to advance not only in the figurative representation, but also in the construction of a mathematical apparatus for describing the universal dynamics of torsion.

In the proposed monistic description, the **object of research** is the supporting cosmic medium – the ethereal Quantum Medium and its structure, and the **subject of research** is the properties of the matrix unit of the ethereal Quantum Medium.

The proposed **monistic description** has in its starting basis a single fundamental principle – the principle of complementarity (**FPC**), the essence of which is in universal dualism: opposite components of duality that complement each other to a whole. The geometric analogue of the complementary interrelation is the Mobius strip, on the basis of which the **quantum-mechanical unit of space-time** is described.

If there is a specific image with the mechanics of motion, then the possibility of a **classical description** of the quantum unit and quantum effects arises, which allows us to get rid of the principles of quantum mechanics and the rules for working with them. This reduces the number of principles of dynamics and improves the quality of the theory.

"A monistic description of a particle in terms of a world function is simpler and more effective than attaching arbitrarily chosen parameters to a particle. In the case of using a monistic concept, there is no need to invent anything and there is no need to coordinate anything." [179]

Since September 2021, I have been conducting an exchange on some issues of theoretical physics, including issues of constructing a unified general theory, with Academician of the Russian Academy of Natural Sciences G.I. Shipov, the author of the Theory of Physical Vacuum. [168]-[174]

Scientific exchange helps in crystallizing one's own thoughts, significantly expands the area of attention and replenishes the knowledge base of both parties, and also stimulates the activity of scientific tone. G.I. Shipov is the author of the theory, the creation of which he devoted his entire life. His latest publication and book "Fundamental Results of the Theory of Physical Vacuum" [168] is the achievement of scientific thought that makes a significant contribution to the program for creating a unified field theory.

Taking this fact into account, I consider it important and necessary to make a short review of this book in my work, since the paths of our theoretical thoughts have a common point of intersection, which is the geometry of Mobius:

"In four-dimensional space, to fully describe the rotation of matter, it is necessary to use the third and fourth derivatives of the coordinate from time. In this case, the theory of general relativity (unified field theory) appears, based on the Mobius geometry and spinors." G.I. Shipov.

At the beginning of his book [168], G.I. Shipov summarizes the stages that theoretical physics went through on the way to creating a unified field theory:

"In fundamental physics, 1913 was a year of fork in the road (Fig. 2), when the single trunk of the physical tree split into three branches, namely: 1) into the phenomenological-constructive physics of the microworld, which led to the creation of the standard model; 2) into the constructive-phenomenological quantum theory, from which grew quantum field theory, quark theory and string theory; and 3) the general theory of relativity (GTR), which allowed A.

Einstein to generalize Newton's theory of gravitation in a fundamental way to the case of relativistic gravitational fields. Now it is clear why string theory and the standard model have failed to unite these three branches, despite many years of intellectual efforts - because it is fundamentally impossible to unite the fundamental theory (A. Einstein's General Theory of Relativity) with phenomenologically constructive theories (the standard model and string theory). A new fundamental theory does not arise as a result of a mathematician generalizing several theories, but is created by a physicist by expanding the physical principles and equations of a fundamental theory previously recognized by all theorists. String theory [7] and the standard model [8,9] are in fact variants of a unified field theory, the creation of which was proposed at the beginning of the 20th century by Albert Einstein. The implementation of this program, according to A. Einstein, consists of solving two problems: 1) geometrization of the Maxwell-Lorentz electromagnetic field equations and 2) geometrization of the equations of quantum field theory - the Dirac equations, etc. [168]

"According to A. Einstein, the implementation of the program for creating a unified field theory consists of solving problems: 1) and 2), while the equations of classical Maxwell-Lorentz electrodynamics should not only be geometrized, but the charge itself should not be point-like (the singularity problem)." [168]

In this direction, as G. I. Shipov points out, he "made a radical step in 1972 in his work [30]. Instead of the Maxwell-Lorentz equations, it was proposed to use the equations of general relativistic electrodynamics with a tensor electromagnetic potential and field equations reminiscent of Einstein's equations." [168]

"In subsequent publications [43-45], for the first time in science, the existence of a new fundamental physical field was indicated, about which A. Einstein prophetically spoke. This field of "unknown nature" turned out to be the inertial field [45]." [168]

The further course of the theorist's reasoning led to the fact that "in the work [43] the completely geometrized Einstein equations (2.39) with the matter energy-momentum tensor (2.40) were proposed for the first time, which made it possible to construct a purely field theory of gravity, which turns into Einstein's theory in the limit when the source of the gravitational field is stationary [45] and is a point. Following the works of R. Penrose [52], the field equations (2.39) were written in the spinor basis [44]."

"Using (3.17), it can be shown that from (3.19) follow the Schrödinger equations for для ψ and ψ^*. This allows us to conclude that quantum mechanics is a purely classical theory of the inertial field, normalized to unity, while the probabilistic interpretation is useful in some cases, but not obligatory, as A. Einstein assumed.

After the solutions of equations (A), (B) are found, then, under certain restrictions, from the field equation (2.39) follow the Einstein equations (2.19) and the equations of general relativistic electrodynamics (2.1), in which the sources of the field are determined through the inertial field T_{jk}^{i}. As noted above, the inertial field determines the wave function ψ in the Schrödinger equation and the density of matter (3.17), while the fundamental inertial field T_{jk}^{i} can be considered as an “internal” field, which is the source of “external” gravitational and electromagnetic fields (Fig. 4).

In 1984, Shipov G.I. first proposed the equations of physical vacuum, written in a spinor basis.

"Finally, in 1987-1988, two monographs were published [67, 68], which presented the physical principles [67] and mathematical apparatus [68] of the theory of physical vacuum, based on the general principle of relativity. This principle is a unification of Einstein's general principle

of relativity with the rotational principle of relativity, requiring the invariance of the equations of physics with respect to six dimensionless, non-holonomic rotational coordinates $\varphi_1, \varphi_2, \varphi_3, \theta_1, \theta_2, \theta_3$.

It is easy to see that the equations of the physical vacuum (A), (B) do not contain any physical constants, just like Einstein's vacuum equations. [168]

The equations of the physical vacuum simply and naturally combine gravitational r_g, electromagnetic r_e, nuclear r_N, and spin fields r_s with inertial fields.

$$r_g = \frac{2MG}{c^2}, \quad r_e = \pm\frac{2Zze^2}{mc^2}, \quad r_s = \hbar/mc, \quad r_N = 3.15 \times 10^{-1}\ cm$$

In the final part of his book, G.I. Shipov gives the following assessment of the results obtained in the proposed theory:

“The fundamental nature of the theory of physical vacuum is confirmed by the main strategic results [101,102] following from its equations, namely:

1. The first problem of Einstein has been solved – geometrization of the equations of electrodynamics.

2. The second problem of Einstein has been solved – geometrization of the energy-momentum tensor of matter in Einstein’s equations.

3. The third fundamental physical field has been discovered – the inertial field associated with the wave function ψ of quantum theory and the Yang-Mills gauge field.

4. The problem of a unified field theory has been solved, uniting not only three fundamental fields – electromagnetic, gravitational and inertial fields – but also classical field theory with quantum theory.

5. Based on the solutions of the equations of the theory of physical vacuum, short-range and long-range potentials have been found that allow a fundamental description of the interactions of elementary particles (gravitational, electromagnetic, nuclear, weak (spin), quark).

6. Equations have been found that allow an analytical study of psychophysical phenomena such as telekinesis, biogravity, levitation (of diamagnets), etc., for the explanation of which neither string theory nor the standard model have approaches.

7. The equations of physical vacuum describe not only light and sublight objects moving at the speed of light and less, but also superluminal and instantaneous signals, allowing the study of supercausal and hypercausal processes, which, as was shown earlier, is indirect evidence of the existence of God." [168]

Also, Shipov G.I. notes one of the most important aspects concerning the foundations of all theoretical physics, and not just its individual parts.

"**Mechanics was and remains the basis of all theoretical physics**. Any new fundamental theory is accompanied by a fundamental generalization of mechanics. As for the nonholonomic mechanics of the theory of physical vacuum, its advantage is the fact that it unites traditional classical mechanics with field theory due to the discovery of the inertial field and the equations that describe its dynamics (Fig. 6)." [168]

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