Kulak L.A. (Antoniya Ilyinskaya)

2. QUANTUM ENTAGLEMENT. MÖBIUS GEOMETRY. THE «YIN-YANG» SYMBLE. PHASES OF FIBRATION.

"Quantum physics urgently needs new images and ideas, which can only arise from a profound revision of the principles that underlie it." *Nobel laureate* ***Louis de Broglie****.*

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

"Geometry exists for this very reason, so that knowledge may not be divorced from spatial contemplation*." P.A. Florensky*

"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." [80]

In my author`s monograph "Substance. Atom. Theory of Everything" [72] 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. [77]

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 [89]

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 exhaustive 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") [82]
6. "Clifford`s parallels", [71]
7. "Fibration of the Mobius Pattern. Formation of the Atom" [81]

This article is a continuation of the article "***1. Quantum Medium. Mobius Geometry. Magnetic Monopole***", which examined the issues of the structure of the etheric Quantum Medium as a supporting Cosmic Medium and proposed the following conclusions:

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 such nodes 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 duality**.

6. The **geometric visualization** of such a magnetic monopole is a Mobius strip with a minimum aspect ratio of a plane closed through an inverse turn of 180 degrees.
   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. [72]
8. The **Mobius Magnetic Monopole** is a 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**. **MMM is the original fundamental unit.** The **geometric shape, metrics and dynamics** of the MMM cycle rotation contain a relationship with numerical values close to three constants: **$\varphi = 1.618$, $\pi = 3.1415$ 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 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. [34]
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**.

In this article, in continuation of the coverage of the format of the application of Möbius Geometry to questions of theoretical physics, quantum entanglement and the fibrational phases of the Möbius Magnetic Monopole are considered.

The Nobel Prize in Physics 2022 was awarded to three physicists: Alain Aspect from Paris, John F. Clauser from California, and Anton Zeilinger from Vienna. The prize was awarded "*for experiments with entangled photons, the establishment of the violation of Bell's inequality, and pioneering quantum information science.*" [60]

According to opinion of Chris Ferry, a lecturer at the Centre for Quantum Software and Information at the University of Technology Sydney, "Quantum entanglement is a complex phenomenon in physics that is usually poorly described as an invisible link between distant quantum objects that allows one to instantly affect the other. Albert Einstein famously dismissed this idea of entanglement as "spooky action at a distance." In reality, entanglement is better understood as information, but that's admittedly bland. So nowadays, every news article, explainer, opinion piece and artistic interpretation of quantum entanglement equates the phenomenon with Einstein's spookiness.

The situation has only worsened with the 2022 Nobel Prize in Physics going to Alain Aspect, John F. Clauser and Anton Zeilinger for quantum entanglement experiments. But it's time to cut this adjective loose. Calling entanglement spooky completely misrepresents how it actually works and hinders our ability to make sense of it." [88]

Chris Ferry says that quantum entanglement is better understood as **information**. Of course, if quantum theory still lacks a picture of the representation of a quantum phenomenon as such and, accordingly, the form of the original quantum unit that creates this phenomenon has not been identified, then in the search for a picture of representation, it is worth grasping the understanding of this phenomenon as information, so that at least in some form it can be represented. Without an appropriate figurative representation, thought simply cannot move in the right direction, much less comprehend the phenomenon being studied and its application in practice.

In essence, the same phenomenon, which represents the original substantial essence, has its individual projections in different spheres. An example of this is the complementary corelation, which in the field of information, where its transmission occurs by binary coding, can be represented by two symbols – "0" and "1", in the field of electromagnetism – a magnetic field and electric current, in the field of electrical engineering – "+" and "-", in the field of cell biology – two strands of DNA, in the field of species biology – division into two sexes, and so on. All these are different forms of expression of one substantial essence – complementarity. Therefore, it is possible to understand and study it in different planes of being, while remembering their fractal-holographic identity.

Regarding the phenomenon of quantum entanglement, according to the holographic principle, it is also possible to study and understand it in various applications. And there is a weighty basis for this, because its nature is embedded in the original form of the quantum phenomenon, which was discussed in the work "***1. Quantum Medium. Mobius Geometry. Magnetic Monopole"***.

The initial form of a quantum phenomenon is proposed to be considered a unit of the etheric Quantum Medium, which is considered as a sub-micro-magnetoelectric circuit in the form of a Mobius strip with one inversion. The absence of figurative pictures in quantum theory from the very beginning of its inception elevated the section of quantum physics to the category of some exception from the category of classical laws and thus gave rise to a number of unfavorable tendencies in it. Nevertheless, the quantum world is not an exception to the general rules and laws of physics, all of which are applicable to the sphere of quantum phenomena. The question is how to apply and how to represent. It is precisely in the absence of figurative pictures of representation that difficulties arise.

I believe that this absence was the reason why, when Erwin Schrödinger coined the term entanglement in 1935, he emphasized that "*not one but rather the characteristic trait of quantum mechanics, the one that enforces its entire departure from classical lines of though"t.* In fact, before quantum theory, "classical lines of thought" simply did not address these issues. The time had not yet come for their discovery.

"The EPR argument concerns the everyday notion of reality as a collection of things in the world with physical properties waiting to be revealed through measurement. This is how most of us intuitively understand reality. Einstein's theory of relativity fits into this understanding, and says reality must be local, meaning nothing can influence anything else faster than the speed of light. But EPR showed that quantum physics isn't compatible with these ideas—that it can't account for a theory of local reality. In other words, quantum physics was

missing something. To complete quantum physics, Einstein suggested scientists should look for a “deeper” theory of local reality”. [88]

This deeper theory of local reality begins precisely in the area of quantum phenomena. Quantum phenomena concern everyday life to the same extent as the things we see, touch, and hear. The difference is that the quantum sphere is more perceptible to us not through the senses, but through intuitive sensations. And if quantum physics speaks of measurable dimensions at the level of the Planck length, then why shouldn't this "quantum length" have "physical properties awaiting their revelation through measurement"?

As for the fact that "nothing can influence anything else faster than the speed of light", I raised this question in the previous article "***1. Quantum Medium. Mobius Geometry. Magnetic Monopole***" and concerns the way light propagates in the ethereal Quantum Medium. The article presents arguments and the results of an experiment regarding the slowing down of the speed of light, and proposes a revision of the method of light propagation in the format of applying Mobius Geometry to the structure of the ethereal cosmic medium.

Based on the concept I proposed, if the propagation of light is assumed to be instantaneous, as the ancients believed, and Descartes, Kepler and Fermat also adhered to this opinion, then all questions related to locality and non-locality disappear by themselves. The basis for the instantaneous propagation is embedded in the matrix structure of the ethereal Quantum Medium, as well as in the geometry and properties of its individual pixels. The main question is always how we imagine this or that phenomenon. The virtuosity of algebra is practically capable of confirming any of the ideas with calculations. But in mathematics there is also geometry, which is just an intermediary between the theoretical studies of algebra and reality.

Let's say that according to Gödel's incompleteness theorem, in any theory built on the basis of first principles, it is always possible for such statements and facts to appear that are not deduced 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. And also, some facts of the science of physics, which are already considered fundamental, may in fact be particular solutions of broader fundamental ideas that are expanding in scientific consciousness in each era. And there is no need to resist this expansion and assume that we have known everything for a long time.

Proposing a generalized concept in the format of Mobius Geometry, I am not afraid to introduce new statements, as well as to revive old ones, but forgotten for a number of objective reasons. Therefore, in contrast to the prevailing opinion about the exclusivity of quantum physics, as well as the explanation of “how quantum physics works, and how it departs from the classical world, from the perspective of information, not physics”, I assert that quantum physics is the original part of the “classical world,” its organic inclusion, does not depart from physics even from the point of view of information, and information is always associated with a material carrier, whatever it may be. If it is not a magnetic card or tape, not a paper carrier, not a computer or server, not cosmic ether, then only one thing remains - our head. And we should not forget about this. There is no information in some immaterial form. If someone still thinks differently, then it is worth twisting this thought until you understand this truth.

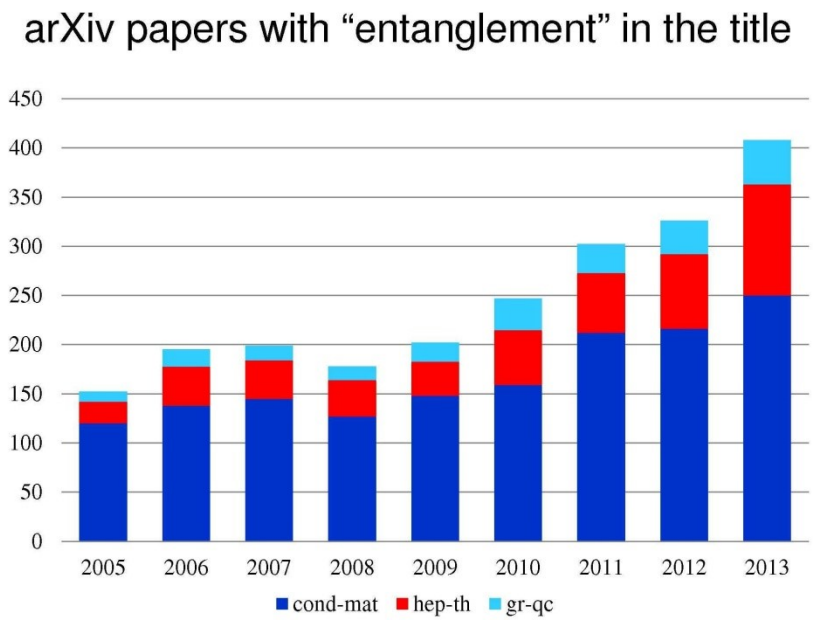
Therefore, quantum entanglement as a phenomenon of the quantum world has both its physical representation and explanation. Everything else is “from the evil one” or due to the incompleteness of knowledge at the current time. In this work I have mostly shown the actualization of quantum entanglement during the formation of an atomic structure in the process of fibration of etheric monopoles and growth of the structure from the inside out, in other words,

in the process of transformation of "dark matter" into baryonic matter. Before directly moving on to this issue, it is necessary to touch upon the current trend and its experimental part.

Today, the facts from the life of the scientific preprint archive (arxiv.org) are such that since 2010, the theoretical section of high-energy particle physics "hep-th" has seen an exponential growth of articles devoted to the phenomenon of quantum entanglement.

The preprint site has shown a steady increase in the number of publications on quantum entanglement since 2009-2010 in the sections on condensed matter physics [cond-mat], high-energy particle physics [hep-th], and general relativity and quantum cosmology [gr-qc]. This fact was noted earlier by John Preskill in the blog of the Institute for Quantum Information and Matter. [11]

A blog by the Institute for Quantum Information and Matter.



[11]

It is also worth citing information about a number of published experiments related to the generation of entangled photons and electrons.

A fairly common method for generating entangled photons is to split a powerful laser beam inside a special crystal with nonlinear optical characteristics. As it passes through the crystal and under the influence of the spontaneous parametric conversion process, some of the photons in the laser beam are split into two entangled photons that have half the energy of the original photon.

One of the publications describing this technique is **May 20, 2022** publication "***Generation of entangled photons with a second-order nonlinear photonic crystal and a beam splitter***" [1].

«We discuss the generation of entangled photons using a nonlinear photonic crystal and beam splitter. In our method, the photonic crystal is assumed to be composed of a material with a large second-order nonlinear optical susceptibility. Our proposal relies on two facts: (1) A nonlinear photonic crystal changes coherent incident light into squeezed light. (2) A beam splitter transforms the squeezed light into entangled light beams flying in two different

directions. We estimate the yield efficiency of pairs of entangled photons per pulse of the very weak coherent light for our method at 0.0783 for a specific concrete example».

As practice shows, this method is ineffective and unpredictable, since only one entangled pair is obtained from tens of millions of photons. At present, along with this common method, new methods are used that make it possible to simultaneously obtain a large number of entangled photons.

An effective approach to multiphoton generation was implemented by Chinese researchers, as described in a publication **August 2022** «***Sequential generation of multiphoton entanglement with a Rydberg superatom***». [2]

In creating an entangled photon generator, they formed a Bose-Einstein condensate cloud from hundreds of rubidium atoms, which had the behavioral pattern of a single large superatom. Then, one of the condensate atoms was excited by laser radiation and passed into the Rydberg state. As the results of experimental verification showed, the interaction of the excited atom with the others led to the effect of the emission of quantum entangled photons by rubidium atoms. Using the Rydberg superatom, the researchers achieved an entangled photon generation efficiency of 27%, which is significantly higher than the 16% maximum obtained using an optical crystal and the spontaneous parametric transformation process. The efficiency of entangled photon generation by the Rydberg superatom exceeds previous results and paves the way for larger-scale photonic entanglement.

«The traditional way of spontaneous parametric downconversion already demonstrates the entanglement of up to a dozen photons but is hindered by its probabilistic nature. Here we experimentally demonstrate an efficient approach for multiphoton generation with a Rydberg superatom, a mesoscopic atomic ensemble under Rydberg blockade. Using it as an efficient single-photon interface, we iterate the photon creation process that gives rise to a train of single photons entangled in the time-bin degree of freedom. Photon correlations verify entanglement up to six qubits. The overall efficiency to detect one photon is 9.4%. After correcting the measurement inefficiencies, we obtain a scaling factor of 27%, surpassing previous results and paving the way for larger-scale photonic entanglement». [2]

A number of publications offer the results of experiments conducted on the entanglement of atoms.

In March 2015, the simultaneous entanglement of 2910 atoms was reported in publication «***Entanglement with negative Wigner function of almost 3,000 atoms heralded by one photon***» [3].

The authors of the experiment created entanglement in a large atomic ensemble by interacting with a very weak laser pulse. Remarkably, the detection of a single photon prepares several thousand atoms in an entangled state. The experimenters reconstructed a negatively significant Wigner function, an important sign of non-classicality, and tested the entanglement depth (the minimum number of mutually entangled atoms) of 2910 ± 190 out of 3100 atoms. Achieving such a negative Wigner function and mutual entanglement of virtually all atoms is unprecedented for an ensemble containing more than a few particles.

More generally, these results demonstrate the power of the announced entanglement generation methods and illustrate how the information contained in a single photon can radically change the quantum state of a large system.

«Here we generate entanglement in a large atomic ensemble via an interaction with a very weak laser pulse; remarkably, the detection of a single photon prepares several thousand

atoms in an entangled state. We reconstruct a negative-valued Wigner function—an important hallmark of non-classicality—and verify an entanglement depth (the minimum number of mutually entangled atoms) of 2,910 ± 190 out of 3,100 atoms. Attaining such a negative Wigner function and the mutual entanglement of virtually all atoms is unprecedented for an ensemble containing more than a few particles. More generally, our results demonstrate the power of heralded methods for entanglement generation, and illustrate how the information contained in a single photon can drastically alter the quantum state of a large system». [3]

In April 2016, a publication «***Bell correlations in a Bose-Einstein condensate***», [4] reported the entanglement of 480 atoms.

«Characterizing many-body systems through the quantum correlations between their constituent particles is a major goal of quantum physics. Although entanglement is routinely observed in many systems, we report here the detection of stronger correlations—Bell correlations – between the spins of about 480 atoms in a Bose-Einstein condensate. Our work shows that the strongest possible nonclassical correlations are experimentally accessible in many-body systems and that they can be revealed by collective measurements». [4]

In October 2017, the entanglement of 16 million atoms was reported in publication «Experimental certification of millions of genuinely entangled atoms in a solid» [5].

The authors of the experiment demonstrated 16 million genuinely entangled atoms in a solid-state quantum memory prepared by the claimed absorption of a single photon. The method is applicable to a wide range of physical systems and is effective even in situations with significant losses. The results clarify the role of many-body entanglement in ensemble quantum memories and demonstrate the accessibility of certain classes of many-body entanglement with limited experimental control.

«Quantum theory predicts that entanglement can also persist in macroscopic physical systems, albeit difficulties to demonstrate it experimentally remain. Recently, significant progress has been achieved and genuine entanglement between up to 2900 atoms was reported. Here, we demonstrate 16 million genuinely entangled atoms in a solid-state quantum memory prepared by the heralded absorption of a single photon. We develop an entanglement witness for quantifying the number of genuinely entangled particles based on the collective effect of directed emission combined with the non-classical nature of the emitted light. The method is applicable to a wide range of physical systems and is effective even in situations with significant losses. Our results clarify the role of multipartite entanglement in ensemble-based quantum memories and demonstrate the accessibility to certain classes of multipartite entanglement with limited experimental control». [5]

In July 2019, the results of obtaining the first image of quantum entanglement of photons were published in ***SCIENCE ADVANCES,*** «***Imaging Bell-type nonlocal behavior***». The article noted that, although entanglement is already used in quantum technologies, this is the first time scientists have obtained an image of this effect. [6]

«Acquiring images of such a fundamental quantum effect is a demonstration that images can capture and exploit the essence of the quantum world. Here, we report an experiment demonstrating the violation of a Bell inequality within observed images. It is based on acquiring full-field coincidence images of a phase object probed by photons from an entangled pair source. The image exhibits a violation of a Bell inequality with $S = 2.44 \pm 0.04$. This result both opens

the way to new quantum imaging schemes based on the violation of a Bell inequality and suggests promise for quantum information schemes based on spatial variables». [6]

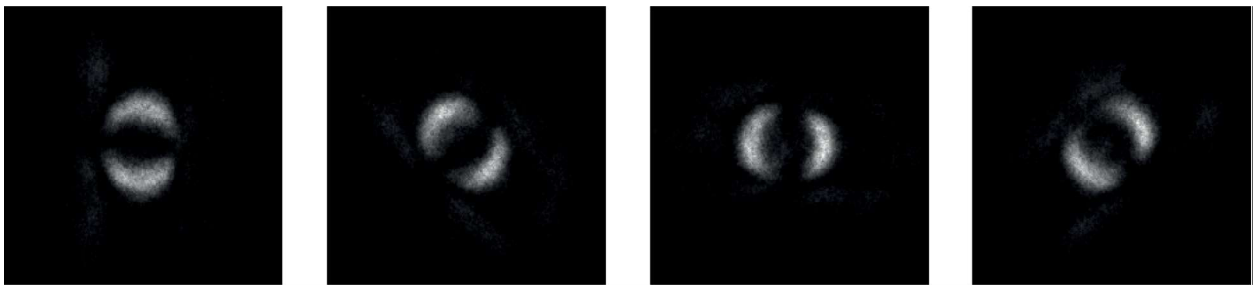
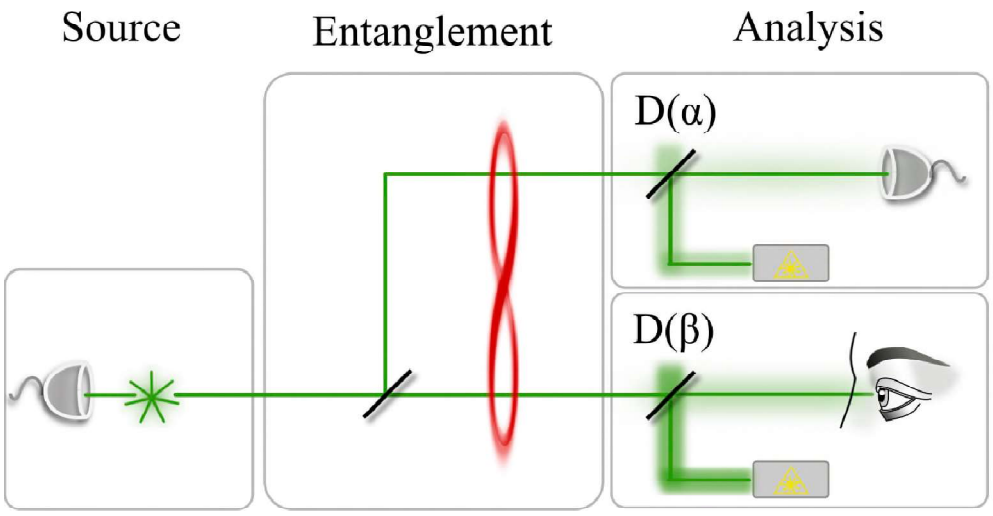


Fig. 2 Full-frame images recording the violation of a Bell inequality in four images". [6]

Before this report, quantum entangled particles could already be observed with the naked eye, when physicists proposed a scheme for such an experiment.

In February 2016, a publication about this, "***What does it take to see entanglement?***"appeared in the source [7].

«Tremendous progress has been realized in quantum optics for engineering and detecting the quantum properties of light. Today, photon pairs are routinely created in entangled states. Entanglement is revealed using single-photon detectors in which a single photon triggers an avalanche current. The resulting signal is then processed and stored in a computer. Here, we propose an approach to get rid of all the electronic devices between the photons and the experimentalist i.e. to use the experimentalist's eye to detect entanglement. We show in particular, that the micro entanglement that is produced by sending a single photon into a beam-splitter can be detected with the eye using the magnifying glass of a displacement in phase space. The feasibility study convincingly demonstrates the possibility to realize the first experiment where entanglement is observed with the eye». [7]



[7]

FIG. 2: Scheme of our proposal for detecting entanglement with the human eye. A photon pair source based on spontaneous parametric down conversion is used as a single photon source, the emission of a photon being heralded by the detection of its twin. The heralded photon is then sent

into a beamsplitter to create path entanglement, i.e. entanglement between two optical modes sharing a delocalized single photon. The entangled state is subsequently detected using a photon counting detector preceded by a displacement operation on one mode, and using a human eye preceded by a displacement on the other mode. The correlations between the results (click and no click for the photon detector, seen and not seen for the human eye) allows one to conclude about the presence of entanglement, c.f. main text. [7]

In February 2021, the results of an experiment on quantum holographic reconstruction of phase images of complex objects using pairs of hyperentangled photons, working with incoherent and unpolarized beams, were published in the journal *NATURE* «***Polarization entanglement-enabled quantum holography***». [8]

In the abstract, the authors of the experiment note:

«Holography is a cornerstone characterization and imaging technique that can be applied to the full electromagnetic spectrum, from X-rays to radio waves or even particles such as neutrons. The key property in all these holographic approaches is coherence, which is required to extract the phase information through interference with a reference beam. Without this, holography is not possible.

Here we introduce a holographic imaging approach that operates on first-order incoherent and unpolarized beams, so that no phase information can be extracted from a classical interference measurement. Instead, the holographic information is encoded in the second-order coherence of entangled states of light. Using spatial-polarization hyper-entangled photon pairs, we remotely reconstruct phase images of complex objects. Information is encoded into the polarization degree of the entangled state, allowing us to image through dynamic phase disorder and even in the presence of strong classical noise, with enhanced spatial resolution compared with classical coherent holographic systems. Beyond imaging, quantum holography quantifies hyper-entanglement distributed over 104 modes via a spatially resolved Clauser–Horne–Shimony–Holt inequality measurement, with applications in quantum state characterization». [8]

In August 2022, the journal *NATURE* published a paper entitled "***Efficient generation of entangled multiphoton graph states from a single atom***." [61]

The authors report the implementation of a deterministic protocol for creating photonic entanglement, overcoming the limitations of probabilistic schemes faced by the most successful photonic entanglement generation techniques to date, and state that "our results may offer a path to scalable quantum computing." [61]

In April 2023, results on high-rate entanglement between a semiconductor spin and indistinguishable photons were published in *Nature Photonics* «***High-rate entanglement between a semiconductor spin and indistinguishable photons***». [62]

The authors note that «Spin–photon entanglement has been proposed to deterministically generate linear cluster states.

First demonstrations have been obtained with semiconductor spins, achieving high photon indistinguishability, and most recently with atomic systems with a high collection efficiency and record length. Here we report on the efficient generation of three-partite cluster states made of one semiconductor spin and two indistinguishable photons. We harness a semiconductor quantum dot inserted in an optical cavity for efficient photon collection and electrically controlled for high indistinguishability.

We demonstrate two- and three-particle entanglement with fidelities of $80 \pm 4\%$ and $63 \pm 5\%$, respectively, with photon indistinguishability of $88 \pm 0.5\%$.Owing to the high operation rate allowed by the quantum-dot platform, the spin–photon and spin–photon–photon entanglement rates exceed, by three and two orders of magnitude, respectively, those of the previous state of the art. Our system and experimental scheme, a monolithic solid-state device controlled with a resource-efficient simple experimental configuration, are very promising for future scalable applications». [62]

In June 2023, the journal PHYSICAL REVIEW B. published a report on the proposal of a quantum Hall interferometer containing a grounded superconducting terminal, «***Quantum Hall Bogoliubov interferometer***». [9]

The author of the article proposed a new method for splitting Cooper electron pairs using a Bogolyubov interferometer. This device allows one to extract pairs of quantum-entangled electrons propagating in different directions from a superconductor. A superconductor is placed in the interferometer, which is a flat semiconductor crystal subjected to a strong magnetic field, from which electron pairs emerge. In this case, electrons entering the interferometer from the superconductor can "leave" the device through two small "slits" called quantum constrictions. This is a kind of running circle, along which particles move strictly in one direction, with the difference that this movement is of a wave nature and at each subsequent circle the electron waves interfere with each other. In this case, by changing the strength of the magnetic field in the interferometer, it is possible to control the interference pattern and, accordingly, the probabilities of electrons exiting through one or another narrowing. As a result, the process of splitting Cooper pairs can be significantly accelerated compared to other approaches existing today, while maintaining efficiency at the level of 50%.

The proposed principle on a purely quantum approach may prove promising for further development. The effect is interesting for fundamental science, since it allows one to control quantum states using small variations in the magnetic field." [9]

The given examples of experimental results show that the growth of research in the direction of quantum entanglement is taking on an exponential character of acceleration and is directed mostly towards the creation of a quantum computer.

In the context of the theoretical view I propose in the format of applying Möbius Geometry to questions of theoretical physics, along with those listed above, one of the latest experiments on quantum entanglement of photons from August 2023 is of interest.

In August 2023, the results of one of the latest experiments on quantum entanglement of photons, conducted by a group of researchers from the University of Ottawa and the Sapienza University of Rome, "***Interferometric imaging of amplitude and phase of spatial biphoton states***", were published in the journal *NATURE PHOTONICS*. [10]

The experiment demonstrated a new technique of biphoton holography, which allows visualizing the wave function of **two entangled photons** in real time. The researchers turned to an interferometric method based on the interaction of waves. This technique, inspired by digital holography, allows you to create three-dimensional images of objects based on the light they emit. The authors applied it to the case of two entangled photons.

Reconstruction of a two-photon state consists of superimposing it on a known quantum state and then analyzing the spatial distribution of positions where the two photons arrive

simultaneously. The image of the simultaneous arrival of two photons is known as a coincidence image. By comparing these two states, information about the unknown state can be extracted.

The proposed reconstruction method allows for more efficient (three orders of magnitude faster) and more reliable (average accuracy of 87%) characterization of states in arbitrary spatial mode bases compared to previously performed experiments. Multiphoton digital holography may pave the way for efficient and accurate computational visualization of ghosts and processing of high-dimensional quantum information.

Biphoton holography is an innovative proposal in the field of quantum visualization. This breakthrough, which combines holographic methods with quantum mechanics, promises to open the way to new applications in the fields of visualization and metrology.

Along with other illustrations, the article presents a holographic reconstruction of a two-photon state and a reconstructed image that completely matches the pictorial graphics of the **ancient Yin-Yang symbol**.

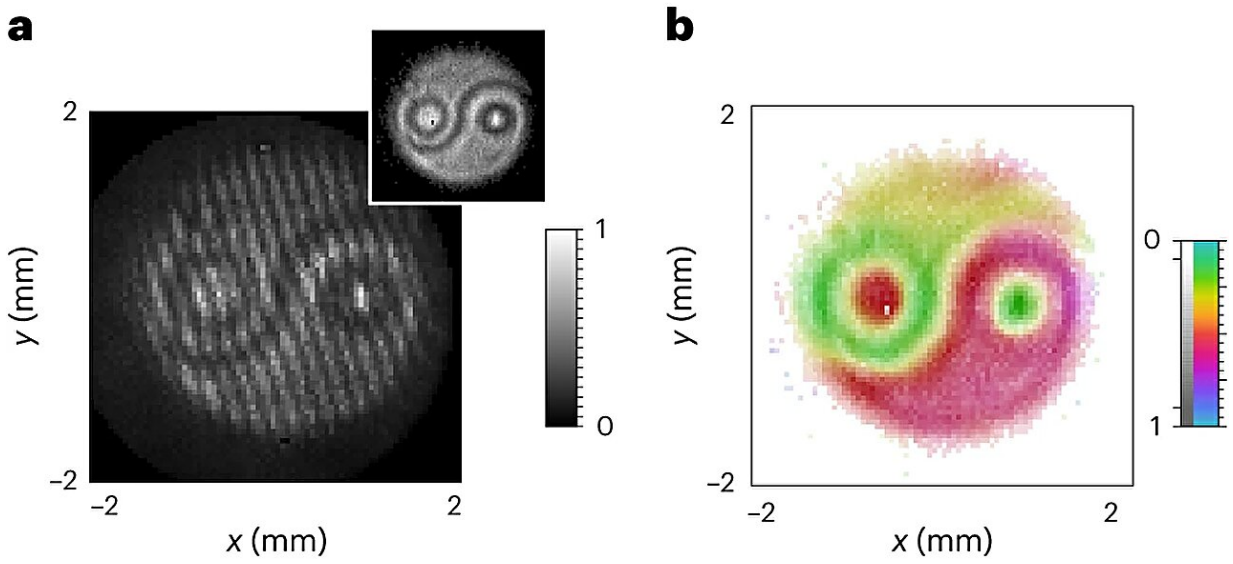


Fig. 6: Image reconstruction. [10]

a). Coincidence image of interference between a reference SPDC state and a state obtained by a pump beam with the shape of a Ying and Yang symbol (shown in the inset). The inset scale is the same as in the main plot.

b). Reconstructed amplitude and phase structure of the image imprinted on the unknown pump. [10]

The matching image in the form of the ancient symbol "***Yin-Yang***" leads to the following logical conclusion that the ancient symbol "Yin-Yang" is an exact **quantum cast** of the entanglement of two photons, which is currently obtained by the method of quantum biphoton holography.

Since ancient times, in philosophical views, the pictorial symbol "Yin-Yang" was a schematic representation of the Two Beginnings of Cosmogenesis. Assuming the Two Beginnings as a **universal complementary duality**, which at each level of scaling and in each plane of being has its own individual manifestation, then according to the result of the experiment, it can be considered that evidence has been obtained that the pictorial geometry of

"Yin-Yang" in its essence belongs to the category of strictly scientific information, and in this experiment displays the quantum entanglement of two photons.

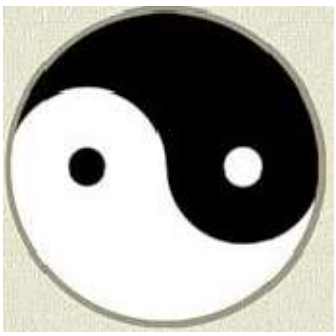
Taking into account the **fractal-holographic structure** of the World Order and philosophical views on this subject, it can be noted that the Yin-Yang symbol is extremely compressed information or a minimized fragment of the universal hologram without only the detailing that branches fractally-like, creating scaling levels.

Based on the result of the experiment and the logic of the **hologram principle**, it can be argued that the ancient Yin-Yang symbol is a **universal template** that can be transferred fractally-identically to different planes of existence as a display of the **basic complementary correlation**. This universal template is a natural **complementary duality** that constitutes one indivisible WHOLE.

As noted above, in philosophical views, the Yin-Yang symbol is a reflection of the Two Beginnings of Cosmogenesis. CosmoGenesis represents the stages of evolutionary movement and the unfolding of the development program from the initial Information Gene of duality, which remains as the basic inclusion and presents in all subsequent transformations of the evolution of movement. Based on this, the geometric content of the Yin-Yang symbol can be extrapolated to those phenomena that constitute the essence of the stages of CosmoGenesis. All stages of the formation of integral systems will fundamentally contain the initial Information Gene of the Two Beginnings of CosmoGenesis in the form of their dual complementary relationship, which can be reflected through the geometry of the Yin-Yang symbol.

As can be seen from the Yin-Yang graphic, the Two Beginnings of Cosmogenesis are antiphase mirror-asymmetric components that complement each other to form a one whole, which is reflected both in the color and in the phases of the wave function, which clearly illustrates the presence of two complementary phases of one closed cycle. The wave function of the Yin-Yang symbol is expressed in the geometry of a sinusoid, dividing the whole into two components of different colors that are in a mirror-asymmetric interrelation.

If you conduct a simple paper experiment and cut out a strip of paper in the shape of a sinusoid, and then close its ends, forming a closed ring, the result will be nothing more than a Mobius pattern. That is, the sinusoid is a **phase portrait** of motion along a closed topological surface of the Möbius pattern, unfolded on a plane.





By deciphering the pictorial compactness of the ancient symbolism of "Yin-Yang", reflecting the principle of complementarity, I have shown that the geometric details of this symbol are identical to the geometry of the Mobius strip. It should be added that, in turn, the Mobius strip is a closed form of "***Clifford parallels***". [71], [47]-[51]

By connecting the geometry of the Yin-Yang symbol and the logic of the paper experiment with a sinusoid, I concluded that the ancient Yin-Yang symbol is a two-dimensional

planar projection of a three-dimensional Mobius Pattern and, in aggregate, reflects all of its geometric elements.

I formulated this conclusion in my author's monograph "Substance. Atom. The Theory of Everything" [72] and in subsequent works, where the application of Mobius Geometry to natural phenomena and difficult questions of physics was further developed. If you take paper painted in different colors on different sides, then the Mobius ring will demonstrate in three-dimensional volume the same color geometric interrelation as the Yin-Yang symbol depicted on a two-dimensional plane.



White side of the plane.
(black inside)



YIN-YANG symbol.



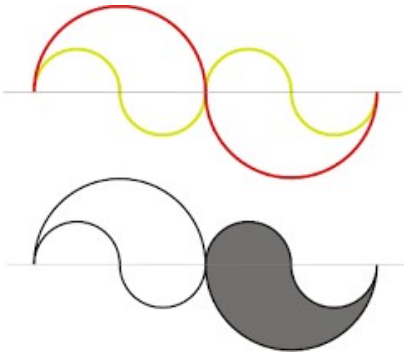
Black side of the plane.
(white inside)

The illustrations above demonstrate that the geometric content of the Yin-Yang symbol completely coincides with the geometric content of the configurability of the Mobius strip with the repetition of all the main lines of bends, as well as the opposites, displayed in color.

Based on the above, the following conclusion suggests itself that the Yin-Yang symbol as a pictorial representation of the original universalism of **the Fundamental Principle of Complementarity** (**FPC**) is essentially a two-dimensional representation on a plane of the three-dimensionality and dynamics of the torsion of the Mobius Pattern, which is adopted in the concept I proposed as a **geometric analogue** of the FPC.

Taking into account the above, such a geometric analogue can be used as a universal template for the visual display of physical phenomena when considering them, making appropriate applications to them of modifications of the original Mobius strip, as well as its transformations.





One of the interpretations of the geometry of the Yin-Yang symbol and its application to the physics of phenomena is the interrelation between the magnetic and electrical components of a one phenomenon of electromagnetism, which is inherent primarily in the etheric support medium itself and has its source in it. These issues are covered in more detail in the article "***1. Quantum Medium. Mobius Geometry. Magnetic Monopole"***, where the unit of the etheric Quantum Medium – the Magnetic Mobius Monopole – is considered as a **magnetoelectric circuit**.

Academician N.V. Petrov in his works also combines the philosophical concept of the Beginnings of Cosmogenesis and their complementary correlation with the phenomenon of electromagnetism, considering the **Feminine Beginning** – Yin – to be the **magnetic component**, and the **Male Beginning** – Yang – to be the **electrical component**. The dynamics of their mutual and inseparable functioning forms a **universal oscillatory circuit**.

"The driving force of the evolution of the Universe is sex, generally represented by two Beginnings – Magnetic and Electric, and in biology by the Female and Male sexes. The magnetic and electric field are completely identical to the Female and Male principles. The connecting link between the Two Beginnings is the space Medium." [83]

"All events in the Universe unfold in time and space due to the automatic rhythm of oscillations provided by the presence of two Beginnings "Yin" and "Yang", female and male, **magnetic** and **electric**. This is an economical and completely simple form of information interaction, allowing the automatic process to be carried out on a huge scale of space with high accuracy." [33]

"There is no doubt that the self-oscillatory nature of cosmic and biological processes is a universal evolutionary invention of Nature. For all worlds, Nature has come up with a universal process – **oscillatory**, for the implementation of which only two elements with the magnetic properties of the Female Beginning and the electrical properties of the Male Beginning are required." [84]

It is the holographic principle that explains the Universe as a **unified oscillatory system**, which requires a single design plan.

"There is no doubt that the self-oscillatory nature of cosmic and biological processes is a universal evolutionary invention of Nature. For all worlds, Nature has come up with a universal process - oscillatory, for the implementation of which only two elements with the magnetic properties of the Feminine principle and the electrical properties of the Masculine principle are required." [84]

"The Universe is a single oscillatory system from the microworld to the macroworld, organized by a hierarchy of memory structures.... The presence of a single field of the Universe requires a single plan for the structure of all forms of matter in order to be able to interact with this field.

Regardless of appearance, all forms of matter in the organic and inorganic worlds are based on duality or dipole, which ensures the rhythm of the oscillatory process. The reversibility of the properties of the dipole - the ability to emit and receive in the same structure - demonstrates a universal technique for creating forms of matter in a full-time mirror version of the information fields of the external environment. The rhythm of oscillations determines the choice of a standard unit of measurement for all forms of matter: the frequency of oscillations as a unit of time and a unit of length." [33]

The picture of the World in such a DIPOLE execution demonstrates very powerful dynamics and amazing stability.



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.

It should be noted that it is the holographic principle that explains the universe as a single oscillatory system, which requires a single structural plan.

The holographic principle was further developed **in 1993-1994** by theorists J. Maldacena and L. Susskind.

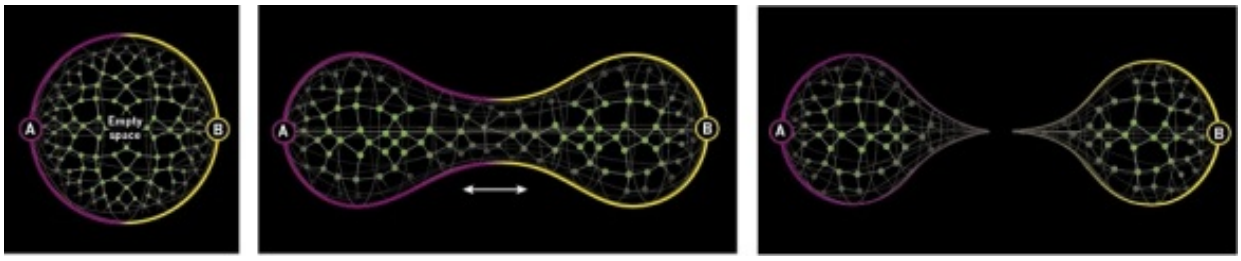
This was followed **in 1997** by Juan Maldacena's landmark work, which went down in history as the AdS/CFT correspondence. [37]

One of the most notable publications on this topic was the voluminous joint article by J. Maldacena and L. Susskind "***Cold Horizons for Entangled Black Holes***". [38]

Also, the works of B. Swingle [39] and M. Van Raamsdonk [12] became a catalyst and a reason that gave rise to the currently growing wave of research in physics devoted to **quantum entanglement**.

In 2010, Mark Van Raamsdonk published an article [12] in which he develops the idea that quantum entanglement is in fact a fundamentally important ingredient of nature, underlying the very geometry that the space of the universe has. And to demonstrate this fact, the author shows how the "***EPR effect***" gives rise to the geometry of classical space-time.

«In this essay, we argue that the emergence of classically connected spacetimes is intimately related to the quantum entanglement of degrees of freedom in a non-perturbative description of quantum gravity. Disentangling the degrees of freedom associated with two regions of spacetime results in these regions pulling apart and pinching off from each other in a way that can bequantified by standard measures of entanglement. Essay written for the Gravity Research Foundation 2010 Awards for Essays on Gravitation March 31, 2010». [12]



[85]

«In this essay, we will argue, based on widely accepted examples of gauge theory / gravity duality, that the emergence of spacetime in the gravity picture is intimately related to the quantum entanglement of degrees of freedom in the corresponding conventional quantum system. We will begin by showing that certain quantum superpositions of states corresponding to disconnected spacetimes give rise to states that are interpreted as classically connected spacetimes. More quantitatively, we will see in a simple example that decreasing the entanglement between two sets of degrees of freedom (e.g. by continuously varying the quantum state in the field theory description) effectively increases the proper distance between the corresponding spacetime regions, while decreasing the area separating the two regions». [12]

"Calculations showed that the corresponding disk in the ADS space began to fall apart as a result of splitting. It looked as if the entangled particles were like buttons threaded through loops and thus holding the fabric of space together. Without them, space immediately began to tear apart." [85]

Having analyzed the picture that opened up, Mark Van Raamsdonk came to the conclusion that the presence of quantum entanglement in nature is the most important ingredient in the origin of space as such.

Conclusions

“We have seen that we can connect up spacetimes by entangling degrees of freedom and 5tear them apart by disentangling. It is fascinating that the intrinsically quantum phenomenon of entanglement appears to be crucial for the emergence of classical spacetime geometry”. [12]

In other words, **space-time is simply a geometric picture** of how everything is connected in the quantum system of the Universe.

The phenomenon of quantum entanglement in its essence turns out to be the node that, in a chain of logical reasoning, can connect into a single whole the quantum physics of the micro-world, the geometry of space-time (gravity) and the holographic principle at the basis of the fractal-holographic structure of the Universe. As this interrelation is understood, it becomes necessary to significantly adjust the fundamental ideas underlying physical science.

As can be seen, when analyzing the effect of quantum entanglement, Mark Van Raamsdonk focuses primarily on the structure of space-time.

In this context, the following should be noted: only that which is a physical entity, no matter in what form this entity is expressed, can have a structure. Therefore, talking about space without its physical content is absurd or nonsense. Nature abhors a vacuum. Therefore, all processes and transformations occur in the supporting feeding Cosmic Medium, and first of all, it is the essence in which all cosmic processes and objects are generated. Without the presence of a supporting medium, no movement is possible.

And if we talk about the universality and comprehensiveness of the fundamental principle of complementarity, then first of all, the supporting etheric medium has its own physical content, and, secondly, it is structured complementarily.

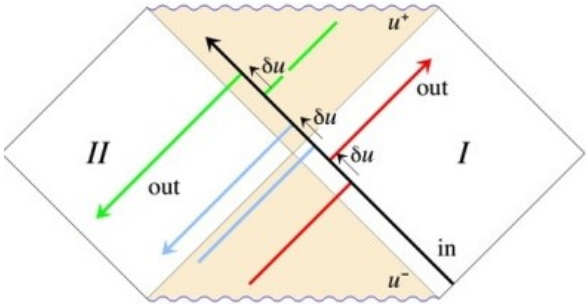
These issues are considered in more detail in the article "***1. Quantum Medium. Mobius Geometry. Magnetic Monopole***".

In January 2016, already a Nobel laureate, **Gerard ‘t Hooft** published a paper entitled “***Black hole unitarity and antipodal entanglement***” [42].

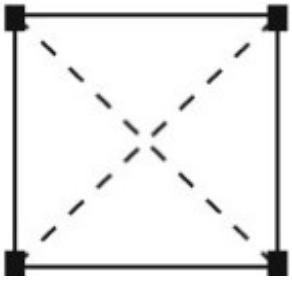
One of the results of his study of the known equations of physics was the following: when a black hole begins to form at one point in space, then somewhere far away on the horizon its twin-antipode is immediately formed, connected to the first hole by quantum entanglement.

This work by Gerard ‘t Hooft is an important result for the stages passed and a “new key” to further progress. This key was initially constructed on the basis of the generally accepted “***Penrose diagrams***”, which clearly reflect the interrelation between the physics of black holes and the 4-dimensional geometry of space-time.

The illustrations below show **Figure 1** from [42] and the famous "***Pauli square***" next to it. It is easy to see that, in general, both geometric constructions essentially display the same dynamics.



[42].



«***Квадрат Паули***».

Figure 1 (to the left): Penrose diagram for Schwarzschild black hole, showing regions I and II , a particle going in in region # I , and particles going out in region I and region II . The shift caused by the in-particle is the same in both cases, but in region II the particle seems to go backwards in time. Since, in region II, the particle is shifted away from the event horizon, region II experiences the same particle as a negative energy one, or an annihilated particle. [42].

First of all, Gerard 't Hooft showed in detail how the geometry of space and the physics of black holes are related. All mathematical calculations were made within the framework of orthodox theoretical physics based on the standard approaches of quantum mechanics and general relativity without relying on the ideas of strings and extra dimensions that were developed by string theorists E. Witten and P. Horava. Gerard 't Hooft's ideas and arguments were put forward without any connection with them.

«Let us also emphasize that hardly any ‘approximation’ has been made. Authors of other publications often belittle our results by claiming that it is merely a ‘classical approximation’ or something like that. To the contrary, the algebra on which it is based is very compelling, having been derived from impeccable physical arguments. Indeed, the physics is very accurate as soon as we look at values well below the maximal limit (at the Planck scale)». [42].

G. 't Hooft's article can be called one of the rarest publications, where the following is clearly stated and demonstrated on behalf of an authoritative scientific figure:

- The **two branes** at the basis of the structure of our universe are not two surfaces, but one and the same surface, **folded in a topologically non-trivial way**, and the author does not use the term "branes" at all.

- The role of black holes on all scales from microscopic to cosmological is shown in a significantly new way. Their roles are considered as objects that both stitch the fabric of space into a unified whole and are at the core of the phenomenon of quantum entanglement.

- According to G. 't Hooft's mathematical calculations, a **pair of entangled particles** located on different branes in the format of other theories **turns out to be asymmetric**. If one part has a point size, then the second part looks like a volumetric "dust shell".

«An elegant way to phrase the new proposed theory, is to say that, when the first trapped region opens up, we can regard it as a very tiny black hole, coming into existence via a very tiny gravitational instanton. The fact that this tiny instanton has antipodal identifications is a minute modification of space-time structure inside the trapped region; then, when the region opens up wide, the new configuration grows together with it. A local observer near the horizon, sees both Penrose's regions I and II , not releasing that region II is a (C)PT image of the antipodal part of the hole, since the same laws of physics apply there. This is why we say we do not violate general relativity with our identifications.

The advantage of our procedure of splitting things up in partial wave expansions, is that different partial waves are completely uncoupled, so that we are left with very simple, finite-dimensional quantum mechanics for each wave, where one can exactly see what is going on». [42].

If we transfer this idea from the macro-world to the micro-world in a fractal-like manner, it can be considered as a step of science towards understanding the unified, but **dual** nature of the "***proton-electron***" as an indivisible basic element of nature.

At one time, Nobel laureate W. Heisenberg, when analyzing the relativistic equation of P. Dirac, pointed out that the answers to many questions posed by this equation will be obtained by creating a «**unified theory for the physics of the "proton-electron" together**». This issue is considered in more detail in the article "***3. Basic Element of Nature. Mobius Geometry. Gravity. Model of the Atom***".

All calculations and arguments of G. 't Hooft were made by the author without using additional dimensions and without redirecting to strings and supersymmetries. This may mean that this theoretical presentation is not about mathematical abstractions, but about results that most likely have a direct relation to the structure of the world around us.

«Let us emphasise, once again, that each partial wave decouples from all other partial waves, and this fact should be seen as a major discovery. It enables us to form a very simple picture of the structure of space-time at or near the Planck scale, without having to take our refuge in functional variables and integrals, which often obscure things». [42].

Since my focus in the field of theoretical physics is concentrated on the application of MG (Mobius Geometry) to its main questions, I immediately noticed in this article those of its calculations that relate to those properties of space and its filling that convincingly prove the fact that MG is embedded in the foundations of the World Order. Therefore, the paragraph below 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. We believe that our results may lead to a superior view of the structure of space and time at the Planck scale». [42].

It can be seen that the conclusions, as well as the visualizations, that Möbius Geometry gives, illustrating the process of mutually inverse transformation of magnetoplasma quanta (***quantum breathing***), are in sufficient agreement with how G. 't Hooft describes the transformation of incoming particles into outgoing ones through the exchange of operators, especially since G. 't Hooft considers space-time in the format of a one-sided surface, topologically folded in a non-trivial way.

Pointing out some problems with algebraic calculations, G. Hooft notes that "we need a procedure of this sort in order to make contact with the Standard Model of the sub-atomic particles, but we would prefer a more elegant mathematical scheme."

This preference rather delicately indicates that such a docking is necessary on the one hand, since Standart Model (SM) is still the leading theory, which has no competition, but, on the other hand, entering this format creates those frictions and difficulties that could be avoided if a more elegant solution were found, possibly creating the necessary competitiveness.

The above-described process of transformation of incoming particles into outgoing particles during the exchange of operators deserves special attention, since it is this process, albeit in a slightly different description format, that points to the transformative process of mutually inverse ***quantum breathing***, which is provided by the geometry of the Mobius inversion and is described in detail in the work "***1. Quantum Medium. Mobius Geometry. Magnetic Monopole***".

The same process of transformations, but in a dipole version, is sewn into the "***Pauli square***", "***Kitaev ladder***" and is reflected in the diagram of R. Penrose.

It is worth emphasizing once again that an important key point in the calculations of Gerard 't Hooft can be considered the fact that the basis of the physics of the Universe is the **same surface**, **folded in a topologically non-trivial way**, which, as already indicated above, is not a mathematical abstraction, but a real geometry of space associated with the ontology of the fundamental principle of complementarity.

It was precisely this geometry of space that the physicist and mathematician W. Clifford pointed out in the history of science [47]-[51], [71] and the surface designated by G. 't Hooft is illustrated by the original Mobius strip and its modifications.

At this point, it should be noted that J. Maxwell derived his equations of electromagnetism based on the concepts of the physics of the **etheric medium** and **its geometry**, namely, the **matrix vortex electromagnetic structure**. And the vortex character is determined precisely by the Möbius type of torsion, that is, rotation with inversion – a change in phase and direction.

It is at this physical point – the topological surface of the Möbius strip – that the views of R. Descartes, his followers, and then W. Clifford, J. Maxwell and Nobel laureates H. Alfvén, F. Wilczek, R. Penrose and Gerard 't Hooft are combined from different angles of scientific thought. In turn, the explanation of the dynamics of universal torsion through the Geometry of Möbius points to the fact, and the results of the given experiment of 2023 with quatic-entangled photons [6] are one of the confirmations, that the geometric transformations obtained on the basis of the Geometry of Möbius lie at the basis of the structure of all levels of the world order.

"The intra-membrane conclusion of complementary components into a Unified Whole mediates the Universal Typology and Topology of the mode of movement through rhythmic rotation and cyclic torsion (UNI-VERSE) and creates at all levels cyclical-rhythmic convective processes of energy transformations with the General fulfillment of the Law of Conservation of Energy." [72]

In my monograph [72] and subsequent articles I developed the application of the complementary principle, represented by the symbol "Yin-Yang" (Mobius geometry) to the phenomena of electromagnetism and I called these oscillations – the oscillating "breath of life" in the oscillation phases "inhale-exhale" or radiation-absorption, which is present in everything without exception – from a unit of the etheric Quantum Medium, an atom to cosmic objects of various scales and is not a feature or prerogative of only biological organisms.

Oscillations are an oscillatory process and in essence this is duality with the presence of two mutually inverse phases of one cycle. The original meaning of the symbol "Yin-Yang" is that the Two Beginnings are opposite (are in antiphase), but they are equivalent, parity, complement each other to one Whole and are connected by continuous and unceasing dynamics of interaction. It should be especially emphasized that these Two Beginnings as components of one Whole do not represent separate entities, but they are the interrelation of the antiphase division of one Whole as a MONO-structure. In other words, this is the program PARTITION of the MONO-module, which is the Initial Dual Integrity.

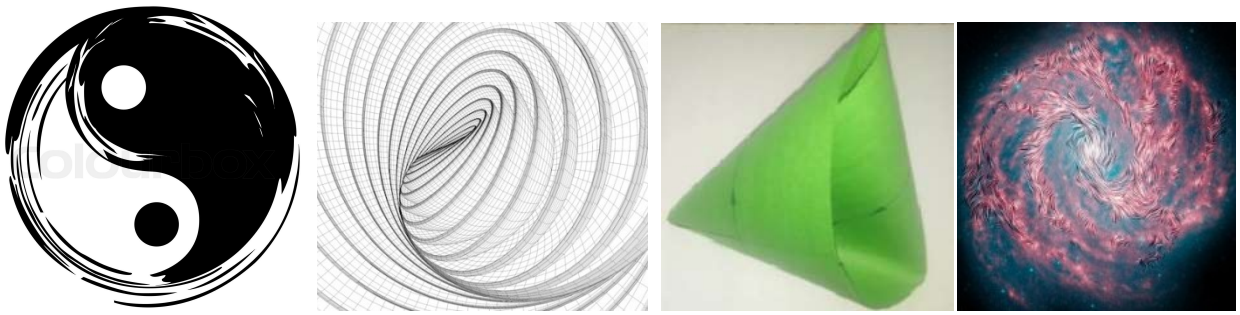
Nothing in the World Order exists without this internal PARTITION, which is the initial Information Gene (InfoGen) of complementarity and ensures the dynamics of internal self-motion, namely, **internal spinning** ("***spin***" – to rotate), which is the source of EN-ERGY ***(*en-*** "inside", ****werg-*** "to do", literally – ***internal doing***, **internal action**).

The fact that spin is associated with internal energy was once pointed out by Nobel laureate R. Penrose.

It is the internal complementary breakdown of the whole by the method of phase opposition that mediates the very phenomenon of magnetism and energy flow (electricity), since this internal breakdown creates a certain gradient as a potential difference and is the initial cause of continuous oscillations that all cosmic objects, from small to large, perform.

Considering the comprehensiveness and fundamental nature of the complementarity principle, as well as the logical conclusions made that magnetism is its physical embodiment, and the Mobius strip is its geometric analogue, then the next conclusion that I made in my previous work in this logical chain will be that the structure of space-time will be complementary and the spatial fabric will be a spin network of vortex formations closed through inversion, in other words, according to the Mobius template.

In the process of continuous oscillations, such a Mobius magnetic loop will produce oscillating magnetoelectric "***breathing***" with the absorption and emission of quanta of etheric magneto-plasma. For the supporting Cosmic Medium with such properties I have introduced the term etheric "Quantum Medium". The illustrations below from left to right show: the "Yin-Yang" symbol, the image of a vortex, the Mobius Monopole, the structure of the giant magnetic field of a cosmic object [91].



The original Mobius pattern is a Mobius ring with one 180-degree turn, pulled into a cone. The inversion will mediate the vortex nature of the movement, which is associated with **short-term internal magnetoelectric reconnections** of the polarities of such a magnetoelectric pattern, creating a quantum filling and vibrational background of the etheric Quantum Medium.

Such a spatial granule will be a Mobius Magnetic Monopole, since its polarity is internally closed and does not have its own external multi-manifestation in the form of dipole or quadrupolarity.

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

The closure of waves into rings is a hydrodynamic property observed in liquids and plasma. The superfluid liquid of the supporting Cosmic Medium, which I called magnetoplasma, also has this property.

In 1989, Antonio Fernández-Rañada, relying on Hopf bundles, found closed solutions to Maxwell's equations [43].

In 2008, physicists William Irvine and Dirk Bouwmeester showed that among the closed solutions there are also stable ones [45].

In 2014, in a joint paper by A. F. Rañada and A. Tiemblo [44] 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])". [44]

If we consider vortex Magnetic Mobius Monopoles as ring magnetoelectric circuits, then in the presence of inversion, a continuous and non-stop process of magnetic reconnections occurs in them. During reconnections, sub-micro-doses of magneto-plasma radiation are released and absorbed.

These sub-micro- doses of magneto-plasma radiation in the theoretical format of the Standard Model are identified as particles due to their discreteness, mediated by the structure and functioning of the Quantum Medium. If we do not take into account the specificity of naming the same phenomenon, then we can see that these quantum emissions-absorptions are the same process of transformation of "incoming and outgoing particles", which is described in the work of Gerard 't Hooft [42]. I believe that the descriptive format of the MG can provide that elegant mathematical scheme in geometric form, with the application of which it will be possible to eliminate the mathematical inconsistencies of algebra.

Returning to the historical facts regarding **quantum entanglement**, it is necessary to note the year 1935.

In May 1935, the article by A. Einstein, B. Podolsky and N. Rosen "***Can the quantum-mechanical description of nature be considered complete?***" was published. [35]

In this article, A. Einstein, B. Podolsky and N. Rosen managed to put forward an extremely powerful argument from a mathematical point of view that quantum mechanics still

has problems with a consistent description of the laws underlying the operation of the micro-world.

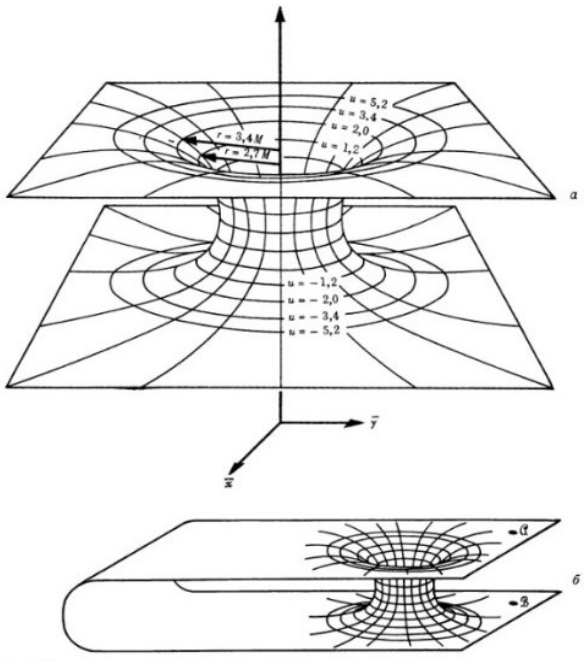
In the fundamental quantum equations, the authors revealed a contradiction – the fundamental possibility for instantaneous interactions between particles completely independent of the distances separating them. That is, if two particles were initially in the same quantum system, and then they were separated and carried away at any distance, then, as the formulas show, a change in the state of one of the particles should immediately affect a change in the state of the other. Over time, the paradox revealed in the study received its own name, the "**EPR effect**", after the authors' surnames, and at the suggestion of Erwin Schrödinger, the new quantum phenomenon began to be called Verschränkung in German and **Entanglement** in English.

Decades later, the technical level of experimental physics made it possible to actually reproduce the EPR "thought experiment" and reliably confirm that entangled quantum particles are capable of instantaneous interaction regardless of the distance separating them.

For further consideration of the quantum entanglement effect (**EPR**), it is necessary to consider a couple more historical works.

In 1915, **A. Einstein** published the equations of general relativity [74], [75]. A few months later, the German astrophysicist **K. Schwarzschild** found a simple and beautiful solution for them, which became known as "Schwarzschild space". [76].

The geometry of the solution indicated that space had the form of two parallel sheets connected to each other by a bridge in the form of a “neck” or a double vortex funnel at the place where the **mass-energy** was concentrated.



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Then, based on this geometry, A. Einstein and N. Rosen made a mathematical discovery, which boiled down to the fact that Schwarzschild's construction is a solution not only for the equations of gravitation of the General Theory of Relativity, but also simultaneously for the

equations of Maxwell's electromagnetism [36]. This pointed the way to understanding not only how elementary particles of matter are structured, but also how gravity and electromagnetism turn out to be different aspects of the same physics.

In July 1935, an article by A. Einstein and N. Rosen with this discovery was published: "***The Problem of Particles in the General Theory of Relativity***." [36]

The next metamorphosis was that this work by A. Einstein and N. Rosen began to be mentioned as the very first scientific study where the possibility of the existence of so-called "***wormholes***" in space-time, otherwise known as the "**Einstein-Rosen bridge**" or "**ER bridge**" for short, was mathematically rigorously demonstrated.

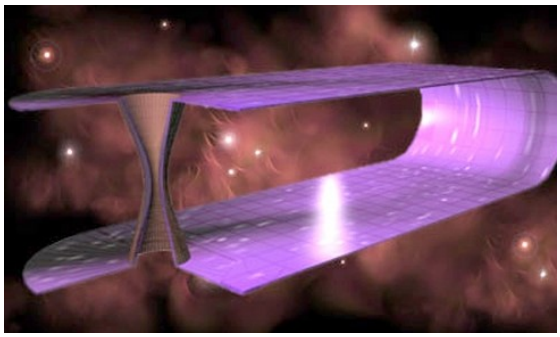
This emphasis was made at the instigation of J. Wheeler and since then the majority of physicists believe that the article [36] is about tunnels-transitions that connect widely separated areas of the universe by a short route. And to this day, with all the talk about "wormholes", almost no one ever remembers what exactly the original article of the authors was called and in what specific context the idea of the "**ER bridge**" was born.

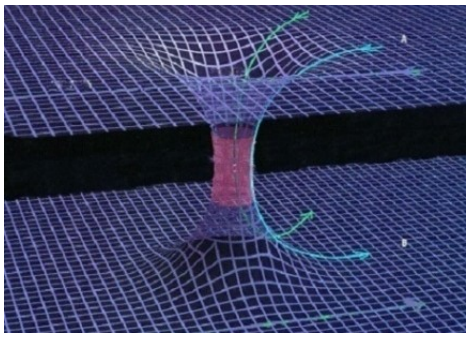
In fact, the aforementioned Einstein-Rosen article [36] was devoted to the physics of the micro-world, and not to the phenomena of cosmology. In search of more natural and comprehensible alternatives than quantum mechanics, the authors looked for ways to describe **particles** based on an organic unification of Maxwell's equations of electromagnetism and the General Theory of Relativity (Einstein's equations of gravitation). In the course of this search, the scientists managed to find a solution that equally fit both the equations of gravitation and the combined system combining the General Theory of Relativity and the equations of electromagnetism.

The abstract to the work [36] says:

"The writers investigate the possibility of an atomistic theory of matter and electricity which, while excluding singularities of the field, makes use of no other variables than the $g\mu\ \ \nu$ of the general relativity theory and the $\phi\mu$ of the Maxwell theory. By the consideration of a simple example they are led to modify slightly the gravitational equations which then admit regular solutions for the static spherically symmetric case. These solutions involve the mathematical representation of physical space by a space of two identical sheets, a particle being represented by a "bridge" connecting these sheets. One is able to understand why no neutral particles of negative mass are to be found. The combined system of gravitational and electromagnetic equations are treated similarly and lead to a similar interpretation. The most natural elementary charged particle is found to be one of zero mass. The many-particle system is expected to be represented by a regular solution of the field equations corresponding to a space of two identical sheets joined by many bridges. In this case, because of the absence of singularities, the field equations determine both the field and the motion of the particles. The many-particle problem, which would decide the value of the theory, has not yet been treated." [36]

As can be seen from the abstract, calculations have demonstrated that if physical space is considered as a set of two identical sheets (or membranes), then an elementary particle of matter is a "bridge" connecting these two sheets. In the "**ER bridge**" hypothesis, the Schwarzschild solution and its illustration were taken as a basis for representing a particle as a jumper tube or a microscopically small "bridge" across the fifth dimension connecting two 4D sheets of parallel spaces. Much later, the following illustrations were created based on this description, and are presented below.





As noted by the authors [36], the special appeal of the "**ER bridge**" design was given by the fact that it was possible to get rid of "singularities" where the radius of the region tends to zero, the concentration of energy – to infinity and any physics-mathematics stops working.

Thanks to the original solution of the equations using the "**ER bridge**", due to the absence of singularities it became possible to determine not only the field, but also the motion of particles in this field.

From the general logic of the proposed design it naturally followed that the atoms of matter – as systems of many particles – should, in theory, be represented similarly – by the usual solution for the field equations corresponding to the space of two identical sheets connected to each other through many "**ER bridges**".

Further, the facts of history are such that the authors were unable to solve the problem with many particles left for the future. Also, it was not possible to integrate the experimentally established effects of quantum physics into this two-sheet concept of space and matter. For this reason, the connection of the "**ER bridge**" with the world of microphysical particles receded into the background, and in the history of science, this phenomenon of GTR, with the help of J. Wheeler, entered as a short tunnel in space-time or a cosmic "**wormhole**".

Therefore, the understanding of the "**ER bridge**" is most often associated with cosmological theories, but not with what was originally meant.

Subsequently, in the history of science, the understanding of the "**EPR effect**" and the "**ER bridge**" developed mostly in cosmology in accordance with the advancement of new theories, and in particular the ***holographic principle***. As a result, in a number of modern works by mathematicians and physicists, the understanding was transformed into the following logic: ***quantum entanglement*** (**EPR**) between two black holes separated in space and the "wormhole" (**ER**) connecting them are in fact different sides of the same phenomenon and the equivalence principle operates between them.

In the laconic language of formulas, H. Maldacena and L. Susskind substantiated the equality **"EPR" = "ER"**, which is considered true, at least for the conditions of black holes.

At the same time, the authors made a more general assumption that such "wormholes" or "ER-bridges" "can also take place for more general cases of entangled states", namely, there is every reason to look for a similar EPR = ER equivalence for quantum particles.

Following these conclusions, a number of new results were published in the development of the same topic. Two similar articles devoted to quantum entanglement in the conditions of particle microphysics were published in November 2013 in the journal Physical Review Letters. [40], [41].

In the articles, the authors note that, thanks to previous studies based on the **holographic principle**, it is already known that two quantum entangled quarks can be mathematically

represented as the ends of a conceptual string in a space of higher dimension. With such a reformulation of the problem, it turns out to be much easier to perform certain calculations for this system.

Based on the results of previous studies in accordance with the holographic principle, K. Jensen and A. Karch analyzed in their study what the physics of an entangled quark-antiquark pair looks like. [40]

The author of another article, J. Sonner, obtained a similar result under conditions where the generation and expansion of a quark-antiquark pair occurs in a strong electric field (the Schwinger effect). [41]

Explaining these results through the prism of the holographic principle and the AdS/CFT correspondence, one of the authors of the studies, A. Karkh, emphasized the following feature of the identified equivalence or duality. Calculations in the 3D world were made for elementary particles that function in accordance with the laws of quantum mechanics and are entangled with each other by a string bond. But, as the author notes, this is a world **without gravity**. Therefore, it should be understood that the wormhole and the entangled pair of particles do not live in the same space. However, from a mathematical point of view, these systems are equivalent.

In June 2015, Physycal Review Letters published the article by Lin, Marcolli, Ooguri, Stoica, "***Locality of Gravitational Systems from Entanglement of Conformal Field Theories***," [53]

«The Ryu-Takayanagi formula relates the entanglement entropy in a conformal field theory to the area of a minimal surface in its holographic dual. We show that this relation can be inverted for any state in the conformal field theory to compute the bulk stress-energy tensor near the boundary of the bulk spacetime, reconstructing the local data in the bulk from the entanglement on the boundary. [53]

«In this Letter, we gained new insight into how spacetime emerges in the holographic setup. We found Eq. (25) to express the local energy density in the gravitational theory using quantum entanglement data in the boundary theory, and that universal properties of entanglement such as the positivity and monotonicity of the relative entropy can be interpreted as positivity conditions on the bulk energy density». [53]

Having given the entire sequence of facts in the development of the theme of the "**ER bridge**" and the "**EPR effect**", it should be emphasized that the main actor on which the explanations of these facts in modern concepts are based is the mathematical apparatus of algebra. But the **problem** of accurately recognizing and relating these effects in the two worlds – the micro-world and the macro-world – remains precisely in the fact that the basic mathematical calculations of algebra and in particular the Standard Model **do not include gravity.**

As for gravity, it remains a scientific fact that gravity has not yet been "squeezed" into the scale of the micro-world and there is still no explanation for it in cosmology. And if this is the state of affairs, especially since the history of science also includes an incorrect interpretation of the meaning of the "**ER bridge**", then how can we conclude that the "**ER bridge**" and the "**EPR effect**" are equivalent?

Without including gravity in the mathematical descriptions of these phenomena, conclusions about their identity or equivalence can be considered premature and incorrect, as it will be indicated by the application of Mobius Geometry to this issue below.

I believe that the episode known in the history of science with Ptolemy's calculations based on the geocentric model of the Solar System is the best example of mathematical ingenuity based on the apparatus of algebra. The frank admissions of Nobel laureate R. Feynman in his last lectures also speak in favor of the fact that algebraic calculations can be mathematically correct, but will not correspond to the true state of affairs in the absence of a picture of the representation.

Therefore, in this case, the conclusion of the equality **"EPR" = "ER"** should not be considered correct only on the basis of algebraic calculations due to the lack of clarity of understanding and representation of the gravitational interrelation between objects of the macro- and micro-worlds. Positioning the presence of gravity only in the macro-world and excluding it in the micro-world does not correspond, first of all, to **the holographic principle** and, secondly, to the **universality** based on it.

It can be confidently stated that both "EPR" and "ER" are **dualities**, but only in a general schematic plan, by analogy with DNA strands, the division into two sexes in biology and universal binary coding – all these are dualities. And in terms of a general understanding of the principle of complementarity, the listed dualities are dual objects. The basis for this is precisely the **holographic principle.**

The holographic principle shows that starting from the **smallest unit** of the supporting Quantum Medium to the **Universe as Whole**, everything carries a **minimum basic InfoGen of duality**. This is the "**primary ingredient** of physical reality that fills space-time and from which everything else is formed," as Nobel Laureate F. Wilczek described it in his book "The Lightness of Being: Mass, Ether, and the Unification of Forces." [87]

And this is the ingredient that is generally schematically embedded in the graphic design of the "Yin-Yang" symbol. Today, according to the results of the experiment [10], this can already be classified as strictly scientific data.

In the process of Cosmogenesis and fractal-holographic multiplication, with the corresponding degree of complication, the minimum duality, according to the universal template, takes the necessary forms and determines the accompanying phenomena. This means that the same principle of complementarity operates everywhere, possessing the property of preserving its InfoGenetics through its physical manifestation – **magnetism**. But at each stage of its development, **complementary duality** takes a new form, doubling its Informational Genome.

Let's see how the **geometric analogue** of complementary duality – the Mobius strip – can illustrate this.

Nobel laureate H. Alfven called the magnetic filling of cosmic space ***living plasma***. The concepts of the universality of magnetism and living plasma are combined by me into the concept of living magnetoplasm, in which a universal method of self-copying operates, in other words, a method of generation based on the hydrodynamic property of vortex division.

"There is a good expression that "*if cosmic bodies did not reproduce, then where would such a large number of bodies with the same properties come from?*"" [33]

And, it must be said, if it were not for the presence of a universal method of self-copying, then you would not be reading the scientific work I created, meaning that you and I would simply not be here.

The most obvious projection of the universal method of self-copying is presented in the field of cell biology using the example of DNA: DNA undergoes bifurcation (fibration into two strands) and then carries out the **doubling** of its InfoGenome with the formation of its **copy** – a new cell with the sameDNA.

The **active matter** of the **living magneto-plasma** of the etheric Quantum Medium operates according to exactly the same scheme. The laws of hydrodynamics work according to the same scheme, according to which [34] vortex objects are capable of dividing spontaneously or under a sharp external influence. The surface of the vortex is capable of spontaneous stratification.

As already indicated above, the finely dispersed substrate of the etheric Quantum Medium consists of vortex formations – magnetic monopoles and a magnetic monopole can be visualized using the original Mobius template with one 180-degree turn. The InfoGenome of the original Mobius Magnetic Monopole is its inversion or minimal binary information "0" and "1", if we associate the elements of binary logic with two opposite sides of the plane of a sheet folded into a Mobius strip.

The Mobius strip is closed ***Clifford parallels***. They are always in antiphase and at the same distance from each other, which is quite clearly illustrated by DNA.

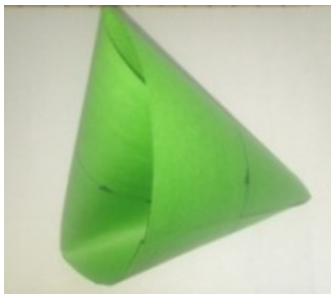


Clifford parallels in the Mobius strip, in DNA, in topological memory braids.

The process of spontaneous division of such a **vortex formation** – a **monopole** – can be called its filamentary splitting or fibration phases into fibers that are stratified along the line of the Mobius curvature. **Fibration** is a process of bifurcation with doubling of the original InfoGenome of duality. The original duality in the format of Mobius Geometry is an **inversion**.

Let us consider the first **three phases of fibration** using the example of a paper experiment, understanding that we are performing actions with a magnetic loop closed through inversion, which mediates the phenomenon of magnetism itself and its nature, and also taking into account the illustration of this universal method using the example of DNA.

1. FIRST PHASE OF FIBRATION.



Mobius Monopole.



FIBRATION.



Mobius Dipole.

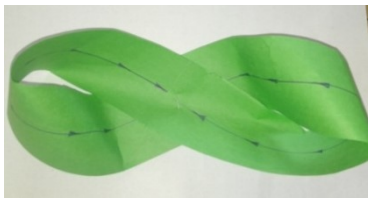
In the first phase of fibration, the first doubling of both the inversion itself (the initial duality) and the length of the Mobius ring occurred. At the same time, the next **duality** was formed – two mirror-asymmetric inversions in the form of a two-armed "eight" or lemniscate with a crossing line of the Mobius curvature. In other words, the geometric configuration of the Mobius Dipole was formed.

As can be seen, the presence of inversion determines the **helicity** of the Mobius ring. The resulting doubled ring has a doubled inversion or helicity and a corresponding twist of the Mobius curvature line. Helicity is associated with the concept of "**spin**" and with the concept of "**energy**".

It should be especially noted that the Mobius crossing point in the Mobius Magnetic Dipole is not a point of direct intersection of magnetic lines. This point is the Center of Equilibration and Tension (CET), in which the magnetoelectric balance of the dipole arms is established and the magnetic intensity tensor is formed. In the magnetic intensity tensor, the process of reconnection of magnetic lines of two antiphase magnetic energy currents occurs, during which energy (magneto-plasma) is released.

The formation of this tensor in the fibration method may be an as yet undisclosed secret for science, which can not only explain a lot, but also open up new possibilities for understanding issues related to both the process of thermonuclear fusion and the process of nuclear decay.

2. THE SECOND PHASE OF FIBRATION.


Mobius Dipole.


FIBRATION.


Two entangled Mobius Dipoles.

In the second phase of fibration, the **next doubling** of the InfoGenome occurred and the next duality of two Mobius Dipoles (two "eights") was formed, interconnected according to the principle of **chain links**. As can be seen, the Mobius inversion mediates the link type of coupling of magnetic rings in the process of filamentary stratification of the original magnetic ring. Due to the presence of inversion and its copying in the fibration phases, each link is a twice-twisted Mobius strip and, as visualized, the links form a **topological knot**. **The formation of a topological knot is mediated by the inverse closure of a magnetic loop**.

3. THE THIRD AND SUBSEQUENT PHASES OF FIBRATION.

The third and subsequent phases of fibrations lead to further **multiplication** of Mobius Magnetic Dipoles connected in a topological node, as well as their **polarization in the radial direction**. The formation of a universal "**Center-Periphery**" scheme occurs, which is directly related to the structure of an atom, cell, bioorganism, society and space systems.



Mobius Dipoles connected in one topological knot.

When forming the "Center-Periphery" scheme, along with the symmetry contained in the Mobius geometry, its mirror asymmetry also acts, which shifts the CBT (Center of Balancing and Tensing), forming from some arms of the Dipoles the Center-**core**, and from the asymmetric mirror arms – the **orbital** Periphery, which is connected to the Center-core radially through the CBT of all dipoles. The "Center-Periphery" scheme is the next type of **duality**, in which the formation of a concentrated Center (core) and a more rarefied Periphery remote from it occurs.

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

The paper experiment version also demonstrates the fact that in the process of successive filamentary splitting of the Mobius Monopole in the phases of its fibrations, its stepwise geometric transformations and growth of the structure FROM THE INSIDE TO THE OUTSIDE occur.

These transformations are in fact directly related to the processes that occur in the geometry of the space of the ethereal Quantum Medium during the generation of its objects: atoms, stellar-planetary systems, galaxies, bio-organisms. All of them are the products of the ethereal Quantum Medium from its original generative granules-monopoles as "seed elements" or the macro-part as collective object. And the Geometry of Mobius quite clearly demonstrates the fact that in the spatial fabric there is nothing but geometric transformations, as W. Clifford claimed. [47], [48], [49], [50]

"In the picture of the world presented by Clifford, not only the gravitational force of gravity generated by curvature is visible. According to the given theses, in essence EVERYTHING that happens in nature comes down to dynamic changes in the geometry of space. Therefore, it is natural and convenient to study and describe this dynamics, relying on the **geometric methods of mathematics**." [71]

"It is believed that all matter, regardless of where it is located – on our Earth or in space – always takes part in the ongoing processes of mutual transformations and phase transitions. Based on this, we can make an important conclusion that the forces that cause movement and change originate **not outside** the chemical elements, but **inside** them." [78]

"...the manifestation of Matter occurs "***from the inside out***" [79]

Now we can try to identify the phases of fibrations with algebraic steps in quantum physics.

"The first spin theory that gives a correct mathematical formulation of "two-valuedness that defies classical description" was proposed by Pauli in his 1927 paper. Avoiding the construction of any visual kinematic models, Pauli introduced the doubled Hilbert space H2⊗H (the space of wave functions), the vectors of which are two-component spinors. Thus, for the first time in physics, two-component spinors and the first doubling appeared. The subsequent doubling (bispinors, the space H4⊗H) was proposed by Dirac in 1928. The next doubling leads to hypertwistors in the Hilbert space H8⊗H. Hypertwistors are vectors of the fundamental representation of the Rumer-Fet group SO(2,4)⊗SU(2)⊗SU(2)', which gives a group-theoretical interpretation of the periodic table of elements. Spinors, bispinors and twistors are special cases of a hypertwistor." [69]

As it`s shown above, the geometric transformation of the Möbius Magnetic Monopole into a two-component dipole is accompanied by the first doubling of the InfoGenome. The formation of coupled Magnetic Dipoles is accompanied by the second doubling of the InfoGenome. The subsequent doubling of the InfoGenome already leads to the Periodic Table of Elements. The stepwise transformations of the Magnetic Mobius Monopole, illustrated by the fibration phases, provide a geometric representation of the descriptive paradigm of spinors in quantum mechanics, the citation of which is given above.

How it is visualized, the geometric solution based on the phases of the fibrations of the Mobius strip (magnetic ring – monopole) clearly illustrates the "*ambiguity that defies classical description*" designated by W. Pauli, or, in other words, the duality that is transmitted to its copy in the universal method of copying through bifurcation (W. Pauli: "*Bifurcation and reduction of symmetry!*") and the structure is doubled. That is, through the bifurcation of the Mobius Magnetic Monopole with the doubling of its InfoGenome, there is a step-by-step generation of matter from within and the formation of atomic elements. This is the basis of the process of charge quantization, which is discussed in detail in the work "***3. Basic Element of Nature. Mobius Geometry. Gravity. Model of the Atom***".

It must be said that the topic of bifurcations and the formation of symmetries was of great interest to W. Pauli. As W. Heisenberg notes: "I once asked Wolfgang why he attached such great importance to the process of bifurcation, and received approximately the following answer: "... The process of bifurcation, or bifidation, as I imagine it, could explain a lot to us here, because it somehow very naturally expands the space of nature, thereby creating the possibility of new symmetries. In the ideal case, one could think that **all real symmetries** arose as a **consequence of such bifurcations**." [69]

We must pay tribute to such intuitive insight, which almost led W. Pauli to that "trick" of Nature, which it uses to expand space (the generation and growth of matter from within) and the creation of new symmetries arising as a result of such bifurcations. As paper experiments with Mobius geometry clearly visualize, each bifurcation creates a new type of combination of symmetry and asymmetry and, as a result, a multiplication of the components of system formation with the growth of the structure.

Each system formation generated from within (from a generative granule or generative region of space, acting collectively as one macro- or mega-object) is held together as a whole due to those interrelations that are actualized in the phases of geometric transformations in the

process of multiplication and growth of the system formation during its generation through the universal method of bifurcation/fibration with subsequent doubling of the InfoGenome.

It is worth emphasizing once again that on the basis of closed Clifford parallels in the form of the Mobius Pattern, those spatial transformations occur that demonstrate those **structural interrelations**, the actualization of which takes place in the method of generating matter from the inside out by the method of filamentary splitting/fibration.

Now let us analyze the results of the paper experiment on the fibrations of the Mobius ring once again and see **what interrelations were actualized**. The original interrelation is complementary.

In the first phase of the fibration of the Mobius Monopole, it is transformed into a Mobius Dipole, which has the configurability of the lemniscate-"eight". This means that in the process of fibration, the original InfoGenome was doubled and, based on the duality of the opposite sides, a new duality of two mirror-asymmetric shoulders with mirror-asymmetric helicity was formed and the length of the loop doubled. The new duality with two 180-degree turns is a derivative of the first original complementary duality of the Mobius strip with one 180-degree turn.

And if in the original Mobius Monopole there was a duality of two symmetrical sides and a complementary mirror-asymmetrical interrelation between them, then in the first phase of fibration a symmetrical duality of two arms with a mirror-asymmetrical chirality was formed.

At the same time, a new interrelation was actualized, providing a balanced retention and functioning of two arms according to the principle of feedback through the crossing of the Mobius curvature line.

This crossing forms a tension and balancing tensor between two arms of the magnetoelectric Mobius dipole ring with two inversions. Considering the functionality of the new interrelation in maintaining the balance of the two arms when their parameters change and holding the arms together, providing mutual support to each other, this interrelation is identified as **a gravitational interrelation**, which, according to the meaning of the root word of the term "***gravity***", is mutually supporting for dipole-bound objects both in cosmology (planet and star) and in the microworld of the atom (proton-electron).

A detailed examination of these issues is covered in the work "***3. Basic Element of Nature. Mobius Geometry. Gravity. Model of the Atom***".

Let us consider **the second phase of fibration**. As a result of the second phase of fibration, the second doubling of the InfoGenome occurred and a symmetric duality of two entangled Mobius Dipoles was formed, mirror-asymmetric relative to each other in their torsion, and a new interrelation was actualized according to the principle of chain links. This interrelation is identified as **quantum entanglement**.

And if we return to the description of experiments on quantum entanglement of photons [1], then, as described above, a fairly common method of generating entangled photons is the splitting of a powerful beam of laser light inside a special crystal with nonlinear optical characteristics. In the process of passing through the crystal and under the influence of the spontaneous parametric transformation process, some part of the photons of the laser beam is split into two **entangled photons.**

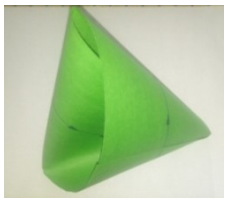
As demonstrated by the paper experiment, entangled Mobius Dipoles were obtained precisely by the method of **filamentary splitting** – fibration. And the indicated method of

generating entangled photons only provides confirmation of the correctness of the logic of the judgment, derived on the basis of the result of the paper experiment with GM.

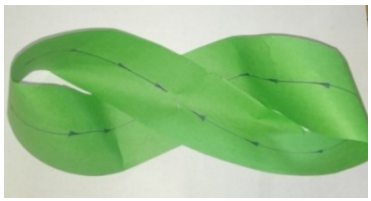
The “Center-Periphery” relationship is the third type of fundamental relationships, which is actualized in subsequent phases of fibration with the growth of the number of Magnetic Dipoles, topologically connected into one node.

The paper experiments with the phases of fibration help to visualize the dualities obtained in each phase of filamentary splitting, as well as to identify the actualized interrelations. The interrelations of phases of fibration form the **Universal Phase Triplet of Dualities.**

THREE PHASES OF FIBRATION.



Monopole

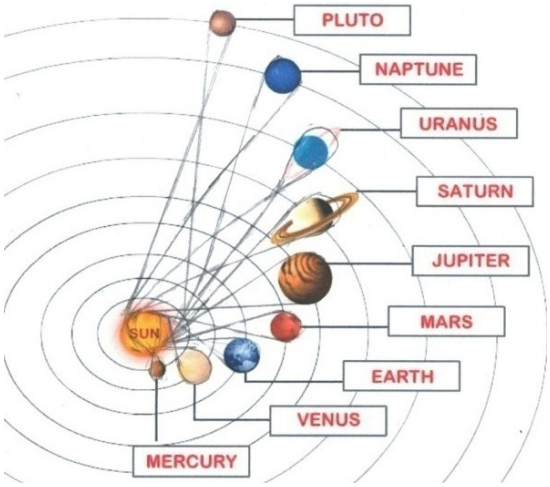


Dipole. Gravity



Two dipoles. Quantum entanglement.





"Center-Periphery": topological Dipole Knot in the atom and in the stellar-planetary system.

Taking into account the results of geometric transformations of the Mobius Magnetic Monopole, we can conclude that the difficulties that exist in theoretical physics regarding the issues of **gravity in cosmology**, as well as its presence in the **micro-world**, can be successfully resolved geometrically in the format of the duality FPC and its geometry analogue – the Mobius strip.

As can be seen, geometric transformations in the fibration phases are accompanied by doubling of the original InfoGenome of duality. The mirror-asymmetric duality (of the sheet sides) of the original Mobius Monopole is doubled and generates a mirror-asymmetric topological duality of the two arms of the Mobius Dipole, which through the next doubling generates the next type of duality – the topological interrelation of the Mobius Dipoles.

And each doubling of the InfoGenome changes the geometry of the form and, accordingly, the properties, which is demonstrated by the Periodic Table of Chemical Elements.

All **three types of dualities** in three phases of fibration represent the set of dualities that is most common in the phenomena and objects of Nature.

"...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." [68]

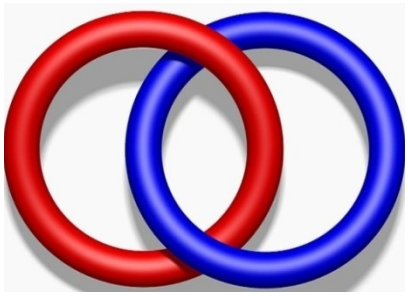
Also, all three types of dualities can be displayed by the symbol "Yin-Yang", since it is a universal template of complementary mirror-asymmetric natural duality, which has its individual functional applications in all step processes of Cosmogenesis. In this regard, all dualities, from the most elementary to the most complex, have within themselves a single complementary substantial foundation as the same Image and Likeness.

Based on the above and illustrated, it becomes obvious that when considering the **gravitational interrelation** and **quantum entanglement**, their geometric visualization is of decisive importance, since natural duality itself has a universal schematic nature and can be reflected through the apparatus of algebra by a **uniform equation or proportion**, through which it is much more difficult to make the identification that was done geometrically above, since the same universal equation can be applied to various modifications of dualities.

The presentation brings the missing clarity to theoretical reasoning, which is important and necessary for the successful resolution of issues related to the geometrization of physics and the creation of a general Theory of Everything.

It should be emphasized that the links of entangled Mobius Dipoles are not circles or ellipses in themselves. Due to the presence of a doubled Mobius inversion, these links have a twisted curvature – "eight". That is, the presence of a Mobius inversion mediates torsion and twisting, as well as the dynamics of spinning as an internal self-motion.

Below is an illustration of a non-trivial link in mathematics – an elementary non-trivial knot "***Hopf link***", and a link – ***topological knot of two Mobius Dipoles***, which was obtained in two phases of fibration of the Mobius strip, geometrically displaying the Magnetic Monopole.



"***Hopf link***".

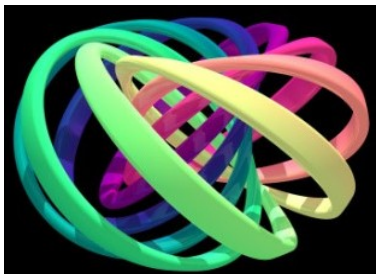


Topological knot of two Mobius Dipoles.

It is necessary to emphasize a very important point, which is connected with the solution of the questions of description of the phenomena of Nature with the help of the apparatus of algebra. No matter how virtuosic and elegant mathematics is, nevertheless the theorist must always keep in mind the fact that it is necessary to think about how Nature performs its "mathematical dance" and to what extent the transformations offered by the mathematical apparatus are possible in it. In the given illustration above, the mathematician must find the **geometrical** and **algebraic way** by which the depicted figure of the "Hopf link" from two interlocking rings can be obtained in the nature of things. That is, imagine how such a connection "***Hopf link***" is obtained in Nature if we include this mathematical description as describing a natural phenomenon?

The transformations I have proposed for obtaining linked links are considered in the format of the FPC ontology and with the application of its geometric analogue (the Mobius strip) and taking into account the already known laws of hydrodynamics, which can be fractally identically transferred to processes in the etheric Quantum Medium, considering it as a kind of magnetoplasmic liquid. A topological node of two MMDs (on the right) is obtained in the case of filamentary stratification of a magnetic loop in the form of a Mobius strip.

The three illustrations below show a comparison of the Clifford-Hopf fibration (1) and (2) – on the left, obtained mathematically, with the fibration of the Magnetic Mobius Monopole, (3) – on the right, obtained based on FPC.



(1)



(2)



(3)

The mathematical proposition (1) and (2) can illustrate quantum entanglement as a topological knot of coupled bundles, but it geometrically lacks the component that gives an illustration of the **gravitational interrelation**, which is closely related to the manifestation of magnetic dipole, charge property and mass, that is, with the properties of the manifested baryonic matter. It is the internal duality of the Mobius Magnetic Monopole, realized geometrically on the Clifford parallels, in the stepwise process of bifidation that gives the actualization of the external magnetic field, polarity and charge property through a change in the geometric shape of spatial vortex modes.

Thus, the proposed geometric solution based on the phases of the fibrations of the Mobius Magnetic Monopole quite elegantly "squeezes" gravity into the micro-world and helps to explain it in the macro-world and also shows its role and the role of quantum entanglement.

As noted above, the **phases of fibration** are the process of **matter growth** from the inside out. The first phase of fibration transforms the monopole state of matter into a dipole state, in other words, from an unmanifested monopole state into a manifested baryonic matter. Gravity is actualized, the properties of external polarity, charge and mass are manifested. All baryonic matter is in a state of dipole. The second phase of fibration shows the principle of interrelation of dipoles into a topological node based on link coupling (quantum entanglement). This is the path to understanding the periodic table of atomic elements.

Let us summarize the three **phases of fibration** in this way.

In the **first phase**, along with the doubling of the InfoGenome, the dual crossed **gravitational interrelation** was actualized, connecting and balancing the arms of the **Mobius Dipole**.

In the **second phase**, along with the doubling of the InfoGenome, the dual link interrelation was actualized – **quantum entanglement** – between the Mobius Dipoles, holding the dipoles in one whole and ensuring their instant synchronized interaction.

In the third and subsequent phases, sets of Mobius Dipoles are formed, connected into a topological knot and forming the following type of duality – the "**Center-Periphery**"

interrelation. In this interrelation, the arms connected in a topological knot form a quantum core, and the arms that are mirror-asymmetrical to them form a peripheral region, through which, as through a **membrane**, the system formation carries out a quantum exchange with the supporting Quantum Medium. Their **mutual symbiosis** allows for the implementation of life rhythms and cycles of Cosmogenesis.

The phases of fibration of the etheric granule (MMM) and its visualization using the Mobius strip show that the main difference between the vortices of the etheric matter and the vortex formations derived from them that make up the atomic matter is that the vortices of the ether do not have a central crossing or interweaving in a topological knot which are actualized in the first and second phases of bifurcation.

This difference is the main element in order to understand that the absence of a central interweaving characterizes unmanifested matter, which contains the duality of the Two Principles of CosmoGenesis in an unmanifested **mono-form**, and the vortices derived from this matter, having a central interweaving in various variations, are already manifested matter, containing the same duality of the Two Principles, but already in various ratios of atomic dipoles creating a variety of atoms and, on their basis, a variety of the manifested physical world. Due to the absence of central interweaving in etheric monopoles, the etheric medium is “transparent” for bipolar electromagnetic interactions.

As can be seen from the geometric transformations, the gravitational interrelation and quantum entanglement are essentially different interrelations that are formed stepwise in the process of system growth from the inside out by fibration. They are actualized as the InfoGenome of the Mobius Magnetic Monopole divides and doubles. This equally applies to the formation of atomic system formations and stellar-planetary ones.

Gravity and quantum entanglement are system-forming interrelations and each plays its role in the balanced retention of the system as a whole. From the geometric transformations it becomes obvious that gravity and quantum entanglement **are not interchangeable** with each other at different scaling levels. They are present together at each of them, performing different roles at each. In their reciprocity, they are equally inherent in both the micro-world of the atom and macro-systems, as well as the world of biology and the world of consciousness. Based on the above, it is concluded that it is impossible to put the equal sign “EPR” = “ER”, since these are not interchangeable essential phenomena, which are initially designated in sources [35] and [36].

$$\mathbf{ER \neq EPR}$$

In their reciprocity, both phenomena are inherent to all scaling levels. They both reflect the principle of complementarity and are both based on it. They both contain the original InfoGen of duality, as do other natural dualities observed everywhere. But this does not mean that they are equal or equivalent. ER is an attempt to depict a “particle”, or in other words, an attempt to display the basic element of nature, which contains the InfoGen of universal duality, and EPR is a phenomenon of dual interaction between two dual objects that formed a single whole before their separation. Both of these phenomena contain complementary duality according to the holographic structure of the World Order.

Until now, it has not occurred to any theoretician that the "**ER-bridge**" can be refined using the Mobius strip: based on bifurcation, obtain from it the ***basic element of nature*** in the form of the Mobius Dipole, and then on this basis propose an **atomic model**, as well as demonstrate the universality of this basic scheme.

Here it is appropriate to emphasize that in mathematics in general and in mathematical physics in particular, it has long been established that many problems considered complex or even completely unsolvable can in fact be solved quite simply if an equivalent description is found for them in another system.

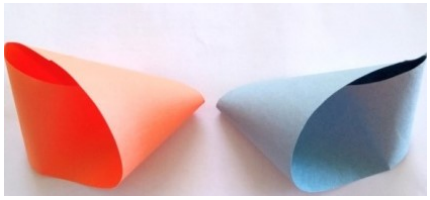
Almost always, the description of the same patterns and phenomena can be approached using different tools. In particular, the same problem can be solved **algebraically** using equations, or **geometrically** using graphs, drawings, geometric constructions and transformations.

"***Geometry is glorified for the fact that, having borrowed so few provisions from outside, it achieves so much***." Isaac Newton, "Mathematical Principles of Natural Philosophy".

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

Since this work focuses on quantum entanglement, it should be shown that quantum entanglement can be formed in other ways. But the condition of the presence of inversion, which mediates this phenomenon itself, i.e. complementarity, must necessarily be met.

Using the example of a paper experiment, one can illustrate the formation of quantum entanglement from two Mobius Monopoles of right and left twist. To do this, it is necessary to arrange the centers of their curvature lines perpendicularly. In this case, a topological interrelation of dipoles in the form of hearts will result. Monads – twin flames – from esotericism involuntarily come to mind.





Mobius monopoles do not annihilate each other, since their magnetic properties contribute to this.

I believe that in the universal quantum space, several methods of forming quantum entanglement are used for different purposes. And a series of experiments demonstrate its obtaining depending on the methods used. I have considered exactly the method on the basis of which the atomic model is built and the quantization of charges and their multiplicity to the minimum is explained.

Visualization of the fibration of a monopole unit of space-time using Mobius geometry gives a clear idea of the transformations that occur in the magneto-plasma of the etheric Quantum Medium, and shows that, being an attribute of one object before the fibration, after the splitting process, two objects retain their inteconnection, since they remain quantum entangled.

According to this principle, cosmic system formations and atoms are built. The same principle applies to the construction of a biological organism. All cells generated by the initial generative remain quantum entangled due to the complementary structure of DNA.

There was a hypothesis put forward by the Soviet cytologist M.S. Navashin that the shape of the ring chromosome is similar in structure to the Mobius strip. The scientist was prompted to

this idea by the fact that the ring chromosome, reproducing, turns into a longer ring than at the very beginning, or into two small rings, but as in a chain threaded one into the other, which corresponds to the above-described experiments with the Mobius strip in the first and second phases of fibration and actualization of quantum entanglement.

To the questions of quantum entanglement, one should also add the aspect that topology is a kind of "rubber geometry", which obviously helps to explain and understand a number of related questions of physics.

Based on the subject of this article, to conclusions 1–16, given at the very beginning, the following conclusions 17–20 are added, which are made on the basis of the content of this work:

17. As shown schematically, the result of the first phase of the bifurcation/fibration process is the doubling of the original InfoGenome of the Mobius Magnetic Monopole (MMM) and its polarization, that is, transformation into the Mobius Magnetoelectric Dipole (MMD), which, when doubling the inversion and loop length, has the configurability of the lemniscate-“eight”.
    As a result of such a transformation, the internal polarity acquires an external multi-manifestation in the form of bi-polarity or **dipole**. The dipole state of matter is its magnetoelectrically manifested state, which is called ***baryonic matter***.
18. All manifested matter in the universe has a magnetoelectric dipole structure. Based on this, the **dipole template** is the ***basic element of nature*** on the basis of which atoms are built and then everything else is fractally-holographically. This template is **universal** and is mediated by the ontology of the principle of complementarity.
19. In the process of step-by-step fibration of Magnetic Monopoles, which can be called the process of generating matter from the inside out, the actualization of those structural interrelations that are necessary to maintain the growing system formation in one whole occurs. This is **bipolar gravity** and **quantum entanglement**, which are derivatives of the original **complementary interrelation**, physically manifested as **magnetism**.
20. In the process of growth from the generative element, the "Center-Periphery" interrelation is actualized, which is equally extrapolated to different levels of scaling and to different planes of being. All **three** described **interrelations**: gravitational, quantum entanglement and center-periphery, represent a functional **Universal Triplet of Interrelations**, equally inherent in all existential levels: the micro-world of an atom, a biological cell, an organism, stellar-planetary and galactic systems, as well as the Universe as a Whole.

In a single monistic concept, when studying new physical phenomena whose patterns are unknown or not fully understood, there is always every reason to draw fractal-identical parallels, in other words, analogies from level to level or from one plane of being to another, which allows us to find answers to the questions at hand more effectively. It is also easier to make generalizations in a monistic concept, it contains a minimum of fundamental concepts and, ideally, one substantial entity, due to which there is no need to make adjustments.

The construction of a monistic concept is the process of geometrization of physics. The proposed format based on the principle of complementarity and its geometric analogue demonstrates the fact that this path can be the “***Ariadne's thread***” that will lead to the desired result – construction of a general Theory of Everything.

Since September 2021, I have been exchanging ideas on some issues of theoretical physics, including the construction of a unified general theory, with Academician of the Russian Academy of Natural Sciences G.I. Shipov, the author of the Theory of Physical Vacuum. [17]-[22]

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***" [22] is the achievement of scientific thought that makes a significant contribution to the program for creating a unified field theory.

I made a short review of this book [22] in my first work "***1. Quantum Medium. Mobius Geometry. Magnetic Monopole***". Continuing the topic of our exchange of opinions, I provide a quote from personal correspondence with G.I. Shipov:

"I read your publication "***Image of an Atom***". It is wonderful when the presentation of the material is conducted by a person with imaginative thinking, as you are.

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 Shipov G.I.
From personal correspondence on **Wednesday, April 3, 2024 at 11:45:56 AM EDT, Gennady Shipov** <warpdrive09@gmail.com>)

"I read your article "Fibration of the Mobius Energy Pattern and Hopf Fibration" on the trinitas.ru website, which surprised and pleased me very much. In other words, it resonates with my thoughts. I am a theoretical physicist and I am engaged in the unification of physical theories in the spirit of Einstein's Unified Theory."
September 15, 2021.

"Your versatile creative abilities and strong intuition are amazing. I and a group of my followers are preparing the second international conference "Physical Vacuum – the paradigm of the 21st century". I have an offer to you to speak at this conference. The conference is scheduled for November 2021. In addition, we are starting seminars on this topic. The seminars will be held in Moscow City in the Empire Tower on the 52-nd floor. I invite you to speak at our seminar."
September 16, 2021.

"There are two ways of knowing Reality – inductive (from the particular to the general) and deductive (from the general to the particular). Modern Western physics uses mainly the inductive method, relying on a private scientific experiment and generalizing already developed and generally accepted physical theories. The deductive method is used by people with advanced Consciousness. They are given the opportunity to receive Knowledge through a communication channel from the Data Bank, which is a set of Laws by which the Universe exists and develops. It seems that you have just such a channel.
September 23, 2021.

"... personally, I like your views on the Mobius geometry, which is associated, as we know, with the spins (3D) and spinors (4D) of particles, with a clear entanglement of wave functions shown on the Mobius strips."
October 21, 2021

"Now about the Mobius geometry. This geometry is used in my work and in the work of other theorists and mathematicians. In physics, this geometry assumes the existence of a spinor frame of reference, which was first introduced in physics by Paul Dirac in 1928. Mathematicians know all this well, but physicists are silent about it. Why? Because it leads to a revision (obviously to a generalization) of the foundations of modern physics. In theoretical physics, this is the most difficult and highly skilled work. Part of your work is related to these issues. It is up to you to decide what to emphasize in your report. "
October 25, 2021.

"I received your articles and read them with great interest. I believe that you have found the right way to generalize the theory of Physical Vacuum.

Your analogies and examples of the Clifford-Mobius-Hopf bundle have deep connections to modern physics. I especially liked the unification of symmetry-asymmetry on the image of the Mobius strip (monopole) and its generalizations. "
May 15, 2023.

"I am sending you my report at the conference on December 9, 2023 "**Fundamentals of Physics and Mathematics**" https://www.youtube.com/watch?v=FlqvQ258Fro&t=167s

60 people participated in the conference. Of these, about 30 in person and 30 in absentia. There were participants from other countries. As for the Mobius geometry, it is this that underlies the theory of Physical Vacuum. Mobius geometry requires a separate and rather serious conversation. Not all geometers know it, not to mention physicists."
March 8, 2024

Fri, Mar 8 at 7:49 PM (2024)
Dear Gennady Ivanovich!

Yes, Mobius Geometry is, let's say, an unplowed field, which must be walked through with a plow and more than once even after the Pioneer.

I believe that you have already read my work "Mobius Geometry on the Podium of Science", which outlines and describes the tendency of its penetration into science, as well as the peculiarity of the modern stage, when MG is pushing into all areas and storming brains.

It is very important, firstly, to be in the emerging flow of the new and, secondly, to be ahead, and not to drag along at the tail.

I believe that MG is a fundamental element that will most likely put all the unformed PUZZLES together.

And if not all geometers know it, and especially physicists, then those who have already "felt" it and understand its place and significance for explaining natural phenomena and creating new perspectives on its basis – the flag in hand.

You hold your flag in the wind and this is important!

I wave mine and pass on the "Morse code of MG" to those who can read it.

Your words are the main gift!

ACKNOWLEDGEMENTS.

I thank E.M. Babosov, Doctor of Philosophy, Professor, Academician, Full Member of the National Academy of Sciences of Belarus for thoughtful review of my dissertation and review about the research work – monograph “Substance. Atom. Theory of Everything” – as well as for participating in a joint article. [93]

I thank (posthumously) A.G. Grivachevsky, Candidate of Technical Sciences, Associate Professor, Executive Director of the State Scientific and Technical Program “Information Technologies”, Head of the Laboratory of Modeling of Technological Processes, for comprehensive assistance and help in contacts and publications in the scientific collection of IAIT, scientific support and attention to my research results.

I thank (posthumously) N.V. Petrov, Academician of the International Academy of Sciences of Ecology and Safety of Mankind and Nature, St. Petersburg, for high evaluation of my monograph, critical comments and additions when creating the annotation to the publication of my monograph “Substance. Atom. Theory of Everything", for personally sent works and dialogues. [93]

I thank Shipov G.I., director of the Scientific Center of Vacuum Physics, director of the Institute of Vacuum Physics, Academician of the Russian Academy of Natural Sciences, Academician of the International Academy of Informatization, Academician of the International Academy of Biotechnology, author of the Theory of Physical Vacuum, for his high assessment of my works, scientific dialogues, exchange of articles, as well as for invitations to speak at seminars and conferences on the theory of physical vacuum.

I thank Bugaev A.F., research fellow at the G.E. Pukhov Institute for Modeling Problems in Power Engineering of the National Academy of Sciences of Ukraine (Kiev), full member (academician) of the Noospheric Public Academy of Sciences (St. Petersburg); full member of the International Academy of Bioenergy Technologies (MABET), Dnepropetrovsk, for his detailed review and high assessment of my monograph "Substance. Atom. Theory of Everything", for creating a review for the its publication, for scientific discussions and attention to my articles, approval, admiration and support, as well as participation in joint articles and personally sent works. [93]

I thank Sergienko P. Ya., Academician of the Ukrainian International Academy of Original Ideas, teacher of philosophy, member of the Philosophical Society, author of the trialectic worldview and harmonious principles of fractal metageometry, for creating a preface to my monograph "Substance. Atom. Theory of Everything", attention to my articles, critical comments, contacts, scientific exchange, information assistance, sent articles and books. [93]

I thank Kuligin V.A., senior lecturer of the Department of Electronics of the Physics Faculty of Voronezh State University, for trust, sent materials and books.

I would like to thank V.A. Etkin, professor, director of the Institute of Integrative Research, for the opportunity to attend webinars dedicated to the topic "Towards a Unified Physics" and the opportunity to deliver reports, as well as personally sent articles and reports.

I would like to thank professor V.A. Artamonov for the invitation to participate in articles on Artificial Intelligence and information and communication technology security issues.

I would like to thank Tatur V.Yu., a scientist, inventor, and editor-in-chief of the website of the Academy of Trinitarism, for the opportunity to publish on the website www.trinitas.ru as well as for the articles he sent me personally.

I would like to thank N.A. Koltovoi, candidate of technical sciences, for creating the library website https://www.koltovoi.nethouse.ru and the enormous amount of work that went into collecting multidisciplinary information, as well as for the personally sent reports.

I would like to express my gratitude to the creator of the websites https://kniganews.org/ and https://kiwibyrd.org/ for his "detective investigation" of facts in the history of science, with the help of which my no less "detective" research based on the created monograph received quick orientation and the appropriate direction in the lists of references. The focus of the author of these sites and the aspects that he touches upon are aimed at integrating scientific knowledge, which attracted my attention. It was clear to me that both of us, but each in his own capacity and in his own place, are involved in a common cause, which involves systematizing the knowledge already obtained and combining it in its unification.

I thank my son's family for computer support, technical maintenance, moral and financial support.

I thank with all my heart my close friend Nikaliuk I.I. for her soulful talent in understanding and accepting the entire concept I proposed, active discussions of the content of the monograph and subsequent articles, contributed thoughts, words of support and encouragement, financial participation.

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