SHOULD THE EQUALITY SIGN BETWEEN THE PHENOMENA OF QUANTUM ENTANGLEMENT "EPR" AND "ER BRIDGE"?

Kulak L.A. (Antoniya Ilyinskaya)

Member of the International Academy of Information Technologies PU IAIT. Engineer, independent researcher in the field of Fractal Synthesis and Linguistic Physics of the corresponding sector of the International Institute of Humanitarian and Ecological Projects (IHEP) as part of the International Academy of Information Technologies (IAIT). Florida, USA. Toronto, Canada. Minsk, Belarus.
Email: antoniyau@yahoo.com

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

ABSTRACT.

In physics, as known, there are two theoretical proposals: quantum entanglement and "wormholes". Quantum entanglement was predicted within the framework of quantum mechanics and describes the connection between distant elementary particles beyond the standard interactions. "Wormholes" were predicted within the framework of the General Theory of Relativity (GTR) and are "tunnels" connecting distant parts of space-time.

Historically, these phenomena have been given names made up of the first letters of the surnames of the authors of the articles in which these theoretical proposals were first published: quantum entanglement is called "EPR", and space tunnels are called "ER bridges".

This article proposes to return to the beginning of the emergence of these theoretical proposals and to the original sources in which these proposals were put forward. Based on the analysis, it is shown that in subsequent reasoning, incorrect conclusions were historically made, which entailed a corresponding logical chain of judgments based on the apparatus of algebra, which led to a hypothetical proposal about the equivalence of the "EPR" effect and the "ER bridge".

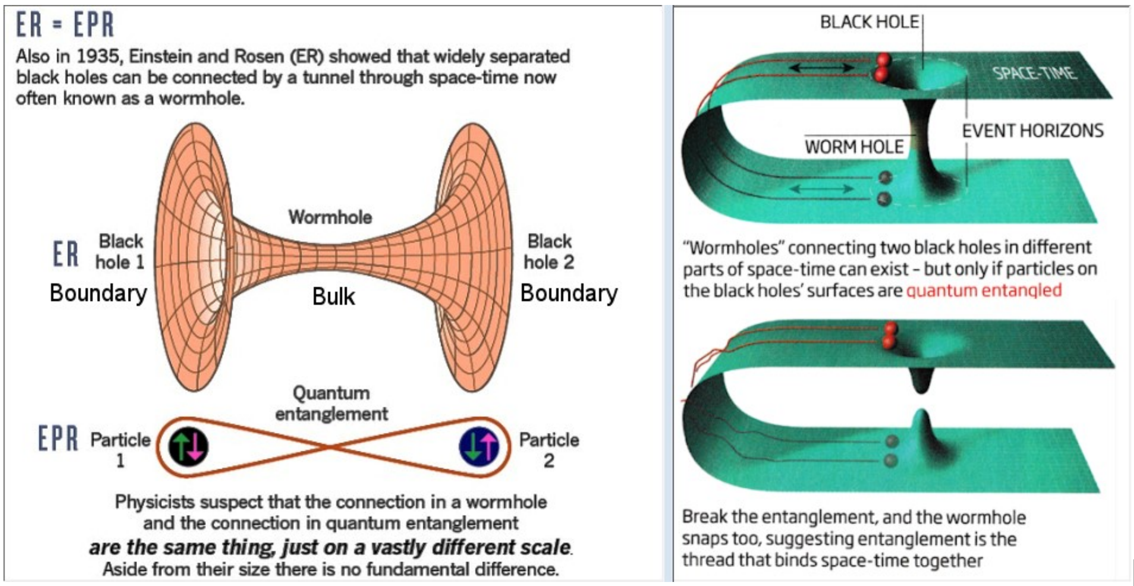
In this paper, a geometric solution to this issue is proposed based on the ontology of the complementarity principle. The author applied a geometric analogue of the complementarity principle of the Mobius strip to visualize the process of filamentary splitting of the "quantum object" and demonstrate the formation of those interrelations that are actualized during fibration of the magnetic loop. The form representation of the magnetic loop is considered based on natural complementary duality, which geometrically contains an inverse turn of 180 degrees and represents a mirror-asymmetric relationship of the components of a single whole.

Geometrical transformations clearly demonstrate the functional difference between the "EPR" effect and the "ER bridge" and lead to the resolution of the question of their equivalence. The content of this article is a more condensed version of the content of the mentioned works. [28] [31] [32] [33] [34]

"***We must not allow all other cognitive organs to degenerate through the development of rational analysis alone***." Nobel laureate W. Heisenberg.

In 2013, Juan Maldacén of Princeton University and Leonard Susskind of Stanford University published a paper proposing the equivalence of two completely different phenomena: the "EPR" effect and the "ER bridge". [1]

This proposed equivalence exists for now as a hypothesis and is attractive because it has led to the consequences that, using the mathematical apparatus of algebra, repeated attempts are made to prove that the "EPR" effect and the "ER bridge" are equivalent. [10] [11] [12] [13] [14]



[42]

Despite the efforts made, the evidence has not yet been obtained. To understand whether it is possible to obtain this evidence at all and what is the fundamental difference between these two phenomena, it is necessary to go back to the origins or to the beginning, when the very first works on this topic were published, and see what exactly the authors of the first publications meant and whether this corresponds to the idea that has formed by the present day.

Why is it necessary to go back to the beginning? Because if at some initial stage a mistake was made or incorrect conclusions were made, then this entails a chain of erroneous judgments, which ultimately lead to a crisis situation, and it becomes obvious that the entire field of science is moving in the wrong direction, which is essentially what is happening with quantum physics.

Let's start with the facts that the 2025 Breakthrough Prize laureate in Physics and 1999 Nobel Prize laureate theoretical physicist Gerard 't Hooft noted in his latest interview with ***Scientific American***. The interview was published on April 8, 2025, under the title "***Quantum Physics Is on the Wrong Track, Says Breakthrough Prize Winner Gerard 't Hooft***." [2]

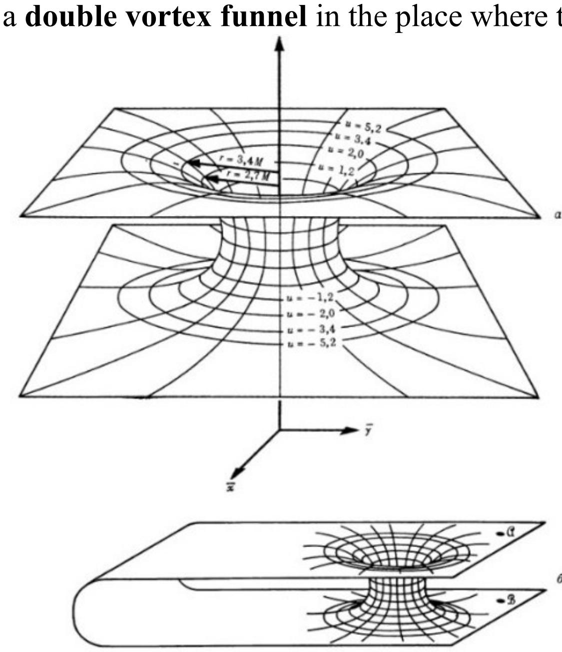
In addition to emphasizing that quantum physics is heading in the wrong direction, the theoretical physicist outlined a number of aspects of the wrong track, one of which is the following: «And people refuse to drop the idea that quantum mechanics is some strange kind of supernatural feature of the particles that we will never understand. No! We will understand, but we need to step backward first, and that's always my message in science in general: before you understand something, just take a few steps back. Maybe you have to make a big march back, all the way back to the beginning». [2]

Expressing full agreement with the position of the theoretical physicist that it is necessary to return to the beginning, I want to emphasize that I made the same emphasis in my author's monograph "Substance. Atom. Theory of Everything" [28], and I also repeatedly express this idea in a number of subsequent scientific works devoted to the application of the geometric format of the self-consistent concept I proposed on the ontology of the principle of complementarity to answers to a number of basic intractable questions of theoretical physics. [4]

A sufficient number of applications show the effectiveness and dominant significance of the geometric approach in identifying those points where something went in the wrong direction, looking at what has been achieved from a new focus of vision and obtaining the necessary answers concerning unanswered questions of theoretical physics: the concept of a magnetic monopole, charges and their quantization, the structure of an atom, gravity, quantum entanglement, a hydromagnetic dynamo, and much more. [31]-[34]

This article is devoted to the application of the proposed geometric format to the issue related to the phenomena of "EPR" and "ER bridge". To illuminate this topic, we will return to the historical period of the creation of GTR and Quantum Mechanics, which marked the beginning of the next period of development of modern physics, and we will begin the analysis with the phenomenon of "ER bridge".

In 1915, A. Einstein published the equations of GTR [5], [6]. A few months later, the German astrophysicist K. Schwarzschild found a simple and beautiful solution for them, which became known as "Schwarzschild space". [7]. The geometry of the solution indicated that the space has the form of two parallel sheets connected to each other by a bridge in the form of a "neck" or a **double vortex funnel** in the place where the mass-energy is 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 general relativity, but also simultaneously for the equations of Maxwell's electromagnetism. [9]

This pointed the way to understanding not only how the elementary particles of matter are structured, but also how gravity and electromagnetism turn out to be different sides of the same nature of things.

In July 1935, an article by A. Einstein and N. Rosen was published with this discovery: "***The Problem of Particles in the General Theory of Relativity.***" [9]

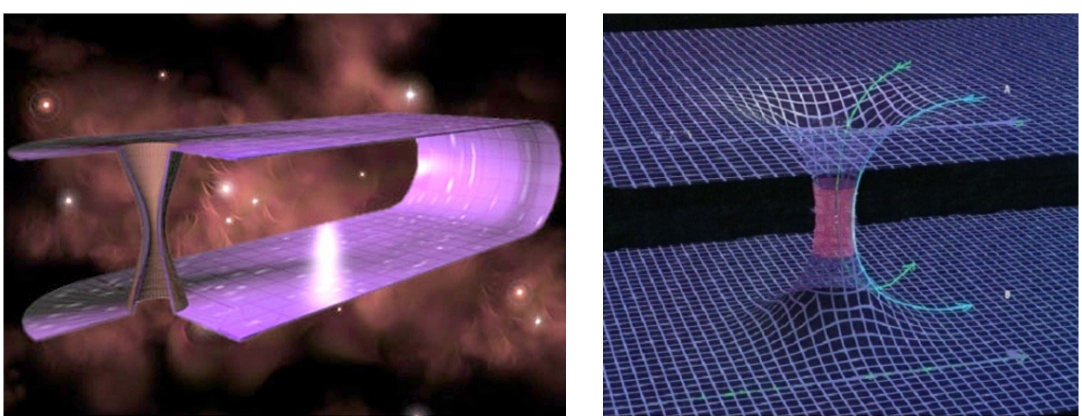
It is especially worth emphasizing that the said article by Einstein and Rosen was devoted to the physics of the microworld.

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 [9] says:

"The authors explore the possibility of an atomistic theory of matter and electricity that, excluding field singularities, does not use any other variables than the $g\mu \quad \nu$ of general relativity and the $\phi\mu$ of Maxwell's theory. After considering a simple example, they came to the need to slightly modify the equations of gravitation, which then allow regular solutions for the static spherically symmetric case. These solutions involve the mathematical representation of physical space as a space of two identical sheets, with the particle represented by the "bridge" connecting these sheets. The most natural elementary charged particle turns out to be a particle with zero mass. It is expected that a system of many particles will be represented by a regular solution of the field equations corresponding to a space of two identical sheets connected by many bridges. In this case, due to the absence of singularities, the field equations determine both the field and the motion of the particles. The many-particle problem that would determine the value of the theory has not yet been considered." [9]

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 the elementary particle of matter is a "bridge" connecting these two sheets.

In the ER bridge hypothesis, Schwarzschild's solution and illustration were used as a basis for representing the particle as a tube-bridge or microscopically small "bridge" across the fifth dimension, connecting two 4D sheets of parallel spaces. Much later, the illustrations presented below were created on this description.



"Einstein-Rosen Bridge"

As noted by the authors [9], 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 a set of particles should be represented similarly – by the usual solution for the field equations corresponding to the space of two identical sheets connected to each other through a set of "ER bridges".

Further, the facts of history are such that the authors were unable to solve the problem with a set of 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 particles of microphysics receded into the background. And the metamorphosis consisted in the fact that this work of 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 was mathematically rigorously demonstrated, which was then called the "Einstein-Rosen bridge" or "ER bridge" for short.

This emphasis was made at the instigation of J. Wheeler, and since then the majority of physicists believe that the article [9] is about tunnels-transitions that connect regions of the universe separated by long distances by the shortest route. To this day, when discussing "wormholes", almost no one remembers what exactly the original article of the authors was called and in what specific context the idea "ER bridge" was born.

As a result, this phenomenon of GTR, at the instigation of J. Wheeler, entered the history of science 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, namely, it was an attempt by the authors to **display the basic element** of nature or, in the terminology of the current paradigm, the geometric structure of the most elementary particle of which matter consists.

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

In May 1935, an article by A. Einstein, B. Podolsky and N. Rosen entitled "***Can the quantum-mechanical description of nature be considered complete?"*** was published. [8]

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 identified a contradiction – the fundamental possibility of instantaneous interactions between particles, completely independent of the distances separating them. That is, if initially two particles were 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 from the authors' surnames – "EPR", and at the suggestion of Erwin Schrödinger, the new quantum phenomenon began to be called Verschränkung in German and Entanglement in English.

During the indicated period of time, there was no experimental evidence either for or against quantum entanglement of widely separated particles.

Decades later, the technical level of experimental physics made it possible to actually reproduce the "thought experiment" of EPR and reliably confirm that entangled quantum particles are capable of instantaneous interaction regardless of the distance separating them. The very first of such experiments was proposed and conducted by Caltech graduate John Clauser [40] in 1969 and 1972, respectively. His results are based on Bell's theorem, developed by CERN theorist John Bell.

Moreover, such quantum mechanics now works not only at very small, but also at very large distances. China's quantum-encrypted communications satellite Micius uses quantum entanglement of photons separated by thousands of kilometers.

Thus, historical analysis shows that the "ER bridge" originally pertains to the structural representation of an elementary "particle" (the basic element of nature), while the "EPR" phenomenon pertains to "particles" that were originally in the same quantum system, in other words, belonged to the same integral structural formation, and were then spatially separated upon separation.

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

In their joint work "***Cool horizons for entangled black holes***" [1], J. Maldacena and L. Susskind used the laconic language of formulas to justify the equality EPR = ER, which is considered to be true at least for black hole conditions. At the same time, the authors made a more general assumption that such "wormholes" or "ER bridges" "may also exist 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 findings, a number of new results appeared 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. [10], [11].

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 higher-dimensional space. With such a reformulation of the problem, certain calculations for this system are much easier to perform.

Based on the results of previous studies, as well as in accordance with the holographic principle, K. Jensen and A. Karch analyzed in their theoretical study what the physics of an entangled quark-antiquark pair looks like. [10]

The author of another article, J. Sonner, obtained a similar theoretical result under conditions where the generation and expansion of a quark-antiquark pair occurs in a strong electric field (Schwinger effect). [11]

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 a “wormhole” and an entangled pair of particles do not live in the same space. However, from a mathematical point of view, these systems are equivalent.

Whether or not these objects live in the same space is the next interesting question. And it will not be said as a reproach to these theoretical studies, but it is necessary to state the fact that the tendency observed in mathematical physics today is such that the mathematical results found in theories give an energetic impetus to the development of a very powerful and beautiful mathematical apparatus of algebra, but which is absolutely not connected with physics as a science about the nature of things and the phenomena observed in nature.

"To represent mathematically", based on the results of algebraic calculations, and to represent physically in a visual form, based on their parallels and analogies in reality, – these can be essentially completely different things.

Undoubtedly, parallels of these EPR and ER effects exist at larger scaling levels according to the holographic property or the Law of Analogies. Nevertheless, and to avoid confusion, it would be a good idea to understand these effects where they originally arose. The powerful apparatus of modern mathematics has already been developed to such an extent that with the help of specially selected formulas and fitting free parameters in equations it has become possible to substantiate practically any theory put forward theoretically, especially with the multiplied army of "particles" that are never observed in nature, but with the help of force research methods are postulated in experiments at colliders.

As for the solution of the fundamental problem of unifying quantum theory and gravitational interaction, which has received the general name "quantum gravity", many scientists continue to hope for a consistent "merger of two foundations" – the Standard Model and the General Relativity of A. Einstein. Others are developing significantly different approaches, such as string theory, loop quantum gravity, twistor theory and others.

However, without ontological observation and identification of the original Geometry of space, the algebraization of theories in the absence of an IMAGE is unlikely to be able to give a final productive result.

And, as theoretical physicist G. t' Hooft absolutely correctly gives the direction of thought: «The true answers must undoubtedly come from the incorporation of the gravitational force. At first sight it may seem difficult to believe that such an extremely weak force could cause so much havoc in a theoretical construction such as the Standard Model.

The point is, however, that if gravity really corresponds to the curvature of space and time, as we must conclude from the successes of Einstein’s theory of General Relativity, then Quantum Mechanics predicts quantum fluctuations in this curvature that, at the tiniest distance scales, grow out of control.

This means that either gravity theory, or Quantum Mechanics, or both, must be replaced by some superior paradigm... Whatever paradigm this would be, it is likely to entirely reform our understanding of the fundamental interactions, answering all our present questions at one stroke». [3]

In addition, I will give a few more examples from publications related to the discussed issue of ER and EPR.

In June 2015, ***Physycal Review Letters*** published the article by Lin, Marcolli, Ooguri, Stoica, “***Locality of Gravitational Systems from Entanglement of Conformal Field Theories***”, [12] “The Ryu-Takayanagi formula relates the entropy of entanglement in a conformal field theory to the minimal surface area in its holographic dual. We show that this relation can be inverted for any state in a conformal field theory to calculate the energy-momentum tensor of a volume near the boundary of a bulk spacetime, recovering local data in the volume from entanglement at the boundary.” [12]

“In this letter, we have gained new insights into how spacetime arises in a holographic setup. We found that equation (25) expresses the local energy density in the theory of gravity using quantum entanglement data in the boundary theory, and that the universal properties of entanglement such as positivity and monotonicity of the relative entropy can be interpreted as positivity conditions for the bulk energy density." [12]

In a **February 2019** Research Article in the International Journal of Cosmology, Astronomy and Astrophysics titled "New groups to ER=EPR conjecture", author Yonghong Liu offers, as described in the abstract, "a new and simple, but rigorous and extensive proof of the ER=EPR conjecture using some pa-group identity. Thus, we can say that the conjecture is true." [13]

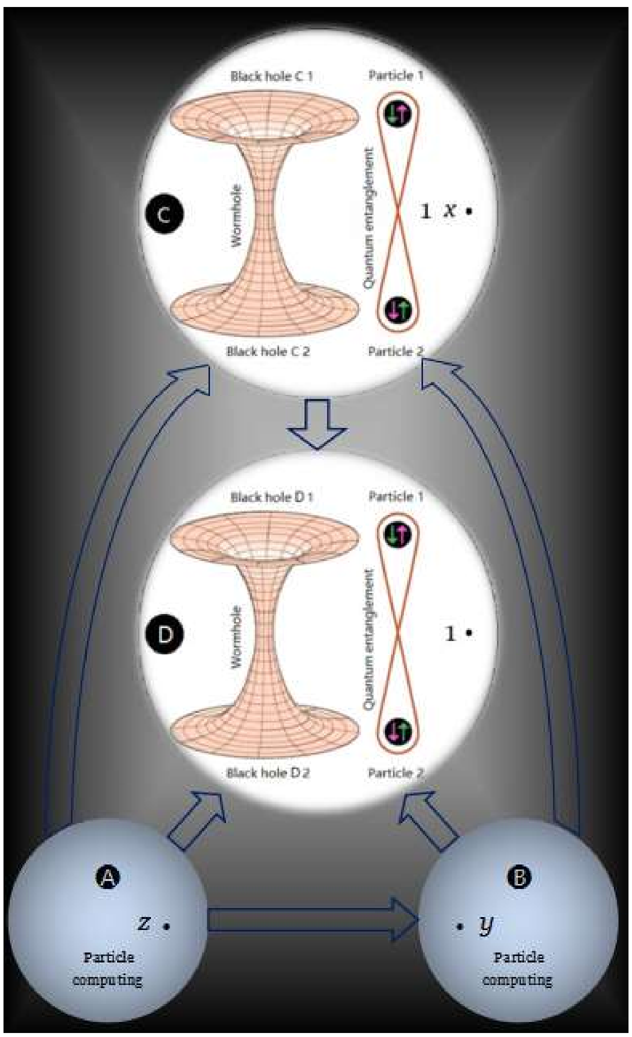


Figure 3. The figure shows the particles of entanglement in the two wormholes. [13]

In **March 2022**, the paper "***The "ER = EPR" Conjecture and Generic Gravitational Properties: A Universal Topological Linking Model of the Correspondence between Tripartite Entanglement and Planck-Scale Wormholes***" was published by Elias Zafiris* and Albrecht von Müller. [14]

The abstract notes the following:

«The "ER = EPR" conjecture, conceived by Maldacena and Susskind, is grounded on the notion that a gravitational theory in the bulk is dual to the corresponding quantum field theory on the boundary in accordance to the AdS/CFT correspondence. The conjecture pertains to the idea that Einstein-Rosen (ER) spacetime bridges and Einstein-Podolsky-Rosen (EPR) quantum entanglement may be considered as dually equivalent. Since ER bridges refer to the connectivity between black holes, the "ER = EPR" conjecture implies that black holes connected by ER bridges are entangled, and conversely, that entangled black holes are connected by ER bridges.

However, the instance of the maximally entangled tripartite (GHZ) quantum state points to the necessity of devising a model of non-classical Planck scale ER bridges going beyond the standard description of these bridges in spacetime.

Based on the topological structure of the maximally entangled GHZ state, we propose that a universal topological link, called the Borromean rings, furnishes a particular linking structure that is able to unravel the equavalence between entanglement and wormholes, and thus, to address the validity of the "ER = EPR" conjecture beyond the initial context of the AdS/CFT correspondence. As a consequence, we propose the explicit construction of distinguishable extensions of the smooth classical spacetime manifold taking place in the transition to the quantum gravity regime according to a naturally induced physical criterion of gravitational generic properties following from this intrinsic topological qualification of the "ER = EPR" conjecture». [14]

A visual topological connection similar to the "Barromean rings" can be obtained using a paper experiment with a Mobius strip, the sides of which are connected into one topology through three 180-degree turns. The experiment consists of cutting the strip along the curvature line and obtaining topologically linked rings. In terms of using a geometric approach, the authors of this theoretical proposal are on the right track. But the Barromean rings used (Fig.?) are an artificial mathematical formation. In order for this to be closer to reality, it is necessary to conduct a real physical experiment to obtain a topological knot from three rings and see the results that will allow a more productive answer to the question of whether the hypothesis put forward is true or not.

The results using a paper experiment visualizing the universal method of multiplication through bifurcation with doubling and obtaining components complementarily connected into topological knots are shown below. In presenting above the entire sequence of facts in the development of the topic of the "ER bridge" and "EPR" and theoretical proposals to prove their equivalence, it should be emphasized that, as is evident from the content of theoretical proposals, 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 the relationship of these effects in 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 scientifically established fact that to date gravity has not been able to be "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, then how can we resolve the issue and draw conclusions that the "ER bridge" and "EPR" are equivalent?

The opinion that these systems are equivalent from a mathematical point of view does not mean that this can be taken as a final conclusion for reality, no matter how beautifully the mathematical apparatus demonstrates it. The revealed mathematical identity of these phenomena may indicate the fact that each of the phenomena (the "ER bridge" and the "EPR" effect) is an **ontological natural duality**, but this does not mean their natural equivalence with each other.

Dual means double, twofold, but dually opposite, or more correctly – **complementarily opposite**.

An example of this are the most well-known existential dualities: opposite electrical charges, elements of binary logic, DNA strands, two biological sexes, the phenomenon of magnetism, electromagnetism, the hemispheres of the brain, the respiratory, circulatory and digestive systems, etc., etc. All structural formations of the World Order basically contain the Information Gene (InfoGene) of complementary duality as a basic inclusion and as a universal substantial template on the etheric material carrier of the Quantum Medium – **magnetic monopoles**, from which, as from seed elements, all objects of outer space are formed. [28]

The frame properties of etheric magnetic monopoles are transmitted InfoGenetically to all generated objects and remain in them as that substantial **primary ingredient**, which Nobel laureate F. Wilczek speaks about in his book:

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

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

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

This is what makes space a multilayer superconductor (or otherwise, a superfluid fluid with a whole spectrum of different properties)." [46]

In turn, Nobel laureate H. Alfven pointed out the **magnetic nature** of this "ingredient", calling it ***magnetic particles***. Due to the activity of such magnetic particles, H. Alfven called the cosmic environment ***a living plasma***. [19] [20] [21]

Continuing the reasoning of F. Wilczek and H. Alfven and using a **geometric approach**, I have substantiated that such a living plasma consists of magnetic monopole rings that are in a mode of non-stop and continuous **oscillations**. [31]

The origin of these oscillations is based on the **inversion** of the magnetic loop. These oscillations are the act of quantum breathing of the living etheric plasma. It is the act of breathing that determines the state of the object as "living". In the act of quantum breathing of magnetic monopoles, the process of **emission-absorption** of quanta occurs. Based on this, I called the supporting cosmic environment the etheric Quantum Medium or ***magneto-plasma***. [31]

J. Maxwell's **vortex wheels**, F. Wilczek's **primary ingredients**, H. Alfven's **magnetic particles**, all of these are reflected facets of the same substantial template of etheric magnetic monopoles as vortex nodes that make up a **dynamic spin network** that is reflected in modern theories. The framework properties of magnetic monopoles are the original InfoGenome for EVERYTHING and are the source of magnetism.

"... the essence of the unity of the world should be sought in a special form of self-motion of matter, in a special structure of this self-motion, from which all other features of the world

necessarily grow. This special form of self-motion, having generated all other forms of motion of matter, exists together with them, simultaneously constituting their essence." [47]

As shown in [31], these self-motions are mediated by the structure of the etheric Quantum Medium, the magnetic monopoles of the matrix of which are complementarily closed. And this initial InfoGene of complementary duality is transmitted to all objects in a universal way of generation. Based on such a single substantial basis, this duality will be constantly revealed both mathematically and in direct observations.

The revelation of numerous natural dualities, which are described by their interconnected mathematics, persistently leads researchers to the idea of the presence of this single complementary basis in all phenomena in nature, both directly observed and revealed analytically on all possible scales from the minimum Planck scale to the Universe as a whole.

The revealed dualities suggest that Nature is ingeniously simple, and complications arise from a misunderstanding of this fact. Through the comprehension of the universality of this duality and understanding of its particular presentations at scaling levels and in planes of being, the single foundations of all physics can be studied in the most natural way.

Complementary duality is reflected graphically in the ancient Yin-Yang symbol. In essence, the mirror asymmetry of two components of a single whole reflected in it is their antiphase interrelation relative to each other. Such complementary duality is the well-known in science "***Clifford parallels***", which in a closed state represent a Mobius strip.

Geometrically complementary duality can be displayed precisely by the Mobius strip, which is adopted in the proposed new approach to the issues of theoretical physics as a **geometric analogue of the principle of complementarity**.

With the help of such a geometric analogue, it is possible to visualize those geometric transformations with the help of which it is more productive to obtain those necessary answers that physicists-mathematicians are looking for using the apparatus of algebra. Thus, the "ER bridge" was considered as an attempt to geometrically display the basic element of nature or, as the authors called it, the elementary "particle", which was illustrated by a jumper tube or a microscopically small "bridge" through the fifth dimension, connecting two 4D sheets of parallel spaces. [9]

Let's move again to the same historical period of the beginning of the birth of GTR and Quantum Mechanics. At the same time, the issue of representing the process of correlating two sides of a plane was studied by Florensky P.A. (1882-1937) and his works are known, where he introduces the concepts of imaginary and real sides of a plane: "The choice of a plane as the initial element of physical space, using the concepts of projective geometry, allows us to move on to matter, a particle." [15], [16]

"Soon, the work of P.A. Florensky [39], in which he proved that the physical plane consists of an imaginary part (side) and a real part (side). In his understanding of the physical plane, P.A. Florensky saw a connection between the "basic ideas of "imaginaries" with theoretical concepts of electrical engineering" and pointed out that "the theory of imaginary will find physical and, consequently, technical application."

It is indicative that "if the area of an ordinary loop is proportional to the energy lost in one cycle of a periodic process, then the area of a mirror loop serves as an indicator of the energy input to this source." [15], [16]

Thus, Florensky reasoned about the direct connection of these plane reversals with the radiation-absorption phases in an electromagnetic phenomenon. And the reversals of the triangle figure described by Florensky P.A. with a change in the sign of the area occur precisely in the

Mobius strip, which is laid out in three triangles, in which the direction of the vector potential changes. And, as Florensky pointed out, in the successive combinations of three triangular "loops" of the Mobius strip, the fundamental possibility of energy release and absorption arises.

In essence, this is the description of the principle of quantum breathing with the phases of emission and absorption (inhalation-exhalation).

And it is precisely the geometric properties of the Mobius template that can clearly demonstrate this, and in reality – ensure the implementation of this reciprocal process. This implementation is physically feasible if the magnetic loop is considered not as a simple "donut", as is accepted in current views and approaches, but with an inweight closure through 180 degrees, since magnetism is a natural duality of polarities. No theoretical physicist has yet put forward a proposal to consider the magnetic loop in the configuration of the Mobius strip. This issue is covered in detail by me in [31]-[34].

Fig. LM 10

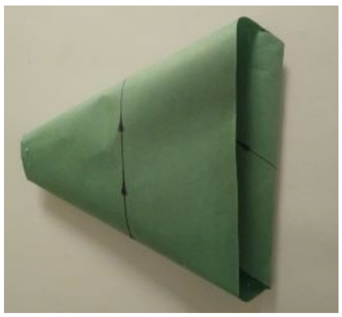


Fig. LM 11

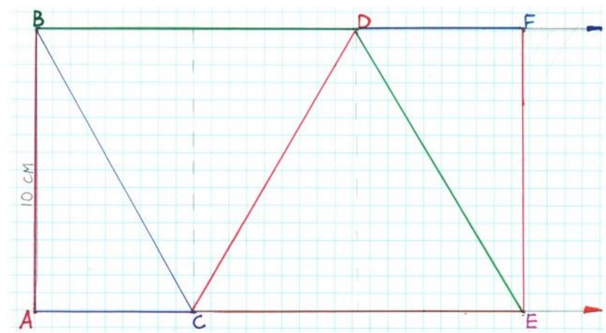


Fig. LM1 from [31]

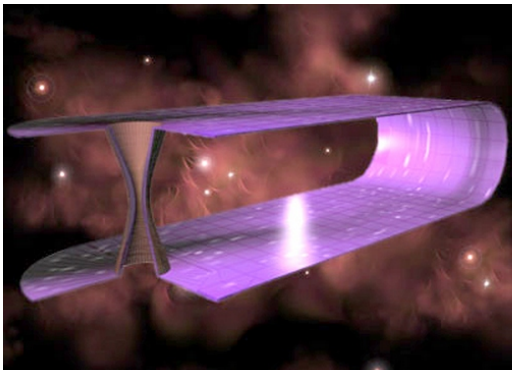
In fact, the above reasoning by Florensky P.A. reflects the principle of the universal process of Mobius oscillations, which functions in the "radiation-absorption" mode, producing radiation (loss of energy) and absorption (introduction of energy) in a topological revolution. This principle is mediated by the Mobius blade inversion and is reflected, for example, in the biological sphere – the respiratory and circulatory systems, as well as in a number of existential technical inventions, such as the Archimedes screw, the meat grinder auger, the screw and others, which can be a clear illustration of this reciprocal process. Florensky P.A. considered a **puncture-diapir** as an element of connecting two sides of one plane. [15], [16]

So, the "ER bridge" is a form of connecting **two sheets** with a **tube-jumper**. And the **puncture-diapir** in Florensky is a form of connecting **two sides of one plane**. The jumper-tube and the puncture diapir are similar in their function, display the same functional element of the connection of two complementary opposites and generally represent the same thing – an element of the interconnection of two sides of a plane or two planes as membranes.

Conclusion. In both cases, an attempt was made through a geometric form representation to obtain an image of the **original principle of dual interrelation**, which complementarily connects two opposites.

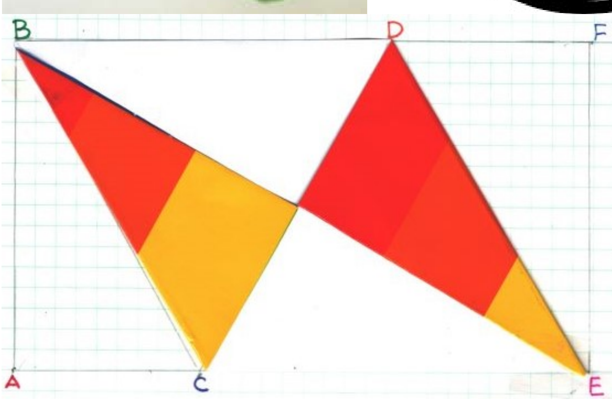
Based on the above, it is clear that scientists independently considered and tried to illustrate a form that has a mirror-asymmetric (complementary) dualism in its geometric basis.

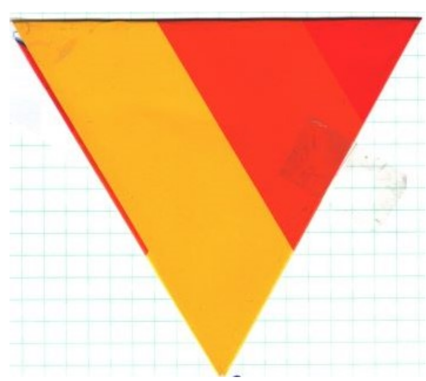
If we combine these mental results, then the conclusion suggests itself – two sheets of the Einstein-Rosen "bridge" must be connected mirror-asymmetrically (antiphase) into one topology of the Mobius strip, that is, complementarily and similar to those revolutions of triangular planes that Florensky studied. This geometric presentation reflects the structure of the etheric magnetic monopole as a seed element for the formation of baryonic matter, which has a magnetic dipole state. These transformations are shown below. It is important to say here that scientists were quite close in their search to the geometry of the so-called "elementary particle", but for a number of objective reasons the geometry remained unfinished.



Einstein-Rosen "Bridge". ***Mobius strip with one turn.***

The Mobius strip with the minimum aspect ratio is laid out in three equilateral triangles, which are ideally symmetrical in this respect, but have differently directed vectors of the dynamics of the internal motion (spin rotations). Below ***Figures*** from [31].





[31]

In the Mobius strip, the role of a puncture or tube that implements a dual interrelation between two components is performed by an inverse 180-degree turn, through which two sides of a plane or two membranes are connected into one topology. In this case, the transition from one side (plane) to another is carried out dynamically smoothly, and also non-stop, due to the properties of magnetism. Such a smooth solution speaks in favor of the fact that the magnetic monopole has the configuration of a magnetic loop closed inversely, which is the topology of a soliton-like wave.

The etheric elemental (magnetic monopole) on the template of such geometry performs self-motion, is energy-carrying and feeds itself. Antiphase closure into one topology organizes the opposite direction of flows, and magnetic reconnection leads to sparking and the release of energy (portions of magneto-plasma).

From the results of recent laboratory experiments with plasma, it has already been established that two opposite plasma flows lead to the effect of energy release. As practice shows from experiments with laboratory plasma [17], [18] and observations of astrophysical plasma, **magnetic reconnection** transforms magnetic energy into thermal and kinetic energy of plasma. That is, in similar processes in the magneto-plasma etheric medium, only transformations of one type of energy into another occur.

The correctness of visualization based on the Mobius strip is confirmed by Nature itself by the fact of the embodiment of the method of bifurcation/fibration in its form constructions. This method has been known to science since 1953, when the double helix of DNA was discovered and then the method of its replication was studied. Using DNA as an example, one can see how the principle of bifurcation (fibration) with doubling is realized and works in the plane of biology.

And since the Observed Reality is a reflection of the Quantum Reality based on the principle of unity and analogy (holographic property), then in fact it only remains to make a fractally identical transfer of this method to the sphere of quantum physics and illustrate it. The universal method of bifurcation/fibration in application to the issues of Quantum Mechanics allows us to visualize how the continuous transition from the state of unmanifested matter (monopole state) to the state of manifested baryonic matter (dipole state) is carried out by the **universal method of copying** – through bifurcation with doubling, the implementation of which is based on the principle of complementarity.

The transition of matter from a monopole (etheric) state to a dipole (baryonic matter) with the actualization of gravity and mass lies in the plane of spatial geometric transformations, which W. Clifford once emphasized. [22], [23], [24], [25], [26], [27]

"In the picture of the world presented by Clifford, not only the gravitational force of attraction generated by curvature is visible. According to the theses he compiled, 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." [27]

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

"... the manifestation of matter occurs "from the inside out" [30]

In the proposed self-consistent concept [31],[32],[33],[34],[28] a new geometric approach to the issues of the structure of the world order is based on the representation of the original magnetic loop-monopole as closed through inversion, i.e. mirror-asymmetric, which corresponds to the universalism of the complementarity principle. It can be said that the original magnetic loop-monopole is a natural duality that has a complementary interrelation, i.e. a connection into one topology through a 180-degree turn. Such a connection does not have an external magnetic field, but is potentially a source of magnetism.

The external magnetic field is actualized when a magnetic monopole is transformed into a magnetic dipole. A topology with one turn (monopole) is a non-orientable surface. The geometric solution of its transformation into an orientable surface (dipole) consists in using a universal method of bifurcation/fibration of a magnetic monopole along the line of the Mobius curvature and its transformation into a Mobius Magnetic Dipole with the actualization of the gravitational interrelation, external magnetic field, charge and mass properties. Such a Magnetic Dipole will be the **basic element of nature**, on the basis of which the atomic system formation is built.

The process of spontaneous division of a vortex formation can be called its filamentary bifurcation or fibration phases into fibers along the line of the Mobius curvature. The process of vortex division is a hydrodynamic property that is equally inherent in the water, air and ether Quantum Medium, which has a matrix structure in the form of a spin network of monopoles and is a kind of quantum liquid – magneto-plasma. Fibration is a process of dividing a magnetic monopole with doubling of the original InfoGenome of duality and formation **of new symmetries and asymmetries**, in other words, it is a process of growth of matter from within with expansion of space.

The transformation of a magnetic monopole into a magnetic dipole by fibration can be illustrated with a paper experiment, while imagining that the actions are performed with a magnetic loop.

1. FIRST PHASE OF FIBRATION.

Mobius Monopole. FIBRATION. Mobius Dipole.

When the Mobius Magnetic Monopole is transformed into a magnetic Mobius Magnetic Dipole, the initial inversion is doubled, and the length of the magnetic loop is doubled too, which is the first doubling of the initial InfoGenome of the magnetic monopole. In this case, the following mirror-asymmetric duality of two arms of the magnetic dipole is formed, interconnected through the crossing of the curvature line.

The mirror-asymmetric helicity of the dipole arms actualizes the property of opposite charge and the external magnetic field, and the crossed interrelation is identified as **gravitational**. With the help of the gravitational tensor, a balance of the arms is organized at the crossing point – the effect of their tension and balancing.

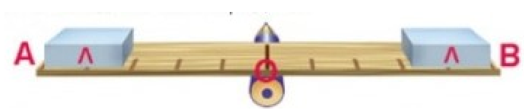
The principle of gravitational balancing is realized due to the effect of creating a feedback on any change that occurs in the method of connection through the Mobius crossing. With such a crossed connection method, a reverse reaction occurs in the form of a restoring force directed against any displacement, due to which a stable equilibrium is formed.

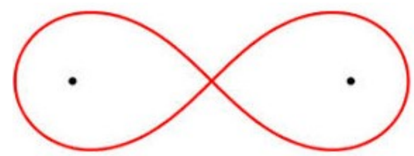
Gravity acts on the principle of a balance beam with a **movable axis**. When the parameters of the Mobius Dipole arms change, it`s CBT – the Center of Balancing and Tension – shifts in one direction or another and the components undergo mutual displacement while maintaining their stable equilibrium.

Fulfillment of the described conditions of mutual (gravitational) support ensures the preservation of a stable configuration of any material objects at all scaling levels, from atoms to giant clusters of galaxies.

Since in current theoretical approaches to physics the explanatory paradigm is based on individual particles, it is the division of one interconnected dipole entity into separate "parts" that is the reason why many aspects, both in the atom and in cosmology, cannot find their explanation and be consistent with known laws.

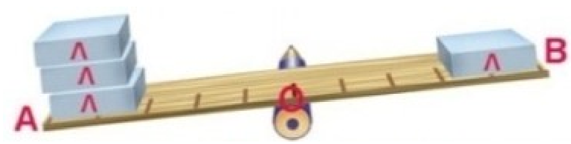
SYMMETRY OF DIPOLE SHOULDER PARTS.

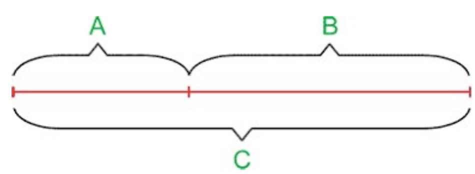


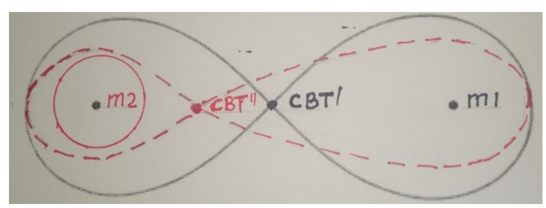


The dipole basic element of nature becomes an atomic element when symmetry is broken and the crossing tensor (CBT) is asymmetrically shifted. In this case, the mass of one of the arms increases and the mass of the second decreases, which is observed in the ratio of the masses of the atomic dipole arms named "***proton-electron***".

REDUCTION OF SYMMETRY ACCORDING TO THE PRINCIPLE OF THE "GOLDEN SECTION" and BALANCING DUE TO THE CBT SHIFT.







Beam balance with a movable axis and the Dipole bundle "proton (**m2**)-electron (**m1**)"

CBT 1 – Center of Balancing and Tension with symmetry between the arms;
CBT 2 – Center of Balancing and Tension with decreasing symmetry between the arms.

Taking into account the universality of the dipole scheme according to the fractal-holographic structure of the world order, the gravitational interrelation as a balancing one between the components of the dipole system formation will have the same functional place in the cosmic macro-world (star-planet), as in the atomic micro-world (proton-electron), and accordingly in other existential spheres. This aspect of the universality of the application of the general scheme is repeatedly emphasized in my articles and in the monograph. [28]

I assume that in cosmology the Lagrange equilibration points (libration points) are the same magnetoelectric tensor of balancing and tension between a star and a planet in the space of the macrocosm, where in the current period the term gravitational balancing is traditionally more applicable.

In the micro-world of the atom, the Magnetic Dipole is a natural duality of mirror-asymmetric dipole arms with different helicity (opposite charges) that have a complementary gravitational interrelation. Since all baryonic matter is in a state of dipole, then, as N. Tesla believed: "I know that gravity is the key to everything."

If we continue the further process of fibration with the bifurcation of the already Mobius Magnetic Dipole, then its geometric transformation into two magnetic dipoles occurs, connected by a link interrelation into a **topological knot**. The link interrelation is actualized in the second phase of fibration and is identified as **quantum entanglement** of two basic elements that previously belonged to one whole. The second doubling of the InfoGenome occurs with the formation of a new symmetry and asymmetry of two magnetic dipoles, growth of the structure from within and expansion of space. Let us illustrate this transformation also with the help of a paper experiment.

2. THE SECOND PHASE OF FIBRATION.



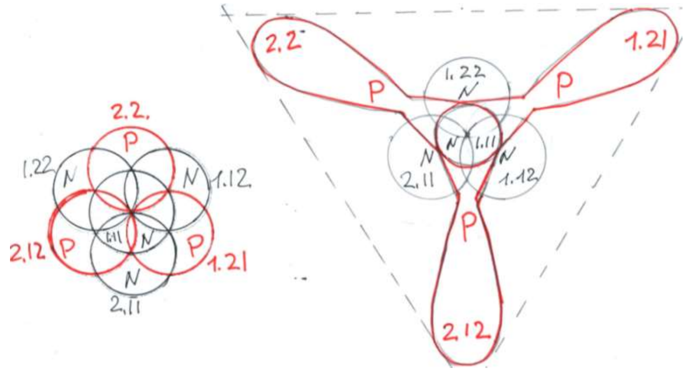
Mobius Dipole. ***FIBRATION.*** ***Two entangled Mobius Dipoles.***

Based on the results of the experiment, it can be concluded that the gravitational interrelation and quantum entanglement are actualized in different phases of fibration and perform different functions in the growing system formation. The gravitational interrelation plays the role of balancing and tensioning the dipole arms (proton-electron, star-planet), and quantum entanglement holds the dipole formations in one integral system (atom, star-planetary system). Issues related to the geometry of the atomic component "neutron" are considered in [32]-[34]

Gravity and quantum entanglement are system-forming interrelations and each plays its role in the balanced retention of the system as a whole. From geometric transformations it becomes obvious that gravity and quantum entanglement are not interchangeable with each other. Each of them is an interconnection of different dual (complementary) components.

These interconnections are present together at each of the scaling levels, while performing different roles. In their reciprocity, they are equally inherent in both the micro-world of the atom and the macro-systems, as well as the world of biology and the world of consciousness.

Subsequent phases of fibrations lead to further multiplication of the Mobius Magnetic Dipoles connected in a topological knot, as well as their polarization in the radial direction. The formation of the next type of duality occurs – the universal "Center-Periphery" scheme, which is directly related to the structure of the atom, cell, bioorganism, society and cosmic systems.



4 dipoles linked into a topological knot. The nucleus and atom of Lithium – 7 dipoles. [33]

The "Center-Periphery" scheme is a type of duality in which a concentrated Core and a more rarefied Periphery remote from it are formed. These issues are covered in more detail in the work "***3. Basic Element of Nature. Mobius Geometry. Gravity. Model of the Atom.***" [33]

THREE PHASES OF FIBRATION.

Monopole.

1. Dipole. Gravity.

2. Two dipoles. Quantum entanglement.

3. ***"Center-Periphery". Topological dipole knots in an atom and in a 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 and its presence in the micro-world can be successfully resolved geometrically in the format of a geometric analogue of the complementarity principle – the Mobius strip.

As a result, and as can be seen from the illustration of the Mobius Magnetic Dipole, the proposed geometric solution based on the fibration phases of the Mobius Magnetic Monopole quite elegantly integrates gravity into the micro-world and helps to explain it in the space of space.

As can be seen, geometric transformations in the fibration phases are accompanied by doubling of the original InfoGenome of duality. And each doubling of the InfoGenome creates new symmetries and asymmetries, changes the geometry of the form, creating a new duality and, accordingly, new properties, thereby mediating the growth of the structure and the diversity of structures, 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."*** [41]

Such a fractal-holographic structure of the World Order on a single and uniform basis for everything in the process of an increasingly detailed study of Nature reveals many dualities for the scientific community. And scientists are increasingly intrigued by the presence of paired correspondences that are revealed in the foundations of physics for seemingly different things and in different areas.

For example, compact objects, still observed in gravitational-wave astronomy, are always found in pairs and never separately. And the gravitational wave signal contains information about two elements at the same time, which indicates that these two objects are one complementarily connected whole. [45]

Based on how this is visualized using geometric transformations in three phases of fibrations, we can conclude that it is not correct to put an equal sign between the "ER bridge" and the "EPR" effect. Based on this, **ER ≠ EPR**.

Obviously, the results of algebra demonstrate that both the "ER bridge" and the "EPR" effect belong to the categories of natural dualities, that is, to dual relations of different objects, which is quite natural, given what was said above about these phenomena and about the principle of dual complementarity. But both of these dualities, as the geometric approach clearly visualizes, are actualized at different stages of the transformation of the magnetic monopole and perform different functions in the growing system formation. These are not interchangeable essential phenomena, which are initially designated in the primary sources [8] and [9].

They both contain the original InfoGene duality, as well as other natural dualities observed everywhere. But this does not mean their functional equivalence. The proposed paper experiment demonstrates the fact that in the phases of the fibrations of the Mobius Magnetic Monopole, those stepwise geometric transformations occur that lead to the growth of the structure from the inside out by the method of bifurcation with doubling.

Further, it is possible to identify the phases of the fibrations of the Magnetic Mobius Monopole and its geometric transformations with algebraic spinors in quantum physics.

"The first spin theory that gave a correct mathematical formulation of the "classically indescribable two-valuedness" was proposed by Pauli in 1927. Avoiding the construction of any visual kinematic models, Pauli introduced the doubled Hilbert space $H2 \otimes H$ (the space of wave functions), whose vectors are two-component spinors. Thus, two-component spinors and the first doubling appeared for the first time in physics. 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 hypertwistor". [35], [36]

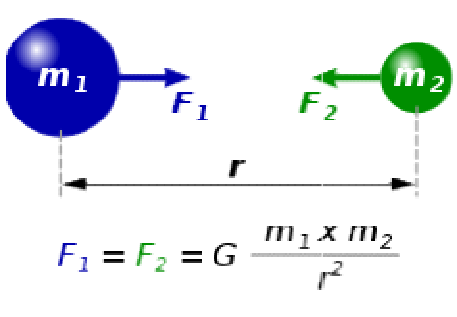
This is a sequence of doublings, which is formed using algebra, "avoiding visual models".

As shown in three phases of fibrations using a visual model and illustration, the geometric transformation of the Mobius Magnetic Monopole (MMM) into a two-component dipole (MMD) is accompanied by the first doubling of the InfoGenome. The second doubling of the InfoGenome leads to the formation of topologically linked Magnetic Dipoles and the formation of the first atomic elements. Subsequent doublings of the InfoGenome and the growth of the "Center-Periphery" structure already leads to the Periodic Table of Elements.

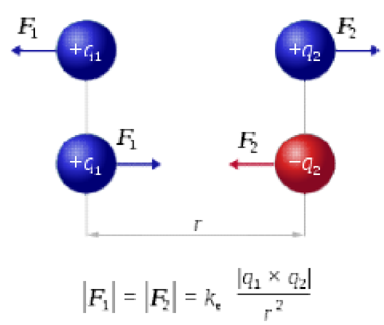
As can be seen, the stepwise transformations of the original Magnetic Mobius Monopole, illustrated by the phases of fibrations, give a geometric correspondence to the algebraic approach in the description of spinors in quantum physics. The proposed identification is made by me at random. For a more complete identification, it is necessary to involve specialists.

Nevertheless, as it is visualized above, 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, duality, which in the universal method of copying through bifurcation is transmitted to its copy and the structure is doubled. That is, through the bifurcation of the 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 for the process of charge quantization, which is discussed in detail in the works [51] and "***3. Basic Element of Nature. Mobius Geometry. Gravity. Model of the Atom.***" [33]

Also, as an example, one can cite the reflection of the universal dipole duality in two well-known laws. Based on the description of the interaction of dipole arms belonging to one dynamic structure of the Mobius Dipole, one can draw conclusions regarding the similarity of the formulas of Coulomb's Law and Newton's Law, since the dual law is described by a uniform proportion.



NEWTON'S LAW.



COULOMB'S LAW.

As it is shown in the format of the Mobius Geometry application, the nature of the dependencies of these laws is the same due to the fact that as "charges" in Coulomb's Law and as "masses" in Newton's Law of Universal Gravitation, they describe the same entity, in other words, a geometric object – a dipole interrelation of two complementarily interacting components. But each of the laws describes the projection of the universal dipole scheme into different planes of existence.

At one time, Nobel laureate R. Feynman was looking for the reason why the formulas of Newton's Law of Universal Gravitation for "masses" and Coulomb's Law for "charges" are the same in form of expression, and he noted the fact that "***no one has yet managed to imagine gravity and electricity as two different manifestations of the same entity.***"

I believe that the proposed version of the explanation based on the dipole scheme in the application of the geometric format of complementary duality, which is extremely simple and elegant, could have satisfied R. Feynman.

The nature of these dependencies is the same, since the universalism of duality lies at the basis, but this does not give grounds to put an equal sign between them. The same is true for EPR and ER.

In terms of the universal method of bifurcation/fibration, it is necessary to recall from the history of quantum physics that the image of the Möbius strip repeatedly came to W. Pauli, and the theme of bifurcations and the formation of new natural symmetries interested him especially, and in this regard his famous phrase is known: “Bifurcation and reduction of symmetry,” he says in one letter, “that is where Faust’s poodle is buried!” [37, p. 288], [35]

Heisenberg notes: “I once asked Wolfgang why he attached so much importance to the process of bifurcation, and received approximately the following answer: “... The process of bifurcation, or bification, 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.” [38], [35]

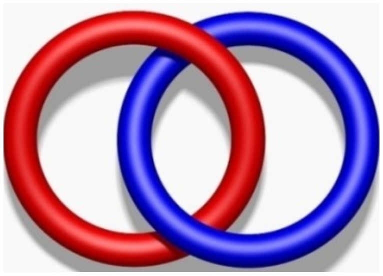
We must pay tribute to such intuitive insight, which almost led W. Pauli to that “trick” of Nature, which it uses to expand space (generation and growth of matter from within) and create new symmetries arising as a result of such bifurcations/fibrations. As paper experiments with Mobius geometry clearly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

Based on what has been said and illustrated, it becomes obvious that when considering the issue of the equivalence of the “ER bridge” and the “EPR” effect (gravitational interconnection and quantum entanglement), their geometric visualization is of decisive importance.

Each system formation generated from within (from a generative monopole or a generative region of space in which monopoles act collectively as one macro- or mega-object) is held together as a whole due to the interconnections that are actualized in the phases of geometric transformations in the process of structure growth through the universal method of bifurcation/fibration with subsequent doubling of the InfoGenome.

Thus, the geometric representation brings the missing clarity to theoretical reasoning, which is important and necessary when constructing a monistic concept and for the successful resolution of issues related to the geometrization of physics and the creation of a unified Theory of Everything. [28]

It should also be emphasized that the links of topologically connected Mobius Dipoles are not circles or ellipses in themselves. Due to the presence of a doubled Mobius inversion, these links have a twisted curvature – a "figure eight". That is, the presence of the 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 "Hopf link" knot, and a link – a topological knot of two Mobius dipoles, which is obtained in two phases of the fibration of the Mobius monopole.



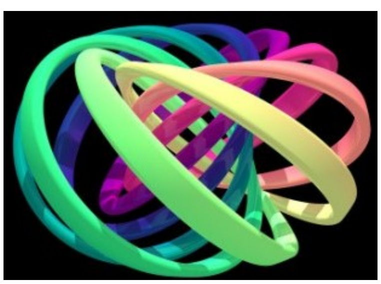
"Hopf link".

Topological knot of two Mobius dipoles.

It is necessary to emphasize a very important point, which is connected with the solution of questions of description of phenomena of Nature with the help of the apparatus of algebra. No matter how virtuosic and elegant mathematics is, nevertheless the theorist must always think about how Nature performs its "mathematical dance" and to what extent the transformations offered by the apparatus of algebra are possible in it.

In this given illustration of "Hopf link" it is necessary to find the mathematical method with the help of which in the nature of things the depicted figure "Hopf link" of two linked rings can be obtained, that is, to find geometrically how such linkage is actually obtained if we include this mathematical description as describing a natural phenomenon.

The three illustrations below show a comparison of the Clifford-Hopf fibration (1) and (2) obtained in mathematics on the left with the fibration of the Mobius template (3) on the right.



(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 formation of magnetic dipole, the property of charge and mass, that is, with the properties of the manifested baryonic matter.

The transformations I proposed for obtaining links linked into a topological knot are considered in the format of the ontology of the principle of complementarity with the application of its geometric analogue – the Mobius strip. As the illustration shows, a topological knot from Mobius Dipoles (3) can be obtained only in the case of a filamentary bundle of a ring closed through inversion in the form of a Mobius strip.

"By 2020, the "Clifford-Hopf fibration" has most often been mentioned in connection with the theory of solitons, where for stable wave phenomena with the properties of a quasiparticle and a specific topology of a three-dimensional knot, a separate class of objects has emerged under the general name "hopfions", that is, topological solitons with the structure of a Hopf fibration.

To date, the characteristic properties of the Hopf fibration have been clearly detected in such areas as, for example, classical electrodynamics (Maxwell's equations) and general relativity (Taub-NUT spaces), Yang-Mills gauge interactions and the Dirac equation in quantum physics, theories of quantum gravity (AdS/CFT in string theory, Penrose twistors) and the theory of quantum computing (the Bloch sphere for the qubit device). There is an opinion in science, according to the expression of the famous mathematical physicist Roger Penrose, that "Clifford-Hopf fibration" could be considered as "an element of the architecture of our world." [48]

One could agree with this. But if the architecture of our world is built on the foundation of the supporting cosmic medium and its description as a dynamic and granular etheric Quantum Medium or a matrix spin network of vortex magnetic monopoles, then the main connecting element in such an environment is the structural interrelations – **gravity and quantum entanglement** – which are actualized during the creation of the entire multi-level architecture of baryonic matter.

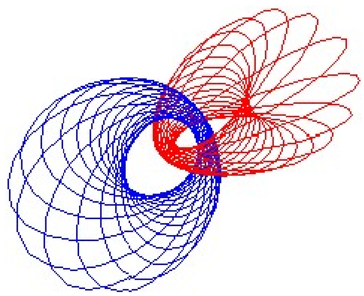
In this case, even if we consider the mathematically obtained "***Clifford-Hopf fibration***" as the Universal Element of the Universe, then, using its structure and on its basis, it is necessary to explain a number of difficult-to-solve questions of theoretical physics, namely, how, on its basis, one can tie gravity to the micro-world, as well as explain the gravitational interaction in the macro- and mega-worlds, give an idea of the model of the atom as the basis of baryonic matter and, accordingly, propose, on the basis of the "***Clifford-Hopf fibration***", a Unified Universal paradigm, in other words, reduce everything to a single denominator and create a unified Theory of Everything.

The mathematical construction "***Clifford-Hopf fibration***" in some approximation reflects the details of the basic element of Nature and gives its partial visualization. But following the given logical chain of reasoning, it becomes obvious that the most important element is missing in the structure of the "***Clifford-Hopf fibration***" – the **gravitational interrelation**. Therefore, to this day, this structure remains a purely mathematical formation, not fully correlated with reality.

And if the results in terms of mathematical description using the apparatus of algebra show that the "***Dirac monopole***" and the "***Clifford-Hopf fibration***" are one and the same, then the geometric approach based on the Mobius strip not only demonstrates this, but also reveals the essence of the gravitational interrelation, elusive using the apparatus of algebra. It is the geometric representation of the magnetic monopole as a magnetic loop with inversion and as the initial form of a quantum phenomenon that gives exhaustive answers to questions related to gravity.

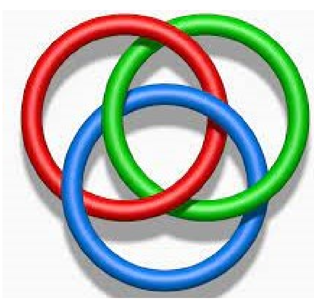
The **geometric approach** brings clarity both to the form of the magnetic monopole itself and to the form of the topological knot obtained on the basis of the fibration of the magnetic monopole and constituting the basis of the atom. And then, theoretically, everything falls into place with the entire architecture of the World Order, because if there is an explanation of the structure of the atom [33] and the method of its formation [34], then in fact an explanation can be given for EVERYTHING.

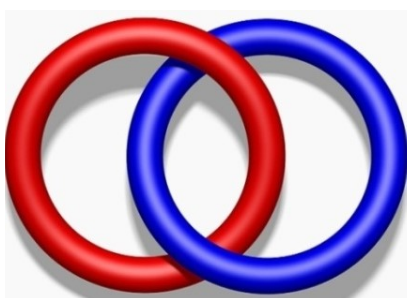
As can be seen from the proposed geometric visualizations based on the Mobius strip and according to the logic of things, in reality there is a complementary other, which in fact is detected and observed in phenomena and form constructions at all scale levels. As is clearly shown, in addition to algebraic ones, it is necessary to connect geometric methods of transformations in order to obtain a real IMAGE of what is observed everywhere and with which the "Clifford-Hopf fibration" as a purely mathematical formation has similar elements. These are topological knots obtained on the basis of Mobius Geometry, and the Mobius strip is proposed to be considered the **original form of the quantum phenomenon**.

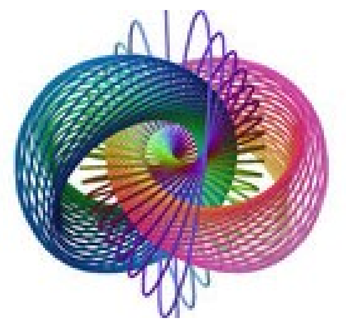


[44]

Regarding the theoretical proposal [14] using Barromean rings, it can be said that Barromean rings, as well as the non-trivial linkage of two rings, as well as the resulting “Clifford-Hopf” fibration, are purely mathematical formations.

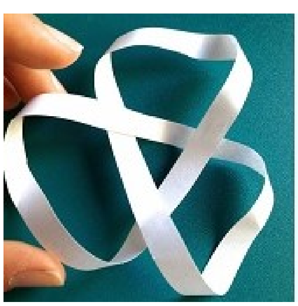


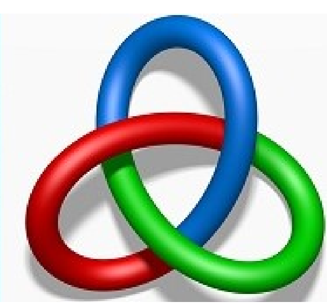


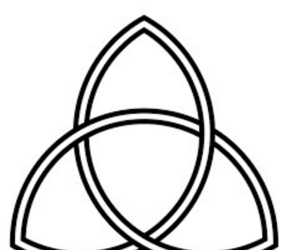


[43]

And as the paper experiment shows, to obtain real non-trivial links, it is necessary to go through the phases of fibration of the structure containing the inverse turn. It is in this case that topological connections and knots are formed. In particular, to obtain a non-trivial connection of three knots, it is necessary to connect the ends of the paper tape making three turns. In this case, a figure is obtained that coincides with the ancient symbolism of Triquetra and Triglav.







TRIKVETRA

TRIGLAV.

The ancient symbolism graphically reflects natural structural interrelations and is a template reference point.

Returning to the phases of fibration, the following can be noted. The phases of fibration of the etheric magnetic monopole and their visualization using the Mobius strip show that the main difference between the vortices of the etheric matter and the vortex dipole formations derived from them, which make up the atomic matter, is that the vortices of the ether do not have a central crossing or interweaving into 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 the central interweaving characterizes the unmanifested matter, which contains the duality of the Two Principles of CosmoGenesis in the unmanifested mono-form without an external magnetic field, and the vortices derived from this matter, having the central interweaving in various variations, are already manifested matter with an external magnetic field, 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 the central interweaving in the etheric magnetic monopoles, the etheric Medium is “transparent” for bipolar electromagnetic interactions.

(For more details on the essence of the monopole as the original duality, see [31] [51]).

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 you find an equivalent description 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.

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

"***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."

"Geometry is that area of knowledge that is located, as it were, between abstract ("pure") mathematics and reality. It is the mediator that resolves the contradiction between knowledge and error." But if it is completely algebraized, then “such geometry takes a person beyond the spatial perception of concrete reality and immerses him in an abstract-virtual reality in which literally everything is possible, including what is impossible in reality.” [39]

In conclusion, it should be said that the relative share of female scientists in the exact sciences, and especially in physics and mathematics, is still much lower than that of men. Although it is women, due to their more sensitive intuition, who often manage to put forward particularly remarkable ideas.

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

CONCLUSIONS.

In essence, the entire observable world has its source in the Quantum Reality of the ethereal Quantum Medium and the correct conclusion is that everything, both in the Observable World and in the Quantum World that generates the observable, has a single initial principle at its core and obeys laws that are the development of this principle at different levels of scaling.

The universalism of complementary duality is an ontological criterion for a complete assessment of the relationships in the phenomena of the physical world and those geometric transformations that occur in the fabric of space.

The process of fibration of magnetic loop with inversion reveals the true physical meaning of structural topological interrelations – gravitational and quantum entanglement – and their role in the structural formations of micro- and macro-worlds.

It is from these ontological positions that the question of whether it is necessary to put an equal sign between the phenomenon of "***EPR***" effect and the "***ER bridge***" should be considered.

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