In 1974, the Belarusian scientist **Sergei Usherenko discovered the** effect of super-deep penetration of microparticles-strikers into steel target barriers, with a colossal amount of energy 10^2 ... 10^4 times greater than the kinetic energy of the particles. The paper gives an analysis of new energy cycles occurring in the ultra-deep penetration mode based on the theory of an elastic quantized medium (UCS) in the framework of the unified field theory (TEP) - the vacuum field, which is ultimately the only source of electromagnetic energy.

Vladimir Leonov is the author of the theory of the elastic quantized medium of the UKS, the first informal unified field theory that unveiled the structure of the vacuum (vacuum field) and combined all known interactions: electromagnetic, gravitational, nuclear (strong), weak (neutrino), laureate of the Russian government award in the field Science and technology, full member of the International Academy of Ecology (Minsk), member of the organizing committee of the conference "Modern problems of natural science" (St. Petersburg), candidate of technical sciences (Moscow).

INTRODUCTION

In 1974, the young Belarusian scientist **Sergei Usherenko experimentally** discovered the effect of superdeep penetration of finely dispersed solid microparticles with a diameter of 1-1000 μm into solid metal barriers (targets) with an anomalous energy release 10^2 ... 10^4 times greater than the kinetic energy of the particle at the time of its Impact on the obstacle with a speed of about 1 km / s. The energy effect was estimated from the energy of burning a microparticle of a threadlike channel in the thickness of the target. The length of the threadlike channel in the steel reached up to 200 mm and even more. Calculations also showed that the kinetic energy of the particle is sufficient for penetrating the target to a depth of no more than 6-10 diameters of the particle itself. The observed effect is not explained from the standpoint of modern thermodynamics, electrodynamics, the theory of relativity and quantum theory, including quantum chromodynamics (QCD). The source of colossal energy in **the Usherenko effect** was not established [1,2,3,4].

The energy release in the target channel is estimated at 10^9 ... 10^{10} J / kg per particle. This greatly exceeds the energy domain related to chemical processes. In addition, according to Usherenko, the spectral analysis of the sections and sections of the channels formed by the advent of microparticles in the thickness of the targets made it possible to detect the appearance of new elements. In the targets of bombarded microparticles in the regime of superdeep penetration, the presence of a radon gas, which was not originally present in the samples under investigation, was also detected. X-ray film installed in the target area was exposed. In some experiments, the nature of the illumination turned out to be ruled. This indicates that the phenomenon of ultra-deep penetration of microparticles into barriers is associated with complex synthesizing and unexplored high-energy physical processes that are characteristic for the physics of elementary particles and the atomic nucleus.

Undoubtedly, Usherenko's **effect** is the greatest fundamental discovery in the history of natural science, comparable to the discovery of Faraday's electromagnetic induction effect and Becquerel's radioactivity. Surprisingly, only a cool attitude to this discovery for a quarter of a century on the part of academic science, although the originality of the observed effect of super-deep penetration, as an experimental fact, should have attracted the special attention of professionals. The situation is quite logical explanation. This is an insufficient level of fundamental knowledge, especially in the field of energy interactions of elementary particles and the atomic nucleus.

If it is not in a position to explain the nature of the phenomenon, then there seems to be no phenomenon itself. Indeed, to date, the structure of none of the elementary particles is unknown, including the main ones: electron, positron, proton, neutron, electron neutrino. The mechanism of synthesis of elementary particles and their mass is unknown. The nature of nuclear forces interacting between nucleons inside the atomic nucleus is not disclosed. It is only known that the release of energy in nuclear reactions occurs as a result of a defect in the mass of the nuclei themselves. But we do not know the reasons for the formation of the mass itself and its inertia, the reasons for the equivalence of mass and energy, which lie in the nature of gravity.

And, finally, in order to understand the nature of energy interactions it is necessary to understand the nature of gravitation itself, since the mass is the only source of the gravitational field and at the same time the accumulator of electromagnetic energy. We must admit that almost nothing has changed since Newton's time in this direction.

Einstein's attempts to combine gravity with electromagnetism in the general theory of relativity (GRT) turned out to be unsuccessful. OTO did not take place as a new theory of gravity, because it could not reveal the nature of gravitational interactions. In general, the theory of relativity more closely resembles the theory of linear measurements by various observers, when the absolute velocity of motion in space is unknown, but not as a fundamental theory. Modern quantum mechanics also can not be called a complete science, let alone talk about its fundamental nature, since it, like GRT, does not disclose the physical causes of the interaction of elementary particles, but states their group behavior and state, relying on a formalized mathematical calculating apparatus of a statistical nature. This also applies to quantum chromodynamics (QCD) trying to explain the structure of nucleons, as if consisting of special particles - quarks - of fractional electric charges. But quarks are hypothetical particles not detected experimentally.

So, the main problems that needed to be solved in order to explain the phenomenon of Usherenko's effect are named. And these problems were solved in the theory of an elastic quantized medium (UCS), which for the first time revealed the electromagnetic structure of vacuum, as the most energy-intensive matter and the only energy source (fifth force) originally accumulated in the universe. This approach made it possible to explain the nature of the four known interactions (forces): electromagnetic, gravitational, strong (nuclear) and weak (neutrino) from a single position, united by a fifth force [5,6,7]. Based on the analysis of the very structure of the vacuum field, the above problems relating to the effect of superdeep penetration were analytically solved.

At the time of my acquaintance with **Sergei Mironovich Usherenko** in 2000, who had already become a doctor of technical sciences and director of the Institute of Impulse Processes in Minsk, the theory of KKS was formed. It was only time for the realization of physical phenomena in the effect of super-deep penetration of microparticles into the barriers and their linkage with the theory of SCR. This allowed us, already together, to develop an original program and a technique for experimental studies of electromagnetic phenomena in **the Usherenko effect** , and to conduct polygon tests. In the near future these materials will be published by us.

Userenko used in his experiments quite cheap disposable explosive accelerators of cumulative type. But the results are unique. Such an effect is almost impossible to obtain even on superpower accelerators of elementary particles. Disintegrated to a speed of only 1 km / s, a speck of silicon with a diameter of 1 μm increases its kinetic energy by $0.61.10^{-9}$ J (3.8×10^{9} eV). For comparison: the proton synchrophasotron in Dubno (JINR) is able to maximally accelerate the protons to an energy of 9.10^{9} eV, that is, up to energies commensurate with the kinetic energy of this speck, accelerated to just 1 km / s. But in this case, the proton must be given a velocity close to the speed of light (0.99C). To do this, the diameter of the accelerator ring of the proton synchrophasotron in Dubna is 72 meters.

For a microparticle with a diameter of 100 μm, its kinetic energy at a speed of 1 ... 10 km / s is commensurable, and even exceeds the energy of elementary particles achieved by a superpower accelerator in the modern scientific complex of CERN (Geneva), whose accelerating ring is around 27 km perimeter. Naturally, the construction of ever more powerful accelerators of elementary particles is associated with large financial costs, incommensurable with the costs that were required to open the Usherenko effect. It is evident that a strong hobby in the second half of the 20th century with accelerating technology only for elementary particles did not allow the development of research in the field of acceleration of fine microparticles, including the study of the fundamental processes of bombardment of various obstacles by microparticles in the regime of super deep penetration.

Undoubtedly, the fundamental aspect of Usherenko's discovery lies in the field of fundamentally new energy technologies, perhaps the main technologies for obtaining energy in the 21st century. It can be assumed that the use of the super-deep penetration effect in the energy sector will make it possible in the short term to exclude environmentally dirty uranium technologies in energy production and make the operation of reactors at nuclear power plants (NPPs) safe and manageable using new types of nuclear fuel.

It is gratifying that microparticles with a size of 1-1000 microns of any solid materials, including ordinary sand (silicon), whose reserves in the earth's crust are incommensurably large in comparison with uranium reserves, can be used as a fuel in nuclear reactors of a new type, and its extraction does not present difficulties . To do this, the microparticles must be accelerated to a speed of the order of 1 km / s and hit a solid fuel-producing barrier (target).

For example, in accordance with the principle of equivalence of mass and energy, even a tiny speck of silicon (density $2.33.10^{3}$ kg / m^{3}) with a diameter of just ^{1} mkm (weight $1.22.10^{-15}$ kg) accumulates a huge energy reserve - 110 J ($6.85.10\ 10^{20}$ eV), determining the maximum energy capacity of the substance 9.10^{16} J / kg. For comparison: when burning 1 kg of gasoline, energy 4.4. 10^{7} J is released, and the known nuclear and thermonuclear reactions are characterized by an energy capacity of 10^{13} -10^{14} J / kg.

Userenko's experiments have already reached the level of specific energy release of 10^{9} -10^{10} J / kg per particle. This is still lower than the characteristics of uranium fuel, but significantly exceeds the energy release of chemical fuel, by almost three orders of magnitude. It is important that the process of energy release in the mode of super-deep penetration is not explosive, it can easily be controlled and controlled.

Naturally, explosive accelerators, for a number of reasons, are practically unsuitable for obtaining energy in new reactors. But now we are not talking about the specific application of this type of accelerator in the new energy cycles of the reactors. What is important is that on such a primitive and cheap device Usherenko established the very fact of having an effect of super-deep penetration and anomalous energy release. This is his credit. And if there is a need to develop more advanced accelerator systems, such systems will be developed. This solution is already purely technical tasks.

The originality **of Usherenko's discovery** lies just in the area that none of the great physicists of the twentieth century could predict. Nuclear power was tried to build on the achievements in the field of creating nuclear weapons and uranium technologies. But uranium and its components are just explosives of a new type, much more powerful than dynamite and gunpowder. But no one comes up with the idea to invent a furnace on powdered fuel. Sooner or later, this furnace will soar into the air.

I think that with the use of uranium fuel in the power industry there was some haste. An example of this is the Chernobyl disaster. This is on the one hand. On the other hand, vast experience has been accumulated in the design, manufacture and operation of nuclear reactors, and in the construction of nuclear power plants. Our task is an easier task. It is necessary to replace the reactors with uranium fuel at the existing nuclear power plants with new type reactors operating literally on sand. This is the reality of Usherenko's discovery.

Undoubtedly, such a luck for the scientist, as the discovery of the effect of superdeep penetration of microparticles into the barriers, falls quite rarely. And of course, I would like to see Sergei Usherenko among the new Nobel laureates. Moreover, its discovery will help mankind, finally, solve energy problems relying on environmentally friendly energy production technologies.

I think that this work will be a pleasant surprise for specialists in the field of theoretical physics, elementary particle physics and the atomic nucleus, nuclear power.

ANOMALOUS ENERGY SELECTION IN THE UCHERENKO EFFECT

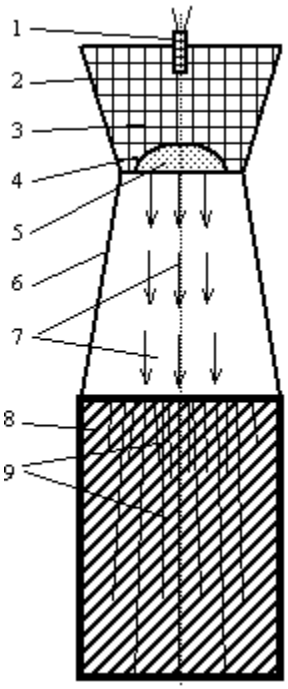

Fig. 1. Scheme of the cumulative explosive one-time accelerator of microparticles for obtaining the effect of superdeep penetration (Usherenko effect).

Figure 1 shows the scheme of the experimental device **Usherenko** , which easily r microparticles into obstructions [1]. The device is a one-time explosive type accele dimensions of 1-1000 μm, and allows them to be accelerated to a speed of the order of

The device includes: an electric detonator 1, a beaker 2 for an explosive, an explosive powder of microparticles 5, a guiding beaker 6, a steel target-barrier 8. Fig. 1 shows th 9 - traces of microparticles in the thickness of a steel target 8.

Glass 2 is designed for the amount of BB up to 200 g. As an explosive, ammonal is use

The device works as follows. With the help of the electric detonator 1, an explosion of the upper part of the device (glasses 2 and 6, reflector 4) is destroyed. The presence of stream of microparticles 7 in the form of a high-speed jet directed toward the target 8. the microparticle stream 7 is reflected, scattering at different angles in space. And interaction with the target in the mode of super-deep penetration.

A possible reason for the low efficiency of the accelerated particle flux is the high inh velocity distribution in the flow, which is characteristic of explosive accelerators, as we the particles with the target at the time of entering the ultra-deep penetration regime in penetration regime should be characterized by a certain critical parameter. At first, for (Y_δ), we can take the ratio of the velocity v of the particle at the moment of impact abou

$$Y_\delta = k_\delta \frac{v}{d} \quad (1)$$

Where $k_\delta = 10^{-6}$ s is the coefficient of dimensionality.

The presence of the coefficient k_δ in (1) allows Usherenko's criterion to be considered as a dimensionless quantity. The factor 10^{-6} makes the criterion value itself convenient in calculations for micron particles. For example, for a particle with a diameter of 100 μm (10^{-4} m) at a speed of 1 km / s (10^{3} m / s), Usherenko's criterion will be 10 units. For a bullet 10 mm in diameter (10^{-2} m), at the same speed of 1 km / s Usherenko's criterion is determined by the number 0.1. A microparticle with a criterion of 10 units enters the superdeep penetration regime, and a bullet with a criterion of 0.1 bounces off when struck against a solid barrier.

Naturally, the superdeep penetration regime has some critical range by Usherenko's criterion, which must be established in subsequent experiments. Apparently, under regimes below the critical criterion Usherenko, the particles will rebound from the barrier, or insignificant penetration into the barrier to a depth of several diameters. At a very high value of Usherenko's criterion, when a particle hits the target, an explosion of the particle will occur with the formation of a crater in the target, determining the mode of cratering, which is not characterized by abnormal energy release, as is observed in the super-deep penetration regime.

In any case, the study of superdeep penetration regimes requires the establishment of fundamental experimental studies in a wide range by the Usherenko criterion for various materials, both the particle of the impactor and the target-barrier. Despite the fact that on this issue, Usherenko and his colleagues did a lot of work, but their work was aimed at creating new composite materials. Now it is necessary to translate the studies of the Usherenko effect into the field of new energy interactions.

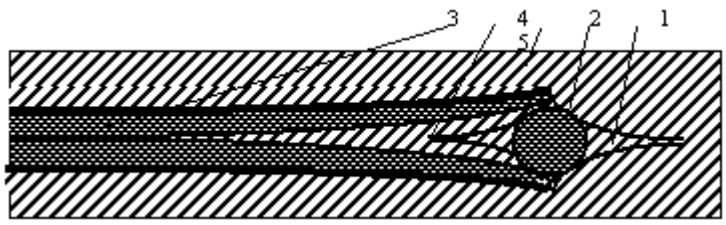

Fig. 2. Formation of a threadlike channel in the thickness of the target in the regime of superdeep penetration of a particle into a target (scheme).

According to Usherenko's own data, th penetration regime is 100 times or more h moment of impact against the target [1, p. 1 is necessary to increase the energy densi some average data.

Figure 2 shows the scheme of the motion of a microparticle in the thickness of the target in the local region in the regime of superdeep penetration. The advance of particle 1 in the super-deep penetration regime in the thickness of target 2 is characterized by the formation of a threadlike channel 3, the region of collapse 4 which begins after particle 1. The very process of penetration of particle 1 into target 2 is possible only as a result of the release of additional energy in the

region 5 ahead of the particle, Front energy front. According to Usherenko, the front energy front produces a modification of the target metal, making the metal plastic. This ensures that the particle is squeezed through the thickness of the target. In this case, the formed channel 3 in the target 2 slams just behind the moving particle 1.

There is **Usherenko's hypothesis of the** thermal plasticity of metal in the target channel, based on the study of target polishing and analysis of structural modifications of metal in the channel section. It is established that the central layer of material in the channel is fused, and the structure of the channel material is subjected to phase changes corresponding to the thermal treatment of the material.

Apparently, the source of the driving force acting on the particle in the channel is the effect of the collapse (closing) of the channel behind the particle. At the same time, as a result of heat removal from the channel itself in the collapse zone 5, metal stresses arise upon its solidification, which create forces (like the wedge, Fig. 2), exerting pressure on the particle in the direction of motion in the channel.

Other hypotheses can be considered. In any case, in order to push the particle into the thickness of the target, energy is needed. The thermodynamic hypothesis of the effect of superdeep penetration of a particle into a target is the least energy-intensive. To realize other hypotheses of this effect, even more significant energy is required. But even the thermodynamic hypothesis gives a disparate imbalance in the energy released in the effect, in comparison with the kinetic energy of the particle at the moment of impact to the target.

Let us consider the energy balance for the real case when a microparticle of silicon (a grain of sand) of the size of the order of d = 50 μm (50 .10 $^{-6}$ m) penetrates the steel target at a collision velocity v = 1000 m / s per penetration depth h $_c$ = 100 mm (0 ,1m). For convenience of calculations, we assume that the microparticle has a shape close to the ball. The mass m of the microparticle is determined from the density of silicon of 2.33.103 kg / m ^{3} and its volume

$$m = \frac{1}{6}\pi d^3 \rho = 1{,}5 \cdot 10^{-10}\,кг \qquad (2)$$

The kinetic energy W $_{k\ of\ a}$ particle with mass (2) upon impact of a target at a velocity v $_p$ = 1000 m / s will be:

$$W_k = \frac{1}{2} m\ v^2 = 0{,}75 \cdot 10^{-4}\,Дж \qquad (3)$$

On the other hand, in order to determine the energy necessary for channel heating and melting, neglecting losses, it is necessary to establish the mass m $_{c\ of\ the}$ metal in the channel of the steel target subjected to heat treatment in the super-deep penetration regime, assuming that as the particle moves in the channel, the channel shape In the cross section decreases, and the channel itself narrows and has the shape of a cone. This is established by the fact that as the particle penetrates the target, the particle decreases in size until complete wear or an insignificant residue. In order for the particle to pass through the channel, the channel cross-section must be 1.2-1.4 times larger than the diameter of the drumming particle, ensuring that the particle flows around the particle when it is pushed out in the target thickness. So, we determine the mass mc of the molten metal of a steel target in a cone channel of length h $_c$ = 100 mm (0.1 m) (steel density r $_c$ = 8.1 .10 ^{3} kg / m ^{3})

$$m_c = \frac{1}{12}\pi (1{,}4 d_p)^2 h_c \rho_c = 1{,}04 \cdot 10^{-6}\,кг \qquad (4)$$

Next, we determine the amount of energy W $_c$ necessary for the heating of the channel and the melting of the metal in it, provided that: the average specific heat of steel with $_p$ = 0.65.10 ^{3} J / kgK when heated to Δ T = 15000K; Heat of fusion of steel λ $_c$ = 2.66 · 10 ^{5} J / kg

$$W_c = (c_p \Delta T + \lambda_c) m_c = 1{,}3\,Дж \qquad (5)$$

Naturally, the obtained energy value of 1.3 J is the minimum energy of the process of superdeep penetration of the particle into the obstacle, which does not take into account the losses and resistance to movement, associated with pushing the particle at high speed through the molten metal and its flow around the metal. Finally, we find the ratio of the minimum energy W $_c$ (5) released in the channel as the particle moves to its kinetic energy W $_k$ (3)

$$\frac{W_c}{W_k} = \frac{1{,}3}{0{,}75 \cdot 10^{-4}} = 1{,}7 \cdot 10^4$$

(6)

As can be seen from (6), even an estimate of the minimum energy release in the regime of superdeep penetration of a particle into a target establishes a significant energy imbalance by a factor of 10 ^{4} . That is, the kinetic energy (3) of a particle is not enough to accomplish such a tremendous work. Naturally, the phenomenon of such a huge energy release in the target is determined by the presence of a source of energy of an unknown nature at the time **Userenko discovered** the effect.

We find the specific energy release wp per unit mass of the particle

$$w_p = \frac{W_c}{m} = \frac{1,3}{1,5 \cdot 10^{-10}} = 0,9 \cdot 10^9 \frac{Дж}{кг} \quad (7)$$

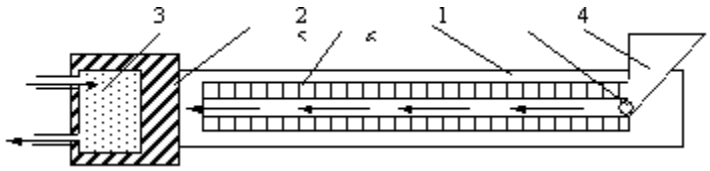

Fig.3. The scheme of the reactor for obtaining thermal energy on the basis of the effect of superdeep penetration of particles into the target. 1 - particle accelerator; 2 - fuel element of the target; 3 - heat exchanger; 4 - the hermetic case; 5 - feeder; 6 - bunker of particles.

The energy release of the order of 10 ^{9} -10 ^{10} J in the effect of superdeep penetration is not a to stronger energy processes. Without going in to draw up a scheme for a future reactor, althou

In Fig. 3 is a diagram of a reactor on **the Ushenenko effect comprising** : particle accelerator 1, fuel elements (targets) 2, heat exchanger 3 and other elements. The reactor is operated as follows. From the hermetically sealed hopper 6, the silicon particles through feeder-dispenser 5 are fed to accelerator 1 and accelerated to the required speed. The particle accelerator 1 is placed in a sealed housing 4, which provides the necessary level of vacuum. Accelerated particles (shown by arrows) strike the fuel element of target 2 in the mode of super-deep penetration. The extracted heat energy is diverted from the target 2 through a heat exchanger 3, whose working body can be any of the known heat carriers, including water converted into steam. Then the steam is fed to the turbine, which drives the rotor of the generator. Thus, using the Usherenko effect, **one** can obtain electrical energy literally from sand as fuel.

It is easy to establish the specific consumption per hour m $_t$ of the microparticle powder for the production of W $_t$ = 1 MW h (3.6 109 J) of thermal energy

$$m_T = \frac{W_T}{w_p} = \frac{3,6 \cdot 10^9}{9 \cdot 10^9} = 0,4 кг \quad (8)$$

Thus, in order to produce 1 MWh (3.6 10 ^{9} J) of energy by the proposed method, the powder consumption of the impactor particles is 0.4 kg / h (0.1 g / s). To produce 1000 MWh of energy, the consumption of the powder is 0.1 kg / s. These are quite real figures showing that the proposed method of energy production can constitute a serious competition to uranium fuel at a power unit capacity of 1000 MW. But in any case, the named figures of powder consumption represent a serious technical problem for the accelerator itself, capable of creating a high-speed flow of the order of 10 ^{6} ... 10 ^{9} particles per second. Optimizing the particle velocities and their dimensions with the material of the powder and target can significantly reduce (by an order of magnitude or more) the consumption of the microparticle powder.

The efficiency of the proposed energy cycle is very high and is close to unity, since the energy consumption for maintaining the energy release process is much less than the allocated energy, since the efficiency itself is determined after deducting the energy costs from the total energy circulating in the cycle referred to the total energy of the cycle.

Naturally, from the diagram of the reactor shown in Fig. 3 to its practical implementation, there is a long way to go. Despite the fact that there is some experience in creating accelerating systems for fine materials up to a speed of 1 km / s and more [8], it is necessary to create a standard size series of accelerating systems (electrodynamic, electrostatic, etc.) capable of operating with a powder of microparticles from 0.1 G / s to 0.1 kg / s and more. This is not an easy technical task. A lot of technical issues also arise on the design of the reactor.

But at this stage of research the main thing is to establish the nature of the energy released in the effect of super deep penetration. Indeed, in order to competently calculate, design, manufacture and operate reactors of a new type, it is necessary to understand the physical processes of energy release occurring in new energy cycles.

EXPERIENCE OF JOULLEY AND NON-LINEAR DEPENDENCE OF MECHANICAL EQUIVALENT OF HEAT

In 1843, Joule, on the basis of experimental data, calculated the mechanical equivalent of heat, taken as the fundamental constant. During the past century and a half, its results were not questioned until they began to explore more energy-intensive and faster processes. To understand the nature of the mechanical equivalent of heat, it is necessary to go back to one hundred and fifty years ago and analyze the experiments of Joule.

Here is what he writes: "To create a friction of the fluid, I applied the propeller and obtained the equivalents 781.5, 782.1, 787.6 with stirring respectively water, seed oil and mercury. Results that closely coincide with each other and with other results obtained earlier from experiments with elastic liquids and an electromagnetic machine do not leave, in my opinion, doubts about the existence of an equivalence relation between strength and heat "[9]. In this case, by force is meant energy.

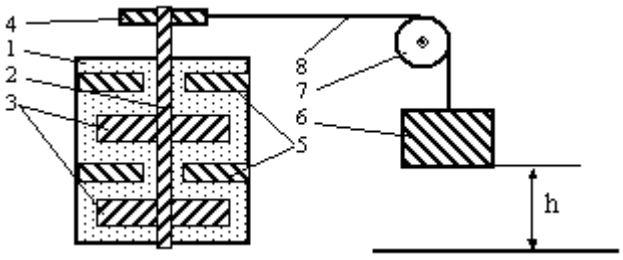

Fig. 4. The scheme of the Joule installation for determining the mechanical equivalent of heat (the scheme is simplified). 1 - capacity; 2 - shaft: 3 - a sprocket wheel: 4 - a pulley; 5 - fixed blades: 6 - weight; 7 - block; 8 - twine.

In Fig. 4 shows a diagram of the experimental Joule ins
mercury), inside which two shafts 3 with brass blades fo
blades 5 prevent rotation of the entire volume of liquid i
shaft 2 by a pulley 4 on which twine 8 is twisted conne
When the load 7 falls from height h, this drive ensures
was heated.The value of the heating was recorded by a
capacity, temperature increase and mechanical work, the

But how much is this technique objective to claim completeness? First of all, we establish that Joule produced all experiments at very low speeds. The rate of drop in cargo was 2.42 inches per second, that is, 6.15 cm / s. Mechanical transmission increased this speed 12 times. At the same time, the speed of rotation of the propeller wheels did not exceed 720 rpm. Joule did not produce the dependence of the heat output on the speed of rotation of the propellers. In science, it is accepted that facts that have not been verified experimentally can not claim universality. This did not affect Joule's experiments. Established, by today's standards, the mechanical equivalent of heat is obtained at low rates of interaction. For higher speeds, more research is needed.

On the other hand, Joule himself wrote that the mechanism of water heating in his experiment is based on the friction of the fluid on the blade of the propeller wheels. But even in the modern view, we do not have a clear mechanism for heating friction, especially for liquids. The mechanism of "abrasion" of the liquid by friction is unclear, with the emission of thermal radiation.

But what will happen in the liquid when the speed of rotation of the wheel with the blades increases? It is generally accepted that the amount of heat released during friction in a liquid is proportional to (linearly) supplied mechanical energy. But is this always the case?

As the analysis shows, Joule did not conduct high-speed studies. In physics, there is already a precedent when the mass of a relativistic particle at high velocities close to the speed of light increases nonlinearly from the speed of movement, although until recently everyone believed that there should be no increase in mass. The mass was considered as a constant. Nonlinear regularities are the main area of modern physics.

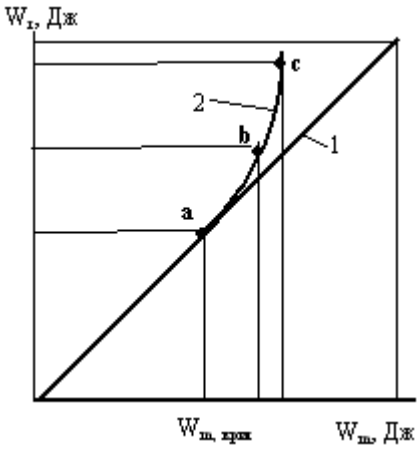

Fig.5. Nonlinear dependence of mechanical work and thermal energy.

In Fig. 5 shows the nonlinear dependence of the mechanical equivalent (curve 2
heat acts as a linear coefficient of proportionality regardless of the speed of intera

Nonlinear effects begin to appear at a certain speed of rotation of the prope
conditions cavitation bubbles begin to form on the surface of the blades rotating
different mechanisms of energy release, violating the linearity of Joule's mecha
character of this dependence is represented by curve 2. Starting from a certain c
is characterized by a significant increase in thermal energy W_t as compared to th

The presence of a large number of cavitation bubbles, their formation and collapse creates a specific noise (acoustic field), the spectrum of which reaches the ultrasonic region of several hundred kHz. It should be noted that cavitation processes are very fleeting: the time of collapse of cavitation bubbles is only about 10^{-6} seconds. In this case, the pressure inside the cavity reaches 100 MPa (~ 1000 atm), and the temperature is ~ 10,000 K (more than on the surface of the Sun).

Now we do not consider the nature of the release of excess energy during cavitation heating, as well as the nature of energy in **the Usherenko effect** . Importantly, cavitation heating with the release of excess heat is a well-proven experimental fact [10,11,12]. Only in the US since 1930, more than 20 patents have been issued for various devices for heating water by friction. And in all these devices, the linearity of the mechanical equivalent of heat is violated. The paper [11] presents data on the energy conversion coefficient (the ratio of the thermal energy output from the device to the spent electric energy for the hydraulic pump drive) in the range from 1.2 to more than 7 in hydraulic pump generators.

In addition to the cavitation heating of the liquid and the **Usherenko** effect, there are a sufficient number of other experimental facts with a violation of the linearity of the mechanical equivalent of heat. And probably there is no need to analyze all these facts. It is more important to understand a single source of energy in all observed cases.

FROM THE SINGLE FIELD THEORY (ETP) TO THE THEORY OF THE SINGLE FIELD (TEP)

Probably the first who tried to create a unified field theory (ETP) was Albert Einstein. To do this, it is even enough to review the name of his work to make sure that this problem has been of interest to him throughout his life. He tried to derive, within the framework of the theory of relativity, a certain universal formula, from which all known and still unknown interactions in nature could be described. But he failed to do this, just as his followers did not succeed [13,14].

The analysis of Einstein's failures lies in the fact that such a single formula in physics was already known before him. And this single formula determined the value of the force F in any interaction as the energy gradient W

$$\mathbf{F} = \mathrm{grad}W \quad (9)$$

But the unified formula (9), apparently, did not suit Einstein, since it contradicted the theory of relativity. Indeed, according to (9), some energy field must be distributed in space, that is, energy must be diffused throughout the space. This is the basis of the field theory, which determines the force as the energy gradient. That is, the force is characterized by a change in energy along the direction in space. And this direction, as a vector of force F, determines the greatest energy drop. The theory of relativity, operating with the geometry of space-time, excluded the existence of an energy basis for it, treating space as an absolute emptiness. This is the main error of Einstein.

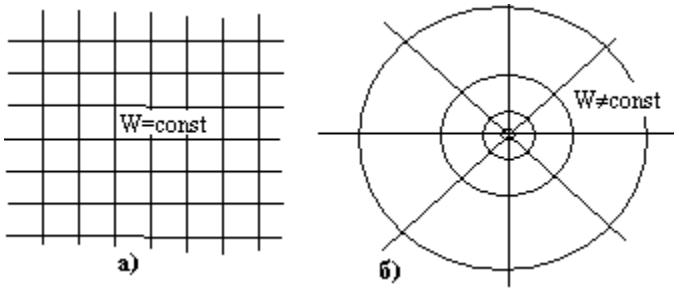

Fig.6. Absence of energy gradient (a) and its presence (b) in energy-intensive space (vacuum field).

Formula (9) is so universal that it makes i
electromagnetic, gravitational, strong and weak. F
energy of the energy concentrated in space and
interaction.

Figure 6 shows the picture of the energy field in th
each node of the grid the energy level remains co
this level however high it was. Accordingly, the fo
since there will be no energy gradients (the gradien

If the field is uneven (b), then there are grid nodes whose energy level is a variable quantity. Each concentric circle corresponds to its energy level, representing an equi-energy line or a surface in space. Then the energy gradient will be directed towards the maximum concentration of energy along the radial lines to some center. This is a typical picture of the field for a single electric or gravitational charge. Only instead of equipotentials and lines of force of field strength, the field pattern is represented by equicoenergetic lines and lines of force direction F (9) acting on the test charge in the unit charge field. Such an equivalent replacement is very correctly justified mathematically, and those willing can do this themselves.

It should be noted that the grid for a uniform field (Fig. 6a) does not have lines of force for the direction of force, but is represented only by equia-energy lines that can be laid in any direction. In field theory, there is the notion of a homogeneous field that must not be confused with the concept of a uniform field. An example of a homogeneous field is the field of the central part of a flat capacitor. But the field of the capacitor as a whole is a nonuniform field, since it leads to a redistribution of energy in space, both inside the condenser and externally, ensuring the presence of an energy gradient in space that manifests itself in the attractive force between the plates of the capacitor.

Unfortunately, expression (9) does not allow us to establish the initial level of energy distributed in space, since this level is determined by the integration constant when performing work on transferring a body (charge) from infinity to a given point of space. Expression (9) makes it possible to determine the energy expenditure at some known part of the motion a-b. But no one prohibits the initial maximum level of energy accumulated in space for a given body (particle) to take into account some constant of integration W_{max} = const. Then integrating (9) along the x-direction in the segment of motion a-6, we obtain an expression for the set of energy participating in the interaction. In this case it is necessary to take into account not only the limiting energy W_{max} = const and the energy W for the particle, but also the remaining fraction of the hidden energy Ws of the space, determining the total energy balance for the particle (body)

$$W_{max} - W_s - \int_a^b \mathbf{F}dx - \int_0^a \mathbf{F}dx = 0 \quad (10)$$

In (10) there is an integral with integration limits from 0 to a. This integral connects all interactions to the absolute space, that is, the energy space, taking the given space as a stationary one with the coordinate of the origin 0. The total energy

balance (10) includes four components, of which the modern mathematical apparatus of physics allows us to calculate only one, that is, the integral on Section a-b.

The main drawback of the differential and integral calculus lies in the fact that this mathematical apparatus does not work with absolute magnitudes, but with their increments. Therefore, when working with an absolute energy space, it is very difficult to determine the integration constant W_{max}. On the other hand, differentiating (10) we arrive at the initial expression (9), since the derivative of the constant W_{max} is zero. Thus, the apparatus of differential calculus used in calculations hides the true energy capacity of space as a special energy field.

It should be noted that the excessive interest in physics in the development of an increasingly complex mathematical apparatus based on work with increments did not yield the desired result. The maximum energy of the relativistic particles was not determined, and the energy intensity of space and other important characteristics, including those included in (10), could not be estimated. In the end, in order to obtain the required result of the calculations, we need a good algebra working with absolute magnitudes.

The posed questions were successfully solved in the theory of an elastic quantized medium (UCS) [6, 7, 15]. First of all, the limiting energy of a particle (body) was established, above which it can not exist, even when it reaches the speed of light

$$W_{max} = \frac{C_o^4}{G} R_s \quad \text{(eleven)}$$

Where G = 6,67.10-11 Nm^2 / kg^2 - gravitational constant; Rs is the radius of the particle (body), m; C_o^2 = $8.99.10^{16}$ J / kg (or m^2 / s^2) is the gravitational potential of the unperturbed space (C_o^2 = Const); C_0^4 = $()^2$ - square of the gravitational potential. $C_0 = 3.10^8$ m / s is the speed of light in the unperturbed space (vacuum) (C_0 = const).

The limiting energy of the particle (11) makes it possible to compose its energy balance (10), tying it to the absolute space in the entire range of velocities, including light (m_0 - rest mass)

$$W_{max} - W_v - m_o C_o^2 \gamma_n = 0 \quad \text{(12)}$$

Where γ_n is the normalized relativistic factor, taking into account the velocity v of particle motion, including the speed of light C_0

$$\gamma_n = \frac{1}{\sqrt{1 - \left(1 - \frac{R_g^2}{R_s^2}\right)\frac{v^2}{C_o^2}}} \quad \text{(13)}$$

The normalized relativistic factor γ_n (13) limits the limiting energy of relativistic particles to the value (11). In (13) enters the gravitational radius $R_{g\ of\ the}$ source of gravitation (without multiplier 2), m

$$R_g = \frac{Gm}{C_o^2} \quad \text{(14)}$$

The gravitational radius R_g characterizes the dimensions of the body when it collapses into a black hole and determines the region of strong gravitational interactions. The interaction of the actually observed particles belongs to the region of weak gravitational interactions. Therefore, for observable bodies, elementary particles and microparticles in **the Usherenko effect** , the gravitational radius is purely a calculation parameter.

The total energy balance of the particle (12) includes, in addition to the limiting and latent energies, its actual value W (not related to complex numbers)

$$W = m_o C_o^2 \gamma_n = \int_0^a \mathbf{F}\,dx + \int_a^6 \mathbf{F}\,dx \quad \text{(15)}$$

In general, the actual value of the particle energy W is determined from the balance (12), as the difference between the limiting and latent energies

$$W = W_{max} - W_v \quad \text{(16)}$$

Expression (16) is remarkable in that it indicates a single energy source accumulated initially in space. All energy processes are related to work (15) aimed at transferring energy from space to particle. The increase in the energy of a particle, like its mass, with increasing its velocity, is explained by the redistribution of energies in space in accordance with (12) and (16).

Thus, even without revealing the structure of space and the mechanisms of energy conversion, it is possible to show with rather simple expressions that at the heart of all energy interactions is the energy field in the form of energy distributed in space. In the UKS theory, such an energy field is called an elastic quantized medium or a single vacuum field, combining all known interactions by the energy of a single vacuum field and expression (9).

Now, if we follow the logic of a single vacuum field, then the union of all interactions should have been sought not in the creation of a unified field theory (ETP) over which Einstein was unsuccessfully fought, but in the creation of a unified field theory (TEP). In fact, changing the combination of just two words significantly changes the whole physical concept of scientific research, and the attitude to the vacuum itself, as to a single vacuum field.

If Einstein tried to search for some unifying universal formula, the theory of UCS came to the unification of all interactions through the real existence of a single field representing the fifth force, or a new type of superstrong fundamental interactions, yet unknown to science, concerning the structure of the vacuum itself as the only source of energy in The Universe. Only a very large force Can unite smaller forces from a unified position, including strong (nuclear) interactions. This is the basic law of nature [7].

Now it is necessary to give some concrete examples of the application of the energy balance presented above (12), (16) and the components of (11), (13), (14) into it.

1. The limiting mass of a relativistic particle.

The limiting mass $m_{\max \text{ of a}}$ relativistic particle can be calculated from the product $m_{o\gamma n}$ provided that its light velocity $v = C_o$ in (13) is reached, taking into account (14)

$$m_{max} = m_o\gamma_n = \frac{m_o}{\sqrt{1-\left(1-\frac{R_g^2}{R_s^2}\right)}} = m_o\frac{R_s}{R_g} = \frac{C_o^2}{G}R_s \qquad (17)$$

Thus, for example, the limiting mass of a proton accelerated to the velocity of light in accordance with (17) is only 10^{12} kg and is determined by its known radius $R_s = 0.81.10^{-15}$ m. This large value, but not infinite, corresponds to the mass of the iron An asteroid with a diameter of the order of 1 km. The limiting mass (17) can be obtained from the limiting energy (11) by dividing it by C_o^2 .

2. Energy of a particle in the region of weak gravitational fields.

The region of weak gravitational fields is characterized by the condition $R_g << R_s$ (13). In this case, the normalized relativistic factor (13) becomes the usual relativistic factor γ , and the particle energy is determined by the known expression

$$W = m_oC_o^2\gamma_n = \frac{m_oC_o^2}{\sqrt{1-\left(1-\frac{R_g^2}{R_s^2}\right)\frac{v^2}{C_o^2}}} = \frac{m_oC_o^2}{\sqrt{1-\frac{v^2}{C_o^2}}} \qquad (18)$$

Expression (18) is limited to relativistic velocities of the order of $0.999..999C_o$ (the order after the decimal point is large). At more significant velocities, the mass of the particle increases so much that the field intensity at its surface is characterized by a strong gravitational field already, and the energy of such a particle must be determined taking into account the normalized relativistic factor (13)

$$W = m_oC_o^2\gamma_n = \frac{m_oC_o^2}{\sqrt{1-\left(1-\frac{R_g^2}{R_s^2}\right)\frac{v^2}{C_o^2}}} \qquad (19)$$

3. Energy of the particle in the region and low velocities $v << C_o$.

In the region of low velocities and strong gravitational fields characterized by gravitational collapse, the energy of the body in accordance with (19) goes over into the limiting energy (11), forming an object of the type of a black hole.

To determine the energy of a particle (body) in the region of low velocities and weak gravitational fields, we use expression (18), expanding the relativistic factor in a series and discarding terms of higher orders

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{C_o^2}}} \approx 1 + \frac{1}{2}\frac{v^2}{C_o^2} \quad (20)$$

Substituting (20) into (18), we obtain the well-known expression

$$W = m_o C_o^2 \gamma = m_o C_o^2 + \frac{m_o v^2}{2} \quad (21)$$

The expression (21) includes the kinetic energy $0.5 m_o v^2$ and the rest energy of the particle $m_o C_o^2$, The causes of which are not able to explain modern physics. From the viewpoint of the theory of VCD, the causes of the rest energy lie in the region of a single vacuum field characterized by a gravitational potential C_o^2 .

BALANCE OF GRAVITATIONAL POTENTIALS OF A SINGLE VACUUM FIELD

The expressions for the limiting energy (11), mass (17), rest mass (21), and energy balance in the vacuum field (12) include the values of the gravitational potential C_o^2 Unperturbed by the gravity of the vacuum field and the gravitational potential $C^{2\ \text{of the}}$ vacuum field perturbed by gravitation. Despite the fact that these gravitational potentials determine the speed of light C_o and C, characterizing them as the corresponding squares of the speed of light would not be entirely correct, because on the contrary, the speed of light in a vacuum field is determined by the corresponding square roots of the indicated gravitational potentials.

The modern theory of gravity so far operates with only one gravitational potential - it is the Newtonian gravitational potential φ_n ,

Which for a spherically symmetric mass **m is** determined by the well-known expression

$$\varphi_n = \frac{Gm_o}{r} \quad (22)$$

However, to describe the state of the vacuum field perturbed by gravity, the Newtonian potential is no longer sufficient for a new theory of gravity. To write the energy Ws hidden in the vacuum field, two additional gravitational potentials C_o^2 And C^2 , taking into account the perturbation of the vacuum by this particle [7]

$$W_s = \frac{C_o^2 C^2}{G} R_s \quad (23)$$

Taking into account (23) and (11), we write the energy balance (12) for a particle in a vacuum field, expressing the rest mass from (22) under the condition $r = R_s$

$$\frac{C_o^4}{G} R_s - \frac{C_o^2 C^2}{G} R_s - \varphi_n \gamma_n \frac{C_o^2}{G} R_s = 0 \quad (24)$$

Having reduced (24) by $C_o^2 R_s / G$ We arrive at the conclusion of a balance of gravitational potentials in a vacuum field perturbed by a particle (body)

$$C_o^2 - C^2 - \varphi_n \gamma_n = 0 \quad (25)$$

The balance of the gravitational potentials (25) is more conveniently represented in the following form:

$$C^2 = C_o^2 - \varphi_n \gamma_n \quad (26)$$

In the region of low velocities for $\gamma_n = 1$, from (26) we obtain

$$C^2 = C_o^2 - \varphi_n \quad (27)$$

Analysis of the gravitational balance (27) changes our ideas to the foundations of gravity. Returning to Fig. 6, representing the absence and presence of gradients in the energy vacuum field, we illustrate this gravitational potentials in accordance with their balance (27).

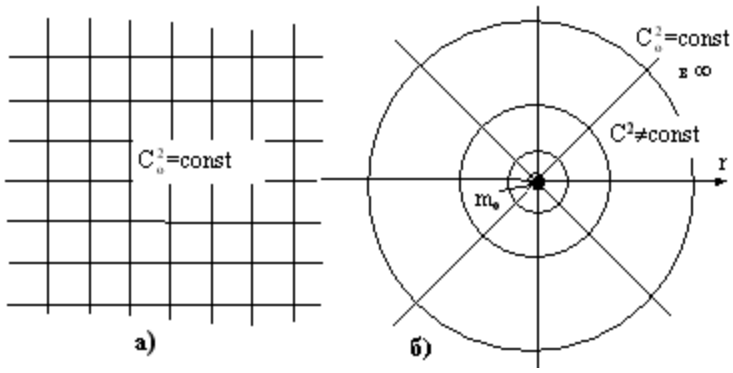

Fig.7. The picture of an unperturbed vacuum field with a gravitational potential C_o^2 = Const (a) and the pattern of the perturbation of the vacuum field by the central mass mo with the gravitational potential C ^{2} No. const.

Figure 7a shows the picture of the unpertu

grid of equipotentials, and at each site of t
Const), regardless of the size of the grid ce
the gravitational potential, and accordingly

It should be noted that colossal tensile forc
not of gravitational but of electromagnetic (

The grid in Fig. 7a can be regarded as
directions.

The vacuum field is a high-potential field. Until recently, physics has considered vacuum as not a potential substance with zero energy level. But this contradicts the principle of the equivalence of mass and energy. Indeed, in the theory of gravitation, the mass m_o is a gravitational charge. Now let us imagine that an elementary particle with a mass is produced in a vacuum field. The uniform gravitational field (Fig. 7a) is transformed (transformed) into an inhomogeneous field (Fig. 7b) with a potential C $^2 \neq$ const. Such a conversion requires certain energy costs, which can be calculated as the work on mass transfer m_o from infinity with zero gravitational potential φ = 0 to the vacuum field region with a gravitational potential (Fig. 7a)

$$W_o = \int_o^{C_o^2} m_o \, d\varphi = m_o C_o^2 \qquad (28)$$

Expression (28) is the simplest and most understandable derivation of the equivalence of mass and energy. If the vacuum field did not have the potential C_o^2, Then the existing field theory would simply not have a place in nature, since the integral (28) is the property of field theory.

In the theory of USS, the gravitational potential C_o^2 Is considered not as a square of the speed of light (although this is the case), as an indicator of the energy intensity of the vacuum field. The dimension of the gravitational potential in the SI system is m ^{2} / s ^{2} . But this dimension is equivalent to J / kg, that is, J / kg = m ^{2} / s ^{2} .

So, the presence of mass in the vacuum field leads to redistribution of gravitational potentials. And this redistribution establishes a balance of gravitational potentials (27).

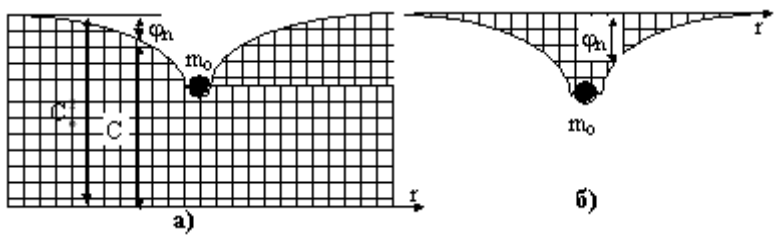

Fig.8. Gravitational diagram of the distribution of gravitational potentials in a vacuum field perturbed by the mass m_o (a) and the field of the Newtonian potential (b)

In Fig. 8a is represented in the form o
gravitational potentials in a vacuum field
corresponding to the balance (27). As ca
potential of the vacuum is equal to C_o^2 = C
potential C_o^2 The vacuum decreases by
Newtonian potential φ_n increases as the
distance r, forming in the vacuum field
C ^{2} No. const. The gravitational diagra
gravitational field in Fig. 7b.

Thus, the analysis of the balance of the gravitational potentials (27) and the gravitational diagram in Fig. 8a show that the actual gravitational potential acting near the perturbing mass in the vacuum field is the variable potential

C^2 No. const, and not the Newtonian potential φ_n. We call the potential $C^{2\ an}$ effective gravitational potential in a perturbed vacuum field.

It is the acting potential $C^{2\ that}$ determines the speed of light in a gravitational vacuum field as a square root of C^2 (27)

$$C = \sqrt{C^2} = C_o\sqrt{1 - \frac{\varphi_n}{C_o^2}} \quad (29)$$

Expression (29) establishes the relationship of gravity with the speed of light in static. If the mass moves in a vacuum, then this motion is taken into account by the normalized relativistic factor from the balance of potentials (26)

$$C = \sqrt{C^2} = C_o\sqrt{1 - \frac{\varphi_n\gamma_n}{C_o^2}} \quad (thirty)$$

In contrast to the special theory of relativity (STR) postulating the constancy of the speed of light C = const, the theory of VCS works with variable values of the speed of light (29) and (30). It should be noted that the dependence of the speed of light on the magnitude of the gravitational potential determines the deviation of the light beam in a strong gravitational field, which is established experimentally.

But if in reality the gravitational interactions are determined by the potential C^2, then how can we consider the Newtonian potential φ_n, which is known to determine the magnitude of the attraction force F of gravitating masses m1 and m2 (22)?

$$F = m_1 grad(-\varphi_{n2}) = G\frac{m_1 m_2}{r^2} \quad (31)$$

Exactly that expression (31) is well tested experimentally and represents the law of universal gravitation, the Newtonian potential $\varphi_{n\ was}$ considered in the theory of gravitation as a real potential. This was a profound error that did not allow us to advance theories of gravity for centuries. In fact, the gravitational field in vacuum is determined by the actual potential C^2 (26) and (27) (Fig. 8a), and not Newtonian (Fig. 8b).

Indeed, substituting (27) in (31) receives the identical law of universal gravitation, since the gradient of the constant C_o^2 Is zero

$$F = m_1 grad(C_o^2 - \varphi_{n2}) = G\frac{m_1 m_2}{r^2} \quad (32)$$

When Newton, developing laws of gravitation, relied on a new calculus connected with the analysis of small functional increments, later called a differential calculus, he thereby unwillingly pushed aside the development of gravity. Indeed, expressions (31) and (32) give the same final result, but the physical meaning invested in the basics of interactions is quite the opposite. Expression (31) relies on vacuum as a medium with zero gravitational potential and negative values of the Newtonian potential (Fig. 8b). Expression (32) is based on the vacuum potential field with the maximum level of gravitational potential C_o^2 = Const and its effective value C^2 (Fig. 8a). At the same time, the Newtonian potential acts as some kind of imaginary (not to be confused with complex numbers) calculated value.

Thus, the deeper analysis, in fact the well-known positions of physics, allows us to state that the surrounding vacuum space is a high-potential medium, which is the only source of energy in the universe.

ELECTROMAGNETIC QUANTIFICATION OF VACUUM

The above studies convincingly prove that the vacuum space is a high-potential environment. Such an environment must have a structure. The cells of the elastic grid in Fig. 7a must be filled with certain particles-quanta of space. In quantum field theory, the quantum of space is called a quantum. This is a real particle that determines the minimal area of space, indivisible further [7,5].

To reveal the structure of an elementary quantum of space (quantumon), we use Maxwell's equations for vacuum, recording the current density of electric j_e and magnetic j_m displacement during polarization of the vacuum field by an electromagnetic wave through a change in the time t of the electric field E and magnetic field H [16]

$$\mathbf{j}_e = rot\mathbf{H} = \varepsilon_o\frac{\partial\,\mathbf{E}}{\partial\,t} \quad (33)$$

$$\mathbf{j}_m = \frac{1}{\mu_o} \mathrm{rot}\mathbf{E} = -\frac{\partial \mathbf{H}}{\partial t} \quad (34)$$

Where ε_o = 8.85 .10 $^{-12}$ F / m is the electrical constant; M_o = 1.26.10 $^{-6}$ Gn / m = magnetic constant.

In view of the symmetry of the electromagnetic wave, the electric and magnetic displacement currents in vacuum in absolute magnitude (modulus) are equivalent to each other

$$j_m = C_o j_e \quad (35)$$

In (35) the current densities are related to each other by a factor equal to the speed of light C_o for the vacuum field unperturbed by gravitation, or C - for the gravitational perturbation. This is due to the fact that the dimensions of the bias current density for the electrical and magnetic components in the SI system are of different dimensions.

Indeed, if in a vacuum experimentally observed the current density of electric and magnetic displacement, then the cause of these currents should indeed be the movement (displacement) of electric and magnetic charges. We write down the densities of the bias currents through the displacement velocity v of massless elementary electric e and magnetic g charges and the quantum density of the medium ρ_0, assuming that the charges e and g enter the vacuum structure in pairs with the sign (+) and (-), forming as a whole neutral particles

$$\mathbf{j}_e = 2e\rho_o \mathbf{v} \quad (36)$$

$$\mathbf{j}_m = 2g\rho_o \mathbf{v} \quad (37)$$

Substituting (36) and (37) into (35), we obtain the relation between elementary electric and magnetic charges

$$g = C_o e = 4{,}8 \cdot 10^{-11} \text{Ам (или Дк)} \quad (38)$$

Where e = 1.6.10 $^{-19}$ Cl is an elementary electric charge.

Thus, in the SI system, the elementary magnetic charge (38) is 4.8.10 $^{-11}$ Am and the dimension expressed in Diracs (Dk), while not officially included in the SI system. In theoretical physics, an elementary magnetic charge (Dirac monopole) is taken, by analogy with the electric one, measured in Coulombs [17]. This introduces some confusion, since in electrical engineering the magnetic quantities are determined by the derivatives of the electric current, and if the magnetic moment has the dimension Am2, then the magnetic charge is determined by the dimension Am = Δk, and not by the Kp.

Thus, the analysis of Maxwell's equations shows that the condition for the polarization of a vacuum by an electromagnetic wave is the presence of currents of electric and magnetic displacement of massless electric and magnetic charges entering into the composition of a quantum. In this case, the quantum itself as an elementary quantum of space must include four elementary charges: two electric charges (+ 1e and -1e) and two magnetic (+ 1g and -1g), representing a static electromagnetic quadrupole, practically unexplored in electrodynamics. In what follows we shall call massless elementary charges monopoles (electric and magnetic).

Indeed, in order to allocate an elementary volume in space, only four marking points are needed from the positions of geometric minimization of the volume. One point is just a point, two points are a line, a three-surface, and four are a volume. And these four points were planned by nature itself in the form of these four monopoles, forming the structure of a quantum. In general, the quantum is an electrically neutral and massless particle, which has electrical and magnetic properties, which are manifested when the vacuum is polarized in an electromagnetic wave.

Naturally, we can not approach the properties of a quantumon in analogy with the properties of known elementary particles, for example, such as an electron that has a mass and is at the same time a carrier of an elementary electric charge. From the standpoint of classical electrodynamics, four dissimilar monopoles in a quantum must collapse to a point under the action of colossal attractive forces. However, this is not observed. Vacuum space is a very stable substance. This means that the monopoles that enter the quantumon structure have finite dimensions, determining the diameter Lq of the quantum itself [7]

$$L_q = \left(\frac{4}{3} k_3 \frac{G}{\varepsilon_o}\right)^{\frac{1}{4}} \frac{\sqrt{eR_s}}{C_o} = 0{,}74 \cdot 10^{-25} \text{м} \quad (39)$$

Where k_3 = 1.44 is the vacuum fill factor of the balloon quantons; R_s = 0.8.10 $^{-15}$ m is the radius of the proton (neutron).

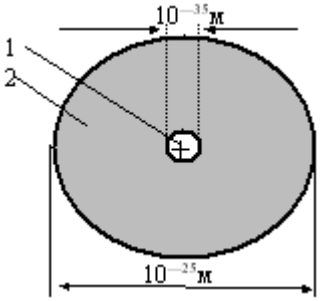

Fig.9.The structure of the electric (magnetic) monopole. 1 - the core of the charge; 2 - atmosphere.

Expression (39) is obtained from the tension conditions of an elastic vacuum as a result of the creation of an elementary particle (proton, neutron) from the vacuum field as a result of its spl gravitational interface in a quantized medium for these elementary particles.

Figure 9 shows the most probable structure of the electric and magnetic monopoles. Appare elastic state of the vacuum field must be a two-phase particle consisting of a central core 1 nucleus 1 that is the source of the field (electric or magnetic) in the form of a charge. It c determined by the Planck length of $^{10\text{-}35}$ m, and the monopole itself has dimensions of the orde charges themselves and the structure of their elastic atmosphere are still unclear. One can or determines the electrical and magnetic properties of the vacuum in the form ε_o and μ_o, alon electrical and magnetic matter inside the quanton.

Then, based on the physical model of monopole charges, one can analyze the process of quanton formation, shown in Fig. 10. Four elastic monopole balls form a figure with the arrangement of its nuclei along the vertices of the tetrahedron, ensuring the orthogonality of the electric and magnetic axes of the whole neutral quantumon. But in such a state the quantum can not remain.

$$\begin{cases} F_e = \dfrac{1}{4\pi\varepsilon_o}\dfrac{e^2}{r^2} \\ F_m = \dfrac{\mu_o}{4\pi}\dfrac{g^2}{r^2} \end{cases} \quad (40)$$

Naturally, the colossal forces of electrom from the monopoles into a spherical parti single particle, and preserving the orthogon the monopole nuclei in the model of the s vertices of the tetrahedron of the internal the electric and magnetic field effects.

The equivalence of the field action is det electric F_e and magnetic F_m charges a tetrahedron inside the quanton, forming the

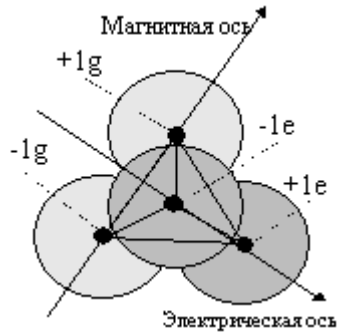

Fig.10. Formation of a quantum of space (quanton) from four monopole charges with a tetrahedral model of the location of their nuclei (top view).

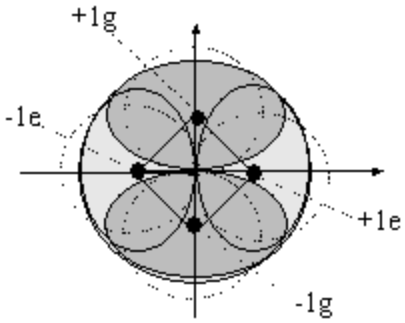

Fig.11. The formation of the quanton s compression of monopoles into a single qu

From (40) we obtain the relation for monopole charges

$$\frac{e^2}{\varepsilon_o} = \mu_o g^2 \quad (41)$$

Given that in the SI $\varepsilon_o\mu_o C_o^2 = 1$, From (41) we obtain the relation between the magnetic and electric elementary charges $g = C_o e$ Corresponding to (38), but obtained in a different way. In this case, the speed of light is established by the actual quantization of the vacuum space by electric and magnetic monopoles that are part of the quantons

$$C_o = \frac{g}{e} \quad (42)$$

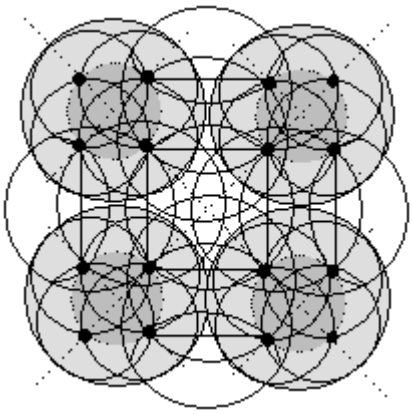

Fig.12. A simplified scheme for the interaction of four quantons in the local region of the vacuum field is presented in the lines of force.

The very process of electromagnetic quantization of a large volume of space is c natural ability to link opposite charges of the sign, the quantons adhering to e tetrahedron form of the arrangement of the monopole nuclei in quantons introduces randomly orienting their electric and magnetic axes in space, and excluding electrically and magnetically neutral homogeneous and isotropic medium is create form of a static electromagnetic field [5, 6, 7], which has been termed in the UKS medium.

Naturally, it is not possible to show a real picture of the static electric and magnetic a plane. But a simplified model of a plane local region of a vacuum field for four qu plane in the form of lines of force of electric and magnetic fields.

The vacuum field can be viewed as a discrete grid with a discreteness of the or electric and magnetic fields, thrown over the entire Universe, and linking all obj electromagnetic field in an equilibrium state [7,18,19]. We live in the electromagneti

On the other hand, the quantum of space (quantum) is an elastic element - an electromagnetic cavity resonator, which determines the course of time in space. For this reason, space and time are inseparable, defining a single category of space-time. The theory of UCS allows us to calculate for different cases the time distribution in space in the form of a chronological field [7,15].

The main parameter of the vacuum field as a quantized discrete medium is the quantum density $\rho_{o\ of\ the}$ unperturbed vacuum, which establishes the concentration of quantons per unit volume of vacuum and is determined by the quantum of the quanton L_g (39)

$$\rho_o = \frac{k_3}{L_q} = 3{,}55 \cdot 10^{75} \frac{\text{кванton}}{\text{м}^3} = \text{const} \quad (43)$$

The quantum density of the medium ρ_o (43) is the fundamental constant of the potential vacuum field and is the equivalent of the gravitational potential C_o^2. In the general case, the quantum density of the medium ρ of $\tau\eta\varepsilon$ disturbed vacuum and the acting gravitational potential C^2 are related by the relation:

$$\rho = \frac{\rho_o}{C_o^2} C^2 \quad (44)$$

Knowing the distance between charges inside the quantumon, equal to 0.5 L_g (39), it is easy to calculate the energy of their coupling, which is determined by the energy of the electric W_e and magnetic W_g fields through known expressions

$$W_e = \frac{1}{2\pi\varepsilon_o} \frac{e^2}{L_q} \quad (45)$$

$$W_g = \frac{\mu_o}{2\pi} \frac{g^2}{L_q} \quad (46)$$

The total electromagnetic energy $W_{g\ of\ the}$ quanton is determined by (45) and (46) and can be expressed in terms of electrical (or magnetic) parameters

$$W_q = W_e + W_g = \frac{1}{2\pi\varepsilon_o} \frac{e^2}{L_q} + \frac{1}{2\pi\mu_o} \frac{g^2}{L_q} = \frac{1}{\pi\varepsilon_o} \frac{e^2}{L_q} = 1{,}2 \cdot 10^{-2} \text{Дж} \quad (47)$$

Taking into account the high concentration of quantons in vacuum (43), the total energy $\varepsilon W_{g\ of\ the}$ bond inside the quantons is determined in one cubic meter of the vacuum space

$$\sum_{\text{вм}^3} W_q = \rho_o W_q = 4{,}5 \cdot 10^{73} \frac{\text{Дж}}{\text{м}^3} \quad (48)$$

In fact, the accumulated energy in the vacuum field exceeds (48) at least twice, since it is necessary to take into account the energy of interaction of charges between quantons. In any case, we are dealing with a vacuum as with a superenergy-intensive substance, and if we activate the energy of one cubic meter of vacuum (48), this will be tantamount to the birth of a new universe as a result of a big explosion.

Naturally, because of the small size of the quanton, the action of electromagnetic forces between the monopolar charges inside the quanton is so great that in nature there are no forces capable of splitting the quantum into separate monopoles. This is confirmed experimentally by the absence of free magnetic charges in nature, despite numerous searches [17]. A certain excess of electric charges of positive and negative polarity is due to the electrical asymmetry of the universe. But it is this excess of electric charges that is the source of birth from the vacuum of elementary particles and all real matter [7].

THE NATURE OF MASS AND THE CAUSES OF INERTIA

In this paper, I consider new energy cycles associated with a mass defect in the reactions of synthesis and annihilation of elementary particles. Therefore, it is important to understand the nature of mass formation, since no known theory gives an answer to this question. The mass is a gravitational charge, the source of the gravitational field. On the other hand, the release of energy is associated with the concept of a mass defect, that is, with gravity.

The state of the vacuum field perturbed by gravitation is described by the Poisson equation, which was originally obtained for solving problems in the theory of elasticity and mechanics of continuous media, and then in electrostatics and magnetostatics. Vacuum field is an absolutely elastic medium without friction, and capable of deformation (Fig. 7 and 8). Therefore, we write the Poisson equation for the deformed (in the theory of relativity-curved) space as the divergence

of the gradient of the quantum density of the medium ρ (44) [7.15]

$$\rho_m = k_o \operatorname{div} \operatorname{grad}(\rho) \quad (49)$$

$$\frac{1}{k_o} = 4\pi G \frac{\rho_o}{C_o^2} \quad (50)$$

Where $1 / k_o = 3{,}3 \cdot 10^{49}$ particles / kgm ^{2} - the constant of the elastic vacuum unperturbed by deformation; P_m is the density of matter of the disturbing mass, kg / m ^{3} .

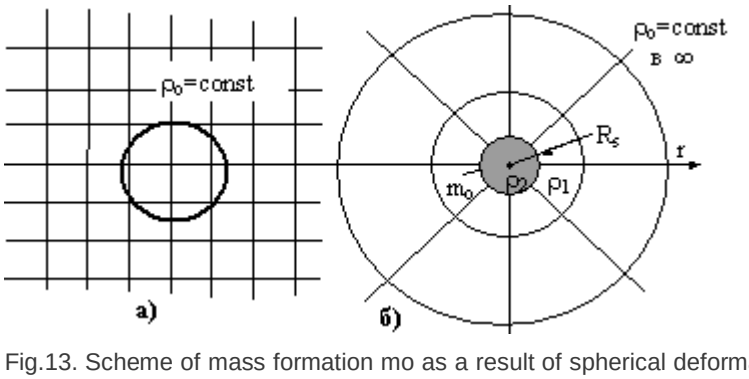

Fig.13. Scheme of mass formation mo as a result of spherical deformation of the vacuum field (a) in the local region up to the radius Rs (b).

To find the correct solution of the Poisso
physical essence of the mathematical op
quantum density of the medium. For an e
given medium in one particular local area,
expand. In the unperturbed vacuum field (F
13a) and begin to pull it uniformly with the r

Obviously, inside the contracted spherical

Rs, the quantum density of the medium ρ

density of the medium ρ_1 will decreas
redistribution of the quantum density of th
law by which this deformation redistribution
the vacuum field, the deformation process
termed the field theory as a divergence of t

For the case of spherical deformation of a vacuum, the integration of the Poisson equation (49) gives an exact solution for the distribution of the quantum density of the medium in the form of a system of two equations in a static

$$\begin{cases} \rho_1 = \rho_o \left(1 - \dfrac{R_g}{r}\right) \\ \rho_2 = \rho_o \left(1 + \dfrac{R_g}{R_s}\right) \end{cases} \quad (51)$$

Where r is the distance from the center of the gravity source (r> R_s), m

In this case, the radius $R_{s\ of\ the}$ gravitational source of mass m_o acts as the gravitational interface in an elastic quantized medium (vacuum).

Solution (51) allows one to estimate the elasticity of a vacuum, for example, by the way the quantum density of the medium ρ_2 inside the surface with the radius $R_{s\ is}$ compressed for the gravitational interface of the Earth, the Sun and the black hole:

- For the Earth at $R_s = 6{,}37 \cdot 10^6$ м, $R_g = 4{,}45 \cdot 10^{-3}$ м ; $\rho_2 = 1{,}0000000007\rho_o$
- For the sun with $R_s = 6{,}96 \cdot 10^8$ м, $R_g = 1{,}48 \cdot 10^3$ м ; $\rho_2 = 1{,}000002\rho_o$
- For a black hole $R_g = R_s$; $\rho_2 = 2\rho_o$

If the Sun collapses, its substance will contract at $1.27 \cdot 10^{16}$ times, while the quantum of space will shrink only in $\sqrt[3]{2}$ = 1.26 times. Indeed, we are talking about a vacuum as a superelastic medium, which has no analogues with known media.

In dynamics, to take into account the velocity of the particle (body) movement, the normalized relativistic factor γ_n (13) is introduced into the solution (51) as the factor $R_g\gamma_n$ to the gravitational radius R_g (13).

Taking into account that the quantum density of the medium r is the equivalent (44) of the gravitational potential of the vacuum field C2 (26), we correctly write the Poisson equation for the gravitational potential with allowance for the velocity of motion through γ_n

$$\rho_m = \frac{1}{4\pi G}\,\mathrm{div}\ \mathrm{grad}C^2 = \frac{1}{4\pi G}\,\mathrm{div}\ \mathrm{grad}(C_o^2 - \varphi_n\gamma_n) \qquad (52)$$

The solution (52) is the distribution of the gravitational potential in the outer and inner regions from the gravitational interface R_s in a spherically deformed vacuum field

$$\begin{cases} \varphi_1 = C^2 = C_o^2\left(1 - \dfrac{R_g\gamma_n}{r}\right) = C_o^2\left(1 - \dfrac{\varphi_n\gamma_n}{C_o^2}\right) \\ \varphi_2 = C_o^2\left(1 + \dfrac{R_g\gamma_n}{R_s}\right) \end{cases} \qquad (52)$$

From (52) we obtain an analytical derivation of balance (26) of gravitational potentials for a particle (body) moving in the whole range of velocities, including the speed of light

$$C^2 = C_o^2 - \varphi_n\gamma_n \qquad (53)$$

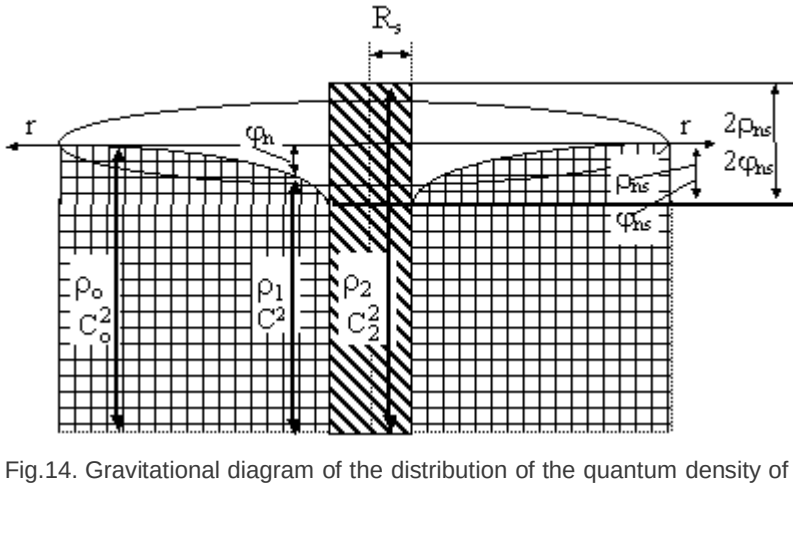

Fig.14. Gravitational diagram of the distribution of the quantum density of the medium and the

Figure 14 shows the gravitational diagram
diagram of the distribution of the quantum d
accordance with solutions (51) and (53) of
the quantum density of the medium and g
gravitational interface at $r = R_s$, the qu
gravitational potential $\Delta\varphi\ \alpha\rho\varepsilon$ observ

$$\Delta\rho = 2\rho_{rs} \qquad \Delta\varphi = 2\varphi_{rs} \qquad (54)$$

Where φ_{ns} is the Newtonian gravitationa
medium, due to the decrease in the quantu
of the gravitational boundary for spherical d

gravitational potential in the outer ($\rho 1 = \rho$, C^2) and inner ($\rho 2$, $C_2{}^2$) regions of the spherically deformed (curved) vacuum space as a result of the gravitational perturbation of the vacuum field by the particle (body).

The presence of the factor 2 in (54) is determined by the physical model of the participation of two components ensuring the stability of the vacuum space due to its simultaneous compression and extension of the elastic medium as a result of gravitational interactions, excluding also the factor 2 of the gravitational radius (14), which was mistakenly introduced by Schwarzschild, Because there is no physical model of gravitational deformation of vacuum. The fundamental role in all gravitational interactions is assigned to the gravitational boundary R_s of the medium, whose properties and structure are described in [7] for nucleons and an electron (positron).

In dynamics, the gravitational diagram in Fig. 14 differs from the static one only in that it is determined not by the static balance (27) of the gravitational potentials, but by the dynamic balance (26), (53), preserving the spherical symmetry. This greatly simplifies the calculations in the theory of gravity, essentially reducing them to the principle of superposition of fields in the solution of the many-body problem (particles), and in most cases, there is no need to apply a complex calculating apparatus using tensor analysis.

In the presence of a large number of elementary particles in a single conglomerate of the body, each particle within the radius of its gravitational interface compresses the vacuum as an elastic medium due to its discharge from the outside, ensuring the manifestation of gravity at the elementary level and determining the effect of the superposition principle of the fields. Therefore, the solutions obtained are valid not only for elementary particles, but also for cosmological objects.

Indeed, the mass of any cosmological object (planet, star) is built from quantons, which it absorbs from itself from the outer region of the space surrounding the given object, limited by its volume. It is another matter that the very mechanism of the redistribution of the quantum density of the medium for cosmological objects is realized through elementary particles that make up the object. Each of the elementary particles forms its mass due to the additional inclusion of quantons from the surrounding space. Since the principle of conservation of the total number of quantons acts in the vacuum field, their increase inside the gravitational interface by a certain amount is possible only by reducing the same number of quantons outside the gravitational boundary, determining the principle of superposition of fields. Naturally, for cosmological objects their radius represents the conditional boundary R_s of the medium.

The Poisson equation (49) includes the gradient of the quantum density of the medium, which determines the deformation vector D of the vacuum field in the static [5, 6, 7]

$$\mathbf{D} = \operatorname{grad}(\rho) \quad (55)$$

And dynamics

$$\mathbf{D} = \operatorname{grad}(\rho\gamma_n) \quad (56)$$

The deformation vector (56) can be written in terms of the Newtonian gravitational potential φ_n for a spherically symmetric system

$$\mathbf{D} = \frac{\rho_o}{C_o^2}\operatorname{grad}(C_o^2 - \varphi_n\gamma_n) = -\frac{\rho_o}{C_o^2}\operatorname{grad}(\varphi_n\gamma_n) = \frac{1}{4\pi k_o}\frac{m_o\gamma_n}{r^2}\mathbf{1}_r \quad (57)$$

Where $\mathbf{I}_r$ is the unit vector in the r direction.

As can be seen from (57), the deformation vector D is an analog of the strength (acceleration a) of the gravitational field, but expressed in other units (particles / m^4).

$$\mathbf{D} = \frac{1}{4\pi k_o}\mathbf{a} \quad (58)$$

It follows from (58) that in the gravitational field of mass m1 characterized by the strength a, a real deformation of the space D is observed, which penetrates the trial mass m2 introduced into the deformed space and induces a gravitational force F (32) directed along the vector D

$$\mathbf{F} = m_2\mathbf{a} = 4\pi k_o m_2\mathbf{D} \quad (59)$$

Conversely, if the mass m2 is affected by an external accelerating force F not related to gravity, then within this mass there will be a deformation D2 of the vacuum field whose vector coincides with the direction of the force

$$\mathbf{D}_2 = \frac{1}{4\pi k_o}\frac{\mathbf{F}}{m_2} \quad (60)$$

Thus, gravity and inertia are based on the same physical processes caused by the deformation of the vacuum field and associated with the redistribution of the quantum density of the medium. The difference between gravitation and inertia is that the gravitational field is characterized by deformation of the outer region of space, and the inertia field is characterized by internal deformation. Naturally, the redistribution of the quantum density of the medium inside the mass at the stage of its acceleration requires external force and energy expenditure. But the vacuum field differs from all known media in that it reacts only to an external disturbance. In the absence of an external force, the body will move by inertia. The very inertial motion also represents a phenomenon associated with complex processes in a vacuum, and is partially considered in [7].

So we came to the main question of natural science. This is the question of the causes of the appearance of the mass. The formulation that mass is a measure of inertia is only partially true, since, as was shown above, inertia is associated with the redistribution of the quantum density of the medium and the deformation of the vacuum. Considering the mass as a measure of inertia, science has already limited itself in cognition, connecting the notion of the mass with the thing in itself.

But it follows from the Poisson equation (49) that a substance with a density ρ m is produced as a result of the redistribution in vacuum of the quantum density of the medium. It is established that the production of matter is related to the spherical deformation of the vacuum field in accordance with the solution (51), which satisfies the experimental facts. Taking into account the gradient of the quantum density of the medium (55), we write the Poisson equation (49) taking into account the deformation of the vacuum

$$\rho_m = k_o \mathrm{div}\ \mathbf{D} \quad (61)$$

Applying Gauss's theorem to (61), we define the mass as the gravitational charge due to the flow of the vector by the spherical deformation of the vacuum field piercing the closed surface S around the mass generated from the vacuum

$$m = k_o \oint_S \mathbf{D} dS \quad (61)$$

Expression (61) first gives the definition of mass as the formation inside the vacuum field obtained as a result of its spherical deformation. And the mass is inextricably linked with the vacuum field, being its integral part. It turns out that the vacuum field is an original matter, and the mass is already a secondary formation of the original matter.

The process of mass motion in a vacuum field becomes clear. If it was previously thought that the motion of the mass by inertia in space is the motion of a completely closed system isolated in itself in total emptiness, the theory of the UCS shows that the mass transfer in an energy-intensive vacuum field is the transfer of the spherical deformation of the vacuum field.

Naturally, all the studies carried out above are aimed at revealing the physical phenomena occurring in **the Usherenko effect** . We are talking about high accelerations and braking inside the channel formed in the superdeep penetration mode of the particles into the target, and the vacuum field deformations that inevitably arise, which lead to synthesis in the channel of elementary particles and their antiparticles. The theory of UCS established that the synthesis of elementary particles with a mass is possible from vacuum as a result of spherical deformation of the vacuum field. Now we need to consider the mechanisms of creation of elementary particles in a vacuum field.

SYNTHESIS OF THE ELECTRON AND POSITRON VACUUM

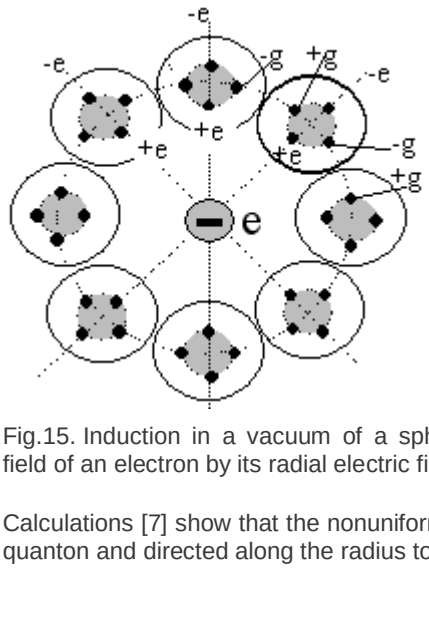

Fig.15. Induction in a vacuum of a spherical magnetic field of an electron by its radial electric field.

As shown, the vacuum field is a static electromagnetic field densely filled with qua
12). Now let us imagine that a massless electric monopole charge of negative
vacuum field. Such a situation arises in reality when a pair of particles is
positron. Naturally, the vacuum field will react to the introduction of an electr
quantons.

Thus, when a charge of negative polarity is introduced, the radial electric fiel
quantons with the electric axis along the line of the radial electric field of the mo
along the electric axis, carrying out the orientational and deformation polariza
vicinity of the monopolar charge in the region of a very strong electric field, the or
direction of the radial field of the monopole charge forms a magnetic field closed a

Calculations [7] show that the nonuniform electric field of the monopole charge creates a gradient force Fe acting on the quanton and directed along the radius to the center of the monopole charge (-e)

$$\mathbf{F}_e = \frac{1}{6\pi\varepsilon_o}\frac{e^2}{r^2}\left(\frac{L_q}{r}\right)^3 \mathbf{l}_r \quad (62)$$

Closed along the sphere, the magnetic field also acts on quantons, pulling them to the center of the monopolistic charge (-e) with the force Ng

$$\mathbf{N}_g = \frac{\mu_o}{8}\frac{g^2}{r^2}\frac{L_q}{r}\mathbf{l}_r \quad (63)$$

Dividing (63) into (62), taking into account (38), we obtain a relation from which it follows that the dominant factor in the contraction of quantons to the center of the monopole charge is the induced magnetic (63) field, closed around the sphere for r = re

$$\frac{N_g}{F_e} = \frac{3}{4}\pi\left(\frac{L_q}{r_e}\right)^2 = 3{,}6\cdot 10^{20} \quad (64)$$

Thus, the induced magnetic field that is closed around the sphere produces a spherical deformation of the vacuum field, forming the mass of the electron.

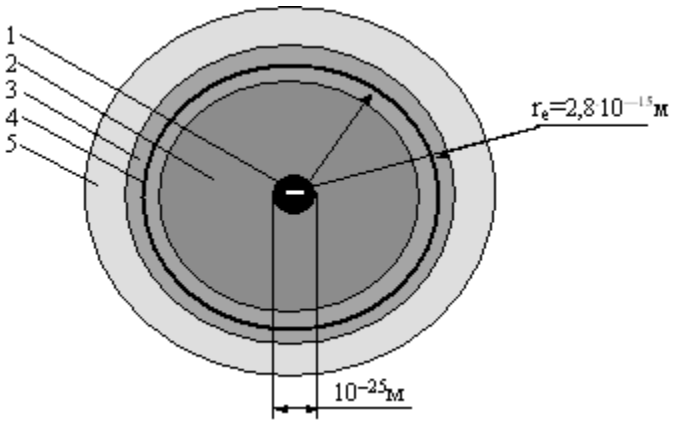

Fig.16. The structure of an electron in a vacuum field. 1 - the nucleus of an electron (electric monopole of negative polarity), 2 - region of compression of the vacuum field by a spherical magnetic field, 3 - transition region, 4 - conditional interface (classical radius of electron), 5 - vacuum field.

In Fig. 16 shows the structure of the electron. In t
form of a central monopoly charge. Around the mo
the vacuum field is formed, the gravitational boun
partition with the quantized medium, and is "smea
electron, forming a transition region. Then comes th

The spherically closed magnetic field of an electron
an anapole moment, only more complex), giving
which can be expressed by the complex charge qe

$$q_e = e + ig \quad (65)$$

Expression (65) makes it possible to calculate the
fields in the appropriate units of measurem
imaginary. The unit of measure (65) can be reduce
analysis in field theory must be supplemented by n
(spherA1) induced by the radial fields (radA2), c
(where A is the tension vector).

In this case, the field of an electron can be described by the complex intensity E + iH, the parameters of which are related to each other by the relation:

$$\mathrm{rad}\mathbf{E} = -C_o\mu_o\,\mathrm{spher}(i\mathbf{H}) \quad (66)$$

The imaginary unit in (66) indicates that the vector H is orthogonal to the vector E, that is, H <E. From (65) or (66) we find the imaginary value of the intensity of the spherical magnetic field of the electron

$$iH = \frac{1}{4\pi}\frac{g}{r^2} \quad (67)$$

The difference between the radial electric field of the electron and its spherical magnetic field lies in the fact that the electric field disrupts the electric equilibrium of the vacuum field and appears externally (can be measured), and the spherical magnetic field does not disturb the magnetic equilibrium of the medium, leading only to a change in the topology of the vacuum field, Providing a spherically closed magnetically balanced system.

With relative motion of an electron in an external magnetic field, a violation of the spherical symmetry of its magnetic field is observed and it is transformed into a rotary field (33). It can be assumed that the accelerated motion of an electron (and the motion by jumps), and also with respect to another electron (proton, etc.), leads to a violation of the spherical symmetry of the magnetic field of the electron.

For a uniform electron moves undisturbed in other fields vacuum field violation spherical symmetry of the magnetic field of the electron must not occur.

Naturally, the electron motion in the space is connected with the transfer of its monopole charge and transfer fields: electrical, magnetic, gravitational. Moreover, the energy of each of these fields are equivalent to each other, the summation of which is inadmissible, since each of the energies is a manifestation of the same entity that associated with the primary electrical polarization vacuum field, followed by induction of the spherical magnetic field and the formation of the gravitational field as a spherical vacuum deformation, which manifests itself as the mass of the electron. Equivalence electromagnetic (electric and magnetic) and electron gravitational fields is considered in [15].

It is obvious that with the increase in velocity of the electron in the vacuum field, the monopole charge begins to interact with more and more quantons, intensifying processes polarization vacuum field, as a consequence, increasing its spherical deformation, eventually, thereby increasing the mass of the electron.

Positron structure (Figure 16) differs from the central electron monopole positive polarity charge and a change in orientation of the polarization direction quantons (Figure 15) near the monopole charge.

SYNTHESIS OF VACUUM nucleons and nature of nuclear forces

In [20] nucleons synthesis questions of vacuum field illuminated by me in some detail. Including disclosed the nature of nuclear forces. Therefore there is no need to completely bring the research data, but rather focus on the fundamental points concerning the synthesis of nucleons (protons and neutrons) in the Vacuum Field.

Specificity vacuum field is such that the only way to form a mass in a method of nucleons spherical deformation of the vacuum field. This follows from the solutions (51) and (52) of equation (49) and Poisson's gravitational diagram (Figure 14), showing the spherical deformation of the vacuum process (Fig.13). Ultimately we obtain nucleon mass as determined by vacuum deformation by the expression (61).

The mechanism itself spherical deformation vacuum field is enclosed in the presence of particles in a gravitational Rs boundary. As shown in the previous section, the spherical deformation vacuum electron and positron carried spherical particles by a magnetic field (its spin).

Spherical magnetic field induced electron and positron radial electric field of the central charge without explicit gravitational boundary. This defines a small mass of the electron (positron).

nucleon mass is much larger than the electron mass. Proton in 1836 and the neutron in 1840 once tyazheleya electron (positron).
The only way to increase the mass of the nucleons in the same size with an electron (positron), is to provide a pronounced gravitational nucleon and an interface environment which has the property of spherical strong tension (compression) of the vacuum field. Recall that classical electron radius of $2{,}8.10^{-15}$ m, and the radius of nucleons (protons and neutrons) is $0{,}81.10^{-15}$ m but classical electron radius -. Is purely calculated parameter [15]. Apparently, the equivalent radius of the electron (positron) with the vacuum spherical deformation must match the radius of nucleons $0{,}81.10^{-15}$ m.

Analysis of options gravitational nucleons border showed that only satisfies the boundary structure nucleon is alternating shell Dialed of electric monopole charges of negative and positive polarities.

It was found that the proton number of electric monopoles in the shell is equal to 69 charges. Of these, 68 pairs of charge - equally represented by charges of negative and positive polarity. And one charge is excessive - positive polarity. This fact determines the presence of the proton charge of positive polarity [5.20].

Neutron formed by the capture sheath of the proton charge of negative polarity, for example, by electron capture. Number of electric monopole sheathed neutron pair charges equal to 70, forming a neutral particle in general. The structure of the nucleon shells is that the proton shell is very stable, and the period of proton decay of the order of 1030 years. Sheath neutron unstable, and as a result of vacuum fluctuations spontaneously loses a negative charge in a time 15.3 min. Neutron turns into a proton. These reactions are discussed in [20].

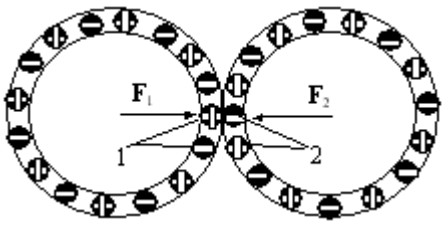

Figure 17. Contact shells Coulomb interaction nucleons. 1 and 2 - monopole charges.

Figure 17 is a diagram of contact interaction of two nucleons with alternating nucleon provides just two basic properties. 1. The number of charges in 69-70 vacuum field corresponding to the masses of protons and neutrons. 2. The forces as the forces F1 and F2 electric attraction monopole charge in the she concept of a unified field theory, when all the interactions existing in the natu electric magnetic).

Defined average distance r_{en} between the monopole charge in the shell nucleons [20]

$$r_{en} \approx 3{,}5 \cdot 10^{-16} \text{ M} \quad (68)$$

The properties of the alternating field such that interaction forces such fields spread over short distances 10^{-15} ... 10^{-16} m, commensurate with (68). This explains the properties of short-range nuclear forces at a specified distance.

For proton and neutron interactions defined functional dependence of the nuclear forces F_k when removing nucleons from each other as the electric charge interaction forces in the envelopes (fig.17)

$$F_r = \frac{1}{4\pi\varepsilon_o}\frac{e^2}{r_{en}^2}\left(\frac{1}{k_r^2} - \frac{3k_r}{(1+k_r^2)^{\frac{3}{2}}}\right) = 2f_r[\text{кН}] \quad (69)$$

In (69) includes removal function f_r (included in brackets) depending on the distance r between the nucleons and removal ratio k_r

$$k_r = \frac{r}{r_{en}} \quad (70)$$

Figure 18 shows a graph of changes of electric power (69) in the interaction of nucleons shells on the distance between the nucleons. The analysis provided the plot of electrical forces nucleon interaction membranes strongly suggests that it forces its characteristics fully comply with nuclear forces:

1. Characterized force areas of attraction and repulsion shells. And the more distant region attracts nucleons and the closer does not allow them get close closer distance

   $$r_{e\,o} = 3{,}5 \cdot 10^{-16}\,\text{м} \quad (68)$$

2. Radius nucleons attraction forces is in a range of distances from k_r to $5k_r$, i.e. 3.5 • 10^{-16} m to about 2 • 10^{-15} m. For all the available experimental data of the specified range corresponding to the radius of the nuclear forces. At distances greater than 2 • 10^{-15} m slump begins action of attractive forces between nucleons shells.

3. It was established experimentally that the interaction dvunuklonnom stable pair nucleons form only a proton and a neutron. This corresponds to the circuit shown in Fig.14 when the neutron capture can proton for excess charge of positive polarity to the proton shell or vice versa. Dvunuklonnyh stable formations of neutrons not observed experimentally.

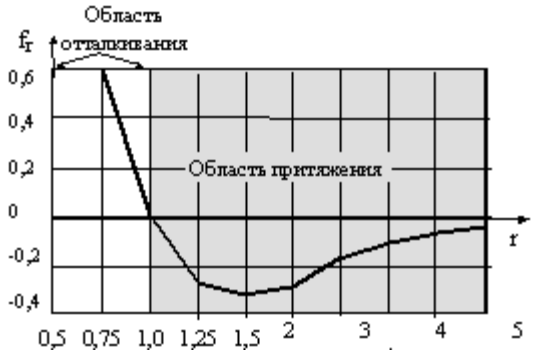

Fig.18. Changing the electrical forces of repulsion and attraction in the interaction of shells of nucleons as a function fr (kr) (69).

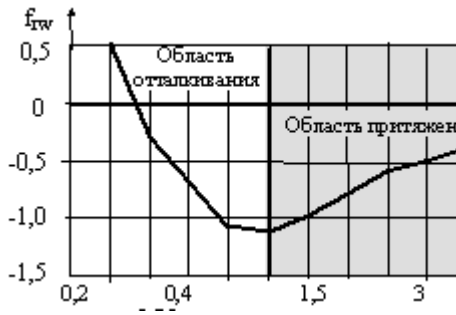

Figure 19. Changing the electric energy of i

Force interaction of nucleons (69) corresponds to the nuclear energy W_r the energy of the electric field at the contact point in the form alternating shells delete function f_{rw} (k_r) to the distance r

$$W_r = -\int\sum F_r dr = \frac{1}{4\pi\varepsilon_o}\frac{e^2}{r_{en}}\left(\frac{1}{k_r} - \frac{3}{\sqrt{1+k_r^2}}\right) = 4{,}2 \cdot f_{rw}[\text{МэВ}] \quad (71)$$

Figure 19 shows a graphical representation of changes of electrical energy (71) by reacting shells nucleons from the distance between the nucleons. It demonstrated that the minimum interaction energy level corresponds to the zero value of the interaction force (Figure 15) at. Attention is drawn to the fact that the negative field of energy does not mean compulsory affiliation of this region to the forces of gravity. The direction of force is determined by the sign of the derivative of the interaction energy. The maximum power level corresponds to a distance of 3.5 • 10^{-16} m (68).

The controversial nature of nuclear forces as forces of attraction and repulsion at short distances the nuclear force, not explained in the physics of elementary particles and atomic nuclei in the analysis of these forces in such situations [21, Figure 2]. But everything falls into place of their own, when all processes are considered in view of the enormous power of the vacuum field and interaction of alternating shells of nucleons.

Interaction of two different neutron interactions of protons and neutrons due to the presence in the shell of the excess charge of positive polarity proton. The forces of interaction of neutron shells quickly subside (hundreds of times faster than the proton-neutron interaction) exponentially [5,20]

$$F_r = \frac{1}{2\varepsilon_o}\frac{e^2}{r_{en}^2}\exp\left(-\pi\frac{r}{r_{en}}\right) \quad (72)$$

For this reason, neutron-neutron interaction is extremely unstable and is not observed in a free state. When the proton-proton interactions overcome the Coulomb repulsion forces of excess charges of the proton interaction is overcome by alternating shells of nucleons. In general, only the presence of nucleons alternating shell allows to collect them from various combinations of atoms and their isotopes under nuclear forces.

Now it is important to show that the nucleons can in principle be produced from vacuum as a result of strong deformation. Thus the process of formation of the shell due to the presence of a nucleon monopole charges in vacuo, combined into electronic neutrino. This was first seen by me in [5] in the justification of the shell structure of nucleons. It is therefore important to consider separately the process of annihilation of particles accompanying the birth of the electron neutrino and the release of energy.

STRUCTURE annihilation of electron neutrinos

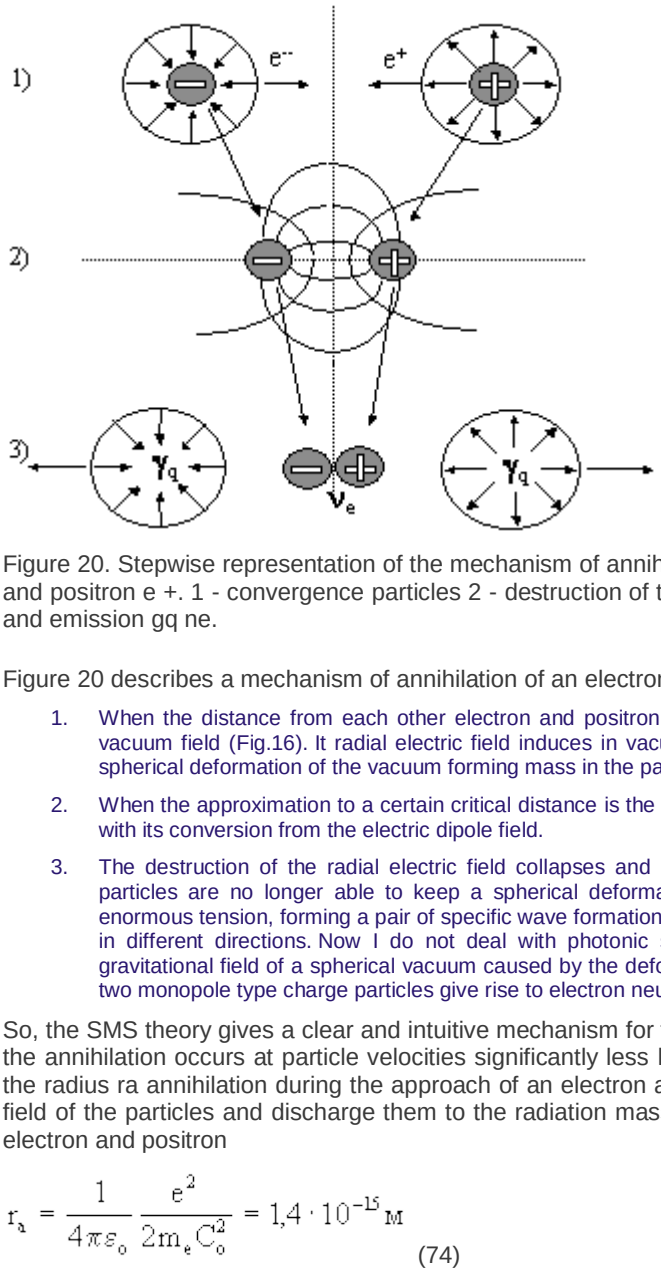

Figure 20. Stepwise representation of the mechanism of annihilation of an electron e- and positron e +. 1 - convergence particles 2 - destruction of their fields 3 - formation and emission gq ne.

Annihilation reaction interesting because in them particles in the radiation energy. This is most clearly

annihilation e + with liberation of two gamma qua

energy and the birth of the electronic neutrino ν_e

$$e^+ + e^- \rightarrow 2\gamma_q + \nu_e \quad (73)$$

Reaction (73) provides the laws of conservation of e the electron and positron into energy passes 2gq r positron negative and positive polarity and have no which is the elementary information bits that once ex

Figure 20 describes a mechanism of annihilation of an electron and a positron, which is divided into three stages:

1. When the distance from each other electron and positron have a radial electric field and the spherical deformation of the vacuum field (Fig.16). It radial electric field induces in vacuo spherical magnetic field (electron spin), and which provides a spherical deformation of the vacuum forming mass in the particles.
2. When the approximation to a certain critical distance is the destruction of the radial electric field of an electron and a positron with its conversion from the electric dipole field.
3. The destruction of the radial electric field collapses and a spherical magnetic field of an electron and a positron. These particles are no longer able to keep a spherical deformation of the vacuum field, which, as it collapses under vacuum enormous tension, forming a pair of specific wave formations in the form of two gamma rays (photons) of the radiation emitted in different directions. Now I do not deal with photonic structures. It is important to understand that the energy of the gravitational field of a spherical vacuum caused by the deformation is fully transferred to the photon radiation. The remaining two monopole type charge particles give rise to electron neutrino as an electrical dipole.

So, the SMS theory gives a clear and intuitive mechanism for the annihilation of a positron and an electron, provided that the annihilation occurs at particle velocities significantly less light. In this case, we can calculate the critical distance for the radius ra annihilation during the approach of an electron and a positron which is the destruction of the radial electric field of the particles and discharge them to the radiation mass, based on the radiation energy determined total mass of electron and positron

$$r_a = \frac{1}{4\pi\varepsilon_o}\frac{e^2}{2m_e C_o^2} = 1{,}4\cdot 10^{-15}\,\text{M} \quad (74)$$

As seen from (74) the radius ra annihilation half the classical electron radius 2,8.10 $^{-15}$ m. On the other hand, as calculations show, not the classical electron radius determines the sizes and dimensions of the positron and the radius of the gravitational boundary whose precise calculations forthcoming. In any case, from (74) it follows that an electron or positron annihilation takes place them closer to the size of gravity close to the boundary. This allows to determine the range of the radius R $_s$ gravitational boundary electron and positron

$$R_s = (0,5-1,0)r_a = (0,7-1,4)\cdot 10^{-15}\text{м} \quad (75)$$

During this size range (75) includes a neutron and proton dimensions 0,81.10 $^{-15}$ m. Apparently, in microcosm particle exists a limit which defines a uniform gravitational boundary. We are talking about stable particles with mass.

Radius annihilation (74) is only conditioned Dimension including equivalence interaction energy of electric charges inside the neutrino energy W $_a$ radiation of two gamma rays when the electron and positron annihilation

$$W_a = \frac{1}{4\pi\varepsilon_o}\frac{e^2}{r_a} = 2m_e C_o^2 = 1,022\text{МэВ} \quad (75)$$

Expression (75) defines a binding energy monopole charges within a neutrino annihilation point. It remains undisputed that after annihilation of an internal energy of the charge inside the neutrinos will depend on the distance between the charges. This distance is limited by the size of monopoles. Naturally, in the free state in the vacuum field, nothing prevents collapse neutrinos to quanton sizes.

However, in the region of strong electric fields near the particles having a charge such as a proton, neutrinos stretching occurs before annihilation radius sizes. It is experimentally confirmed that production of a pair of electron and positron particles is a proton at an energy corresponding to radiation exposure (75).

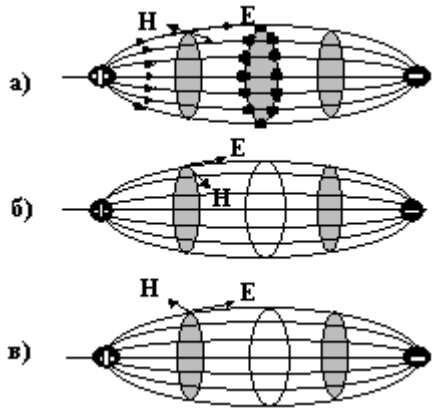

Fig.21. electron neutrino structure in a vacuum box (a) and its existence as a normal neutrinos (b) and antineutrinos (c).

Figure 21 shows the structure of the electron neutrino in the vacuum field (a) a and antineutrino (c). The field of an electron neutrino in vacuum is a field of ar not been practically studied in a vacuum field, since the electric polarization of of the magnetic component of the vacuum field.

The electric polarization of the vacuum is related to the polarization of quantons axis in the direction of the dipole field line of force. Since the magnetic axis magnetic component is induced in space in a similar manner, as was done electron (Fig. 15). When the vacuum field is electrically polarized, the perturbin charge (65), including the imaginary magnetic component (67).

In Fig. 21a, the quantons are represented symbolically in the form of a cross cr the electric axes of the set of quantons are oriented along the electric lines of fo a position in the plane perpendicular to the electric lines of force (the orthogona orthogonal section that the magnetic charges of quantons begin to interact with cross-section to the center of the cross section. This explains the compression o

But, as can be seen from Fig. 21a, the magnetic field induced by the dipole electric field is not spherical, but more suitable to the anapole (toroidal) field, which is induced in cross sections orthogonal to electric power lines. A feature of this field is that the magnetic field of a free dipole neutrino, despite the fact that it is completely balanced in a vacuum field, still changes its topology.

The change in the topology of the vacuum field can be purely electromagnetic, gravitational, or provide in aggregate a joint manifestation of two interactions, as is observed in an electron. In order to evaluate the preferential type of interaction with a vacuum field by generating an electronic neutrino, it is necessary to turn to the theory of UCS, which uniquely determines that the gravitational interactions are characterized by a change in the quantum density of the vacuum field, that is, they are characterized by its deformation. Purely electromagnetic processes are characterized by the polarization of the vacuum without changing its quantum density.

All the experimental data show that the neutrino does not have a noticeable mass. This indicates that, in spite of the presence of a contracting magnetic field of the neutrino in the cross section orthogonal to its electric field, no real compression of the quantons occurs in such a way that the quantum density of the vacuum field changes significantly.

The electric and magnetic fields of neutrinos can not sufficiently deform the vacuum, causing gravitational interactions in it.

Indeed, all attempts to compress neutrinos by electric and magnetic fields can be compared by analogy with attempts to compress an air rubber ball by hand. The compression of the ball in one direction leads to its stretching in the other direction, leaving the volume practically unchanged. To significantly reduce the volume of the ball it must be uniformly compressed from all sides, providing a spherically symmetric compression. In the case of an electron, a spherically

symmetric compression of the vacuum field can be achieved as a result of the action of spherical magnetic and radial electric fields, providing the electron with mass formation from the vacuum.

The absence of spherical compression of the vacuum field in neutrinos does not allow the vacuum field to deform, exhibiting normal gravitational properties. For this reason, it is impossible to observe a significant mass of neutrinos. Nevertheless, some of the gravitational properties of neutrinos can be judged from the non-spherical compression of the vacuum and the possible deformation of the vacuum field in these sections. Apparently, this contraction is insignificant in certain directions, and its possible estimation can be obtained analytically using the calculating apparatus of the theory of VKS.

In general, in the free state, the electron neutrino and antineutrino are indistinguishable (Fig. 21a). The magnetic field H of neutrinos and antineutrinos is completely balanced. The difference can be detected when the neutrino is polarized by an external magnetic field H2, when the equilibrium of the internal magnetic field H is disturbed (Fig. 21b and c). In this case, the directions of the vectors of the magnetic field strength of the neutrino and antineutrino are opposite.

Naturally, dipole electron neutrinos can join together, forming in space conglomerates of already new neutral particles that do not possess mass. Perhaps different combinations of electron neutrinos give a new type of neutrinos, the so-called muon and t-leptonic ones. But when the electron neutrinos form an alternating shell closed around the sphere, then in a vacuum particles with a mass are produced. In nucleons, the alternating shell is very stable. In unstable particles the alternating shell is unstable and they quickly decay.
It is important to note that the electronic neutrino is also an elementary spatial bit of information. Nothing prohibits these bits of information from being combined into complex information vacuum systems, the role and impact of which has not been practically studied.

PRINCIPLE OF SPATIAL TRANSFORMATION OF ENERGY

The principle of spatial transformation of energy was formulated as a result of the development of the theory of KKS [6]. In accordance with this principle, all the energy cycles, ultimately, are reduced to the release of energy from the vacuum field, regardless of whether we light a candle or explode a nuclear bomb. In this respect, the energy aspect of the Usherenko effect is no exception, and all the energy processes in it are connected with the vacuum field. Now it is important to understand the energy cycles that underlie Usherenko's effect.

In the vacuum field, there are many exchange electromagnetic processes that do not produce excess excess energy. To understand why this happens, it is necessary to analyze the structure of the quantum (Fig. 10 and 11). Quanton in a vacuum field is the only carrier of electromagnetic energy and has the property of preserving this energy in electromagnetic interactions of the polarization type [15].

In order to, literally, squeeze out energy from the quantum, it must be uniformly compressed on all sides, changing the distance between the charges and their binding energy. But uniform compression of a quanton is possible as a result of spherical deformation of the vacuum field. And this is the area of gravitational interactions associated with the formation and change in the mass of elementary particles. The source of excess energy passing into radiation is precisely the change in mass due to a defect in the mass of elementary particles.

Energy science without understanding the processes taking place in the vacuum field, did not even touch such a promising area of energy as the synthesis of elementary particles, focusing on the synthesis of nuclei. An example of this work is the program "Tokamak", the completion of which can not see the end. On the other hand, in the Usherenko effect, many synthesizing processes are concentrated, including both the synthesis of elementary particles and the nuclei themselves. The simplest way is to look at the example of synthesis from a vacuum of a pair of particles: an electron and a positron.

The synthesis of a pair of electron and positron particles from a vacuum is a reaction in the vacuum field of the reverse annihilation reaction. Synthesis and annihilation are reversible reactions, albeit asymmetric. In the interaction of an electron and a positron, an annihilation reaction occurs in the emission of two gamma quanta of radiation (73). However, under the action of a single photon with an energy of 2 γ_g on an electron neutrino ν that are in a free state in a vacuum field, the neutrino splits into an electron and a positron does not occur

$$2\gamma_q + \nu \neq e^+ + e^- \quad (76)$$

This is an experimentally established fact. High-energy photons (gamma quanta) permeate outer space, and naturally, they meet on their way a lot of electronic neutrinos. However, this does not cause synthesis from the vacuum field of an electron and a positron. On the other hand, the KKS theory makes it possible to calculate the energy of a single photon γ_g capable of splitting in the vacuum field any neutrino into an electron and a positron

$$\gamma_q + \nu \longrightarrow e^+ + e^- \quad (78)$$

However, in nature, there are no single high-energy photons capable of ripping any pair of these particles out of the free vacuum. This is due to the fact that the electron neutrino can collapse in a vacuum to a level close to the quantum's size, for example, up to 10^{-24} m. In order for the electron (73) electron and positron synthesis to proceed from the vacuum

field, the electron neutrino must be excited by a strong Coulomb field, For example, by the field of the orbital electron or the atomic nucleus itself. Such a field makes it possible to stretch the electron neutrino (Fig. 21) and substantially weaken the interaction energy of charges, increasing the distance between them more than the annihilation radius> r_a (74)

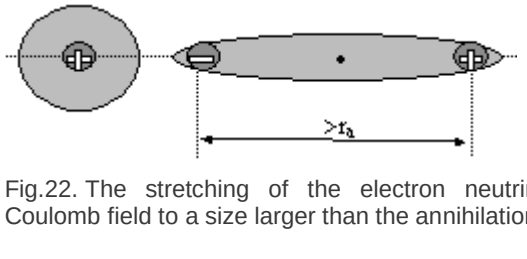

Fig.22. The stretching of the electron neutrino in a strong Coulomb field to a size larger than the annihilation radius.

Figure 22 shows the stretching of the electron neutrino in a strong elect
10^{-15} m annihilation radius (74). In a strong electric field created by an e
a long axis in the direction of the force line of the electric field of the ex
charge of positive polarity (for example, a proton), then the electric
structure will be directed towards the perturbing charge, and the charg
result, the neutrino can stretch to annihilation size and more when its
energy Wa of the annihilation reaction (75), or it may turn out to be less
state.

Neutrinos in the excited state can be decomposed into separate monopoles under the action of a sufficient photon energy, which synthesize a pair of particles in the vacuum field: an electron and a positron (78). Let us describe step by step the process of synthesis in the vacuum field of an electron and a positron:

1) $\nu_e + E_Q \rightarrow \nu_Q$ (79)

2) $\nu_Q + (2\gamma_q) \rightarrow +1e + (-1e)$ (80)

3) $+1e + V_f \rightarrow e^+$ (81)

4) $(-1e) + V_f \rightarrow e^-$ (82)

In the first stage (79) of synthesis, the electron neutrino ν e is transferred to the excited state ν Q by an external strong Coulomb field EQ. In the second stage (80), the already excited neutrino is exposed to pulses of electric and magnetic fields of a single photon electromagnetic radiation with an energy of close annihilation (2 γ q). As a result, the neutrino splits into two free electric monopoles of positive and negative polarity. Further, in the third (81) and fourth (82) stages, the free electric monopoles interacting with the vacuum field Vf synthesize the positron e + and the electron e-.

Not knowing the mechanism of the splitting of the electron neutrino, one might think that the synthesis of an electron and a positron manifests itself as a tunneling of particles from a vacuum field. In fact, the overcoming of the energy barrier is provided by an external electric field.

Unfortunately, science knows nothing about the neutrino concentration and its velocity distribution. But having a dipole structure, the neutrino is concentrated in matter under the action of an inhomogeneous electric field of charges of atomic structures. This is manifested experimentally when the substance is exposed to gamma quanta, accompanied by the production of a pair of particles. It can be assumed that, depending on the structure of matter, the energy level of neutrino excitation may not be sufficient for the synthesis of an electron and positron with an energy of 1.022 MeV. In this case, it is necessary to increase the energy of photons.

In any case, as a result of the photon splitting of the electron neutrino in a strong Coulomb field, the synthesized pair of particles acquire a mass whose energy does not exceed the energy of the photon radiation. For this reason, your described reactions of electron and positron synthesis did not attract the attention of energy scientists, as possible prospective reactions of production of excess energy.

In **the Usherenko effect, gravitational** splitting of the electron neutrino is possible when the vacuum field is deformed. This type of reactions is predicted by the theory of the KKS and has never before been considered in physics.

The possibility of synthesizing a pair of particles by acting on a neutrino by deformation of a vacuum field follows from the properties of the vacuum field and the structure of the electron neutrino. Indeed, if the vacuum field is sharply compressed or stretched in which the electron excited neutrino is located, a change in the energy state of the vacuum field will cause an energy change in the neutrino state, and it can split into two charges, synthesizing an electron and a positron

$$\nu_Q + D \rightarrow e^+ + e^- \quad (83)$$

Where D is the deformation vector of the vacuum field (55).

In [6], I formulated the principle of spatial transformation of energy, consisting in the realization of the reaction (83). As the replacement of the high-energy photon in (80), the deformation energy of the vacuum field can be used in the equivalent. Ultimately, the energy of deformation of the vacuum field is electromagnetic energy, like the energy of photon radiation.

But how can we get an artificial deformation of the vacuum field? Considering the equivalence of the fields of gravitation and inertia, it was established that the deformation D of the vacuum field can be ensured by accelerating a (acceleration or deceleration) of a particle in a vacuum field (58)

$$\mathbf{a} = 4\pi k_o \mathbf{D} \quad (84)$$

In expression (84), the deformation vector D is due to the inertia of the particle when it brakes (or accelerates) and redistributes the quantum density of the medium inside the gravitational boundary of the particle. The gravitational boundary of elementary particles is determined by dimensions of the order of 10-15 m, that is, by dimensions comparable to the dimensions of annihilation. The effectiveness of the interaction will increase in the presence of many particles participating in the process, as is observed in **the Usherenko effect** when the impactor particle strikes a steel barrier.

Thus, in order to provide a certain local area of the deformed vacuum field, it is necessary to concentrate a large number of particles in this region and give them a sharp acceleration or deceleration. This means that we can talk about active continuous media in which a synthesis of an electron and a positron is possible when the vacuum field vector D is applied to a continuous medium.

Since the gravitational splitting of an electron neutrino in the deformation of a vacuum field has an applied nature in **the Usherenko effect** , and is associated with the production of excess energy in new energy cycles as a result of the synthesis of an electron and a positron, then the annihilation of an electron and a positron whose mass in accordance With the principle of equivalence goes into energy.

Naturally, the new energy cycles associated with the release of energy from the vacuum field as a result of the impact of deformation perturbations on it through sharp deformation loads in matter are still poorly understood. But even now it can be argued that in thermonuclear reactions of helium synthesis from hydrogen, it is fundamental to create strong deformation perturbations of the vacuum field as a result of an atomic explosion, which is a detonator in a hydrogen bomb, rather than a high temperature. For this reason, the "Tokamak" type system can not be started in the mode of obtaining excess energy.

In this respect, Usherenko's effect is most promising, since the effect is still being sought in the Tokamak system, and Usherenko's effect is already established. Naturally, the reactions of electron and positron synthesis in **the Usherenko effect** can provoke nuclear reactions of cold synthesis. This is established by the presence of new elements in the channel of superdeep penetration. When the sensational report of American physicists M. Fleischmann and S. Pons about the discovery of cold nuclear fusion in 1989 shocked the world, although the discovery itself was not reliably established, the effect of Usherenko from the opening day was 15 years. In this, apparently, the excessive modesty of the author of the discovery appeared.

As an active continuous medium that realizes the principle of spatial transformation of energy, any medium can act: liquid, solid, gaseous. The most typical example, the deformation of a continuous medium is the effect of cavitation on the liquid. As a result of the explosive nature of cavitation within the cavitation bubble, there are large accelerations of the cavitation front at the liquid-gas interface (pairs) leading to a strong deformation of the vacuum field and a change in the energy of deformation. In the results, conditions arise in the vacuum field leading to the splitting of the electron neutrino into an electron and a positron, followed by its annihilation and the release of excess thermal energy as a result of reradiation of gamma quanta into thermal photons. Such reradiation is possible with the fragmentation of gamma quanta into low-energy photons, as a result of scattering in the structure of matter.

Fig.23. Realization of the principle of spatial energy transformation in the cycle of synthesis and annihilation of an electron and a positron

Figure 23 shows a scheme for implementing the principle of spatial energy t
the vacuum field of an electron and a positron in the presence of an active r
release in **the Usherenko effect** when the deformation vector D is applied t
target), as a result of which the excited electronic neutrino splits into a positr
leads to the formation of an electron neutrino and gamma-ray emission. Perha
is observed experimentally in **the Usherenko effect** , capturing into the int
elementary particles, and even atomic nuclei, while ensuring the release of
ahead of the drumming particle in the ultra-deep penetration regime .

Analysis of new energy cycles shows the promise of their application in power

THE FUTURE OF ENERGETICS

Advantages of fundamental research is that based on the results obtained, it is possible to predict the development of new technologies, including energy technologies. In this respect, the theory of UCS is the most powerful analytical apparatus for studying matter and physical phenomena within the framework of the unified field theory (TEP).

Naturally, the forecast of new energy technologies can be built on their ecological purity. Let's analyze the state of energy for such an important indicator as the full efficiency (EFFICIENCY) of the energy cycle

$$КПД = \frac{W_a}{m_o C_o^2} 100\% = \frac{w_T}{C_o^2} 100\% \quad (85)$$

Where W_a is the energy released in the cycle, J; M_o is the mass of fuel, kg; $C_o^2 \approx 9 \cdot 10^{16}$ J / kg is the gravitational potential of the unperturbed vacuum, w_t is the energy output of the fuel, J / kg.

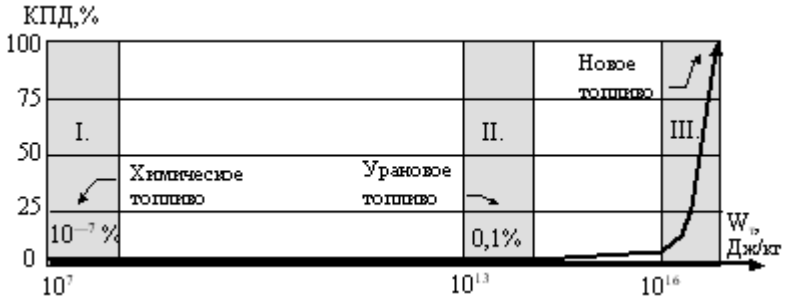

Fig.24. Increase the efficiency of the energy cycle from the energy output of fuel.

Gravitational potential C_o^2 In fact, determi field in gravitational interactions. This is th the whole mass is converted into energy. I the energy output of fuel is only a fraction energy output of fuel to its limit value give cycle.

Figure 24 shows the graphical dependence of the full efficiency of the energy cycle on the energy output of fuel. As can be seen, three characteristic areas are identified on the graph:

I. Chemical fuel. Energy output - 10^7 ... 10^8 J / kg. Efficiency - 10^{-7} %. Waste is 100%. Stocks are limited.

II. Uranium fuel. The energy output is 10^{13} ... 10^{14} J / kg. The efficiency is 0.1%. Radioactive waste - 99.9%. Stocks are limited. Environmentally and economically unpromising fuel.

III. New fuel. Energy output is 10^{16} ... 10^{17} J / kg. Efficiency - up to 100%. There are no harmful wastes. Stocks are not limited.

The new fuel means a fairly wide range of different substances and elements that can be used in reactors that realize the Usherenko effect. As the microparticles that activate the vacuum field in new reactors, ordinary sand (silicon), whose reserves are huge, can act. Ultimately, all new technological activities in the reactor are aimed at the synthesis of elementary particles and their antiparticles from the vacuum field, and only then the nuclei. First of all, this refers to the synthesis of electron-positron pairs from the vacuum, and the organization with their use of new energy cycles. Thus, the most promising fuel in the 21st century can be considered antimatter extracted from the vacuum field in **the Usherenko effect** .

The energy transfer in **the Usherenko effect** is still 10^9 -10^{10} J / kg per particle. This is considerably less than the limiting energy output ~ 10^{17} J / kg, which is achieved in the annihilation reactions of particles and antiparticles. The explanation for this lies in the fact that the impactor microparticle activates a rather small amount of electronic neutrinos in a vacuum, allowing the extraction of a certain amount of electron-positron pairs. This number of pairs of particles and antiparticles so far determines the energy transfer achieved to the particle-impactor, which exceeds 1000 times the energy output of the chemical fuel.

CONCLUSION

The development of basic energy in the 21st century will develop on fundamentally new fundamental theoretical and experimental discoveries in the field of natural science. First of all, this refers to the discovery of an elementary quantum of space-the quantumon-in the theory of ultrasound and the Usherenko effect of superdeep penetration of microparticles into steel barriers (targets).

The effect of superdeep penetration of microparticles is characterized by a colossal energy release, 10^2 ... 10^4 times greater than the kinetic energy of the impactor particle. The source of energy in **the Usherenko effect remained unknown for** almost a quarter of a century, despite numerous experiments reproducing this effect.

It was possible to establish the nature of energy release in the effect of superdeep penetration only in the theory of the USS, which considers the vacuum field the only source of electromagnetic energy in the framework of the unified field theory (ETP). In the end, all the energy cycles are reduced to the liberation of energy from the quantum as a result of gravitational spherical compression of the vacuum field.

To the new energy cycles in **the Usherenko effect, one** should include the cycles of synthesis of elementary particles and their annihilation with the release of excess energy. The simplest are the cycles of production of electron-positron pairs with their subsequent annihilation, and avalanche activation of other processes, including nuclear ones. In new cycles, an energy release of the order of 10^9 ... 10^{10} J / kg per particle is achieved. This is almost 1000 times higher than energy release in chemical reactions.

The practical implementation of the new energy cycles is connected with the development of reactors based on continuous-action accelerating systems for finely dispersed microparticles with a diameter of 1 ... 1000 μm and heat-producing target barriers. As a material for microparticles, sand (silicon) can usually be used, its reserves are huge and extraction is not difficult.

Reactors of a new type, literally working on sand, can replace uranium fuel reactors at nuclear power plants in the near future. The use of reactions of synthesis of elementary particles from the vacuum field in the power industry will make it possible to ensure high environmental friendliness and profitability of nuclear power plants.

In the development of new energy technologies, environmentally safe and easily managed, the governments of many countries and the big energy business will be interested, solving the problems of energy supply of various branches of economic activity and defense.

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