1. Energy levels and the development of matter

1.1. Scientific knowledge and modeling

The aim of this work is to build a mental model of the physical world around us in order to obtain new knowledge about it, showing the unity of matter and fields, electricity and gravitation. Feature of object modeling is a fundamental unobservability of many of its elements. We see the border where it starts our ignorance. Therefore scientific imagination can only be selected as a method of modeling. The criterion of truth is the correspondence of simulation results with experimental data.

Currently the theoretical physics engaged mainly the construction and the study of mathematical models. They quantitatively relate the observed parameters of the physical processes and phenomena. Mathematical images and concepts are useful and valuable in the analysis of physical phenomena. Often, however, they are treated then as objective physical reality or as inherent properties of physical objects in the nature of things.

Thus some abstract mathematical representations and symbols were introduced in a natural way of thinking. They do not reflect the real content of the physical phenomena and objects. That are, for example, the action at a distance, the view of the particles in the form of points, an absolute vectors, wave passage through empty space, wave-particle duality, the singularity, etc. The symbolic mathematical representations of nature are alone in many theoretical works.

Physical models should reflect the essence of the simulated systems, their birth, development and destruction. The mechanisms of interaction with other objects and the environment to be reflected in the model of the object. This requires the introduction of systems analysis, the hierarchical levels of the organization of physical objects. It is needed not only horizontal, but also vertical approach to the description of events. Model is not a snapshot of what is happening but the panorama of the life of the object.

Creating intuitive visual models is the most important function of the imagination in the process of scientific inquiry. Visualize a system that displays the object of research is understood as a visual model of an imaginary. She is able to replace him so that her study provides new information about this object. In this paper, a visual representation of the model is formed to deal with the cognitive task of studying unobservable micro world objects, as their direct investigation difficult or impossible. In each case, we tried to identify the object only some elements and use them to recreate the character of the internal structure of the object.

The simulation process reflects the ratio between essence and appearance: "The essence is in phenomenon and a phenomenon is essential led." Most of the research in physics devoted to the study of phenomena, linkages between the input X and output Y parameters of the system (Figure 1.1). Most often, that is quite enough for practical use of the phenomenon. The system itself or the phenomenon remains with a "black box".

But after some time, the lack of knowledge or understanding of the essence of the system starts to reduce the efficiency of the phenomenon and slow development. For example, there is a problem of controlled thermonuclear fusion. The phenomenon of energy when connecting the hydrogen isotopes in the helium nucleus has been used in the development of the hydrogen bomb. The same principle of a high temperature and pressure was the basis of controlled fusion. However, lack of model representations of the nuclei did not allow any move in this direction.

Another example relates to microwave radiation. It is believed that in the hot universe gas that filled her, becoming a neutral, was virtually transparent to the photon radiation. Therefore, the ancient expanding light reached us almost unhindered from the depths of space and time. But at that time it was not the radio waves, and light, that is, photons. The question is, how do particles-photons can turn into electromagnetic waves, i.e. vibration in the environment? How many would not stretch the photon, a particle will remain. Only the lack of models of photons and radio waves leads to such assumptions. Although, of course, for the construction of errors requires no less brain than for the discovery of truth.
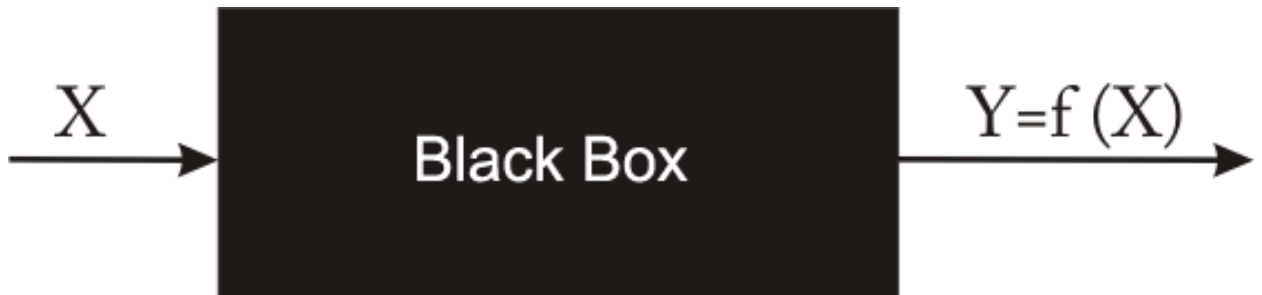

Figure 1.1. Communication output and input parameters of the model

All models are ideal. All models are fundamentally inaccurate. They are only a means of correlating logical knowledge to objects of nature. Theory expresses the mental content of visual forms of model representation in the description. Mathematics is a description of the physical phenomena in the language of symbols and equations. But this is not the physics. Physics, in turn is only a hypothetical model description of nature, not nature itself. We describe the photons from the point of view of the wave-particle duality, i.e. as a particle and a wave. But the light at the same time remains itself. We describe the nature of the language of force effects we observed. The nature acts in the language of motion.

The essence of the simulated processes and objects can be opened only in the analysis of their interaction with the environment. Experience shows that the most common property of the world around us is its quantization. The idea of quantization in its broadest sense encompasses the idea of the spatial discontinuity of all physical processes and objects in the background of their continuity. It follows that empty spaces between the individual elements (quanta of the physical content of space) are inadmissibility. So the question of medium filling all space and directly involved in all physical processes as a transmitter of all kinds of interactions is essential for the further development of quantum physics.

In this paper, it is assumed that the entire matter of the universe is distributed embedded quantized energy levels of the field and matter. Levels differ binding energy. The level at which there was formatter at the time of the Big Bang is the most vigorous. As the cooling due to adiabatic expansion part of formatter passed at a low energy level of the field, highlighting the binding energy. The substance is a layer of matter with a lower energy density than the levels of the field.

Nearest to the substance the field level of dark matter we call the electromagnetic field. In the time of Maxwell this level was called ether. Quantized elements of the electromagnetic field environment — the gravitons — are in the form of vortex fermions, particles composed of two neutralinos. Rotational energy of the vortex is maintained from the time of the Big Bang.

The substance particles are swirling among gravitons. Substance immersed in the graviton. The levels of gravitons (Dark Matter) and high-flow environments (Dark Energy) with respect to the substance can be considered continuous media. Field quanta and matter are completely immersed in the continuum formatter. So is discontinuous in continuous.

The substance particles themselves do not have the properties of gravity and charge. A necessary condition for modeling of objects and phenomena of quantum mechanics and relativity theory is the existence of quasi-continuous material medium that fills all of space. Regarded environment of the vortex gravitons is the mandatory universal participant in all interactions embedded in her neutrinos, photons and matter. Flows of gravitons form the observed force fields: electric, magnetic, gravitational, nuclear, etc. Vortex vibrations of the graviton environment perceived as radio waves.

The proposed micro vortex model allows you to find the answers too many questions. For example, today, physics does not answer the simplest question, "What are the charge and mass?" Mass in classical physics is defined as a measure of inertia and the measure of gravity of the body (inertial and gravitational mass, respectively). [1] Property of the inertial mass is manifested in the fact that the body changes the value of its impulse by an external force. H. Lorentz, using Newton's second law, introduced to the body, "longitudinal" and "transverse" mass. Both masses were dependent on the speed, but in different ways:

$$m_\parallel = \frac{m}{(1-\frac{u^2}{c^2})^{\frac{3}{2}}}; \quad m_\perp = \frac{m}{(1-\frac{u^2}{c^2})^{\frac{1}{2}}} \ .$$

In 1900 Poincaré coined the relativistic mass characterizing inert properties of electromagnetic wave. Then there was another mass — the rest mass, which coincides with the Newtonian mass as "quantity of matter in the body". This quantity is now called simply the mass.

When the gravitational mass is considering one uses the term passive gravitational mass and active gravitational mass. Here a qualitative difference in the masses is meant. For example the mass of the body is attracted to the Earth (passive gravitational mass, the test body) and the mass of the Earth (active gravitational mass).

In 1905 Einstein came to the conclusion that the mass m of a body is a measure of its energy content of rest: $E_0 = mc^2$, where E_0 - energy of a body at rest (particles), and c - the speed of light. If a body gives off the energy ΔE, then the weight is reduced by the amount of: $\Delta m = \Delta E / c^2$. In the theory of relativity the energy lost its classical uncertainty — additive constant. She became a physical quantity with absolute value. In the relativistic theory of the mass of a composite body is not equal to the sum of the masses of its constituent bodies, the energy is additive. The general theory of relativity is based on the equivalence of inertial and gravitational mass of the body.

As for the electric charge, the sources of information are usually limited to the determination that the charge is a property of the body to create an electric field. In classical electrodynamics the question of the causes of charge quantization is not discussed since the charge is an external parameter, not a dynamic variable.

By analogy with the electric charge in the Standard Model is formally introduced baryon, lepton and hypercharge — additional numbers that are stored in a particular class of transformations of elementary particles. Formally new field and the boson interaction carriers in these fields are introduced. But their physical meaning is unknown. Quantum field theory and the theory of relativity have assumed only the role of kinematics, essentially giving up modeling, and clarify the causes of natural phenomena. In particular there are no clear models of the charge has not yet proposed.

Modern physical theories do not contribute to understanding of the nature of mass, charge and electromagnetic field. Almost all theoretical works are a combination of relativity and quantum mechanics. They calculated the interaction of point particles and strings in the virtual space. To confirm the theories costly experiments put. But today, the physics is limited not so much by the powerful colliders, supercomputers and many levels of our ideas in the modeling of objects and processes. So first

of all in this paper introduces a new concept of the essence of the model of the quantized electromagnetic field.

> **Electromagnetic field is a viscous compressible flow medium in the form of fine grained discrete vortex particles — gravitons filling the whole space**

The translational motion of quanta of the electromagnetic field — gravitons — comes with light speed. Electromagnetic field is a light medium - it moves neutrinos and photons, which are the vortices created in this environment. In the electromagnetic field radio waves are propagated in the form of vortex disturbances. All the visible matter and photons immersed in the electromagnetic field. The flows of gravitons determined the interaction between the fragments of matter.

This work is not due to the accumulation of statistical information and its systematization. Vortex model aims to create a seamless intuitive picture of the universe. We want to give the system a logical explanation of physical phenomena with one voice in identifying common patterns of development. The notion of discrete energy levels of matter is the basic concept in this model.

1.2. The energy levels

Matter

In the world there is nothing but eternal extended moving matter in the different states of matter and fields.

> **Matter is not created and indestructible substance of which all the objects of the material world consist.**

Matter is one — of matter and antimatter is not. All that exists in nature, there is a specific condition of a single substance. Energy, mass, force, inertia, gravity, electricity and magnetism - everything is a manifestation of the properties of matter in motion.

Existing view "Field is a special kind of matter" is not justified. Now in physics many fields are introduced. Therefore to describe them we have to introduce many kinds of matter. Our world then would consist of many kinds of matter. But this is not one world, but many worlds.

This vortex model assumes that matter exists in four states:

1. Formatter — the substance in the form of continuous of the continuum.

2. Quantized field (dark energy, dark matter) — a substance in the form of fine grained set of invisible vortex sites.

3. Matter (substance) (particles, atoms and molecules, macro matter) - a substance in the form of composite assemblies based on particles of neutrinos.

4. Space objects (planets, stars, galaxies, clusters of galaxies, black holes).

The matter has no other inherent properties, except energy. It is the energy of matter determines its development and the transitions between states.

Levels and development

Recall that in the modern view, all systems tend towards equilibrium. The world is in principle symmetric, polarity is the basis of the microcosm. Mainly the physics studies the stable state bodies. It is

believed that the inorganic medium is not evolving. It is assumed that the processes of self-organizing systems are negligible.

Offered the level approach is grounded on idea of **Developments** and **Self-organising** any Object or a natural phenomenon [2].

> Development is a process of transition to the energetically favorable, optimal state for the given conditions and environment

Nature is inherent asymmetry. Spontaneous development is not in the bilateral (symmetrical, mirror) direction. In a no equilibrium open nonlinear system under the influence of small fluctuations of irreversible processes evolve in the same direction — toward the least action, i.e. lowering the energy levels. Self-organization is a process with a decrease in entropy.

All natural objects are discrete energy levels. At each of these levels the nested objects in discrete sub-levels tend to move to lower levels due to dissipation of energy, or by binding with other objects with allocation of binding energy. Directed downward movement occurs spontaneously due to the dynamics of the processes continuously interact within the system by "trial and error". The positive feedback is required for effective self-existence. The external forces prevent the movement down the levels. Their action makes the system at equilibrium, an inability to develop or lifts it to a higher level. The external forces perform work equal to change in the binding energy.

For example, consider, for example, stages of change physical state of water vapor. Figure 1.2 shows three levels of the state of matter: gas, liquid and crystal.
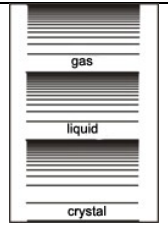
Level 1	Steam	
Level 2	Water	
Level 3	Ice	

Figure 1.2. Aggregate state of water

Assume that the steam vessel is isolated from other bodies, so that the heat does not come from the outside. Vessel spontaneously cooled by heat radiation into space. The steam is converted first into the water. Water status, with further cooling is characterized by changes in its structure. In the water there are more associates, connecting hundreds of thousands of molecules — embryos future crystals. The water then freezes. The role of positive feedback in these processes is thermal radiation. The entropy of the system decreases. The binding energy of crystalline ice is dissipated kinetic energy of the gas and water. To melt the ice and evaporate water it is necessary to bring to a vessel the lost power.

With a layered approach all physical objects are considered as structured system. Therefore the consideration of interactions between the components of these systems is great importance. For example, the interaction of electrons and nuclei is importance in the formation of atoms and ions. Changes of the system state between sublevels within the same level are most discrete. In a system which is at some sublevel accumulate quantitative changes. Accumulation of quantitative changes into qualitative move: the system switches to another sub-level and function in a new way. Jumps to the next level from the upper floors of this level as a random event is unlikely. With each step the probability of transition to the next level increases. By analogy with the electrons in an atom the lower sublevel we shall called as the ground state (or the base state), while the overlying sublevels — the

excited states. All real systems tend to move from the excited state to the ground. This property is the basis of the evolution of natural systems.

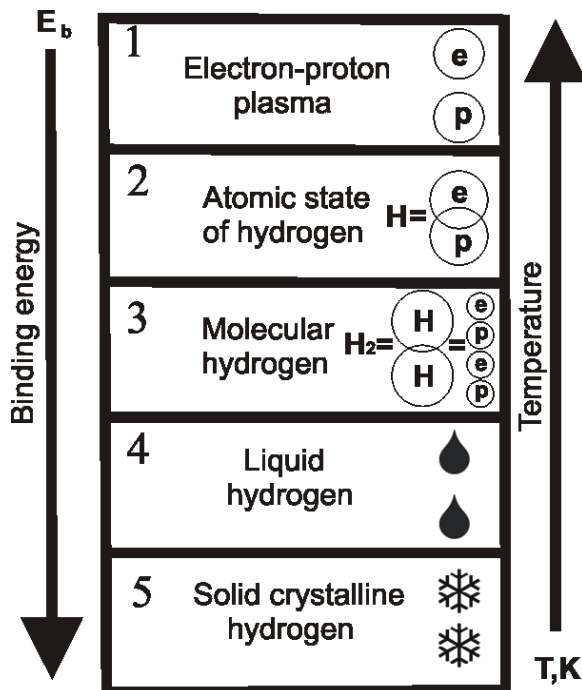As an illustration, Figure 1.3 shows a diagram of the energy levels of hydrogen.

Figure 1.3. Energy levels of hydrogen

The numbers in the figure indicated the following levels:

1. Level of electron-proton plasma.
2. The level of hydrogen H. Here are the quantum energy levels of the electron binding energy with the proton in the range of 13.6 eV.
3. Levels of gaseous molecular hydrogen H2. There are also two energy sublevels: parahydrogen and orthohydrogen and many sub-levels of excitement. The dissociation energy is of 4.776 eV.
4. The level of liquid hydrogen. Boiling Point (LNG) -252.60 C.
5. The level crystalline solid hydrogen. Melting temperature (hardening) -259.1 0C.

With decreasing levels of temperature T decreases, while the binding energy increases. The first level - this is the form of ionized hydrogen. For the second level (the level of atoms) the upper boundary is the "sea of protons and electrons." For the third level (the level of molecules) the upper boundary is the "sea of hydrogen atoms." For the fourth level (the level of liquid hydrogen) the upper bound is the "sea of hydrogen molecules." And the "sea of liquid hydrogen" freezes when switching to the fifth level.

Meaning layered approach here consists in the following. We view the object "Hydrogen" as a given amount of a substance from the elements (electrons and protons), of which it was formed, to its transformation into a crystal. Its constituent electrons and protons remain basically unchanged. But depending on the external environment the parameters and shape of the object communication "Hydrogen" changes. Levels are different states of the object, depending on the binding energy. Directed downward movement occurs spontaneously due to the dynamics of the processes continuously interact within the system by "trial and error". The inflow of energy from outside is needed

to move up. To evaporate the liquid hydrogen requires heat it. To destroy the H_2 molecule, i.e. go to the top level of atoms, molecules need to transfer energy.

Note here that the level of one could turn into a "sea of neutrons." These "test" is certainly under way. But neutrons have more energy than the hydrogen atoms. Therefore, these fluctuations are recognized as a "mistake" and not supported.

Laws of development of systems are qualitatively similar at any level

The principle of least action occurs when there is no appropriate resistance. All systems seek to achieve the lower limit of the interval level. For example, all of the electrons "want" to connect with protons. All chemical elements "want" to be "inert gases" when the top shell is filled by electrons. All neutrons "want" to dissolve. However, if these intentions there is a reaction in the form of force or excessive heat coming from outside, then descend the stairs levels suspended. Upon reaching the lower edge of each level of the system is a single unit. The structure of them is most streamlined. Its qualitative state, in terms of this level is optimal.

For example, we shall consider in more detail the energy spacing of the second level for hydrogen. Within the interval level can be a body of nested energy sublevels, characterizing the state of the system. Figure 1.4 shows a diagram of the quantum levels of the electron in the hydrogen atom. Final and unambiguous solutions of the Schrödinger equation exist only for the following values of the binding energy of an electron moving in the Coulomb field of the nucleus:

$$E_b = \frac{E_0}{n^2} = \frac{Z^2 e^4 m}{2h^2} \frac{1}{n^2},$$

where E_0 = 13.53 eV, e - electron charge, Z - the nuclear charge in units of e, m - mass of the electron, h - Planck's constant, n = 1, 2, 3, ... - the principal quantum number.
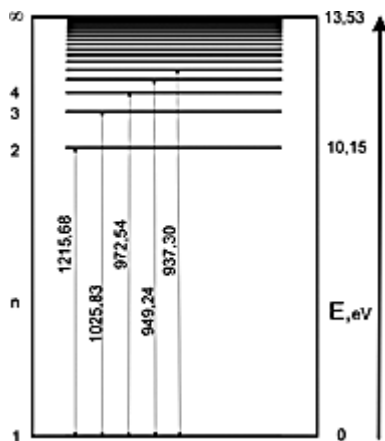

Figure 1.4. The energy levels of an electron in a hydrogen atom

The values of the principal quantum number n are on the left axis. On the right available potential energy in electron-volts, measured from the bottom level (n = 1), is marked. The lines connecting the sublevels are shown. Its length is proportional to the wavelength of a photon in angstroms, that is emitted or absorbed when the electron jumps between these sublevels (Lyman series).

As can be seen, with increasing principal quantum number n energy levels are closer. When n = 1 electron in the ground state with the binding energy E_b = 13.53 eV. To break up this relationship and make an atom into an ion, one must expend energy 13.53 eV. Then the electron and the proton would be at the level of the electron-proton plasma in the continuous spectrum.

Note that the transition from the ground state (n = 1) in the first excited state of the patient (n = 2) is E_{12} = 10.15 eV - more than any other transitions. In the absorption of a photon with energy E < E_{12} electron is

excited, but can not reach a steady state and returns to the ground state with emission of a photon with the same energy E. This "island of stability" provides the relative stability of the ground state.

Bohr showed that in the atom kinetic energy of particles less than half the energy of the electrostatic attraction of the electron to the proton. This ensures the stability of the hydrogen atoms. At the third level (Figure 1.3), the kinetic energy of a molecule is less than the binding energy of atoms in molecules.

Further energy dissipation provides a transition to the fourth level. Here, a liquid is formed by adhesion molecules due to still uncompensated links. At the fifth level matter becomes the most energetically favorable form of the crystal lattice. Perfect crystal has the lowest possible potential energy. There is not energy away from it anymore. Its evolution is over. Crystallization matter is the result of self-organization of inorganic medium. Next in nature there is "caking" of solids. Different crystals connect together to further reduce the total potential energy.

1.3. The energy levels of matter in nature

Experience shows quantization microcosm. It is due to the discreteness of angular momentum. Therefore, a fundamental property of the elements of the microworld is rotation. It is realized in the form of vortex corpuscular particles of different energies and their conglomerates. The rotation of the vortex in the environment is stable at the lowest possible value of angular momentum. This determines the quantum of energy.

Therefore, the basis of the proposed model is based on two hypotheses:

1. Matter of the universe is distributed nested inside each other's quantized energy levels of the field and matter.
2. Quanta of the field and matter are vortex formations.

Figure 1.5 shows the hierarchy of the energy levels of the organization of matter in our universe. [2] The figure shows four levels: formatter, field, substance and space. The last three levels are divided into sublevels. Levels differ with binding energy. The highest energy level has formatter, which was all the matter before the Big Bang. The properties of this level provided inflationary expansion of the universe after the explosion. As the cooling due to the further adiabatic expansion the part of matter consistent transition to a low-energy levels, creating a system of discrete sub-levels.

The development of our universe started from a continuous solid continuum — formatter (physical vacuum, the scalar field, the inflaton, the quintessence). Formatter filled a white hole - an volume in which nothing can enter. Let us consider in more detail the mechanism of white holes, which are still in the set exist in our universe. But you need to understand how a black hole is formed.

Today many astronomers believe that in the centers of most galaxies black holes are located. In particular in our Milky Way galaxy mass of the central black hole is estimated at 30 000 solar masses. According to the event horizon of this formation horizontal (along the surface) flows of gravitons has broad. They close on the inside hole with a large curvature of the trajectory. Escape velocity from the black hole equal to the speed of light. Therefore, only the light (flying at a speed of light!) can leave the event horizon, if the photons fly in radius. Black hole is a region from which nothing can escape.

The force of attraction of the mass m in the gravitational field of mass M in the general theory of relativity (GR) is defined by

$F = G \dfrac{Mm}{R^2 \; \overline{\overline{1 - \frac{2GM}{c^2 R}}}}$, where c - speed of light in vacuum, G - gravitational constant.

When $R = r_g = \dfrac{2GM}{c^2}$ (gravitational radius of the event horizon), the expression for the force F becomes infinite.
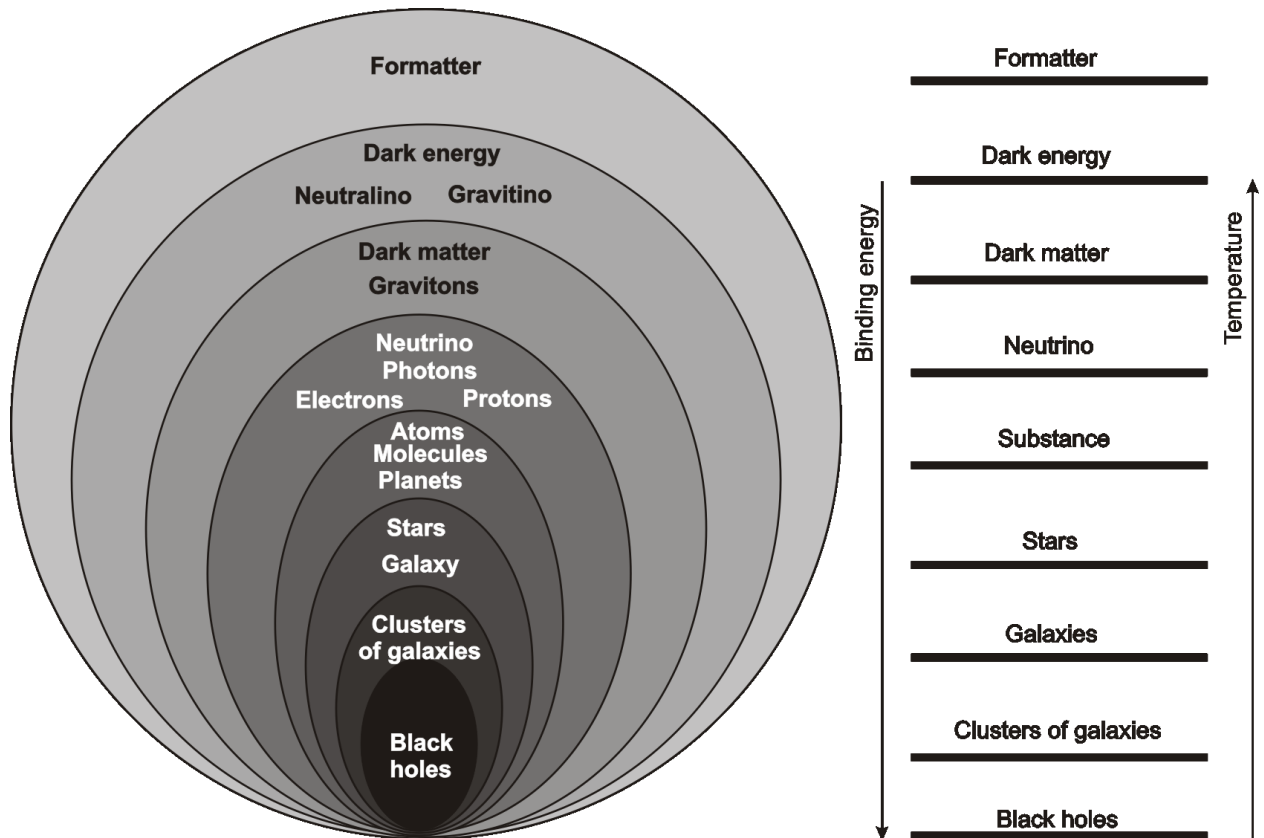

Figure 1.5. The energy levels of matter

The modern model of black hole does not consider the structure of phase transformations of matter when subjected to large forces. Let us imagine that some spherical gas volume of a star begins to shrink by its own gravity. Within the sphere of the gas pressure must be increased to the center to ensure that the pressure gradient, and hence the force that prevents shrinking. As we approach the Schwarzschild sphere of compression force will increase. The pressure inside the star increases so that the vortex structure of fermions and bosons will be destroyed. All hadrons and leptons become neutrinos. If the compression continues, the neutrinos inside the star will turn into vortex gravitons, later in the neutralino, and finally — in a structureless formatter.

As for the mass of matter there is a "gravitational radius", and for the matter there is a "critical pressure" p_{cr}, or "critical energy density» ρ_{cr}. At the critical pressure every structure of matter is destroyed. Matter passes into the state of structureless continuum. Collapse of matter and radiation of the stars leads to the fact that the black hole formed an antigravity core — White Hole (Figure 1.6). In the structure of natural objects inherent unity of opposites, so that the stability achieved in dynamic equilibrium. Supercompressed structureless substance formatter that is filled the black hole has the properties of negative pressure: it can only grow in every point. During free expansion formatter during

inflation it a pressure was greater than the critical one, and it is expanding at every point without phase changes. When the energy density will be less critical - environment will test phase transformations will be mixed.
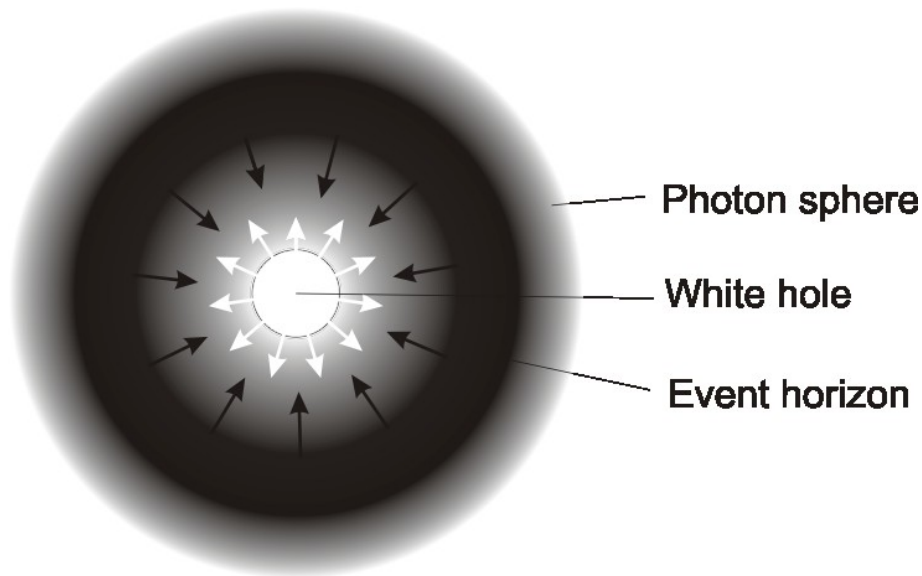

Figure 1.6. The structure of the black hole

Satellite pictures of distant galaxies (Figure 1.7) allow us to see that the ordinary black holes, which are the centers of galaxies, occupy a significant (up to ~ 10%) of the amount of the size of the galaxy. So sometimes encountered the notion that the universe before the Big Bang took the amount of nearly a pinhead — are unfounded. Volume of Mega Black Hole — the source of our Universe — before the Big Bang was certainly extremely great.

From the photos it is clear that the black holes in the centers of galaxies glow brightly. Most of the radiation from the hole formed outside, in the photosphere, due to the energetic particles of matter. Therefore, to obtain information about the internal structure of the hole on photon emission is difficult. As to save the information that has fallen into a star, any information required material carrier. A black hole destroys the carriers themselves, along with the information.

Figure 1.7. Black holes in the centers of galaxies

Sizes of black holes are automatically limited under normal conditions of formation. With increasing size of the energy of the black hole increases. Also inside the increasing share of the antigravity component - formatter. This leads to a decrease in the force of gravity and reduce revenues substance inside the hole. Black holes turn into a steady state.

The core of the Black Hole is antigravity White Hole

It is clear that as the black hole grows and its nucleus — white hole grows too. We can say that a black hole is a shell to hold the white hole. But there comes a time when the pressure is the black hole can not restrain the desire to expand the white hole - the system will inevitably explode. So that "the birth of the universe," not a rare process. An example is the statement by the Israeli astrophysicists Alon Retter and Heller Sholom that cause anomalous gamma-ray burst GRB 060614 at number recorded in 2006, it was a "white hole." GRB 060614 is located in the constellation of American Indian at a distance of more than half a million light-years from Earth. This outbreak was recorded June 14, 2006 several powerful telescopes. It was accompanied by an unprecedented duration of light effect, which allowed astronomers to measure the parameters and determine the coordinates of the object. The authors of the study called the flash as «Small explosion».

According to experts, the long gamma-ray bursts occur most often as a result of the collapse of massive stars that become black holes. The emergence of a short gamma-flash is the result of the merger of neutron stars or black holes and neutron stars, which leads to the formation of a new black hole. Recorded outbreak lasted 102 seconds, which should mean that it will end supernova explosion. But no supernova, which would be associated with GRB 060614, scientists have found. In addition, this area of the sky was not expected at all gamma-ray bursts, and new facilities. Therefore, the most probable is the idea of the expiration of the formatter from the black hole.

Formatter is supercompressed, superfluid, continuous (solid) continuum, the basis of our universe

Formatter is a holistic entity, which now include the following properties:

- continuum continuum;
- maximum possible energy density of the supercompressed state;
- maximum possible entropy at T = 0 K;
- antigravity (negative pressure, the desire to expand)
- superfluidity;
- critical pressure boil.

All views of the physical vacuum are quantum: a vacuum is composed of particles. Formatter is continuous and does not allow the quantum principle, even in the form of representation of an infinite set. It can not take anything, i.e. to increase its energy but only to give. It is not consist of anything and contains actually nothing but potentially all. It might include potentially all the different objects and phenomena of the universe. Formatter has no structure, there is no order. Recall that the order is less probable state of the system, and disorder are more likely. Formatter is the perfect chaos so it has the maximum possible entropy.

Since in formatter maintained high pressure, it tends to expand in all directions at each point, reducing the expansion of its energy density. Due to the property of superfluidity, this density is isotropic in the whole volume expansion. For the state formatter concepts of space, time and mass does not exist. Formatter rotation in the corners does not make sense - it is homogeneous. It has only one dimension - the radial in spherical coordinates, i.e. can only expand at each point. Since it has no parts, then there is no relative motion. Therefore, the «temperature» is always equal to the absolute zero.

Einstein believed that the universe must be in addition to gravity and cosmic forces of repulsion, which, after all, and do not allow the universe to contract under the influence of gravity. It is for this reason that Einstein introduced his gravitational field equations additional term Λ, which leads to a force that

has the desired properties. Only attract additional repulsion (antigravity) that allowed Einstein to create his model of a stationary universe. The above properties formatter describes Einstein's cosmological constant Λ.

At higher pressures, formatter is similar to the superheated liquid. It seeks to expand explosively. In the process of expansion the energy density and pressure decrease. At the critical pressure the liquid formatter "is boiling" with the formation of vortex fluctuations.

In this case two kinds of vortices are stable: small-scale vortices — neutralino particle and large-scale vortices — the future of the galaxy. With further expansion formatter simultaneously at each point of the Galaxy differ among themselves, forming a cellular structure.

In connection with the submission formatter as the fundamental substance of the universe should be clarified and philosophical definition of matter. In the basic properties formatter we did not mention the property of "movement". After all, before the Big Bang formatter was largely immobile. It had only the potential energy of compression. It should therefore be considered as the basic property of matter "energy" and not "move". For the "matter in motion" requires only the kinetic energy.

To describe the formatter as a continuum need a new theory that takes into account the phase transformations of matter and would include quantum mechanics as an integral part. The most important task of quantum mechanics then becomes a description of quantum fluctuations as engines of self-organization of matter.

After the Big Bang freed from compression formatter began rapidly expanding simultaneously in each point. This condition is described by the inflationary de Sitter - solving the equations of general relativity with a cosmological constant. In this case, the dynamics of the universe is determined only by the cosmological constant (i.e. properties formatter) and the contribution of cold matter and radiation are neglected («empty Universe»). It should be noted the high homogeneity and isotropy of the initial state of the expansion due to "superfluidity" of formatter. If Mega Black Hole had rotated, now in the universe must be a preferred axis of symmetry with respect to which are the elements of the structure. In any case, every point of space is a point explosion and a center of expansion.

At adiabatic expansion energy density and pressure of formatter decrease. In the late stages of inflation formatter entered the turbulent regime of "boiling" superheated liquid. In the whole volume of formatter simultaneously had right screw and left screw linear vortices. With frequent collisions of them had bented into a ring and remained in a stable condition. Forces that bent linear vortex in the ring, gave fluid velocity along the ring. Toroid vortices have to have two streams: toroid (along the small circle of the torus) and ring (along a great circle of the torus) rotation (Figure 1.8). Left screw vortices we call neutralinos (spin (-h/2)) and right screw vortices we call antineutralino (spin h/2).
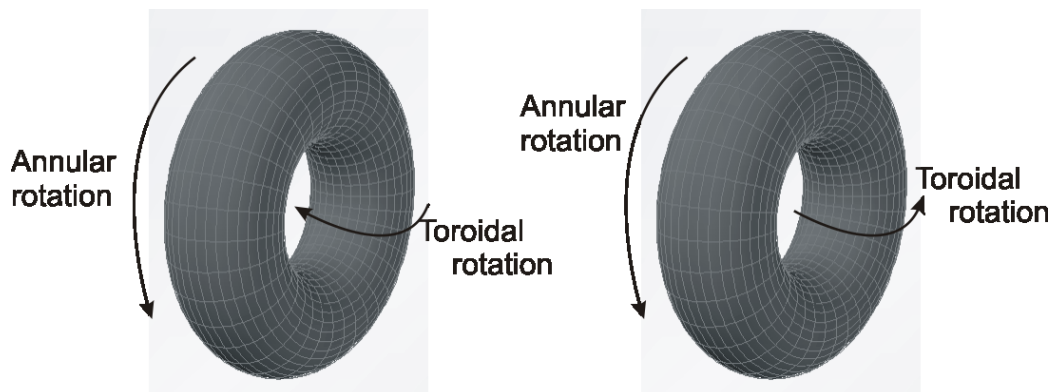

Figure 1.8. Scheme of neutralino (left) and antineytralino (right)

Mass as latent energy particles occurs during the formation of the primary vortex formatter. Toroid vortex ring can continuously move along the axis perpendicular to the plane of the vortex (Figure 1.8 - left). So it has no longitudinal mass. But the motion in the plane of the vortex ring will have transverse mass, i.e. transverse energy vortices. Thus a mass is the kinetic energy of toroid rotation at the «rest» when toroid is stop. This moving is hidden. Primary quanta of matter — the neutralino — can be considered the "Higgs boson", which are responsible for the generation of the masses of all particles of the field and matter. In the limit at the level of dark energy vortices must be characteristic parameters of the Planck mass, length and time, expressed in terms of the constants h, c, G:

$$m = \left(\frac{hc}{G}\right)^{\frac{1}{2}} = 2{,}2 \cdot 10^{-8} \text{kg}, \quad l = \left(\frac{hG}{c^3}\right)^{\frac{1}{2}} = 1{,}6 \cdot 10^{-35} \text{ m}, \quad t = \left(\frac{hG}{c^5}\right)^{\frac{1}{2}} = 5{,}3 \cdot 10^{-44} c.$$

Mass m is, of course, determines the measure of the energy vortex particles:

$$E = mc^2 = 2 \cdot 10^{-8} \cdot 9 \cdot 10^{16} = 1{,}8 \cdot 10^9 \text{J} = 1{,}125 \cdot 10^{22} Mev.$$

Length l characterizes the size of the fundamental vortex field and the time t - frequency of rotation: $\cong 2 \cdot 10^{43} \ Hz$. Note first that the angular momentum of the vortex is determined by the Planck formula

$$mcr = mc\frac{l}{2} = \frac{1}{2}\left(\frac{hc}{G}\right)^{\frac{1}{2}} c \left(\frac{hG}{c^5}\right)^{\frac{1}{2}} = \frac{h}{2}.$$

The standard model of the «Hot Universe» implies a high degree of homogeneity and isotropy of the universe. In the time interval from the Planck epoch $T_{Pl} = 10^{-43} c, \rho_{Pl} = 10^{93} \ g/sm^3$) before the era of recombination its behavior is determined by the equation states that are close to the following:

p = ε / 3, where p - pressure, ε - energy density.

The scale factor R (t) changed in this interval time according to R (t) ~ t ^ (1/2), and then, to the present, according to the law R (t) ~ t ^ (2/3), the corresponding equation states:

$p \ll \varepsilon = \rho c^2$, where ρ - the average density of the universe.

At present, an acceleration of the expansion of time, which gives an opportunity to speak about the inflationary expansion of the universe at the present stage of its evolution. This acceleration is due to relativistic neutralinos and photino among expanding formatter. Additional energy is supplied in the box by the reset of the field in the material.

In the process of pair interactions toroid vortex neutralino encountered, forming composite vortex particles. If neutralinos connected planes, obtained bosons, which we call "Fotino" (Figure 1.9). The spin of a pair neutralino in photino may be equal to 1, -1,0.
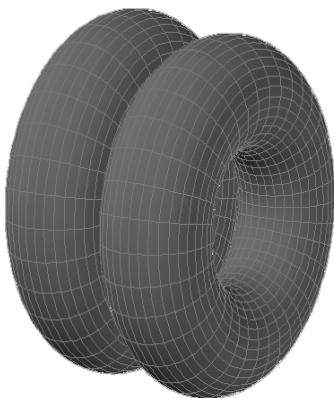

Figure 1.9. Scheme photino

Photino have zero longitudinal mass and non-zero transverse mass. Photino is super relativistic particles. As the neutralino, they are constantly moving steadily along. However, their rate is likely much higher than the speed of light.

Streams of photino and neutralino longer not possess superfluidity, they have a certain viscosity. High flows of neutralinos and photino forms with space-filling compressed formatter "dark energy" that is responsible for the expansion of our universe. The dark energy density is almost uniform throughout the entire Universe.

When connecting opposing bosons neutralinos created relativistic fermions "gravitons" (Figure 1.10). The spin of the graviton can be 1/2 or -1 / 2. They have a longitudinal mass, and their transverse mass is zero. The motion of gravitons is the speed of light on a tangent at the junction of the rings.
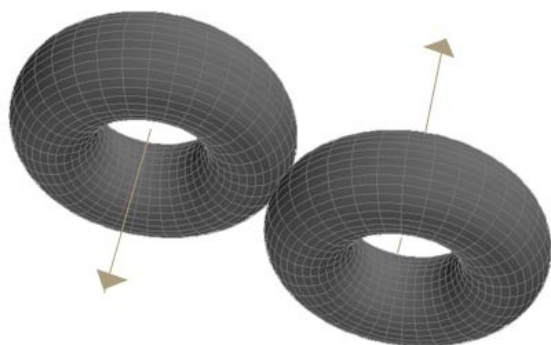

Figure 1.10. Scheme graviton

Gravitons are gravitationally unstable particles. Within a short time after its inception, they formed heterogeneity as voluminous fragments with increased density, location of future galaxies. With further expansion formatter size of fragments held by the gravity, and the distance between the fragments increased. Today, the entire environment of relativistic gravitons we call "Dark Matter" or "Electromagnetic Field".

Perhaps there is another mechanism of formation of inhomogeneities of dark matter. At the time of «boiling» formatter and forming gravitons existed not only fine-grained vortices, but also large-scale turbulence, which led to the formation of "graviton galaxies."

Neutralino, photino and gravitons are type SWIMPs (SuperWeakly Interacting Massive Particles) - a new class of non-baryonic cold dark matter. They are of an extremely weak interaction with matter and light, and a large mass (energy).

Energy is the only universal for all levels of the value that is stored in all inter conversion. The energy values of the field eluded measurement. This is due to a fundamental fact that all physical interactions occurs only difference in energy of physical systems at different times or in different points in space. Gravity only «feels» the energy itself, not the difference. Therefore, for the discovery of dark energy and dark matter are served whole observable Universe. Its levels of the field was dominated by the value of the energy density and produced by gravitational effects.

In the extremely high density of relativistic flow environment gravitons behave as a superheated liquid. With the rapid expansion of formatter fluid flow becomes turbulent. Large Reynolds number was due to a high density, high speed and low dynamic viscosity flow. Graviton fluid «boil» with the formation of the whole volume of the medium and sets linear vortex flows. Some of these vortices acquire a resistance, withdrawn into the ring. Such circular formations of gravitons we now call the neutrino.

Neutrino is the toroid vortex stream of the gravitons

Since neutrinos begin to form the substance of neutrinos through the formation of composite particles.

1.4. Energy levels and extra dimensions

To describe the material objects of the universe in space and time is necessary, first of all, to clarify the concepts of space and time, which are always at the quantum level indivisible unity.

Space

At levels of scalar fields can not enter a three-dimensional system of coordinates and time. Who has ever found himself in a very dense fog on the sea; he would agree that the concept of direction (left and right, forward and backward) is meaningless in this environment, and the very same time «stops». For reference position in space needed guidance. To count time intervals needed corresponding event.

Absolute space, empty mathematical space itself, as a distinct physical entity, does not exist. The space is not a repository of matter in motion. Inane does not in nature, all the phenomena occurring in the material medium. From the point of view of a relativistic concept the «space» expresses the set of relations in the movement and interaction of real physical objects. Space is a manifestation of the extent of the matter due to its movement. But the space is characterized by measurements (coordinates). If there are no measurements, that is just the length.

Space occurs after the formation of vortices in the continuum formatter. Environment microvortices field contains three varieties: the neutralino, photino, gravitons. In a separate vortex can distinguish its linear movement and angular rotation. But due to the identity and the small size of the vortices in any linear direction of macro-field isotropic. Three-dimensional coordinates of the linear system becomes for us a physical sense only on a real stage of the matter. Only here there are guidelines for us to set up and coordinate reference line.

Emerging three-dimensional measurement of a substance is containing a hidden old field measurements. In this new unit of measurement scale increases so that the actions of the new measurements are characterized by a "continuum" of the old measurements. For us, water is a continuous medium, although we do know is that it is composed of discrete molecules. The substance collects in eddies stellar galaxies just as gravitons formed vortices neutrinos. If the field of view of the observer would be a galactic scale, our earthly dimension would be for him hidden.

Time

In the physical space the events due to «short-range». But then, in each small volume of the medium can be seen a series of successive events of different durations. Turnover events associated in our minds with the final rate impacts over time. Abstracting from the observations of specific phenomena, we can introduce the concept of continuous-time uniform. But we do not observe the time itself, as long as allowed and turnover effects. As a distinct physical entity, the time does not exist. Objective repeatability phenomena and give the impression of a continuous turnover of the «flow of time». Time is continuous, empty time does not happen.

Time is not a repository of events is the "distance" between events. Time reflects the sequence and duration of movements of matter, its energy state. Time shows that actually exist in the nature of physical processes. From the theory of relativity, time can be different for different bodies, i.e. physical

systems can have different proper time and that their ability to depend on how these bodies act gravity and the speed with which they move. Time has only two main features: its direction and pace. Pointedness «arrow of time» due to the physical entity of origin of time, i.e. causal sequence of interactions of the elements of matter. The pace of own time due to power saturation elements of matter, the density of the internal energy.

The pace of time knowable universe is different in different cosmological epochs and steadily slowed down in the course of its evolution. The energy density and the rate of evolution of the universe in the past era were significantly higher than in the modern era.

The pace own time of formatter at the Big Bang was very high. Big Bang began from inflation, increased the size of white hole to a critical size, at which the possibility of the formation of vortices comes. We can assume that the Big Bang, i.e. during inflation, in homogeneous and isotropic expansion formatter for domestic observer's virtually events are absent. Therefore, the rate of expansion during inflation was extremely high.

Events occur only after the formation of vortices, when a structure of matter has emerged. It is then possible to separate one from the other element of matter and distinguish the event with every single vortex. However all events with micro vortices field for macro observer are equally chaotic because macro observer averages all events. Proper times of massive vortex of dark energy and dark matter are $\sim 10^{-43}$ s. Therefore, they are minimized, hidden from macro observer, whatever it may be the perfect tools used for their detection.

Only in the state of matter observer can compare the different events taking place simultaneously with the material elements. Therefore, at this stage only takes time for us to physical meaning and requires the introduction of a temporary coordinate for its measurement.

Kaluza-Klein theory and the electromagnetic field

Since the establishment of the general theory of relativity theorists continuously work hard to consider the laws of gravity and electricity from a general point of view. In 1919, Theodor Kaluza proposed the idea that electromagnetism is a kind of «gravity» but not normal, and the «gravity» in unobserved dimensions in space. Kaluza introduced into Einstein's equations of general relativity fifth minimized (unobservable) measurement in a cylindrical (angle) coordinates. He suggested that this measurement is in the form of an infinitely thin rings of very small radius is present at each point in space, and we observed that it is responsible for electromagnetic phenomena (Figure 1.11).
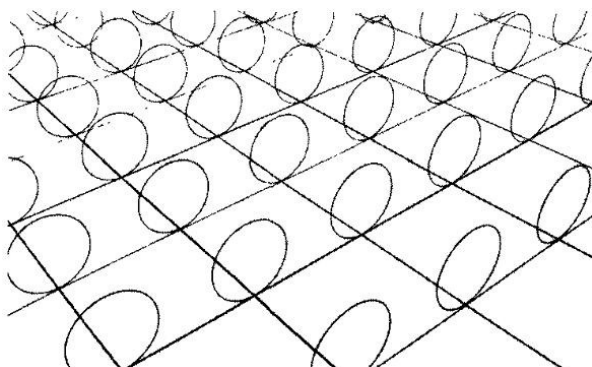

Figure 1.11. Cylindrical measuring Kaluza

Kaluza once received not only the gravitational equations, but Maxwell's equations. It turns out that the 4 position (three spatial and time) describe the gravity and the fifth coiled cylindrical space coordinate describes the electromagnetic phenomena. Moreover, if the same equations are obtained and the

gravitational and electromagnetic relations, the conclusion can be only one: they have the same physical mechanism of implementation.

The main idea of Kaluza was going from a 4-dimensional Riemannian geometry, the 5-dimensional, when the square of the interval is represented as:

$$ds^2 = G_{AB}dx^A dx^B \quad (A, B = 0,1,2,3,5).$$

The components of the 5-dimensional metric tensor G_{AB} quadratic form matrix that has 15 different components:

$$G_{AB} = \begin{matrix} G_{00} & G_{01} & G_{02} & G_{03} & G_{05} \\ G_{10} & G_{11} & G_{12} & G_{13} & G_{15} \\ G_{20} & G_{21} & G_{22} & G_{23} & G_{25} \\ G_{30} & G_{31} & G_{32} & G_{33} & G_{35} \\ G_{50} & G_{51} & G_{52} & G_{53} & G_{55} \end{matrix} = \begin{matrix} G_{\mu\nu} & G_{\mu 5} \\ G_{5\nu} & G_{55} \end{matrix} \Rightarrow \begin{matrix} g_{\mu\nu} & A_\mu \\ A_\nu & G_{55} \end{matrix}.$$

Then the 5-dimensional action can be written as:

$$S \sim - \int R^{(5)} \sqrt{-G} \, d^5x = -\frac{1}{k} \int \sqrt{-g} \, R^{(4)} \, d^{(4)}x - \frac{1}{4} \int F_{\mu\nu} F^{\mu\nu} \sqrt{-g} \, d^{(4)}x.$$

It is postulated that the components G_{AB} not depend on the fifth coordinate (cylindricity condition). Then ten components of the 4-dimensional metric tensor indices correspond g_μν Einstein gravity theory, and four additional components G_{5A} Kaluza proposed to identify the components of the electromagnetic vector potential

$$A_\alpha = \frac{c^2}{2\sqrt{G}} G_{5\alpha}$$

Here, c - speed of light, G - Newton's gravitational constant and α = 0,1,2,3.

Geodesic equations become:

$$\frac{d^2 x^A}{dl^2} = -\Gamma^A_{BC} \frac{dx^B}{dl} \frac{dx^C}{dl}.$$

Generalized five-dimensional Einstein equations can be written as:

$$^5R_{AB} - \frac{1}{2}G_{AB}\, ^5R = \chi Q_{AB},$$

where χ = constant.

It turns out that fifteen 5-dimensional Einstein equations split into a system of ten ordinary four-dimensional Einstein equations, the four equations of Maxwell and another equation for the scalar field.

To eliminate the 15-th equation, except the condition cylindricity, sufficient to require:

$$G_{55} = -1.$$

Sign «-» is taken from those considerations that the coordinate x^5 is space-like (for the desired character to the energy-momentum).

Four from five-dimensional equations of geodesic lines coincide with the known 4-dimensional equations of motion of a charged particle in the gravitational and electromagnetic fields, if we assume that the fifth component of the 5-dimensional velocity represents the ratio of the electric charge q of the particle to its mass m:

$$\frac{dx^5}{ds} = -\frac{2}{\sqrt{G}} \frac{q}{m},$$

and the fifth component of the momentum takes the meaning of the charge

17

$$p^5 = m \frac{dx^5}{ds} = -2 \ \overline{G} \ q.$$

Additional 5th geodesic equation becomes a condition of constant ratio of the electric charge of a particle to its mass:

$$\frac{d}{ds} \ \frac{q}{m} = 0 \ \Rightarrow \ \frac{q}{m} = const.$$

Known in electrodynamics the gauge transformation of the electromagnetic potential:

$$A'_\alpha \rightarrow A_\alpha + \frac{\partial f}{\partial x^\alpha}$$

is due to the transformations of the 5–th position:

$$x'^5 = f \ x^0, x^1, x^2, x^3 \ .$$

Thus, Kaluza extended Minkowski space to 5-dimensional space, showing the unity of electricity and gravitation. The source of gauge theories is the multidimensional theory of general relativity. Additional cylindrical (angular) measurement of very compact. It has a very small size of the space of loops and therefore unobservable. According to Klein calculations, these dimensions are 10^{-32} meters. But measured is the coordinate motion.

Consequently, the general theory of relativity claims that our three-dimensional space of matter and radiation immersed in the fine invisible quanta of electromagnetic field with angular rotation. That angular rotation interacts with the environment gravitons. Toroid rotation due to the inherent characteristics of the gravitons. In particular, it provides a constant movement of the speed of light along the axis and the transverse mass.

Extra dimensions in string theory

It is interesting to compare the representation of the birth of the universe with the results of the superstring theory. This family of five theories, leading to similar physical results. Superstring theory is one of the constructions TAT ("Theory of All Things"), which are designed to combine large and small - the general theory of relativity and quantum mechanics.

According to string theory, the universe is composed of tiny strings, which can fluctuate like a guitar string. Sounds, which publishes the string excitation (e.g. pinch), determined by its tension and size. Frequency resonant oscillations determines the pitch. Known particles interpreted as different modes of vibration single string. The frequency of each mode is determined by the energy, mass, charge particles and coupling constants of the elementary particles. Due to the existence of vibrational modes corresponding to a massless spin-2 graviton, gravity is an integral part of this theory. To avoid meaningless probabilities, the theory requires nine spatial dimensions, which can vary string 3 extended spatial, one time and another 6 folded (unobservable) dimensions.

Superstring theory or the theory that links all versions (called M-theory) is considering extended objects of a number of spatial dimensions and requires ten spatial dimensions. Extensive three-dimensional objects are called 3-branes, extended four-dimensional — 4-branes, and so on up to 9-branes. In Figure 1.12 shows an example with two additional dimensions, folded in the shape of a torus. These extra dimensions are present at each point in space described by our conventional extended measurements. Duality in string theory reflects the above multilevel discrete states of matter.

In this work the vortex model is implemented, namely the case doubles extra dimensions. Vortices are known to exist in the environment only as a closed ring structures (vectors). Each torus is measured along the axis and two circular (angular) measurements: a ring rotation around the axis of the torus and

the toroid rotation along the small circles. But thanks to the axial symmetry around the axis of rotation has no physical meaning. Therefore, we believe that the toroid particles have two dimensions only.
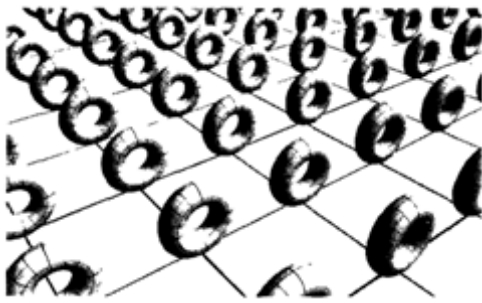

Figure 1.12. Folded extra dimensional measurement (torus)

Measurement is those degrees of freedom, which has a selection of primary formatter in these components of the structure. For example, ring vortices neutralino axisymmetric and can be described in two dimensions. A graviton (Figure 1.10) requires a description of the three dimensions: it is the neutralino two rings rotate around a common axis. Formatter has one dimension — it can only expand. So for a visual simulation of the expansion at each point of the space inside the torus (Figure 1.12) it is nessesary to place the sphere (Figure 1.13). In general the extra dimensions in string theory describes the multi-dimensional Calabi-Yau manifolds.
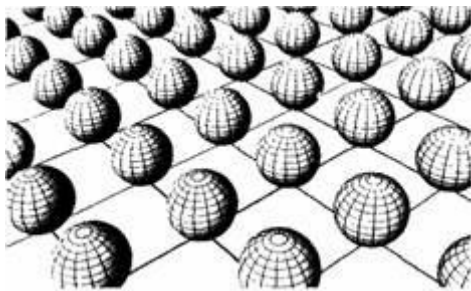
Figure 1.13. Folded measuring of expanding formatter

When the string moves and oscillates during its movement the geometry of extra dimensions plays a crucial role in determining the resonant oscillation modes. This modes manifest the masses and charges of elementary particles. Therefore, the fundamental properties of the universe is largely determined by the size and shape of the extra dimensions.
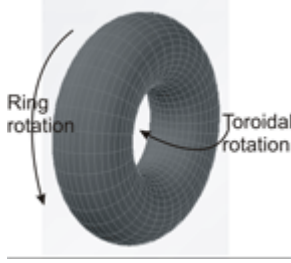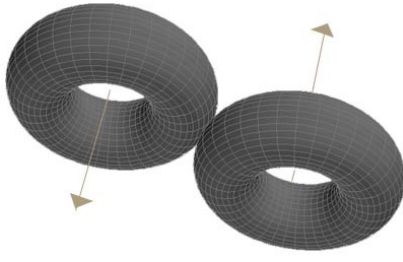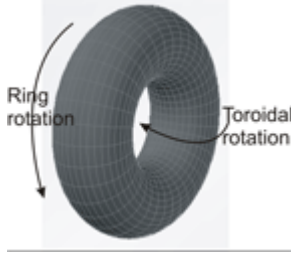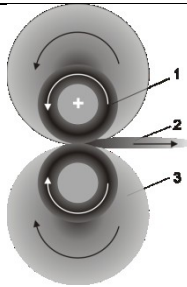
Superstring theory has not achieved its purpose of becoming a «theory of everything» because of the lack of a physical model. Identification of additional folded spatial dimensions is not treated as invested in extensive measurement, i.e. given structure. String object is unstructured, like a classical point elementary particles. Multi-dimensional branes as real objects can not be taken seriously. A further interpretation of the measurements as a "way out in another universe" refers to science fiction. The theory does not address additional temporary measurements. And of course the particles in the form of strings in nature does not exist.

Cycle of matter in nature

Additional folded spatial and temporal dimensions are directly related to energy levels that determine the development of matter. Hidden dimensions indicate the direction of "depth"; define the structure of the particles of matter. It's just the scale factors of composite systems. If our field of view occupied an area of the galaxy, the measurements would be folded earth coordinates. In fact, the gravitons have dimensions of the order of the Planck scale ($\sim 10^{-35}$ m). They form eddies neutrinos (size $\sim 10^{-15}$ m),

neutrinos are produced macro material (size ~ 1 m), the material collected in the eddies of the galaxy (the size of our Galaxy ~ 10^{20} m).

As a concrete example, we show that the electron has 11 dimensions. Its structure will be discussed later, but for now let us just say that it is the configuration of the graviton with the replacement of the neutralino to neutrino. Hidden time measurements are not considered. As usual, as it will mark a small volume formatter and trace his movements in sub-structural elements.

Level	Object	Scheme	Number of measurements
Formatter	Formatter		1
Field	Neutralino		2
	Graviton		1
Microparticles	Neutrinos		2
	Electron		1
Macro material	The spacial coordinates		3
	Time		1
		Total:	11

Level approach presupposes the unity of the physical laws at all levels. The basic essence of discrete objects on nested levels does not change, and differ only in the structure of the phenomenon. Fine swirl gravitons, space-filling level of the electromagnetic field, we often will be viewed as a continuous

viscous compressible fluid. This fluid contains local vortices — particles. Part of the vortices are connected. There are more complex body structures that retain vortex parameters.

> ## Substance formed as planets, stars and galaxies - just a small, visible part of the matter

Most of the matter in the form fields are not given to us in experience, even though it surrounds us on all sides. The real world is radically different from the visible world. Matter in the universe is about 4.4%, dark matter accounts for ~ 23% of all matter. The share of higher levels (Dark energy and formatter) has ~ 72.6% of matter in the universe.

Levels of dark energy the universe is striving to expand due to its negative pressure. Levels of dark matter and substances provide the gravitational contraction of the universe. The difference in density between the dark matter and dark energy are not very high. Now, however, we observe the acceleration of scattered galaxies. This means that the modern era is a shift from the predominance of the forces of dark matter and matter to the predominance of the forces of dark energy.

We have no reason to believe our universe as unique. Obviously, these objects are endless. World is like a lather of continuum formatter with flaring or collapsing bubbles of separate universes.

What is the future of our universe? Now the expansion of the universe is due to consumption of energy of formatter, accumulated during the collapse of matter before the Big Bang. Resetting of the field into a substance can support high speed expansion. When the head of the field of our universe weakens, matter and the nearby universe with a higher density will squeeze our formatter, passing some of its energy. Gradually the Galaxy will be collected into a black holes, until a giant-sized Mega Hole. The core of the black hole will again be in the form of a white hole, filled super compressed formatter. There will come a time when the pressure of the compressed volume formatter exceed the ambient pressure — you will hear a new Big Bang in the form of inflation of the formatter. The whole story will be again in a new way. Thus is the cycle of matter in nature (Figure 1.14). And you and I are members of this great cycle.
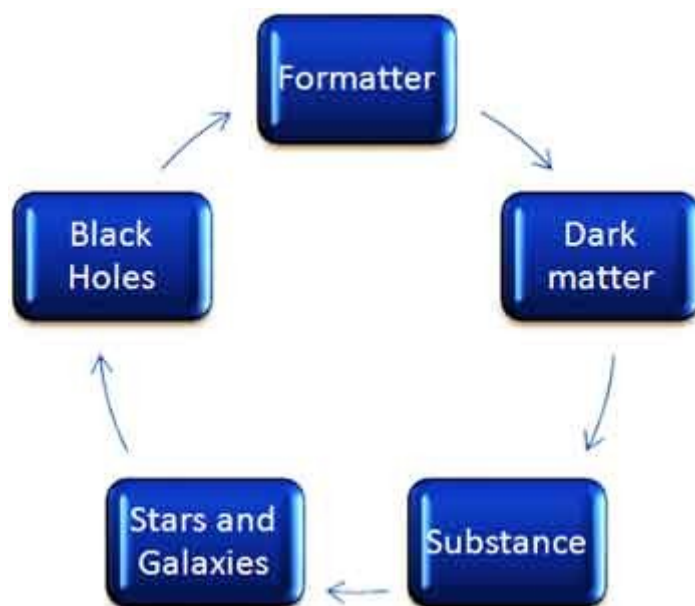

Figure 1.14. Cycle of matter in the Universe

The formation of the universe happened by a dissipative of energy and a reduction of entropy. The creation of life is just a continuation of inorganic nature, the increase of the order. Nature has evolved

from unstructured formatter — absolute chaos — to highly organized human brain with its 10^{11} neurons connected. Motor of matter self-organization is a random quantum fluctuations. Positive feedback reinforces and magnifies a part of them, secured by expanding formatter, or due to the dissipation of binding energy.

Disclosure of interaction levels essence is currently great interest in cosmology and to address energy issues. Let us note that the thermodynamic, thermal equilibrium between distant levels may not be due to the inability of their interaction. Interact with each other can only objects nearest levels with similar parameters of sizes and power. The interaction energy of the particles at the atomic and molecular level is ~ (0.1-1) eV. The interaction energy of the electrons with the nucleus of the atom ~ (1-100) eV. In the nuclei of atoms, the binding energy reaches 10 MeV. In forming the proton binding energy is 100 MeV. Often, even within one level the "temperature" of objects is various or the components parts of the objects have the high order motion. In that case heat exchange is not possible. So talking about the possibility of equalization of the "temperature" of all objects, i.e. of the heat death of the universe as a whole, there is no reason.

Thus, the basic form of existence of matter is in the form of vortices. Therefore, before analyzing the specific material objects, consider the general properties of the vortices.

1.5. Basic properties of the vortex

Filled with a wide cylindrical vessel of finite height (Figure 1.15), dropping liquid. If it is to unleash, we get rotational motion.

Figure 1.15. The change in the linear velocity of the vortex

Central cylindrical column of a certain thickness — core or core of the vortex — rotates as a solid body around its axis. The rest mass of the fluid — coupled layer — revolves around the nucleus. The linear speed in the layer decreases in the direction of the axis of the vortex as 1/r. For points of liquids far away from the core velocity is inversely proportional to the cubes of the distance from the nucleus $1/r^3$.

Similarly twisted vortices in environment gravitons. Area attached layer outside of the vortex core is, of course, an integral part of this vortex. But we will call only a compact core particle — the high-speed part of the positive velocity gradient. Extended outside of the negative velocity gradient is called an «attached layer environment gravitons». In this case, the vortices can be considered as a solid «body», surrounded by the attached «own field». This view is traditional. For example: the flow of "hard" electrons and their accompanying electric and magnetic fields, "solid" stars and planets, and accompanying gravitational field. Actually, these fields are an integral parts of the objects.

Let us remember, however, that gravitons layer around the particles is not the capture of particles of the environment by rotating solid. The Earth does not move through the "fixed ether", creating the

effect of "ether wind". The Earth is not "carries away" the ether. The surrounding boundary layer of gravitons is an integral part of the object "Earth". The light and radio waves spread in this layer. The radius of the layer determines the "curvature of space" created by the gravitating mass of the Earth.

The vortices are characterized by two main parameters:

1. Voltage or the intensity of the vortex w. It is a multiplication area of the normal section of the central column of the vortex on its angular velocity.

2. Velocity circulation along a closed contour Г. It is a multiplication of the length of the contour on the average speed of all components of the velocity contour points.

Assuming that the radius of the central column is equal r_0, we obtain:

$$2w = 2\pi r_0^2 \omega = 2\pi r_0 v = \Gamma.$$

Theorems of Helmholtz about vortices in an ideal fluid:

1. Vortex line always consists of the same particles.
2. The velocity circulation of the vortex filament is constant for all sections.
3. Vortex line must either confine them or end at the boundaries of the liquid.

If the ends of the vortex line do not lie on the boundaries of the liquid, then they should be closed to each other. All the fluid particles that lie outside the ring are moving at the same time on the closed curves passing through the ring. The velocity circulation rate for all these curves is the same and equal to the velocity circulation along the contour of the cross section of the ring. Maximum velocity of the particles is on the surface of the ring.

Element of vortex line dl calls at each environmental point M the speed determined by the formula Biot-Savart:

$$dv = \frac{\Gamma}{4\pi} \frac{dl \sin(dl, r)}{r^2} \quad \text{or} \quad d\vec{v} = \frac{\Gamma}{4\pi} \frac{[\vec{dl}\vec{r}]}{r^3},$$

where dl — element of the vortex line, $d\vec{v}$ — the velocity caused by this element at the point M of the environment, r — the distance from the element to the point M, Г — circulation along a contour enclosing the vortex line (figure 1.16).

Vector $d\vec{v}$ lies in the plane perpendicular to the element $d\vec{l}$. It is directed at a tangent to the circle, which is conducted through the point M and has a center on axis, which is a continuation of $d\vec{l}$.

For the rectilinear segment of the vortex line the speed at the point M caused them is determined by the formula:

$$v = \frac{\Gamma}{4\pi r}(\cos a - \cos b),$$

where a and b are the angles, as shown in Figure 1.16.

If the vortex is straightforward and extends to infinity in both directions, that caused them to speed equal $v = \Gamma/2\pi r$ Note that here the word "vortex" we use in a broader sense than the above. Namely, a vortex means any configuration of fluid flow with closed streamlines. The circulation velocity in the vortex of closed contours is not equal to zero. In other words, the vortex velocity has not potential.
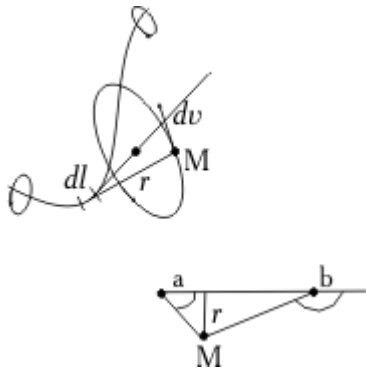
Figure 1.16. Scheme of determining the speed *dv*, caused in the point M by element of vortex line *dl*

If you have a variety of vortex field sites there is a general mechanism of interaction between them. Attraction, repulsion and merging of particles to create a new structure are determined by those velocities, which vortices cause in their environment. The vortices interact with each other only at the distance at which the rotation of the surrounding environment can be perturbed to enthrall other bodies. If the zone of rotation of the attached vortex layer gets a second wind, it revolves around the first vortex. The same is true for the second vortex (Figure 1.17). This is not a movement of one body by impact or friction forces from the other body. This motion of the medium — as if the chip came on stream in the whirlpool.

Newton's Second Law states that the change of quantity of motion is proportional to the driving force and is in the direction of the line in which that force acts. The motion of rapidly rotating vortices is not subject to this law: the movement of the vortex axis is not determined by the direction of force but moment of external forces. A vortex moves perpendicular to the current force.

If two vortices are equal in magnitude but opposite sign of intensity, they inform each other of equal value and equally directed velocities, i.e. moving steadily (Figure 1.7 a). Two of the vortex with the same magnitude and sign of the intensity revolve around an axis through the middle of the distance between them (Figure 1.17 b).
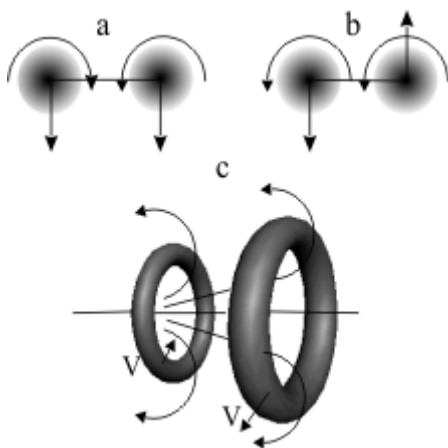

Figure 1.17. The interaction of vortex rings

Suppose that two identical vortex rings have a common axis (Figure 1.17 c). Then the front ring (due to the velocity defined by the rear ring) increases in diameter and is slowing. Back ring is compressed and accelerated. As a result, the rear ring passes through the front ring, and all over again ("Game of vortex rings").

Suppose that the toroid vortex, shown in Figure 1.18, operates the external force F directed to the left. Then it seeks to shift the centers of circular streamlines the left. But here the rotating liquid is directed down the left side of the ring and up in the right side of the ring. Therefore, under the force the axis of the torus will be rolled out counterclockwise.
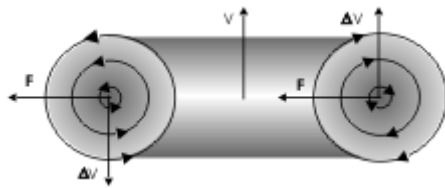

Figure 1.18. Rotating vortex ring under the force

Suppose that force F applied perpendicular to the vortex ring (Figure 1.19). It pushes up the axis of the two vortices. But here the rotating fluid particles move in opposite directions: the left part of the ring in the left and the right side of the ring — in the right. Therefore, the ring will stretch, i.e. move perpendicular to the applied force. The diameter of the ring at the same time increases. If the force would be directed downward, the size of the ring must be reduced. Thus, the impact on the vortex some force, we obtain the displacement under the action of this force is not the vector of force, and in the direction perpendicular to it.
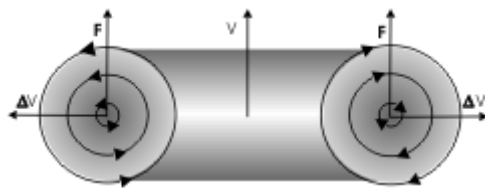

Figure 1.19. Stretching of a vortical ring

Once again, we list the basic properties of linear vortices:

1. Uniform and rectilinear motion of the vortex occurs only when action on it of another vortex of the same intensity in opposite directions. Exposure is not caused by acceleration and speed.
2. Under the influence of external torques the axis of a rapidly vortex rotates in a different plane, in which she turned to without rapid rotation, and in the plane perpendicular to it. The motion of the axis at a constant torque is not accelerated, but with a constant angular velocity and lasts only as long as the external torque. Once terminate external torque, immediately cease and the motion axis.
3. Vortices interact like elastic body, but pass each other does not impulse, and the angular momentum of precessional motion.
4. The attached layer of the vortex of the vortex environment carries over to its other vortices, which it deployed. The offset center of mass of other vortices causes them to move in the direction perpendicular to the shift — on the linear speed of fluid in the new center of mass.
5. The ring vortex in the medium moves steadily along its axis in the direction of flow through the central hole.
6. Vortices in the interaction does not perform the work and do not show inertia.

The vortex ring can not remain immobile. It will move in the direction perpendicular to the plane of the ring in the direction in which the fluid flows from the ring. This movement will be faster, the greater the intensity of the vortex and the smaller size of the ring. The ring will move uniformly, moving to a whole swirling around the liquid.

Ring vortex can be compared with bagel which turns out self. It has its own "propeller" in the form of toroid rotation. The attached layer adheres to free gravitons. In this vortex graviton does not resist compression and shear. Offset gravitons is perpendicular to the current force, i.e. work force is zero. In other words, the body moves in the vortex environment without "friction". This applies to photons and to the planets of the same.

The motion of the vortex in the field can compare with how we walk on the ground. The ground pushes back with our foot, and the friction of rest our feet on the ground push us forward. Closest analogue would also be movement of a wheeled or tracked vehicle. His outer part of the whirlwind like "rolling" on the outer tubular layer coupled with a field (figure 1.20).
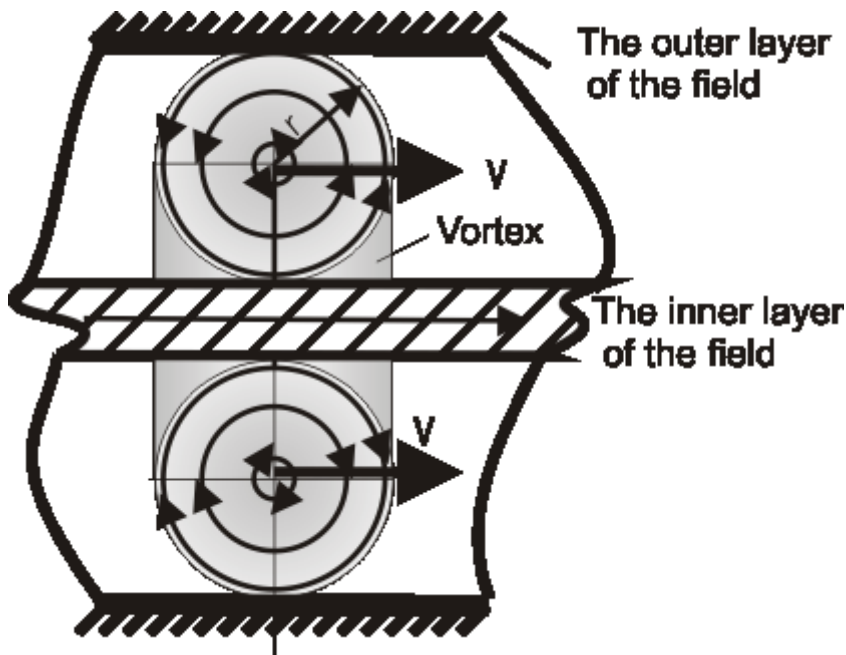

Figure 1.20. The motion of a toroid vortex in the viscous-pipe

The condition of translational movement is the viscosity of the medium. Frequent assertion of the motion of massless micro particles (neutrinos and photons) as "unsupported" is not justified. The vortices repel particles from the surrounding viscous fluid vortex gravitons.

When the motion of the vortex momentum continues the outer layer of the field dropped back, and the inner layer of the field is thrown forward. A similar picture we have in passing man in a boat from the bow to the stern. Concerning the water the boat goes right, and people goes to the left. Center of mass remains in place. Here, instead of the boat is the field, but instead of man is a whirlwind. Work at this not taking place.