# Electromagnetic Gravity. Part 1. The formation of fields and substances. Particle structure

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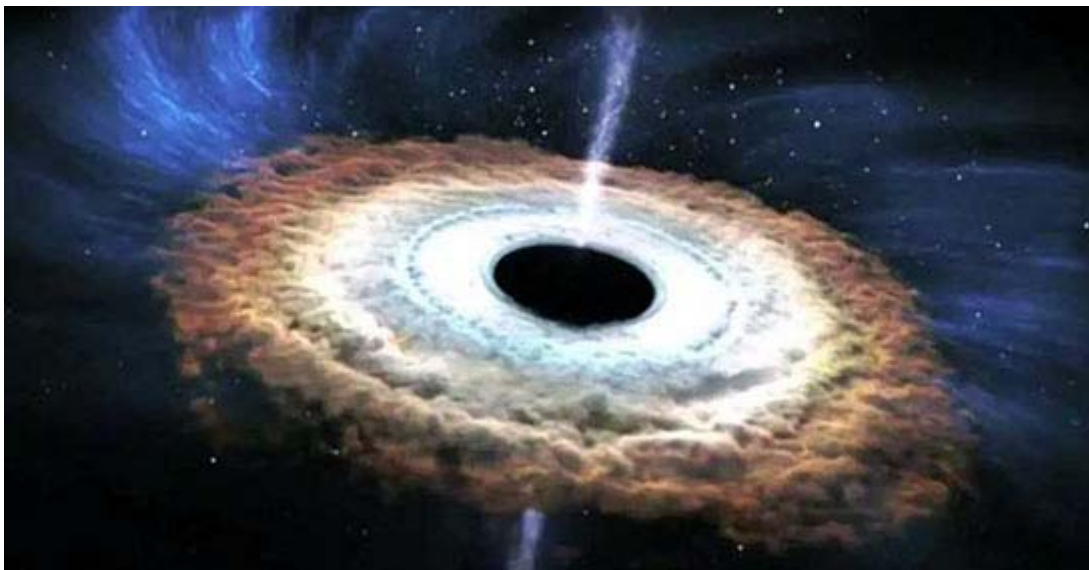Project  The Nature of Gravity View project

Project  What are photons? View project

Valeriy Pakulin

# ELECTROMAGNETIC

# GRAVITY

## Part 1

## The formation of fields and substances

## Particle structure

Modern physics is difficult to understand. The abstract concepts used there are devoid of a sense of nature. Therefore, we try in vain to adjust them to the usual scheme of ideas based on logic and common sense. We have a deep psychological need to reduce all the phenomena of the world to simple, concrete and understandable images. They have nothing-irreplaceable dignity — visibility. To understand an object or a phenomenon is to create its mental image in our imagination.

The three parts of the book "Electromagnetic Gravity" are three steps into a new physics, to the visual model of the unity of the world. We tried to overcome the heavy inertia of formalism.  We tried the impossible to make possible.

Three general hypotheses are the basis of the first part of the book:

1. *We live in a multidimensional world. Three fundamental phase states of matter — the Pre-matter, the Electromagnetic Field, and Substances — fill all the space. Black Holes carry out phase transitions.*

2. *Pre-matter and Electromagnetic Field we call "Dark Energy". Electromagnetic Field is vortex thickenings of Pre-matter. Neutrinos and Halo of galaxies are vortex thickenings of the Electromagnetic Field. Galo galaxies we call "Dark Matter".*

3. *Neutrinos and antineutrinos formed the remaining particles. All particles rotate in order not to merge under the action of gravity. All particles have dimensions and mass. The number of neutrinos determines the type the particles.*

The first part of the book shows the hypothetical process of formation of the field and substances from the Pre-matter at the Big Bang. We are trying to understand how and why, with the help of which mechanisms from the chaos of the no equilibrium state of matter, high-order structures of the micro and Mega world arise.

The book first describes the visual representation of the structure, mass, charge and magnetic moment of the particles. We are reviving the visual model of the "Neutrino Theory of Light" by Louis de Broglie. The vortex model explains the nature of the wave-particle duality of photons.

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CONTENT

## Introduction

All new technologies we can implement only in accordance with the laws of nature. An understanding of these laws is a prerequisite for any practical activity. *Phenomena* show the *essence* of the laws. Most studies in physics are devoted to the study of phenomena only. We establish formal relations between the output Y and the input X parameters of the system. The essence of the system itself often remains a thing in the "*black box*".
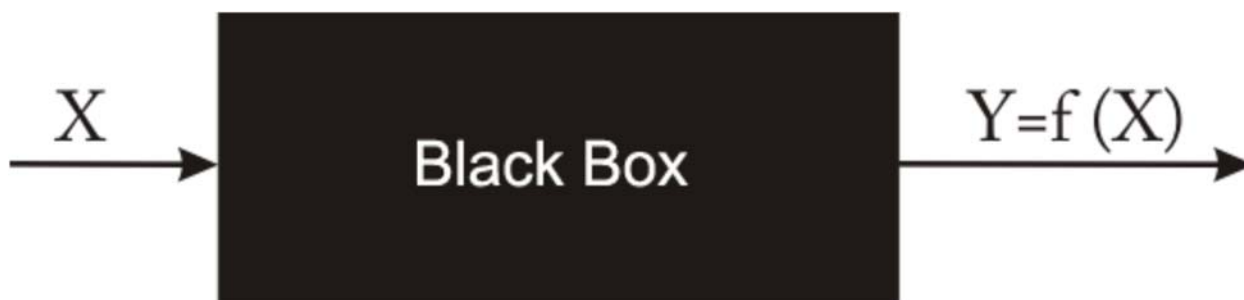


As a rule, for the purposes of practical use of the phenomenon of the formula Y = f (X) is quite sufficient. We practice using the laws of Newton, Ampere, Coulomb, and Faraday every day. However, we do not go beyond the boundaries of familiar physics to name the reasons for the existence of these laws. We see boundaries where our ignorance begins. What can a fish say about land if it has been swimming in water all its life?

The relationship between essence and phenomenon reflects the process of *modeling*. The lack of a *model*, i.e. knowledge or ideas about the nature of the system after some time begins to reduce the efficiency of the use of the phenomenon and inhibit the development.

The successes of classical mechanics gave hope to understand all physical phenomena through *mechanical concepts*. The concept is the ideal mental image of the object of reality. The coincidence of the concept with the object is the *truth*. The greatest physicists of the past centuries claimed that they did not understand the phenomenon until they built its mechanical model. The statement is a summary of the scientific worldview of an entire era. However, model representations suffered a catastrophe with the penetration of the electromagnetic phenomena into the scientific world.

We live in the world of things. Moreover, the *electromagnetic field* is the environment for a substance. That is the only field of Faraday and Maxwell, the existence of which we feel every time we bring a mobile phone to our ear. The field turns the motors and lights the bulbs. However, our senses do not provide us with direct information about the nature of the electromagnetic field. Therefore, in the system of mental concepts of the world around us, we must include not only visible things, but also an *invisible* object — the field.

The development of modern physical theory does not bind itself to model representations. Of course, mathematics plays a crucial role in physics. However, mathematics remains for physics only an instrument. The object of the mathematical description is a physical image. The essential difference between classical and modern physics is not in the mathematical description, but in the difference between the physical images themselves. In this sense, the new physics remains just as model, as the old physics.

However, the models of modern physics differ from the models of classical physics in that they are not visual and contradictory. Theorists argue, for example, that the micro world is significantly different from the macro world. However, to describe the properties of the micro world is possible only in the macroscopic concepts that are familiar to us. Therefore, often the properties of micro-objects appear incompatible when they endow with macro-objects. For example, the property of an electron to manifest itself as a *particle* in a photoelectric effect and a *wave* in a double-slit experiment. Here, until now, no one has been able to offer a consistent visual model. Everything just formally said not to break his head over it. Then the contradictions of wave-particle duality did not embarrass anyone. Although theorists' refusal of visual models is very similar to the fox's refusal of unripe grapes.

Over the past 400 years of development, physics alternately replaced each other in the era of a rational-physical (model) and formal-mathematical method of describing the world.
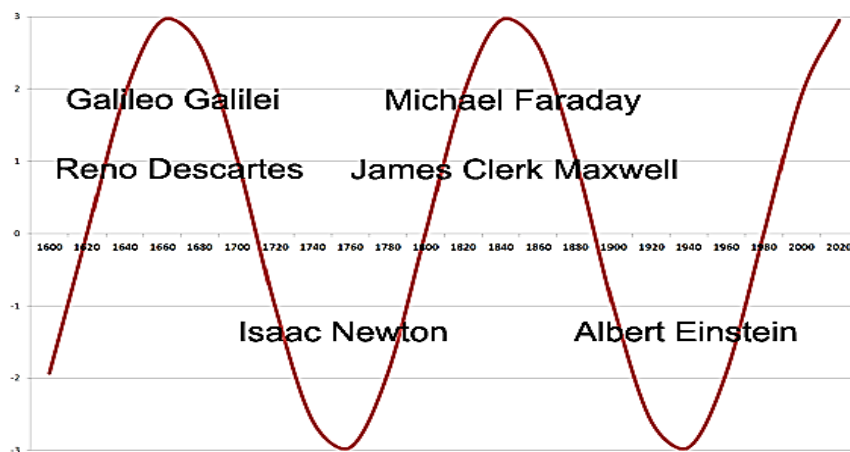


Today, formal methods of describing phenomena have exhausted themselves. Therefore, it is necessary to move from the tradition of axiomatization to a visual model description, to logic, to common sense. We must swim against the stream to the sources, return to JK Maxwell, JJ Thomson, Lord Kelvin and Louis de Broglie. Above all, it is necessary to realize the role of the electromagnetic field as *our environment*. The study of its structure and its place in the picture of the world is relevant. Modern physics in general does

not set as its goal the study of the nature of fields. The electromagnetic field is not in the parameters of the Standard Model.

When building a New Physics, it is necessary to abandon outdated models. The standard model considers that the elementary particles are point and structure less. However, these "points" have a mass, charge, spin, magnetic moment. All material objects must have a shape and a finite size. We need to return to the definitions of the basic concepts of mass and charge, taking into account the surrounding particle of the medium. It is necessary to abandon the status of massless particles, particles-carriers of interactions and the concept of attraction as an inherent property of mass.

A new reality is the need to take into account the multidimensionality of the world - the existence of matter in several phases. Today we distinguish the phases of Pre-matter, Electromagnetic Field and Substance. It is necessary to abandon the substances whose existence we cannot prove experimentally: the ether, the physical vacuum with virtual particles and numerous "fields" with carriers of interactions. The electromagnetic field completely fulfills the role of ether.

Several fundamental principles — the laws of the vortex motion of the flow of the field — generate a huge variety of physical phenomena of nature. Nature is fractal. All phenomena in their deep essence are similar and act in a similar way on any energy level. Neutrinos arose like micro vortexes in the field. The field formed from neutrinos particles, atoms, molecules, crystals. We see a similar picture in the Mega world. The "Dark Matter" halo originated as Mega vortexes in the field. The field formed galaxies in halo, which merged into clusters, superclusters, and cellular structures. The external environment provides all the fundamental interactions between particles.

The book opens the page of New Physics, in which the basis of the study of the essence of the phenomenon lies in physical models. Identifying the dominant role of the electromagnetic field in physical phenomena is the answer to the dictates of time. We need new ideas that would ensure progressive development for the years ahead. We need a solid base for practical applications.

# 1. The formation of fields and substances

The problem of the origin of the field and matter is one of the most difficult unsolved problems of physics. The vortex model assumes that the field and matter are phase states of matter that arose after the Big Bang.

## 1.1. White Holes

In the centers of quasars and most galaxies are located rotating large *Black Holes*. A Black Hole is an area from which nothing can get out. The speed of escape from the Black Hole is equal to the speed of light. In our Milky Way galaxy, the mass of the central Black Hole is about 4 million solar masses, and the Schwarzschild gravitational radius exceeds 12 million kilometers. The radius of the Black Hole is about 180 million kilometers.

The force of attraction of mass m in the gravitational field of mass M in the general theory of relativity

$$F = G \frac{Mm}{R^2 \sqrt{1 - \frac{2GM}{c^2 R}}},$$

where G — gravitational constant, c — the speed of light in the void. With $R = r_g = \frac{2GM}{c^2}$ (Schwarzschild gravitational radius) the expression for force F becomes infinitely large.

When R < $r_g$ the compression should become infinite, and the object should be pressed to a point (singularity). However, Black Holes have finite dimensions. Collapse stops due to opposing nuclear pressure.

Inside the Black Hole, tremendous pressure destroys any existing field particle and substance structures. A jump-like phase transition of a substance into a relatively unstructured state - Pre-matter takes place. The Black Hole forms inside a super-compressed core — the White Hole. Nothing can enter in this area. You can say that the Black Hole is just a shell to hold the White Hole (Figure 1.1). You can simply call the Hole "Black and White" [1].

The unity of opposites is a property of the structure of natural objects. Dynamic equilibrium is a condition of stability. There is an automatic limitation of the size of Black Holes. With increasing sizes, the gravitational mass tends to squeeze the Black Hole more strongly. The increase in internal pressure leads to an increase in the proportion of the White hole. However, this implies a decrease in the gravitational mass and the attraction ability of the Black Hole. The Black Hole goes into a steady state.

Gravitational mass disappears in the over-compressed White Hole. It turns into a mass of anti-gravity Pre-matter. The true mass (amount of matter) remains unchanged. The gravitational mass of Black Holes is less than the gravitational mass of the substance it had

swallowed. There is a significant decrease in the gravitational mass of the universe during the formation of large Black Holes.
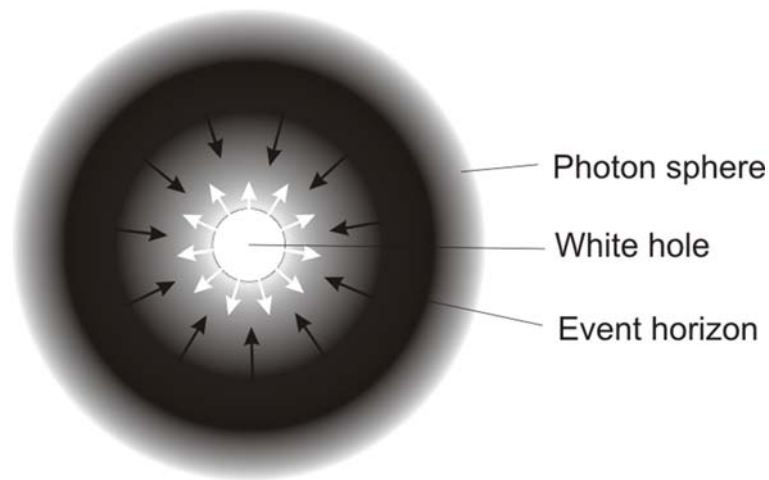


Figure 1.1. Black Hole Structure

We observe several options for the further development of Black Holes. First, part of the Black Holes is inactive and is in a steady state. Secondly, there may come a moment when the pressure of the Black Hole will not be able to restrain the desire to expand the White Hole - the system explodes. Thirdly, we observe the stabilization of the state due to the release of excess pressure through a safety valve — the emission of super-relativistic jets of Pre-matter.

| The Black Hole creates an antigravity White Hole inside |
|---|

An example of the second option is the anomalous gamma flash number GRB 060614, recorded by several powerful telescopes on June 14, 2006. GRB 060614 was located in the Indian constellation at a distance of more than one and a half million light years from Earth. Astronomers observed light effects of unprecedented duration, which made it possible to measure parameters and determine the coordinates of an object. The fixed flash lasted 102 seconds, which should have meant that it would end with a supernova explosion. However, no supernova scientists have found. They called the flash "Small explosion".

## 1.2. Jets

Every tenth of the known rotating Black Holes emits superrelativistic jets through the poles in opposite directions. The presence of jet emissions is a characteristic feature of many astronomical objects. There are emissions from the newly formed very massive stars and stars that are at the stage of collapse. Objects formed after the collapse — neutron stars and Black Holes, as well as active galactic nuclei — quasars and blazars — also emit jets.

Figure 1.2 (left) is a photograph of a small Black Hole (GX 339-4 dual system), made in infrared rays by a Hubble satellite. The accretion disk surrounding the hole is clearly visible, as well as the donor star, the substance of which flows into the Black Hole.
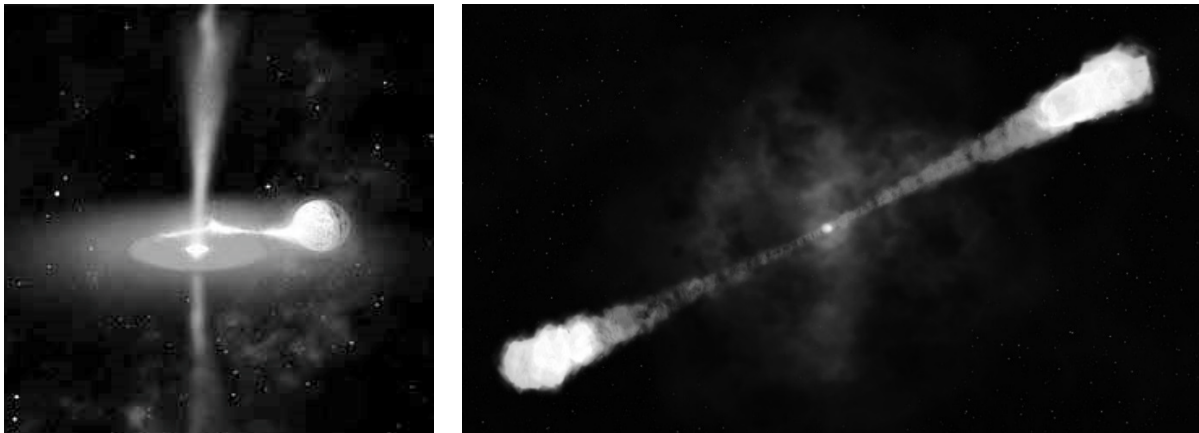


Figure 1.2. Black Hole Jets

The breakthrough of super relativistic jets in the poles of the Black Hole reveals the presence of tremendous counter-pressure of anti-gravity Pre-matter. Narrow jets of Pre-matter leave from under the event horizon with superluminal speed. As in the injection pump, they carry along a wide layer of the surrounding medium. Jets retain intensity at a distance of thousands of light years.

The brightest gamma-flash occurred on April 27, 2013 in the constellation of Leo because of the supernova explosion GRB130427A. At the site of the explosion, a black hole formed with two extremely powerful bright jets (Figure 1.2, right). The energy of gamma particles was about 95 GeV. The flash lasted 20 hours. The light went to the Earth 3.8 billion years.

*We can call jets "Small Bangs"*

The discovery of super relativistic jets shows that inside supermassive objects, under the action of a gravitational collapse, matter passes into another phase state — the antigravity material. The Kaluza-Klein theory and the theory of superstrings reflect the structure of such a phase transition.

### 1.3. Additional rolled measurements

We live in a multidimensional material world, boundless in time and space. The Kaluza-Klein theory revealed the presence of additional folded vortex measurements in nature.

These measurements are present at every point in the space described by our usual extended measurements. Superstring theory claims that there are 7 additional dimensions in the world (branes) that show the form of motion of matter at a deeper level.

Collapse additional measurements can be different. For example, we can roll a two-dimensional surface into closed structures: either the surface of a sphere or the surface of a torus (Figure 1.3). Their sizes can be extremely small. However, they differ significantly in their topology.
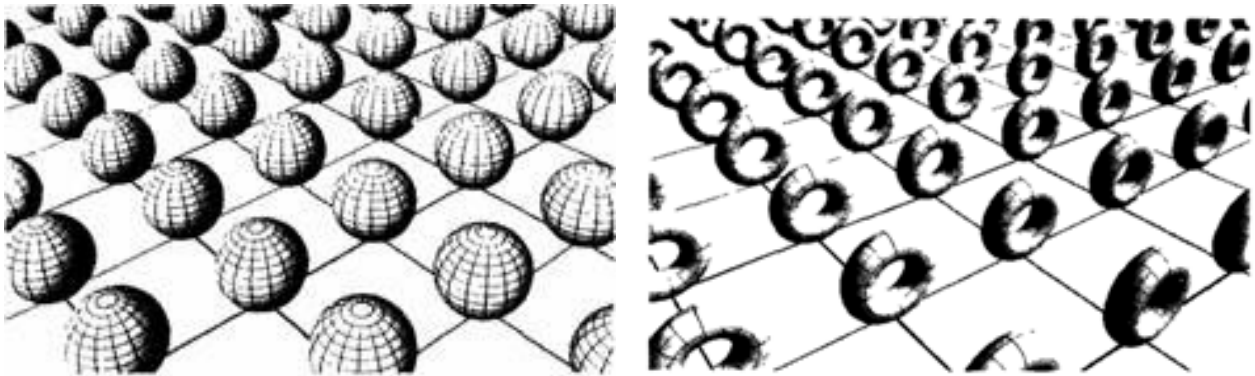


Figure 1.3. Collapsed extra dimensions

We assume that the form of the Pre-matter quanta is a sphere. The feature of these spherical quanta is that they can only reduce or only magnify their radius [2]. The shape of the torus (Helmholtz ring vortices) are matter quanta at the level of the electromagnetic field. At each point of the space we observe, a closed field flow rotates around a circle of small radius (toroidal rotation) and simultaneously rotates around the axis of the torus (ring rotation). Clay estimated the dimensions of the vortex in $\sim 10^{-32}$ m.

> *Additional measurements describe the phase states of matter*

### 1.4. Pre-matter

The contents of the White Hole — Pre-matter — is a holistic object. It has the following basic properties [3]:
— temperature 0 K (no relative movement of particles);
— maximum entropy and maximum energy density;
— antigravity (drive for expansion);
— superfluidity (lack of internal resistance during expansion);
— the presence of a critical pressure transition from laminar to turbulent (vortex) expansion mode.

Matter divides deep into infinity. The structure of the Pre-matter has a much smaller scale than the existing substance and field. The quanta of Pre-matter are the spheres shown in Figure 1.3. The internal discrete components of these spheres have great energy and, therefore, the Pre-matter seeks to expand in all directions *in each of its points*, reducing the density of its energy during expansion. It is possible that the surfaces of spheres under the influence of internal forces may be bent and adjoin each other. Therefore, it is possible conditionally to consider Pre-matter as a continuous medium.

> Pre-matter is a superfluid substance with maximal entropy, which tends to expand

At this stage of consideration, we assume that the Pre-matter does not actually contain anything. Potentially, it contains all the variety of objects and phenomena of the universe. Pre-matter as a whole has no structure, there is no order in it. Therefore, Pre-matter has the greatest possible entropy, it is an ideal chaos. Due to the property of super fluidity, the density is isotropic in the entire volume occupied. Pre-matter moves without friction, has zero temperature and does not participate in energy transfer in the form of heat.

For the state of the Pre-matter, the concepts of space, time and mass do not exist. Rotation of the Pre-matter in the corners also does not make sense — it is homogeneous. Since the Pre-matter has no constituent parts, there is no relative movement in it. Therefore, its temperature is always equal to absolute zero. Experimental evidence of the existence of Pre-matter is the continuous expansion of the visible Universe.

### 1.5. Field formation

At high pressures, Pre-matter is similar to the superheated liquid. In the Big Bang, the White Hole Pre-matter began to expand explosively. During the inflationary expansion, the energy density and pressure decreased. Reaching the critical pressure expansion turned into a turbulent regime. Liquid Pre-matter "bubbled" with the formation of vortex fluctuations. Right and left linear vortices appeared simultaneously in the entire Formatter volume.

With frequent collisions, part of vortices had bent into rings, and remained in a stable condition. Forces that are bent linear vortices in rings attached fluid velocity along the ring. Vortices had toroidal (along the small circle of the torus) and ring (along the great circle of the torus) rotation

Vortexes grouped together to form a combination of two, three, and four rings (Figure 1.4). The spins of these particles are equal to 1/2, 1, 3/2, 2, respectively. Due to the toroidal

rotation, the vortices constantly move in the medium of Pre-matter. The speed of their trans-lational motion is equal to the speed of light.

In composite structures, vortices continuously pass through each other, simultaneously rotating around an axis. We now call the left-handed vortices called *gravitons*, and the right-handed vortices called *anti-gravitons*. The totality of all the vortices that fill the space, we call the *electromagnetic field*.

The inertial mass is equal to the latent energy of the rest of the particle $E_o = mc^2$. It arises in the formation of graviton vortexes from the primary Pre-matter. The toroidal vortex ring moves freely along an axis in the direction perpendicular to the plane of the vortex at the speed of light. Therefore, it does not have longitudinal inertia. However, when moving in the plane of the vortex ring will have transverse inertia. When considering the transverse motion, the rest energy of the vortices is equal to the kinetic energy of the toroidal rotation.

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*Primary quanta of matter — the gravitons — are the elements that responsible for the formation of the masses of all particles.*
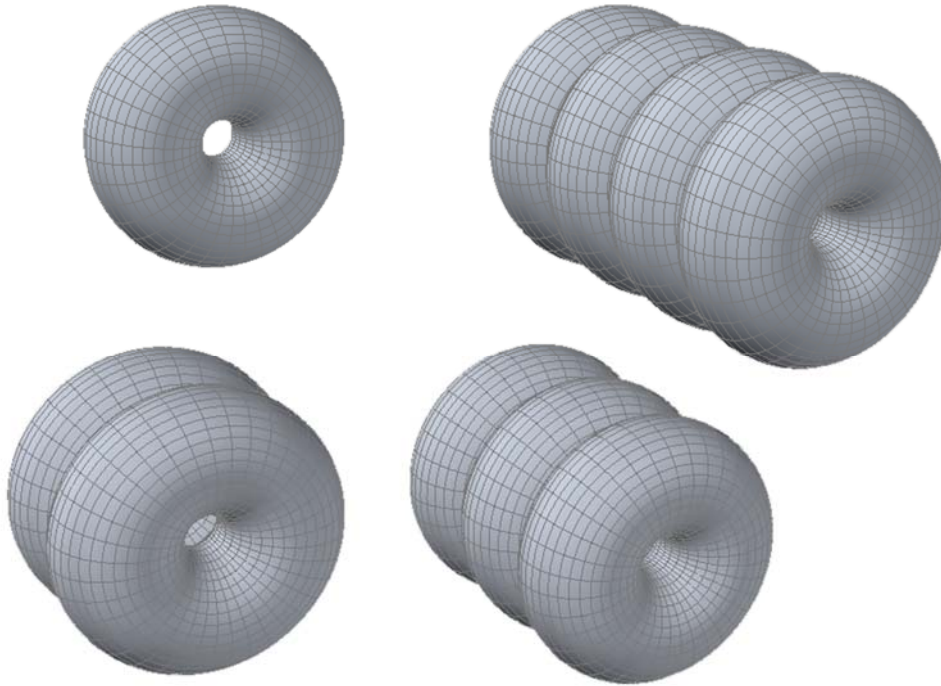
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Figure 1.4. Graviton family diagram

Average graviton density is $\varepsilon_o$ [kg/m$^3$]. The average "thermal" speed is equal to the speed of light, which creates pressure $p_o$. Let the average temperature of the medium be T = 2.7 [K], and the graviton mass $m_{gr}$. Then the pressure of the medium of the electromagnetic field $p_o$ we can estimate from the relations:

$$\frac{m_{gr}c^2}{2} = \frac{3}{2}kT; \qquad m_{gr} = \frac{3kT}{c^2} = \frac{3 \cdot 1{,}38 \cdot 10^{-23} \cdot 2.7}{9 \cdot 10^{16}} = 1.25{\cdot}10^{-39}[kg];$$

$$p_o = nkT = \frac{\varepsilon_o}{m_{gr}}kT = \frac{\varepsilon_o{\cdot}c^2}{3kT}kT = \frac{\varepsilon_o{\cdot}c^2}{3} = \frac{8.85{\cdot}10^{-12}{\cdot}9{\cdot}10^{16}}{3} == 2.65 \cdot 10^5 \left[\frac{N}{m^2}\right] \approx 2.65[atm].$$

The random motion of gravitons at the speed of light creates this pressure. Due to the pressure, the gas of the graviton field tends to expand. Primary matter together with the electromagnetic field push galaxies apart.

| Dark Energy = Pre-matter + Electromagnetic Field |
|---|

The expansion of the Pre-matter can be compared with the super fluidity of liquid helium II below the lambda point (T = 2.172 K). The first phase transition of the part of the conditionally unstructured superfluid Pre-matter to the vortex field sharply reduced the rate of explosive expansion of the Pre-matter. A further sharp slowdown in the rate of expansion occurred due to the second phase transition — the formation of a substance.

## 1.6. Substance formation

With further expansion of the Pre-matter, the fine (vortex size of 10–32 m) graviton component also entered the turbulent vortexes formation regime. Vortex substances formed in the field. This process was similar to the phase transition of a part of the Pre-matter into the field vortices. As is well known, only toroidal vortices with either minimal or maximal angular momenta are stable when moving in a medium. Therefore, most of the vortices quickly disintegrated. Only the largest and smallest vortexes of the substance have survived.

Large-scale toroidal vortices are three-dimensional fragments of the "halo" — the locations of future galaxies. Into these gravitational wells, all substances further flowed, forming massive Black holes with galaxies around them. Today, we call the totality of large-scale relativistic vortexes of gravitons (halo of galaxies) "Dark matter" [4].

Vortex halos and galaxies interacted with each other, forming clusters, superclusters, and cellular structures — an analogue of macroscopic crystalline structures. With the further expansion of Pre-matter, the gravity forces of galaxies kept the sizes of galaxies, and the distances between galaxies increased due to the expansion of the medium of Pre-matter. Filaments and voids formed.

| Dark Matter is vortices of the electromagnetic field |
|---|

Small-scale stable graviton vortices formed neutrinos and antineutrinos. It is the only truly elementary particles of matter (Figure 1.5 on the left). We identify the left-handed graviton vortex ring with the electron neutrino, and the right-handed graviton ring with the electron antineutrino. These particles are asymmetric. According to the law of conservation of

momentum, they arise in pairs. They cannot annihilate because of their asymmetry. This structure of the neutrino underlies the law of conservation of combined parity.

Experience shows the quantization of the micro world. It is due to the discreteness of the angular momentum. The fundamental type of motion of the elements of the micro world is rotation. Matter realizes itself in the form of vortex particles of various energies and sizes and their conglomerates. The rotation of the vortex in the environment is stable at the minimum or at the maximum value of the angular momentum. It defines a quantum of energy.
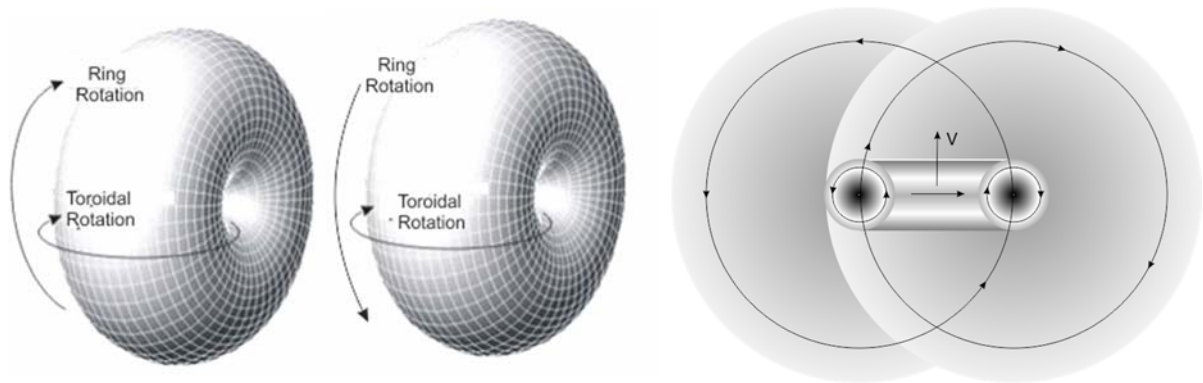


Figure 1.5. Neutrino and antineutrino ring vortices (left) and the vortex toroidal rotation scheme (right)

The moment of impulse of the toroidal rotation closes itself. Neutrinos cannot waste latent internal energy when interacting with other objects. The guarantee of particle stability is the closure of the moment. Toroidal rotation maintains a constant translational motion of a free circular vortex of neutrinos in a viscous medium of gravitons.

The electromagnetic field pushed the neutrinos to each other, forming composite particles. The combination of two neutrinos is photon. The combination of three neutrinos formed a muon neutrino. A muon neutrino consists of two neutrinos and one antineutrino. A muon antineutrino consists of one neutrino and two antineutrinos. Further, these particles formed quarks, muons and mesons.

Figure 1.5 (right) shows a section of a torus rotating in a medium. The left vortex rotates counterclockwise. It carries along the boundary layer of the field environment. At the location of the right vortex, this flow flows upwards. The right vortex rotates clockwise. It forms a stream of the medium at the location of the axis of the left vortex upwards. The left vortex moves up the right, and the right vortex moves up the left. The speed of light is the average "thermal" speed of the gravitons. Therefore, the speed of neutrinos in "thermal" equilibrium with the field medium is also equal to the speed of light.

Rotation is the main type of movement of particles of dispersed matter at all levels. Rotational movement is fundamental. Only rotation can store more energy in a small volume. Ring rotation with frequency ω determines the angular momentum M and the neutrino energy hω/2. In the ground state, the minimum (intrinsic) angular momentum (spin) is h/2. When excited, the frequency of the ring rotation ω increases. The energy range of particles can be quite wide.

The direction of translational motion and ring rotation forms the left-handed system of the neutrino and the right-handed system of the antineutrino. Neutrinos have a (-1/2), i.e. spin is directed against the direction of movement. The antineutrino helicity is 1/2.

Neutrinos and antineutrinos are the transmission link in the chain of levels of evolution of matter. Only a part of the Pre-matter passed into gravitons, and then into neutrinos. If we could reduce the field of view to the neutrino scale, then we would see them as rare dark dots on a continuous bright background of the "environment".

## 1.7. Scheme hierarchical levels

Figure 1.6 shows a diagram of the hierarchical energy levels of the organization of matter in our Universe [5].
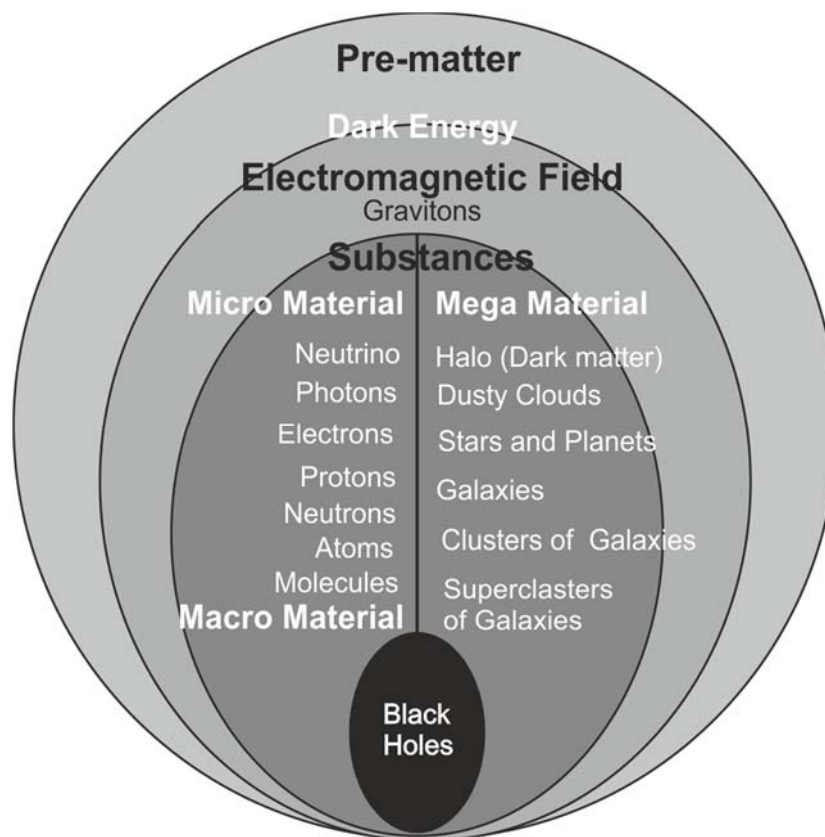


Figure 1.6. Hierarchical levels of matter

We can observe three nested levels: Pre-matter, electromagnetic field and substance. Levels differ in energy. The highest energy density was at the level of the Pre-matter at the time of the Big Bang. The properties of the Pre-matter provide an explosive expansion of the Universe in the Big Bang and an expansion now. Pre-matter does not interact directly with the substance. However, we can observe the expiration of the Pre-matter in the form of jets from Black Holes.

A field is a medium for a micro substance. Field vortices have become fundamental elements for the smallest structures of matter. Vortex particles in the field (neutrino) can only rotate. Everything else makes the field. The field pushes the particles towards each other and keeps these structures from decay. The streams adjacent to the particle fields determine the particle characteristics (charge, magnetic moment, etc.) and their interaction with each other. The field is a light-carrying environment: photons of light move in it.

The field is a medium for Mega substances. Field vortices became the basis for the largest structures of matter. Vortex-halo rotate galaxies and interact with each other. Figure 1.7 on the left shows "vortex in vortex" in the double star system GG tau-a: gas and dust flow from a massive external vortex releases in the internal vortex of the system [6]. In the picture on the right, we see a ring galaxy with a Black Hole in the center. The outer part of the rotating halo holds all the stars in the torus.



Figure 1.7. Cosmic vortices of the electromagnetic field

In the environment of the electromagnetic field, various disturbances can propagate. Radio galaxies are the most powerful sources of radio waves. Radio galaxies emit graviton fluxes. Giant elliptical galaxy Swan-A is the brightest space radio source. In this galaxy, the energy of radio waves prevails over the energy of optical radiation. It is 700 light years from Earth. In the center of the galaxy are two Black Holes. One of them radiates jets. The radiating regions extend 300,000 light-years on either side of the nucleus along the same axis

(figure 1.8). Until recent observations, the second black hole was invisible, since it did not throw jets of matter. This means that, relatively recently, Swan-A collided with another galaxy and the supermassive Black Holes still did not have time to merge.



Figure 1.8. Galaxy Swan-A in the radio and optical bands

Fantasies about additional dimensions as transitions along wormholes to other worlds have no justifications. Additional measurements are experimentally detected nested media of various dispersity, filling the entire space.

Finely divided Pre-matter (2 dimensions) is a medium for vortex quanta of the electromagnetic field (2 dimensions). The field is a medium for neutrino-particles (2 measurements). There are 6 additional measurements. Fragments of a substance have 4 dimensions: 3 spatial and 1 temporary. The whole body has 10 dimensions.

Additional collapsed spatial dimensions indicate the direction "inwards" of matter. They determine the structure and size of matter particles at energy levels. If the field of our vision occupied the area of the Galaxy, then the earth coordinates would be convoluted measurements. In fact, gravitons have dimensions of the order of Planck ($\sim 10^{-32}$ m). They form neutrino vortices (size $\sim 10^{-15}$ m), neutrinos form macro substance (size $\sim 1$ m), the substance gathers in the vortices of the Galaxy (size of our Galaxy $\sim 10^{20}$ m).

## 1.8. The circulation of matter in nature

Mystical ideas about the singularity and the emergence of the Universe out of nothing - they do not explain anything. The universe is infinite in time and in space. The matter of the universe is divisible to infinity. We are mortal and we cannot even imagine infinity. If the

universe has boundaries, then what is behind these boundaries? If the universe has a beginning, then what was before the beginning?

The cyclical of the dynamic processes occurring in nature ensures the eternity of the Universe. The development is a spiral. Objects that have passed their life cycle must "die". Instead, nature must "give birth" to new structures. Black Holes are such "time machines". In the Present, they absorb the Past to transform it into the Future. Black Holes carry out the circulation of matter. They grind the old stars into the dust of the Pre-matter.

The Big Bang of the Mega Black Hole gave rise to our universe. However, the process of converting the mass of a substance into the Pre-matter and back into the substance continues even now. Black Holes are the centers of most galaxies. Inside the Black Hole, there is a huge amount of anti-gravity Pre-matter, which is comparable to the mass of stars in the galaxy. The Pre-matter breaks through the shell of the Black Hole in the form of intense super relativistic jets. Quasars emit especially powerful jets. The length of their jets reaches millions of light years. At the same time, the power of the radiated energy of quasars is on average $10^{10}$ times higher than the power of our Sun.

The substance formed as planets, stars and galaxies are only a small, visible part of the matter. Most of the matter in the form fields we cannot feel in sensation, though it surrounds us on all sides. The real world is radically different from the visible world. Substance in the Universe is ~ 4.4%, Dark Matter is ~ 23% of all matter. The share of the higher levels accounted for 72.6% of matter.

Levels of Dark Energy are seeking to expand the Universe. Levels of Dark Matter and substances provide the gravitational contraction of the Universe. The difference in density between Dark Matter and Dark Energy is not very large. However, now there is the acceleration of the removal of galaxies. This means that the modern era is a shift from the predominance of the forces of Dark Matter and substance to the predominance of the forces of Dark Energy.

We have no reason to believe our universe like unique. Obviously, there is an infinite number of such objects. The world is like soapsuds of a continuum Pre-matter with flaring or collapsing bubbles of separate universes.

What happened before the Big Bang? Obviously, the same thing that we see around us now. What is the future of our Universe? Now the expansion of our universe is due to energy consumption of Pre-matter accumulated in the collapse of matter before the Big Bang. Reset of the field into a substance allows maintaining a high rate of expansion. When the pressure of the field of our Universe will weaken, matter and the nearby universe with higher density will compress it, passing it a part of their energy. Slowly the Galaxy will be

collected in the Black Holes that will form by the collapse a giant size Mega Hole. The core of this Black Hole will again be as White Hole filled super compressed Pre-matter. The pressure of compressed volume exceed the ambient pressure. There will be a rebound and we will hear a new Big Bang in the form of inflation of Pre-matter — the whole story will be again in a new way. Therefore, the cycle of matter in nature implements (Figure 1.7). You and I are members of this Great Cycle.
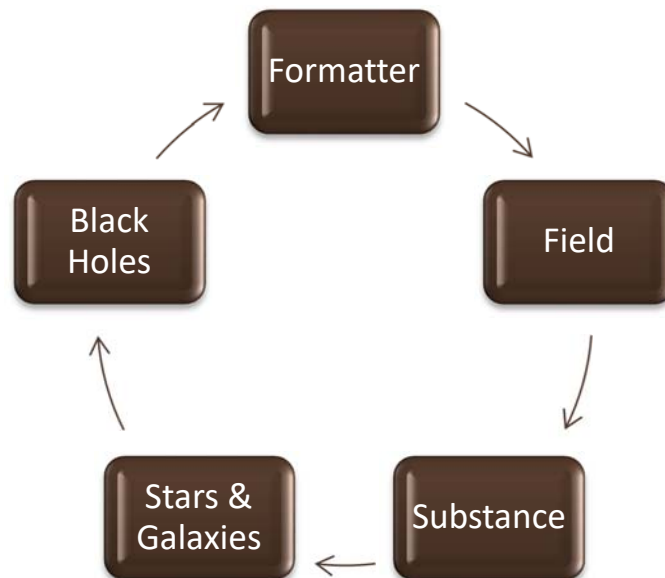


Figure 1.7. The circulation of matter in Nature

The formation of the universe happened by dissipative through energy dissipation and the decrease in entropy. Creating life is just a continuation of the lifeless nature, the increase of the order. Nature have evolved from unstructured Pre-matter — absolute chaos — to highly organize human brain with its $10^{11}$ neurons, interconnected. Self-organization of matter engine is random quantum fluctuations. Expanding Pre-matter, either the energy dissipation provide positive feedback, fixing and amplifying some of them.

Disclosure of the level interactions is currently of great interest for cosmology and for solving energy problems. We note immediately that the thermodynamic, thermal equilibrium between distant levels cannot be due to the inability of their interactions. To interact with each other can only objects of nearest levels with similar size and energy of quanta. The interaction energy of the particles at the atomic and molecular level is ~ (0.1-1) eV. The energy of interaction of the electrons with the nucleus of atoms ~ (1-100) eV. In the nuclei of atoms, binding energy reaches values of 10 MeV. In forming the proton, binding energy is ~100 MeV.

Often, even within the levels there is the own "temperature" or "frequency" of each object and its "heat exchange" is impossible because of the high traffic ordering of parts constituting the object. Therefore, to talk about the possibility of leveling the "temperature" of all objects, i.e. heat death of the Universe as a whole, there is no reason.

## Brief conclusions

1. Matter is infinite in length, in duration and in divisibility. The main type of movement is rotational. The main states of matter are Pre-matter, electromagnetic field and substance. Phase transitions between states determine the development of matter.
2. The Pre-matter and the field form "Dark energy", expanding our Universe.
3. Small-scale vortex condensations of Pre-matter — gravitons and antigravitons — form an electromagnetic field.
4. Large-scale vortex condensations of an electromagnetic field form a halo of galaxies — "Dark Matter".
5. Small-scale vortex condensations of the electromagnetic field — electron neutrinos and antineutrinos — are the fundamental principle of micro and macroscopic substances.
6. The nesting of media determines the multidimensionality of the world. Material bodies are composed of neutrinos. Neutrino is a vortex of the electromagnetic field graviton. Graviton field is a vortex of Pre-matter. In general, the bodies of the macrocosm are determined by ten dimensions — four basic and six additional rolled dimensions:
    - spatial coordinates and time                        — 4;
    - toroidal neutrinos                                        — 2;
    - toroidal gravitons of the electromagnetic field       — 2;
    - spherical branes of Pre-matter                        — 2.
7. Black Holes and quasars provide the circulation of matter in nature. They absorb the gravitational mass and translate it into anti-gravity prime material. Stable Black Holes and quasars shed excess internal pressure through jets.

## 2. Particle structure modeling

The standard model defines three families of fundamental particles listed in the table. Mass units are parts of proton mass and MeV.

| Family 1 | | Family 2 | | Family 3 | |
|---|---|---|---|---|---|
| Particle | Mass | Particle | Mass | Particle | Mass |
| Electronic neutrino | $<10^{-8}$ | Muon-ium neutrino | <0,0003 | Tau-neu-trino | <0,033 |
| Electron | 0,00054 (0,510 MeV) | Muon | 0,11 (106 MeV) | Tau | 1,9 (1777 MeV) |
| u- quark | 0,0047 (4 MeV) | c- quark | 1,6 (1250 MeV) | t- quark | 189,0 (175000 MeV) |
| d- quark | 0,0074 (7 MeV) | s- quark | 0,16 (150 MeV) | b- quark | 5,2 (4500 MeV) |

Additionally, the Standard model claims the existence of a photon, a carrier of electromagnetic interaction, W + -, Z - bosons - carriers of weak interactions, a gluon transporting a strong color interaction between quarks, a graviton transferring gravity, and a Higgs boson producing mass. The Standard Model does not raise the question of the structure of fundamental particles and the "genetic" connection between them.

### 2.1. Particles of the first family

**Electrons and positrons**

If free neutrinos have oppositely directed velocities, then when flying at a very close distance they can interlock and form a new particle. Figure 2.1 on the left depicts a block diagram of an electron, and on the right — a diagram of a positron [7].

The electron contains two vortex-neutrinos with oppositely directed velocities. Neutrinos attract each other by the mechanism of vortex interaction. They rotate with a speed of light around a common point in a plane perpendicular to the plane of the rings. The neutrino moments are opposite. The new vortex formed during the rotation of the "eight" has a spin - the intrinsic electron moment $M_s=h/2$.

Consider this model in a different plane (see the right parts of the figures). In contrast to the neutrino and photon, here the annular flux is the mover of the particle. Toroidal flow will determine the "hidden energy." In Figure 2.1, the electron moves to the right - in the opposite direction to the spin of the $M_s$. The positron moves on the back of the $M_s$. The speeds of their movement correspond to the frequency of the ring rotation. As the angular velocity of the rings increases, the forward velocity of the particles also increases.
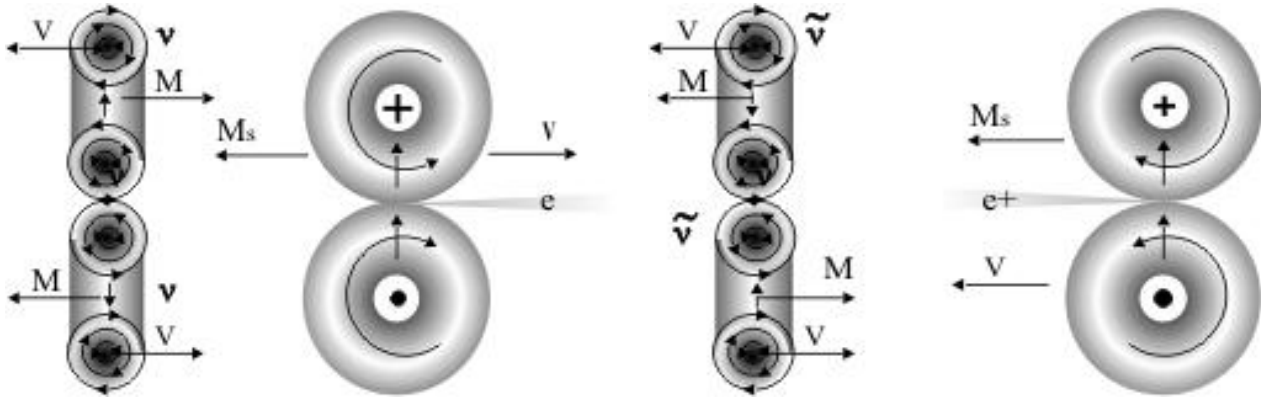


Figure 2.1. Electron structure (left) and positron structure (right)

The rotating in the electron neutrinos forms a kind of "gear pump". They are tightly squeezing the central part of the surface layer of the field. Then the rings push the jet-entrained gravitons in the direction of the velocity **V**. The flow of gravitons forms along the axis the open vortex tube. It rotates around its axis with a frequency of toroid rotation.

Charge tube is a beam with a screw motion of gravitons. It is coming from the point of contact vortices neutrino. The rotation of the vortex tube for the electron forms a left screw, and for the positron forms a right screw with the direction of flow.

Screw beam of gravitons in the open vortex tube is *the electric field*. The flux intensity (kg/s) determines the particle charge e. We may say, at the beginning of the charge tube, the positron has a source, and the electron has a drain. Therefore, the positron charge we call positive, and the electron charge we call negative.

During the rotation, the neutrino entrains the boundary layer of the field (Figure 2.2). The field flux originates at point a. Together with the neutrino, the field layer rotates around the electron axis along the path abcd. Next, the layer flows along the axis in the form of a narrow rotating beam along the straight-line ae. The flow rate of gravitons in the beam (electric field) is much less than the speed of light. The mass of the boundary layer of the field around each neutrino is equal to the relativistic mass of the neutrino. Consequently, the mass of the emitted beam flux is equal to the relativistic mass of the electron.

Figure 2.2 shows the formation around the electron of the attached vortices of its own electromagnetic field. The translational motion of the vortex we identify with the flow of the vector potential **A.** The rotational motion of the vortex determines the magnetic moment of the electron (magnetic induction **B**). In Maxwell's equations, div**A** = 0 is usually assumed. Here it means that the magnetic fluxes along the path *abcd* and the electrical fluxes along the path ae are independent. It is believed that the field flux *abcd* closes itself around the neutrino to the point of outcome *a*. The gradient part of the vector potential **A** (outgoing flow *ae*) is a scalar potential: grad$\varphi$=**E**.
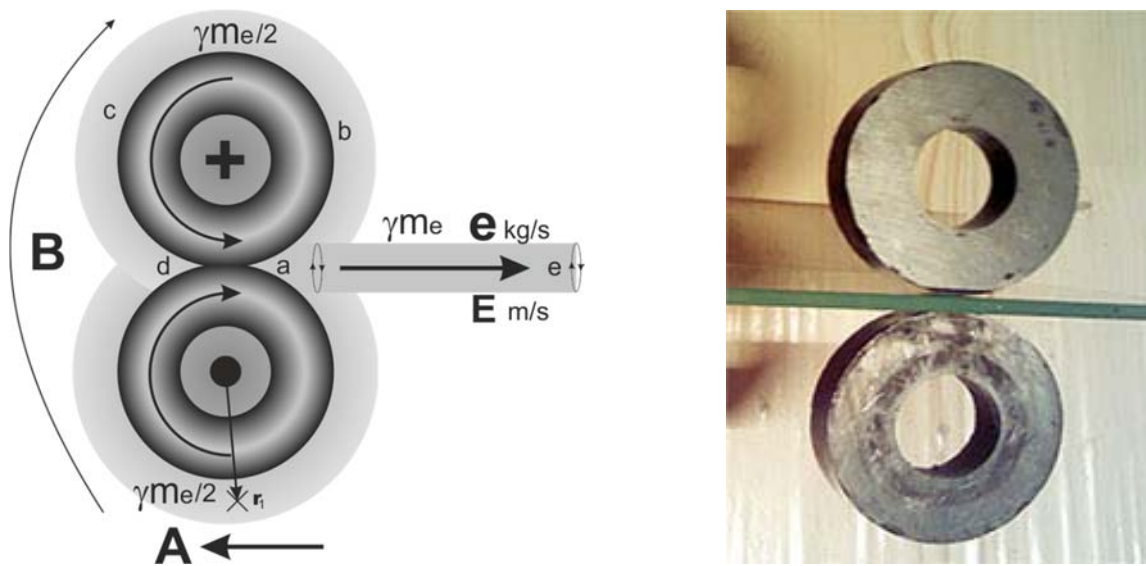


Figure 2.2. Diagram of the electron's own field and its model of magnets

In atoms of matter, electrons and protons exchange currents of the electric field **E**. These streams do not go outside. Then we can consider the self-field of particles and fragments to be purely vortex (magnetic). In macro bodies, **B** magnetic fields emerge, creating an "aura" around the body.

The vortex viscosity of the electron field causes the electrical resistance of the conductors. At superconductivity, when the temperature is close to absolute zero, Cooper pairs of electrons arise (Figure 2.3).

Vortex neutrinos moving counter with the same direction of rotation attract each other. The component particle-boson with zero spin and charge 2e is the result of attraction. An increase in temperature destroys these structures.

The field fluxes that form the magnetic moment of each electron now flow around the whole pair as a whole. The outer field envelope of a Cooper pair consists of opposite flows of gravitons, so the pair does not interact with the environment. The combination of Cooper

pairs is a superfluid Bose condensate with zero viscosity. This phenomenon is similar to the super fluidity of liquid helium, the atoms of which also have zero moment.
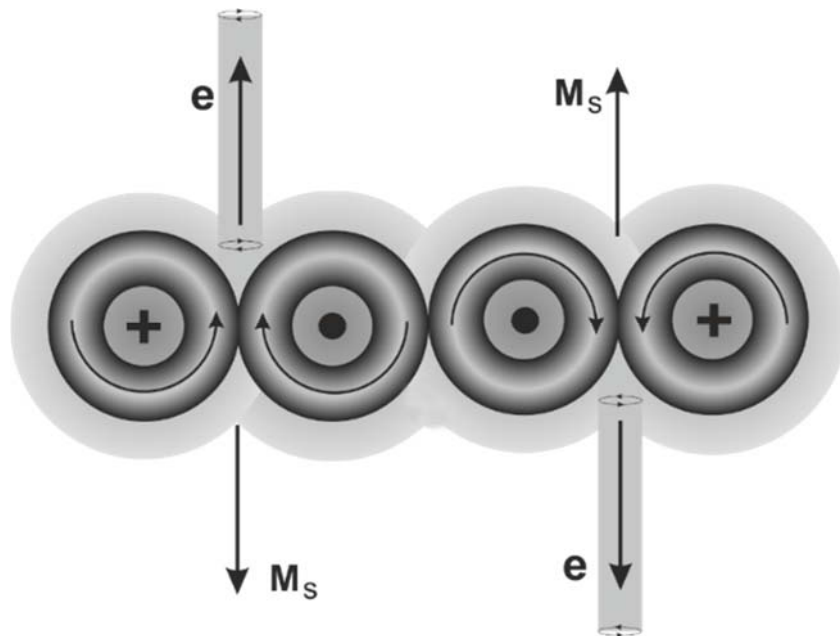


Figure 2.3. Scheme of formation of a Cooper pair

Thus, the model gives a new idea about the electron and its charge. This is not a ball covered with tinsel charge. For the outside world, this is an axisymmetric magnetic dipole rotating at the speed of light. It radiates along the axis a narrow radial rotating stream of gravitons in the field.

| We call the *magnetic field* rotating around the axis of the boundary layer of gravitons. |
| --- |
| We call the *electric field* rotating beam of gravitons emanating from an electron. |
| We call the *electron charge* the mass of the outgoing graviton flow in one second. |

**Photons**

Figure 2.4 shows scheme of formation of photons. Photon has two neutrinos (the left screw photons) or of two antineutrinos (the right screw photons or "anti-photon"). They attract each other by vortex interaction. Neutrinos are constantly changing places, changing their size, and passing through each other on the principle of "game of vortex rings".

Front ring operates its flow of attached field layer on the back ring. It shifts the center of mass of the rear vortex to the axis and forward (see rigs line the left of the figure 2.4). Then the own stream of toroid rotation causes the rear ring to reduce its diameter and accelerate. Similarly, the rear ring (see the middle line of tanker design) inhibits and increases

the diameter of the front ring. When the rear ring will have gone through the hole in the front ring, then it becomes the front and the whole picture will be again.

Newton's second law says that the change for motion is proportional to the applied driving force and occurs in the direction of the straight line along which this force acts. The motion of rapidly rotating vortices does not obey this law. The force does not determine the motion of the axis of the vortex, but the moment of external force. The vortex moves perpendicular to the current force.
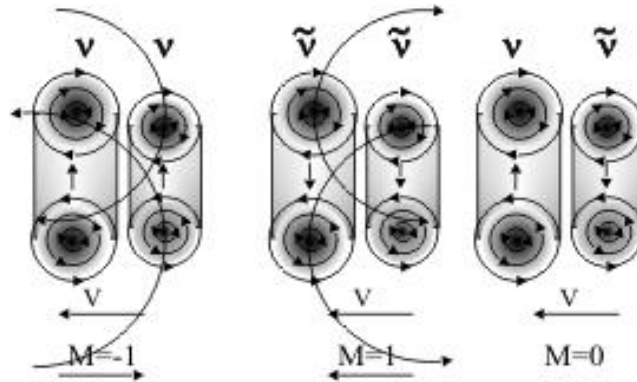


Figure 2.4. Photon structure

Let the force F act on the ring vortex in the axial direction (Figure 2.5). Then the vortex will change its size. The force will push the axes of the two vortices up. However, the rotating particles of the liquid move in opposite directions: to the left in the left part of the ring and to the right — in the right part. Therefore, the ring will stretch, i.e. move perpendicular to the applied force. The diameter of the ring will increase. Let the force F be acting upwards towards movement. Then the size of the ring should decrease. The displacement under the action of force is not according to the vector of force, but in the direction perpendicular to it.
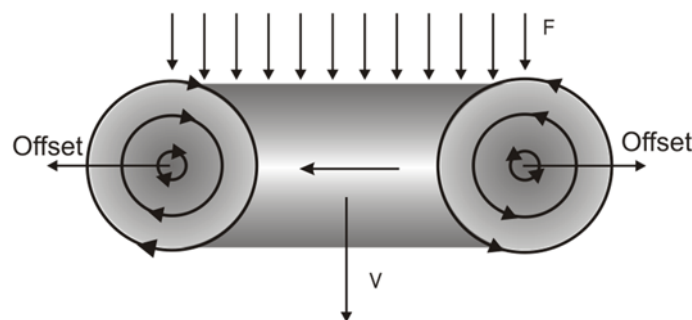


Figure 2.5. Vortex Ring Stretch

Need to draw attention to the fact that the circular rotation of neutrinos in a photon is in the same direction. After attached layer, the frequency of circular rotation of the two neutrinos aligned. They revolve around the axis as a whole.

The figures show that the merger of the two-antineutrino helicity (the projection of spin on the momentum) is equal h. When connecting two-neutrino helicity is –h. A pair of neutrino-antineutrino give helicity equal to zero. We say that the spin of a photon in units of h can have values 1, -1, 0. The figure shows that while there are different particles, although other parameters are indistinguishable.

Look at the third option in the figure 2.4. This particle is its own antiparticle. The connection neutrino with antineutrino we cannot observe, although it may exist. Moments of ring rotations cancel each other out here. Such photons can only have its own frequency $\omega_0$ (corresponding to zero energy $h\omega_0/2$, which cannot be taken away). However, if the photon cannot pass its momentum to recording device, it is not available observation and it is impossible to fix. Therefore, the number of possible spin orientations of a photon is equal two, not three, which would have a particle with spin S=1 (2S+1 = 3).

Each photon has energy, impulse, angular momentum, frequency of "playing rings" and the frequency of rotation rings as a whole. Toroid rotation provides a constant speed of photons of translational motion. Photon cannot dissipate the energy of the toroid rotation in interactions. The angular momentum is closed by itself. Therefore, the photons are constantly moving with light speed, being in thermal equilibrium with the surrounding environment gravitons. Toroidal rotation provides photons in the "thermal" equilibrium with the environment, constant translational velocity. This speed c depends on the dielectric $\varepsilon\varepsilon_0$ and magnetic $\mu\mu_0$ permeability of the medium:

$$c^2 = \frac{1}{\mu\mu_0\varepsilon\varepsilon_0}.$$

The ring frequency $\omega$ not connected with their own intrinsic properties of the photon. Therefore, it can serve as a carrier of energy and information. In one place, the photon was twisted action of some factors. If it moves to another place, untwisted, also produced some action. This is the frequency of rotation of the ring involved in Planck's formula $\varepsilon=h\omega$ and determines the color of light. The forward speed of photons of different "colors" is the same. The photon can decay into two neutrinos with absorption of communication energy.

At low temperatures, electrons create Cooper pairs due to vortex attraction. A similar combination of doublets and even triplets we can observe in the photon flux [8]. The researchers passed a very weak laser beam through a dense cloud of ultracold rubidium atoms. The photons, passing through the atoms, gave them their energy. Due to the attraction between the vortices by photons of the same polarization, the particles created pairs and triplets (Figure 2.6). The figure represents frontal photon views with different phases of the

game of vortex rings. With an increase in temperature (energy) of photons destroyed these complexes.
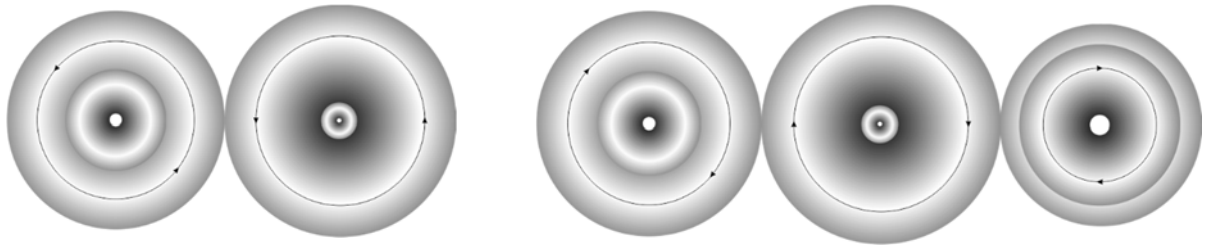


Figure 2.6. Structure of doublets and triplets of photons

While photons do not have longitudinal inertness and move with the speed of light, coupled photons actually acquired a fraction of the electron mass. Their longitudinal velocity was about $3 \cdot 10^3$ m/s.

The boson-photon and fermion-electron differ only in structure. We can call them super-symmetric partners. They can turn into each other in the annihilation reaction — in the collision of an energetic electron and positron (Figure 2.7).
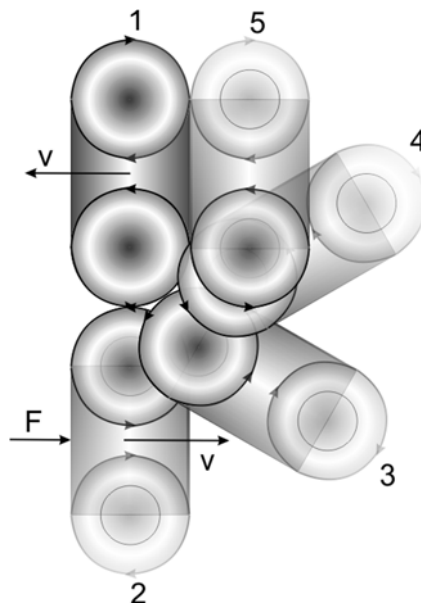


Figure 2.7. The transformation of an electron into a photon

The figure shows the transformation of an electron into a photon. Neutrino 1 and neutrino 2 in an electron are in relative equilibrium with respect to each other. When an electron collides with an accelerated positron, the neutrino 2 receives the impact of the force F. Under the action of the moment of this force, the neutrino 2 begins to rotate around the point of the coupling with the neutrino 1. Neutrino 2 successively passes through intermediate positions 3, 4, so far not "negotiated" neutrino 1, taking position 5. However, neutrino 1 and neutrino 5 constitute a stable photon. The resulting photon moves progressively and

leaves the collision area. Similarly, an antiphoton is formed from a positron. Its impulse will be opposite to the impulse of the "electronic" photon. The interconvergence of elementary particles is sufficient proof of the presented model.

**Quarks**

In the first family of fundamental particles they assume to exist u-quark with a charge of +2/3 e and d-quark with charge -1/3 e. Production of new particles in the hot universe occurred most likely in the binary collisions. Binary collisions of neutrinos generated electrons and positrons. These particles again faced with the neutrino, creating quarks. In Figure 2.8 shows a diagram of d-quark. This is electron with the addition of the electron antineutrino.

Figure 2.8 shows that one ring of antineutrinos emits the positive flow of gravitons from a point of contact rings on the reader. Two rings of neutrinos emit negative flow of gravitons behind drawing. Charge of the particle is the intensity of the forward flow of gravitons along axis. If we assume that all three rings form a flow equal to a single charge, the charge d-quark at one end is 1/3, and at the other end is -2/3. If we assume the charge of the positron is 1, then the share contributed by the charge on each ring, is equal to ½. Quark charge in this case is -1 on one end and 1/2 — from the other end. Attached flows of gravitons will close between the poles of the particle, so that uncompensated charge -1/3 or -½ e. The spin of d-quark is equal to - ½. Analyzing the scheme u-quark in figure 2.8 (right), we conclude that the charge of the quark will be 1/3 or 1/2e. The spin u-quark is ½.
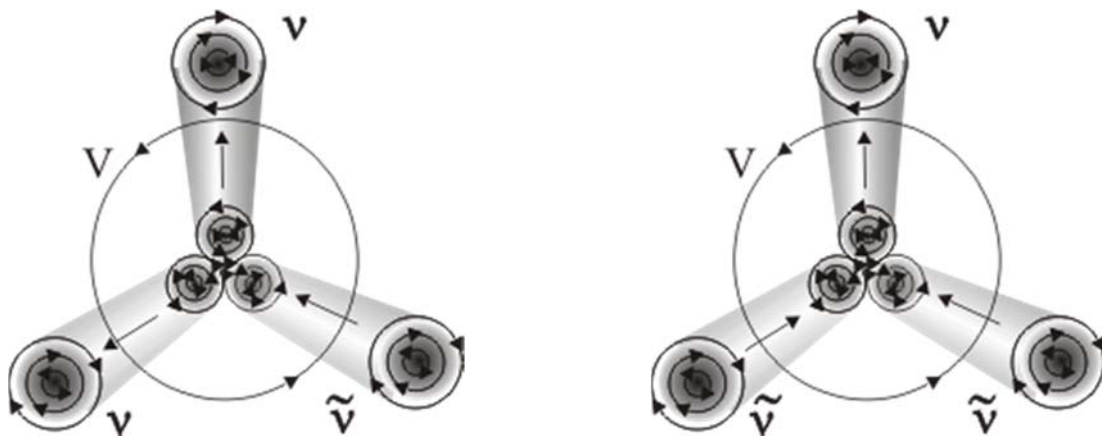


Figure 2.8. Diagram of d-quark (left) and u-quark (right)

Because of the fractional charge, quarks are metastable particles. They were free to exist only in a hot dense Universe. They must unite or rebuild. Figure 2.9 shows a diagram of the reconstructed d-quark. Two neutrinos of the quark occupied a relatively stable position

and became an electron. Therefore, the rebuilt quark began to have a charge equal to - e. The external environment hold antineutrino near the new electron. By trial and error, the antineutrino finds for itself such a place that the moment (spin) of the whole structure would be equal to zero. Between an electron and an antineutrino supported vortex attraction by the same directional toroid rotation.

Spin reconstructed d-quark is zero and longitudinal inertness equal to the inertness of the electron. When particles were forming, protons attached rebuilt d-quarks and became neutrons. Restructuring of quarks is an irreversible process. This is the reason for confinement.
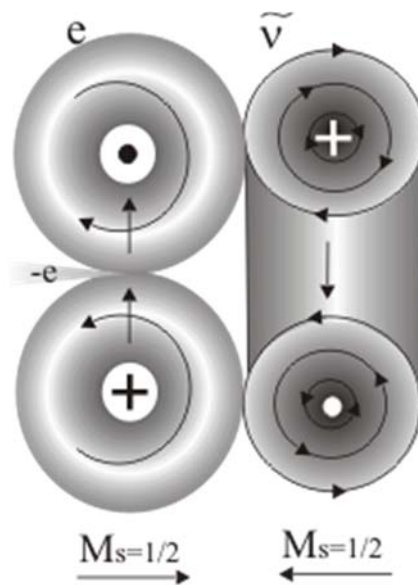


Figure 2.9. Rebuilt d-quark

Obviously, u-quarks and d-quarks cannot turn into each other. For their interaction in the medium, no "transmitters" in the form of gluons are not necessary. Ideas about the anomalous nature of their attraction force are not justified.

## 2.2. The second family of fundamental particles

**Muon neutrino**

In the second family of fundamental particles, muon neutrinos and muon antineutrinos occupy the ground state. They, like neutrinos and photons, always travel at the speed of light. Muon neutrino consists of two neutrinos and one antineutrinos (Figure 2.10). You can also say that the muon neutrino is formed neutrino photon and antineutrinos in binary collisions.

Translational motion is a "game of vortex rings". Rings of neutrinos constantly pass through each other. Speed of all the components in the same direction. The spin of muon neutrino, equal h/2, is the opposite of speed. The spin of the muon antineutrinos and the direction of speed are the same.

Rings of neutrino in the muon neutrino, as in a photon, attract each other due to the vortex interaction. The direction of rotation of the attracted vortices have to be the same. In the figure 2.10 the direction of flow rotation in all sections of the upper vortexes is clockwise, and the lower — counterclockwise.
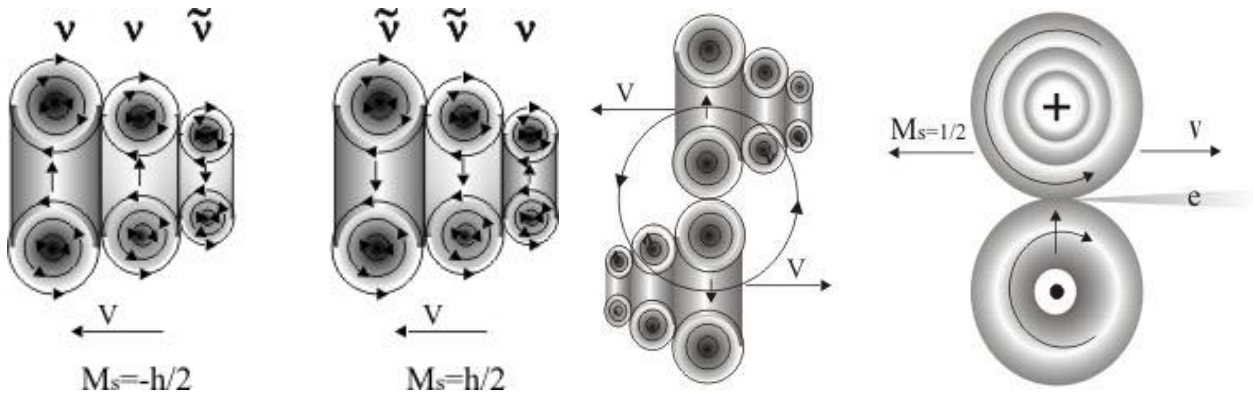


Figure 2.10. Muon neutrinos, muon antineutrinos and $\mu^+$-muon

Compare figures 2.8 and 2.9 to figure 2.10. Boson the muon neutrino $v_\mu$ is a super partner for fermion d-quark and the muon antineutrinos $v_\mu$~ is super partner for u-quark. These quarks can turn into a muon neutrino and antineutrino, respectively, according to the scheme in Figure 2.7. The physical interpretation of the problem of "neutrino oscillations" is obvious. It is simply the decay of unstable muon neutrinos into electron neutrinos.

**Muons**

Most unstable particles obtained in excess of the energy on the powerful accelerator by bombarding the targets. We can judge about the structure of the particles by their decay products. Let us see, for example, the possible structure of the muons. According to the properties they can be called "heavy" electrons with a mass of 206.7 $m_e$ and lifetime $2.22 \cdot 10^{-6}$ s. Muon decay is most likely under the scheme:

$$\mu^- \rightarrow e^- + v^{\sim} + v_\mu,$$
$$\mu^+ \rightarrow e^+ + v + v_{\tilde{\mu}}.$$

Since the muon spin is 1/2, their structure is generally repeats the structure of the electron. Only instead of the electron neutrino, the muon neutrino rotates around the axis (Figure 2.12). This structure of the muon gives him a significant increase of the measured

"longitudinal" mass in comparison with the electron. The increase in mass occurs due to a decrease in the size of the orbit and an increase in the speed of rotation of the neutrino around the axis of the muon.

Since the muon has a half-integer spin, it can decay into three particles only. Therefore, in the decay one muon neutrinos should break into two parts: an electron and an antineutrino.

As for the $\tau$-neutrino, we can assume that structurally it continues the boson series: the electron neutrino – photon – muon neutrino. It is possible that $\tau$-neutrino contains four neutrino rings standing coaxially behind each other (similarly to gravitons). In family 3, the $\tau$-lepton with a mass of 1784.1 MeV and a lifetime of $0.3 \cdot 10^{-12}$ s is now also known. The structure of the $\tau$-lepton is most likely similar to the muon, only instead of the muon neutrino in the orbit of the particle is $\tau$-neutrino.

**Second family of quarks**

In the second family of fundamental particles quarks can be formed by joining the muon neutrino to $\mu^+$-muon or by joining the muon antineutrinos to $\mu^-$- muon. Figure 2.11 shows a scheme of the c-quark.

C-quarks formed by the capture of the antimuons muon neutrinos. The three particles: two antineutrinos and neutrinos fasten quark on the axis of the vortex forces of attraction. In the resulting structure two antineutrino create flow of positive charge, aimed at the reader. One neutrinos create a stream of the negative charge, of the drawing plane. Recall that the direction of rotation of forward flow of gravitons determines the sign of the charge.
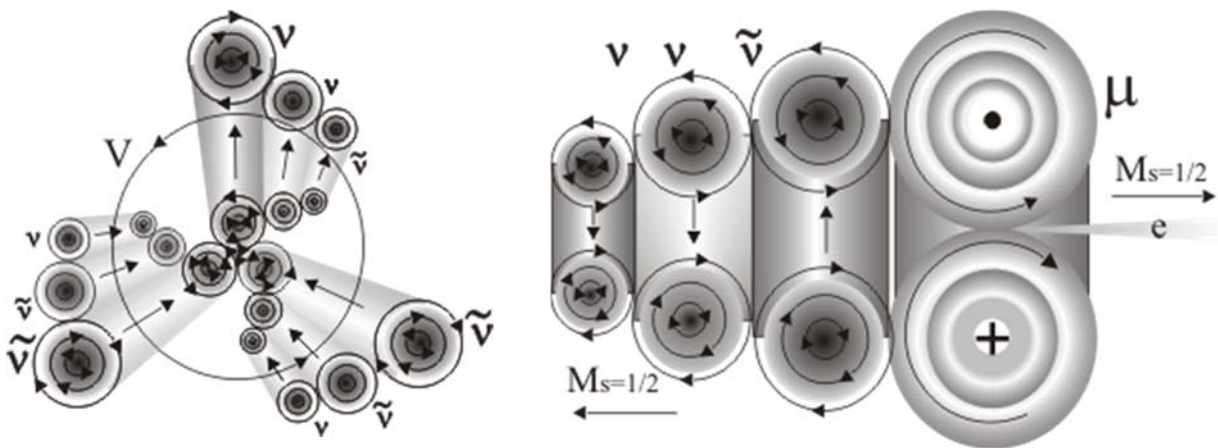


Figure 2.11. Scheme of c-quark and $\pi$-meson

If we assume that all three rings form a flow equal to a single charge, the charge of a quark at one end is equal to 2/3, and the other end is -1/3. If we assume the charge of the

positron is 1, then the share contributed by the charge on each ring, is equal to ½. Quark charge in this case is equal to 1 at the end and -1/2 from the other end. Attached flows of gravitons will close between the poles of the particle, so that will remain uncompensated charge of 1/3 or ½ e. C-quark spin is equal to ½.

Analyzing similarly scheme s-quark, we find that it has on one hand a charge -2/3, on the other hand 1/3. Uncompensated charge s-quark is -1/3 or -1/2e.

The structure of the c quark, shown in Figure 2.11, cannot exist on its own due to the fractional net charge (+ 1/2e). This quark connected to the same quark to form a proton with charge + e. Structure interaction components is not changed. In other cases, the c-quark turns in the design shown in Figure 2.11 (right). It becomes $\pi^+$-meson (pion) with a charge of +e (compare with figure 2.9).

### 2.4. Protons

According to modern concepts, the proton is a composite particle. It consists of three quarks with spin h/2 (one d-quark with charge -1/3 e and two u-quarks with charge 2/3 e). However, in the conventional quark model, there are several uncertainties.

1. Fractional charge of quarks. It turns out that the elementary charge -1/3 e have d-, s- and b-quarks. In order to have twice the charge 2/3 e u-, c-and t-quarks must contain two elementary charge carrier. However, if we accept the truth of the assertion that the quarks have no structure, then we will have been four elementary charge: -1/3 e, +2/3 e, + e,-e, which contradicts the experience.
2. The property of confinement: composed of quarks the proton cannot parse to quarks ("free quarks do not happen!"). This situation resembles the child's question, "Mom, where hides the uncle, who says of radio?"
3. In the proton quarks have spin ½, should be oriented so that the total spin of the three quarks also equaled ½. If the spins of the quarks are parallel to each other, then one of them must have a rotation opposite to the other two. In this case, it will repelled from the other two quarks. Proton would be unstable.
4. Mass of three free quarks that form the proton is 4 +4 +7 = 15 MeV. By combining three quarks mass should decrease with the energy of communication. In reality, mass increases to 940 MeV. This is contrary to the law of conservation of energy.

Based on the above existing (uud)-quark model of the proton we must consider unfounded. The proton decay products can judge its structure. In the annihilation of the proton and antiproton are most likely to flow (jet) free pion and photons, for example:

$$p + p^- = 2\pi^+ + 2\pi^- + \pi^0$$

We can assume that the decay of the proton spawned two π⁺ meson and antiproton spawned two π⁻ meson. Particles is not the first, and the second family formed the proton.

Protons formed in the hot Universe in binary collisions with c-quarks (figure 2.12). In the formation of the binding energy of the proton is released 2 * 1250 - 940 = 1560 MeV. The high kinetic energy of the particles ensure a uniform distribution of particles rotating around an axis. Because of the strong interaction between the rings, the combination of three particles (two $\mu^+$-muon and a $\mu^-$- muon) formed. All three vortex-muon revolve in the same direction. Muon spin also are such that the total spin is ½. Flows of electric charges are added, so that the total flow is + e. After the formation of a proton, there is no the old quarks — there is only muons. Therefore, after decay of the proton to get c-quarks is im-passible.
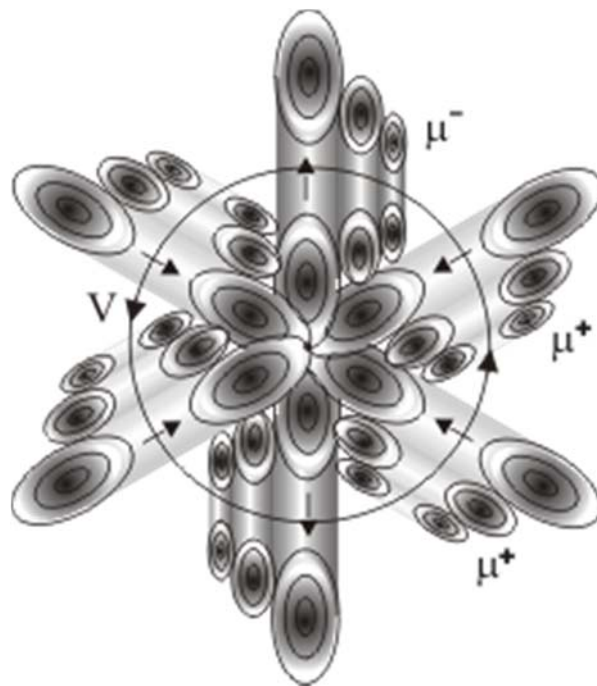


Figure 2.12. Proton structure

The neutrino rings of different particles are facing each other with their planes. In the photon, front vortex is compressing and accelerating back vortex ring, providing a "game of vortex rings." Here, in an axially symmetric proton each of the vortices neutrinos we can consider "back." Therefore, all the rings strongly compressed towards the center. Longitudinal inertness of the proton is 1836 $m_e$ or 938.256 MeV. Proton transverse inertness is zero.

The rotation of the attached field layer forms a magnetic moment of the proton. Figure 2.13 shows the scheme the formation of intrinsic field of the proton. The upper part of the figure shows half $\mu^+$-muon, at the bottom — half $\mu^-$ –muon. Two neutrinos of $\mu^+$-muons are forming the upper flow. They go way abcd. Neutrinos of $\mu^-$-muon is forming the bottom flow. Flows revolve around the axis of the proton in the same direction. This rotation we regard as a magnetic field B. The magnetic moment of the three flows should be almost three times

greater than the "normal" magnetic moment $\mu_{nuc}$. Really, proton magnetic moment is 2.79 $\mu_{nuc}$. If we assume $\mu_p = e \cdot c \cdot r_1$, then radius of the center of mass of own field layer will be equal

$$r_1 = \frac{\mu_p}{ec} = \frac{2.79 \cdot 5.05 \cdot 10^{-27}}{1.6 \cdot 10^{-19} \cdot 3 \cdot 10^8} \approx 3 \cdot 10^{-16} \text{ м}$$
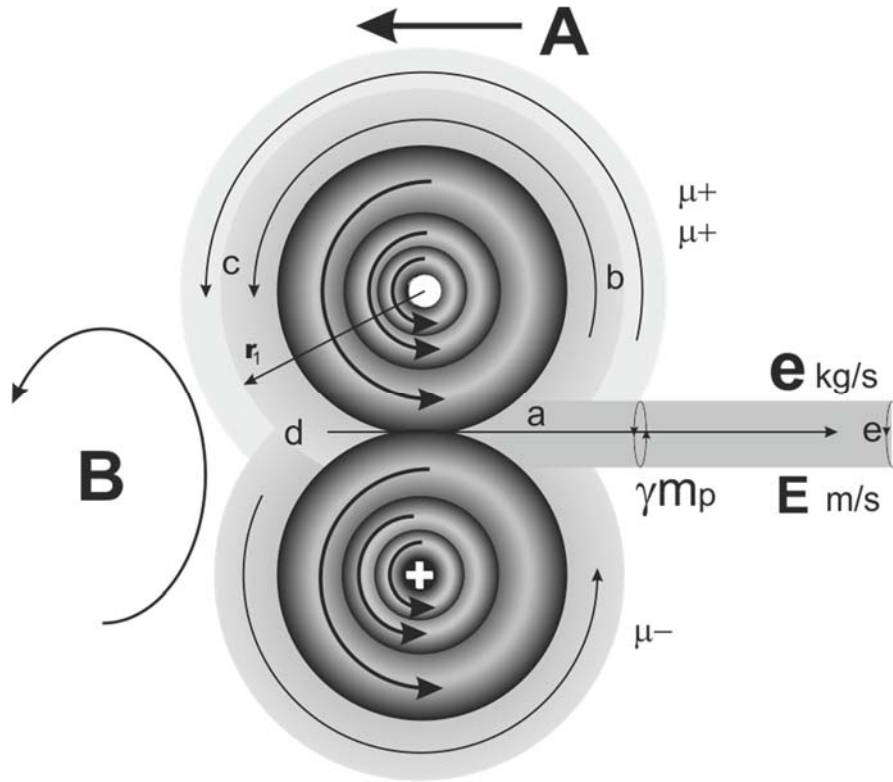


Figure 2.13. Scheme of formation of own field of the proton

Proton charge is mass of gravitons outgoing along axis ae into a second. In analyzing the structure of the electron, (see. Figure 2.7), we considered that the rotating with speed of light beam of "electric" field is the continuation of a rotating "magnetic" flow envelope surface of the particle. If only the "positive" flow is going out right into the environment, the proton would charge 2e. If only "negative" flow is going out to the left to the external environment, the proton would charge -e. The figure shows that the entrained field flows revolve around a common point in different directions. Half of "positive" flow compensated by counter "negative" flow. In the environment through the charge tube e kg gravitons leaves per second.

Figure 2.14 (left) shows the likely appearance of a proton. All proton mesons are in the "bag" of a rotating stream of gravitons, i.e. magnetic field. In composite particles and atoms, the electric beam closes itself to the opposite charge. Electric exchange interaction is the exchange of rotating field flows, i.e. moment. The magnetic vortex shell in composite particles and fragments goes outside.

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## 2.5. Neutrons

According to modern concepts of neutron contains one u-quark and two d-quark. In Figure 2.14 (right) shows the Feynman diagram for neutron β-decay involving heavy W⁻ boson. One of the d-quark turns into a u-quark, emitting an electron and an antineutrino. The mechanism of this transformation is not considered.

In determining, the structure of a neutron will consider the following:

- decay scheme: $n \rightarrow p + e + \tilde{v}$   with energy yield 0.782 MeV;
- neutron charge is zero, the spin s = 1/2;
- magnetic moment  = - 1,91 $\mu_{nuc}$ (for proton μ = 2,79$\mu_{nuc}$);
- the value of the mass difference: $m_n$-$m_p$ = (1,29344 ± 0,00007) MeV;
- the neutron lifetime is (917 ± 14) s, i.e. ~ 15 min.

Of other quantum numbers neutron has baryon charge equal to 1, the lepton charge and strangeness are zero, isotopic spin -1/2. In the nucleus of the atom, neutron takes up the volume of radius about 1. 5 • 10-15 m. Neutron involved in all types of interactions.
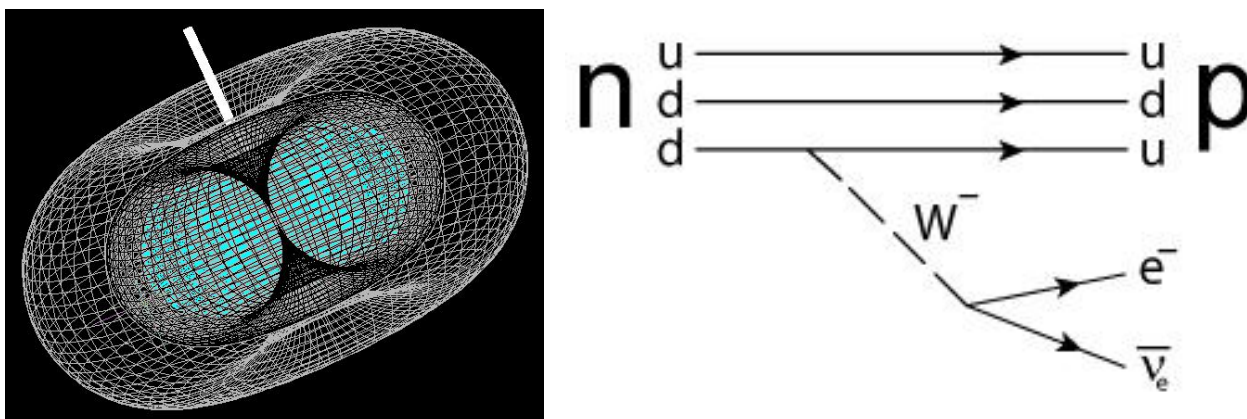


Figure 2.14. Proton view (left) Feynman diagram β-neutron decay (right)

Neutrons are the result of binary collisions of protons with high energetic d-quarks. Energy d-quark should be in a range that the size of the incoming particles would be comparable. Under the action of the rotating field of the proton, d-quark rebuilt structure, shown schematically in Figure 2.11. Figure 2.15 shows a possible structure of a neutron by this scheme. Obviously, parts of the neutron are proton, an electron and an antineutrino.

The design of the proton is complete nature. It cannot build into your "bag" with the quark-pion additional neutrino rings. Joining the electron to the proton is possible due to the electrical connection, as in the hydrogen atom. Then the total electric charge is zero. How-

ever, the spin will increase to one. Joining antineutrinos with opposite spin reduces the general spin to the value of $M_s = 1/2$. Antineutrinos cannot place between the electron and the proton. Electron closed from interaction with the environment.

Such a block diagram of the neutron is most rational for practice. Velocity of an electron and an antineutrino are opposite proton velocity. Electron and an antineutrino press on proton due to its internal energy.
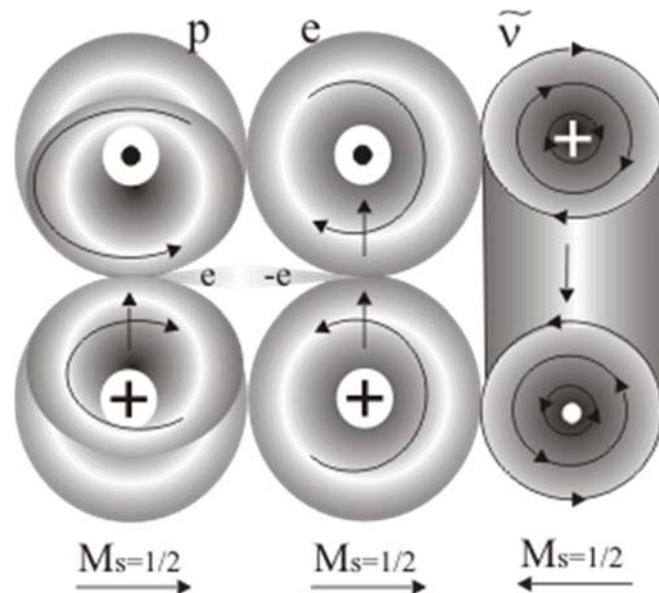


Figure 2.15. Neutron block diagram

The electron and the proton are repelled by the vortex field, but attract each other by electric forces. Their charges shield each other. Magnetic moment of electron is predominant. The speeds of the electron and antineutrino are opposite to the speed of the proton. The electron and antineutrino "put pressure" on the proton due to its high internal energy. Quark not only has the charge connected them with the proton, but also a strong pressure on him by the force of inertia. Energetic antineutrino presses a light electron to a massive proton due to its impulse.

Like all particles with spin ½, a neutron can decay only into three particles. When the photons of the environment take energy away from antineutrino and electron, their pressure on the proton will decrease, and the particle size will increase. The forces of repulsion will exceed the force of inertia and the force of electrostatic attraction — the neutron will disintegrate. Explanation of the neutron decay of specific exchange gauge bosons is incorrect. The quanta of the electromagnetic field - gravitons successfully fulfill their role. They provide attraction and repulsion of interacting particles.

The described interaction of particles we call the weak interaction. The essence of the weak interaction is in the confrontation of the forces of repulsion and attraction of parts

of composite particles with excess energy. Their pressure under the action of inertial forces maintains the stability of the composite system of energetic repulsive particles. The compressing factor can be third particles that exert a force from the outside.

There is an example of "shielding" of weak interaction. Figure 2.16 shows a block diagram of a $\alpha$-particle. The protons p1 and p2 and the neutrons n1 and n2 form a closed circuit. The moments and charge tubes of protons direct outwards, and the moments of neutrons direct inward. The total moment of the $\alpha$-particle is zero. No nucleons have an orbital moment. They rotate only around its axis. The upper proton (as seen from the top of the figure) rotates counterclockwise. The lower proton rotates clockwise. Neutrons rotate around the axis in opposite directions too.



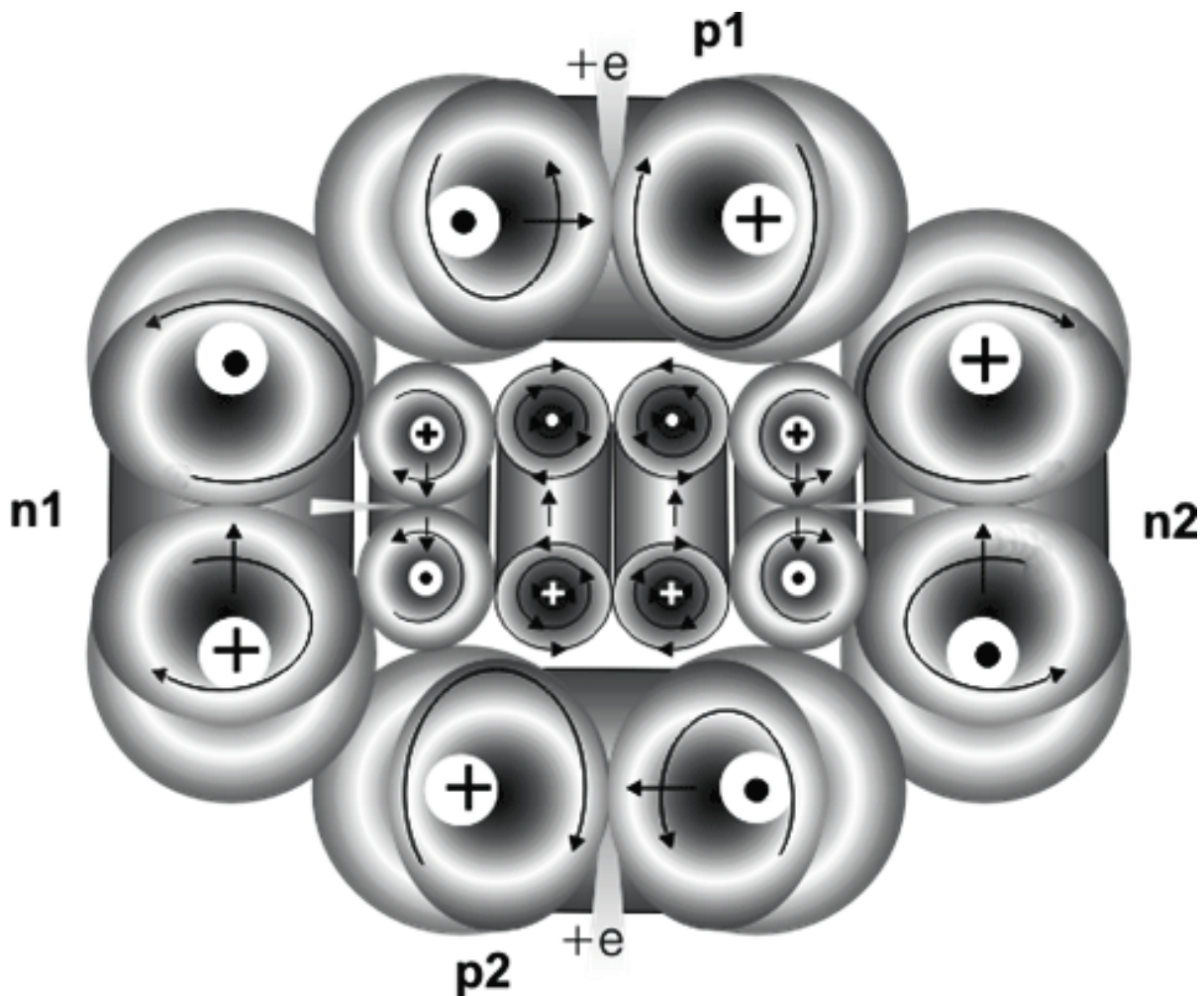Figure 2.16. Block diagram of the $\alpha$-particle

The diagram shows how in the nucleus of an atom the forces affect the neutrons that prevent them from falling apart. The free protons p1 and p2 and the protons bound in the neutrons n1 and n2 form a strong four-link power circuit. The components of neutrons — two electrons and two antineutrinos (two quarks) — are enclosed within this circuit. Protons

chain quarks, the chain does not allow them to transfer their energy to the external environment, does not allow increasing their size.

We note, however, that the attractive forces of the vortices are weaker here than in elementary particles. The ring vortices of neutrons are only part of the time in the same plane as the ring vortices of the proton. Therefore, the bond strength of the particles in the nuclei is less than the strength of the particles themselves.

Why do we need neutrons in the nucleus? After all, protons can attract each other by the mechanism of strong interaction. The fact is that protons can connect to each other in the Orto-position, when their moments direct in one direction. Neutrons between the protons allow the protons to be in the Para-position so that they have a total zero moment. At the same time, the neutron moments directed towards the center also compensate each other. This provides the α-particle with the minimum potential energy and the highest stability among the nuclei.

Electrons in neutrons are in an excited state. They tend to shed off excess energy (give it away, for example, to photons) and go into the ground state. If the forces pressing the neutrons weaken (the excess neutrons in the atoms), then the neutrons decay. This factor is the cause of the natural radioactivity of nuclei.

The above material shows the possibility of a visual ("macroscopic") representation of the micro world. The structure of dynamic equilibrium maintained in the world of particles fully fits into the framework of "common sense".

## 2.6. Scheme of the particles

Now we represent schematically the formation of particles from the neutrino. Each own stable particle has its antiparticle. The table shows on the left the number of vortex neutrino in particles. Neutrinos and antineutrinos are the simplest high-energy vortex formations in a continuous medium of gravitons. All other particles are composed of a neutrino from the elements.

In the formation of the fundamental particles of neutrinos, pair collisions were the most likely. Interactions of neutrinos or antineutrinos form electrons and positrons. Binary collisions with quarks form protons. Binary collisions of protons with muon neutrinos or d-quarks led to the formation of neutrons.

Note that there is symmetry between the number of particles and antiparticles. Substance contains the equal amounts of neutrinos and antineutrinos. Radiation contains the equal amounts of left-polarized and right-polarized photons.

Periodic system of fundamental particles
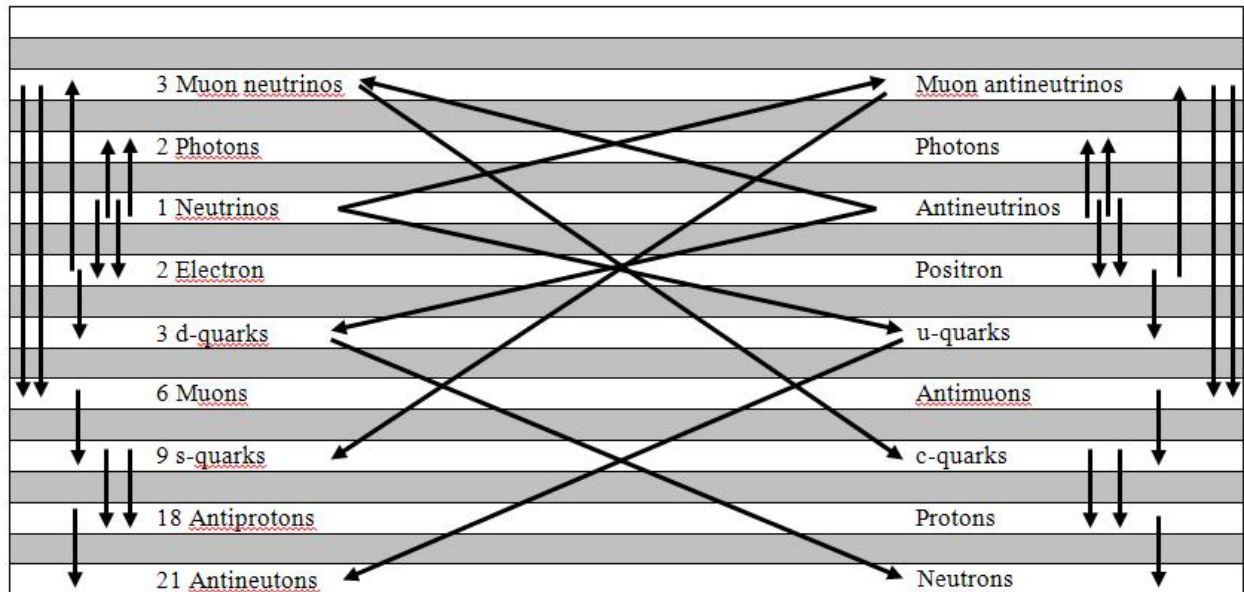


People often ask where the antimatter is. Where anti Galaxy to look? Now we should be clear that antimatter contained in ordinary matter and find it not anywhere does. Proton has eight neutrinos and ten antineutrinos. Therefore, it is more "anti". In the hydrogen atom — the most common element — contains the same number of neutrinos (10) and an anti-neutrino (10):

| Electron | $\nu\nu$ |
|----------|----------|
| Proton | $10\nu \sim 8\nu$ |

The table shows that electrons and photons each contain two neutrinos — they are superpartners. The same we can say about muon neutrinos and d-quarks. As in the Periodic system of the elements of Mendeleev, there are also many "particle-isotopes" containing the same number of neutrinos. Experimental confirmation of this scheme is the interconversion of particles.

**Brief conclusions**

1. Electronic neutrino is the only truly elementary particle. Neutrinos and antineutrinos form all other particles.
2. Neutrino is a closed vortex of field gravitons. The kinetic energy of the vortex flow determines the mass of the neutrino, and the angular momentum of the vortex determines the spin of the particle.
3. A muon neutrino contains two neutrinos and one antineutrino..
4. Two muon neutrinos form a muon.
5. Free quarks are unstable and pass into fermions.
6. Two c-quarks form a proton and pass into three mesons..
7. The proton form a neutron by the addition of a d-quark.
8. The charge and magnetic moment of the particles are the characteristics of the attached vortex field fluxes flowing around the particles.
9. The number of neutrinos contained in the particles is the main parameter for their classification.

## 3. Estimation parameters of particles

Neutrinos and antineutrinos have formed all particles. Vortices neutrinos have mass $m_e/2$ and angular momentum $h/2$. They rotate at the speed of light. They are completely transferred its rotation to the medium of gravitons, creating around a rotating speed of light closed vortex field. In the composite particles, atoms and fragments of material attached particle layer has displaced outwards. The parameters of this layer field determine the characteristic properties of the particles and their interactions provide. Consider a simple physical model of an electron and a photon.

### 3.1. Electron charge

Since there is nothing but matter in motion. Then the property of the charge due to the mechanical movement of flows of gravitons in the attached layer of the particle. Forward flow of the graviton from particles we take as the electric field. Rotational motion of attached graviton layer of the particle appears to us as the magnetic field. The magnetic field is not "created by moving charges." It is an inherent property of both the electron and the proton.

Consideration of electron model requires the redefinition of the basic electrical parameters in terms of flow in the MKS-system (meter, kilogram, second, $[A] = [kg/s^2]$). To elucidate the physical nature of the basic concepts of electrostatics we write the expression for the energy density of the electrostatic field:

$$u = \frac{\varepsilon \varepsilon_0}{2} E^2, \qquad (3.1)$$

where $\varepsilon_0 = 8{,}85.10^{-12}$ F/m — electric constant;

$\varepsilon$ — relative dielectric constant of the medium;

$E$ V/m — electric field intensity.

On the other hand, the energy density per unit volume for the continuous medium flow inside the charge of an electron tube stored as

$$u = \frac{\rho}{2} v^2, \qquad (3.2)$$

where $\rho$ kg/m³ — density of gravitons in the selected volume;

$v$ m/s — speed of selected medium volume.

Comparing formulas (3.1) и (3.2), obtain the relations:

$\varepsilon \varepsilon_0$ [F/m]$= \rho$[kg/m³] ,

$E$ [V/m]$= v$ [m/s] .

The absolute dielectric constant, expressed in F/m ($8.85 \cdot 10^{-12}$), is the density of the flow of gravitons in the charge tube, expressed in kg/m³. The electric field intensity expressed in V/m is a flow speed of gravitons in the charge tube, expressed in m/s.

According to Coulomb's law, electric field is inversely proportional to the square of the distance from the charge:

$$E = \frac{e}{4\pi\varepsilon\varepsilon_o R^2},$$ 
<div align="right">(3.3)</div>

where $e$ — electron charge.

It follows from (3.3) that the charge e in terms of the flow has the dimension [кg/s]. Rewrite (3.3) in terms of flow:

$$e = 4\pi R^2 \rho v.$$

Charge is a flow of gravitons density through a sphere of radius R, inside which electron is located. Figure 2.2 shows schematically how gravitons attached layer comes between the neutrinos rings and emitted in the charge tube. The electric charge of an electron is mass of gravitons emitted in one second, expressed in kg/s, with the own frequency of circular rotation $\omega_0$.

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*The electron charge is the mass of the outgoing flow in one second.*

---

By analogy with the mass could be to introduce the concept of "relativistic charge."

The equation of motion of a relativistic charge we can write in the form:

$$\vec{F} = d\vec{p}/dt = \frac{d}{dt}\left(\frac{m\vec{v}}{\sqrt{1-v^2/c^2}}\right) = e(\vec{E} + \vec{v}\times\vec{B}).$$

Generalized forces on the four-dimensional space is a "4-force" $f_\mu$:

$$f_\mu = \left(\frac{\vec{F}\cdot\vec{v}}{\sqrt{1-v^2/c^2}}, \frac{\vec{F}}{\sqrt{1-v^2/c^2}}\right) = \left(\frac{e\cdot\vec{v}\cdot\vec{E}}{\sqrt{1-v^2/c^2}}, \frac{e\cdot(\vec{E}+\vec{v}\times\vec{B})}{\sqrt{1-v^2/c^2}}\right) = \left(\gamma e\cdot\vec{v}\cdot\vec{E}, \gamma e(\vec{E} + \vec{v}\times\vec{B})\right),$$

The first time component of the four-vector equal to power, i.e. the rate of change of energy or rate of doing work Fv. Spatial components are values $\vec{F}/\sqrt{1-v^2/c^2}$. Note that there is the expression $\gamma e$, similar expression $\gamma m$. Therefore, we can speak of a "relativistic" increase the particle charge.

Thus, the electron charge is a dynamic concept, referring to his own electromagnetic field, not the particle cores. We can say that the rotating speed of light coming in the form of a beam graviton mass is the charge of the particle. Approximately, we can assume that the mass of the attached layer is equal to the mass of the core (see Figure 2.2). In other words, in one revolution, the rings eject $m_e$ [kg], and in one second, they eject mass e [kg/s]. The specific electron charge e/m = $\nu_o$= 1,76·10$^{11}$ [c$^{-1}$] determines the intrinsic (smallest) number of revolutions of the neutrino ring rotation in one second.

Own ring rotation energy $E_{ro}$ = 2πh$\nu_o$ = 1,161·10$^{-22}$ Дж = 7,253·10$^{-4}$ эВ.

For comparison, the self-energy of toroidal rotation is

$E_o$ = $m_e$c$^2$ = 8,187·10$^{-14}$ Дж = 5,117·10$^5$ эВ = 0,511 МэВ.

### 3.2. The magnetic moment of the electron

Usually we call electron only the hard core of the particles formed by rotating the neutrino (Figure 2.2 left). Therefore, two point masses of neutrino moving in spirals can represent the electron. However, it should be borne in mind that thin vortex graviton gas as "sticks" to the surface of the neutrino. Moving gas layers partially carries with neighboring layers due to viscosity. There is attached a layer of gravitons, covering the ring neutrino. Particle layer at the same time participate in the toroidal and ring rotations. The rotations convert an electron into electromagnetic complex has own electric and magnetic fields.

The ring rotation of the neutrino forms the electrostatic field. Gravitons of attached layer trapped rotating neutrino. Then they emitted along the axis in the form of a narrow beam rotating flow.

The magnetic field generated by the rotation of the attached layer of gravitons around the axis of the electron. In the ground state at zero translational velocity the electron pro-duces a magnetic field, which corresponds to own (spin) magnetic moment $\mu_s$. The value is practically the same as the Bohr magneton $\mu_B$ — the product of spin h/2 on the specific charge e/m:

$$\mu_B = \frac{h}{2}\frac{e}{m} = 9{,}274 \cdot 10^{-24} \text{ (J/T)}.$$

The spin of the electron is h/2, takes into account the energy of rotation of the two neutrinos around its axis in only one turnover. Electron spin is the angular momentum of the mass center flow: $h/2 = m \cdot c \cdot r_0 = 0{,}53 \cdot 10^{-34}$ (J•s). Hence the radius of the electron neutrino is $r_0 = 1{,}932 \cdot 10^{-13}$ m, radius of the electron in the ground state twice $r_e = 3{,}863 \cdot 10^{-13}$ m.

Magnetic moment is the rotational energy of the attached layer per second ([J = kg • $m^2 \cdot s^{-2}$]). This is the moment of charge e relative to the radius of mass center of the attached layer $r_1$ (remember that charge is mass):

$$\mu_S = e \cdot c \cdot r_1 = m \cdot \frac{e}{m} \cdot c \cdot r_o \cdot \frac{r_1}{r_0} = \frac{h}{2} \cdot \frac{e}{m} \cdot \frac{r_1}{r_o} = \mu_B \cdot \frac{r_1}{r_o}.$$

Hence the known value $\mu_S = 9{,}285 \cdot 10^{-24}$ J/T we find $r_1 \approx 1{,}934 \cdot 10^{-13}$ m. Deviation values of the magnetic moment of the electron from the value of the Bohr magneton due to mismatch of the centers of mass of neutrinos and the associated layer (see Figure 2.2 ).

Figure 3.1 shows for the first time a photo of the atomic orbital of a hydrogen atom placed in a static electric field. A quantum microscope with a magnification of more than 20,000 times was used. The device has developed at the Institute of Atomic and Molecular

Physics in the Netherlands [9]. In the center of the picture, we see a bright spot of a stream of an electric field. There is a surrounded circular region of rotation of the neutrino. Outside, an electron is captured by its own (trapped by rotating neutrinos) magnetic field flux.

Look at scheme gravitons flows around the core of the vortex electron (Figure 3.1 right). The flow passes through the cross-sectional area of the vortex core. Outside the electron part of the gravitons emitted along the axis as a narrow rotating beam sustained vortex tube. We fix this up as an electrostatic field E.

With an increase in translational velocity, the intensity of vector potential flow **A** increases. This flow direct opposite to the motion of the electron. It simultaneously rotates around its axis at a linear velocity close to light velocity that determines the magnetic induction **B**=rot **A**.
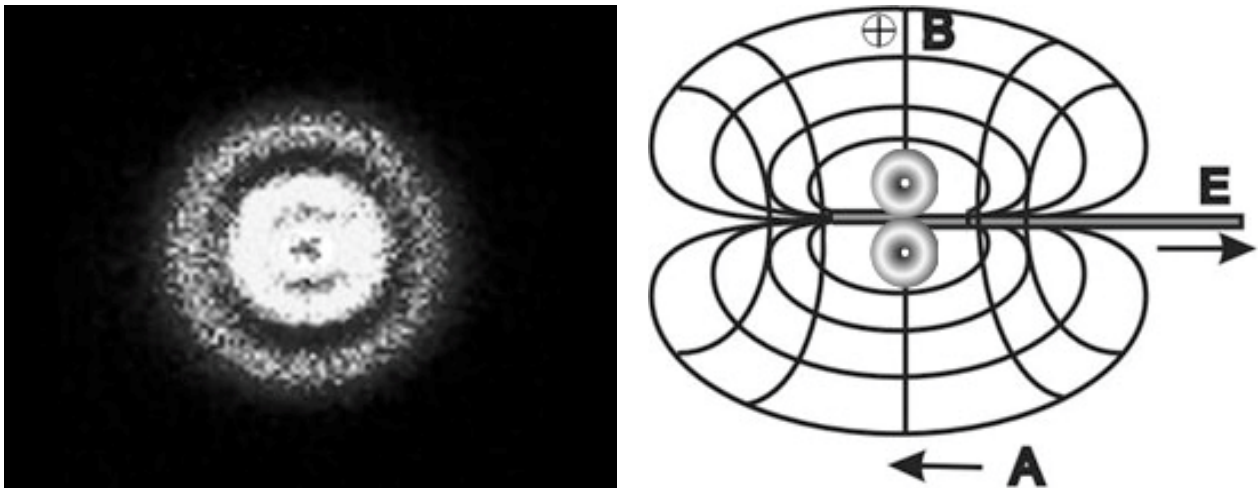


Figure 3.1. Photo of an electron (left) and field flow diagram (right)

In a normal conductor, electrons are not oriented. Their average magnetic field is zero. In the flow, there is adding of electron fields. Electric fields direct along the flow axis. In the transverse direction of the flow, there is not the mutual repulsion of electrons. Like vortices with the same direction of rotation, electrons attract each other in a stream. Stringing the arc in vacuum confirms these findings.

| *The charge and magnetic moment of an electron are the parameters of own vortex electromagnetic field* |
|---|
| *What we perceive as the potential energy of an electrostatic field and a magnetic field in a wider system is the kinetic energy of invisible translational and rotational flows of gravitons* |

## 3.3. What is mass

Newtonian mechanics takes mass as a basic property of matter that resists further clarification. Newton argued that the substance contains the same nature and density of elementary particles. Therefore, the mass as a measure of the amount of substance is proportional to its density and volume. Inertness has an innate property of matter. The amount of substance in the body determines its inertness, the weight and the gravitational effects on other bodies. Newton mass as the volume of primary matter is a static and separated from the movement.

Today we consider mass as a dynamic property of matter, arising from concepts that are more fundamental. The property of mass arises in matter during the formation of elementary vortices of gravitons. The vortex appears transverse inertia. Inertness is a second-rank tensor, and mass is a scalar, the sum of static inertia.

Suppose that on a toroidal vortex an external force F acts (figure 3.2). If the force directs to the left, the centers of the circular current lines shift to the left. Then the rotating fluid directs down on the left side of the ring and up on the right side of the ring. Therefore, under the transverse force axis of the torus will turn counterclockwise. Vortex has inertness in the transverse direction; it resists movement in the direction of the force.
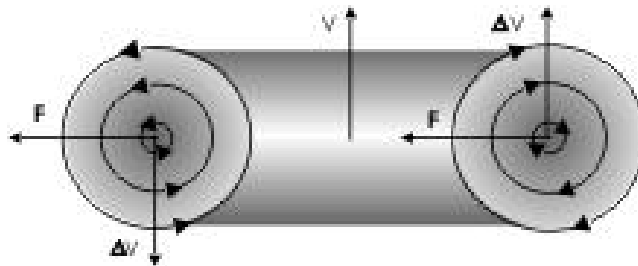


Рисунок 3.2. Поворот вихревого кольца под действием силы

Mass in classical physics is a measure of inertness and measure of gravity body (inertial and gravitational mass, respectively). Property of the inertial mass is the fact that the body changes the value of its impulse by an external force. Inertness measured as the ratio of force to acceleration. If the speed of the body during acceleration directed along the axis z, then x, y, z components of inertness are equal $\gamma i_o$, $\gamma i_o$, $\gamma^3 i_o$, where $i_o$ — a static inertness, $\gamma i_o$ — transverse inertness, $\gamma^3 i_o$ — longitudinal inertness and

$$\gamma = \frac{1}{\sqrt{1-v^2/c^2}}.$$

In 1907, Einstein concluded that the mass *m* of a body is a measure of the rest energy contained in it: $E_0=mc^2$, where $E_0$ - energy body at rest (particle), and *c* - the speed of light. If a body gives off the energy $\Delta E$, the mass of the body is reduced by the $\Delta m = \Delta E/c^2$. In the theory of relativity, the energy lost its classical uncertainty — an additive constant. She became a physical quantity with an absolute value. In the relativistic theory the mass of the composite body is not equal to the sum of the masses of its constituent bodies, the energy is additive. Equivalence of inertial and gravitational mass of the body is base of General relativity.

We cannot say that the amount of matter in a proton is 1836 times more than in an electron. We have shown above that the electron is composed of two neutrinos, and the proton contains 18 neutrinos. This means that the mass of the proton has a relativistic nature. The particle mass is the kinetic energy of the flow of gravitons forming this particle. The significance of relativistic mass for a moving body we can better understand by considering the following equations expressing its main mechanical properties [10]:

| | |
|---|---|
| $E = \gamma mc^2$ | Energy |
| $\vec{g} = -G\gamma m \dfrac{\vec{r}\cdot(1+\beta^2)-\vec{\beta}(\vec{\beta}\cdot\vec{r})}{r^3}$ | Acceleration of free fall when active gravitational mass moving |
| $I = \gamma^3 m[(1-\beta^2)u + \beta\beta]$ | Inertness for an arbitrary direction of the velocity |
| $\dfrac{d\vec{p}}{dt} = \gamma m[(1+\beta^2)u - \beta\beta](\text{GM}\dfrac{\vec{r}}{r^3})$ | Speed of change of impulse in a gravitational field when passive gravitational mass moving |
| $\vec{p} = \gamma m\vec{v}$ | Impulse |

Here we have introduced the notation:

$\vec{\beta} = \vec{v}/c$ ,

$\gamma = 1/\sqrt{1-\beta^2}$ ,

$u = ii + jj + kk$ — single dyadic tensor,

G — gravitational constant,

M — active gravitational mass.

All of the mechanical values in the table are directly proportional to the relativistic mass $\gamma m$, i.e. mass moving by inertia with speed v. From the point of view of metrology mass m and mass $\gamma m$ equivalent, since the intrinsic properties of the body do not change when inertial motion. However, here we want to show that the relativistic mass $\gamma m$ is the number of gravitons in their own field of particle. The own flux of the field of a macro body is the sum of the own fluxes of the field of elementary particles that make up the body.

For each revolution, the neutrino in the electron at rest push into the medium $m_e$ kg gravitons. The mass of the own field, carried away by the particle, is equal to the mass of the particle $m_e$. This is true only for its own (minimum) frequency of the ring rotation of the neutrino.

Now let the frequency of the neutrino ring rotation had increased. This is possible to do, for example, by external force or by increasing the temperature. The electron will move along the axis or be rest. The latter is possible when the electron rests on an obstacle, in another particle. In any case, the total energy is the particle's own energy plus the kinetic energy of ring rotation (energy additivity). Energy increases, but the "amount of matter" in the particle remains unchanged.

With an increase in the speed of ring rotation of a neutrino with an inertial mass $m_e$, an additional amount of gravitons is attracted into own (gravitational!) electron field (Figure 2.2). This is the physical meaning of the principle of equivalence. The "gravitational mass" of body (the mass of the intrinsic field) is always equivalent to the relativistic "inertial mass" $\gamma m$.

<div style="border:1px solid">

*Relativistic body mass is the mass of gravitons in the own electromagnetic field*

</div>

The Earth carries away a layer of gravitons. The mass of the layer is equal to the relativistic mass of all neutrinos constituting the Earth. The region of this layer forms the Earth's own electromagnetic field. We call it like the Gravitational field.

Thus, the promoted neutrinos realize the inertial mass. The vortices of the surrounding field realize the gravitational mass.

### 3.4. Масса электрона

The basic relations of the special theory of relativity for freely moving point particle (particles system) are the relationships between energy E, impulse p and mass m:

$$E^2 - p^2 c^2 = m^2 c^4; \qquad \vec{p} = \frac{\vec{v} E}{c^2}. \tag{3.3}$$

Note that here the impulse is the energy flow, rather than mass. Value (3.1) reflects the law of conservation of energy, while the expression $mc^2$ describes the potential energy. Based on the formulas we can write the expression for E and p:

$$E = \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}}; \qquad \vec{p} = \frac{m\vec{v}}{\sqrt{1-\frac{v^2}{c^2}}}. \tag{3.4}$$

The energy E and impulse p are the components of the four-vector, like a four-dimensional coordinate's t and r. Therefore, the equation (3.3) is true for each of the coordinates.

Particles are not point objects, but axisymmetric vortices. In circular vortices, the motion is independent along the axis and in angle. Their motion we must consider in a cylindrical coordinate system. Total energy is the sum of the energy of translational motion and the energy of rotation. Therefore, we rewrite equation (3.3) for independent translational and rotational motions of the vortex:

$$(E_z)^2 - p_z^2 c^2 = m_z{}^2 c^4, \quad \vec{p}_z = \vec{v}_z\, E_z / c^2 ; \tag{3.5}$$

$$(E_x)^2 - p_x^2 c^2 = m_x{}^2 c^4, \quad \vec{p}_x = \vec{v}_x E_x / c^2. \tag{3.6}$$

$$\left(E_\varphi\right)^2 - p_\varphi^2 c^2 = m_\varphi{}^2 c^4, \quad \vec{p}_\varphi = \vec{v}_\varphi E_\varphi / c^2. \tag{3.7}$$

In the equations, we use the notation $m_z$ for longitudinal inertness and $m_\varphi$ for transverse inertia. Longitudinal inertness is inertial mass, which for the electron will continue again denoted as $m_e$. The mass of the vortex is $m = \gamma m_z + \gamma m_x + \gamma m_\varphi$.

We now apply equation (3.5) for the electron motion along the axis OZ. Please refer to Figure 3.1. Let the impulse $p_z$ along the axis is zero. However, the ring of neutrinos will continue to rotate around the axis with the light speed. The energy of these flows is the rest energy of the electron. Consequently, the energy of the toroidal rotation of gravitons determines the longitudinal electron inertness. We can say the same thing by considering the transverse movement along the X-axis in equation (3.6). For point particles, the mass appears as potential energy. However, for size particles, when considering the wider system, it is the kinetic energy fluxes of gravitons.

Let us apply equation (3.7) for the angular motion of an electron. In a plane perpendicular to the axis, neutrinos rotate around an axis with a linear velocity close to the speed of light: $v_\varphi = c$. Therefore, $m_\varphi = 0$ — the angular inertness of the electron is zero.

The electron has a longitudinal inertness in the translational motion along the axis. In the transverse direction, it is also inertial, since its transverse inertness is not zero.

### 3.5. Mass of the photon

All material particles-fermions have inertia, gravitational field and have weight. What properties a photon has? The assertion that the photons are quanta of the electromagnetic field is not justified. Photons have neither the electric nor magnetic fields. The same applies to the recognition of light as electromagnetic wave. Photoelectric effect, Compton Effect, Raman scattering of photons speak clearly of the corpuscular structure of photons.

In the theory of relativity, the mass of the system is not equal to the mass of bodies constituting the system and energy is additive. Consider two photons flying in opposite directions with equal energies E. The total impulse of such a system is zero, and the total

energy is 2E, i.e. mass of this system is $2E/c^2$. Then the mass of each photon is $E/c^2$. If the photons fly in one direction, then the mass of this system is zero. Consequently, each of the photons will also have zero mass. What then is the physical meaning of the photon mass?

It is easy to notice the symmetry between the photon and the electron. They differ not in composition, but only in structure, orientation of spins of neutrinos relative to each other. However, the internal energy of the neutrino rings and the "amount of matter" in both particles are the same. Therefore, we can say that the photon is the electron's super partner.

Applying equation (3.5) to the translational motion of the photon along the axis, we find that the photon's longitudinal momentum is $p_z = E_z/c$, and the photon's longitudinal inertness $m_z$ is zero. Apply the formula (3.7) to annular rotation of the photon. When $p_\varphi = 0$, the photon will have angular inertness $m_\varphi$. Photon energy of the toroidal rotation of gravitons determine the angular inertness. We can say the same about transverse inertia along the X-axis.

However, the photon mass is not equal to the electron mass. We have shown above that the size of the back neutrino decreases to pass through the forward neutrino. In this case, the energy of the rear neutrino increases due to its acceleration by the front neutrino. The increase in neutrino energy is an increase in the angular velocity of the ring rotation. The moment of the neutrino pulse is h/2. The size of the neutrino inside the particle decreases inversely with the momentum:

$$r = \frac{h}{2p} = \frac{h}{2}\frac{\sqrt{1-v^2/c^2}}{mv} \quad , \quad \beta = \text{v/c}.$$

Relativistic neutrino mass at $\beta \approx 1$ is:

$$\frac{m}{\sqrt{1-v^2/c^2}} = \frac{h}{2c} \cdot \frac{1}{r \cdot \beta} \approx \frac{h}{2c} \cdot \frac{1}{r}. \tag{3.8}$$

A decrease in the radius of the rear neutrino by 100 times leads to an increase in its mass by a factor of 100. A ray of light is a symbol of straightness. The straightness of the light flux is due to the presence of significant transverse inertness in photons. To deflect photons in the transverse direction, you need to do the work.

Known, however, the Sun attracts by the gravitational field the light rays passing close to it. From the general theory of relativity implies that the body with a large mass M acts on a light particle with energy E moving at speed v. Energy-impulse tensor determines: the force F [11]:

$$\vec{F} = -G\frac{ME}{c^2r^3}[(1+\beta^2)\vec{r} - (\vec{r}\vec{\beta})\vec{\beta}], \quad \vec{\beta} = \vec{v}/c.$$

The theory says that the value playing the role of "passive gravitational mass" depends not only on the energy of a particle, but also on the direction of the vectors **r** and **v**. If the photon flies vertically (**v** || **r**) then its "gravitational mass" is equal $E/c^2$. If the photon is

flying horizontally (**v** $\perp$ **r**) then its "gravitational mass" twice and is equal to $2E/c^2$. The force of neutrinos acting on the vortices in the transverse direction.

## 3.6. Muon and proton masses

### Muon mass

Muon contains two muon neutrinos. They rotate around a common point at a speed close to the light (Figure 2.10). The mass of the muon is proportional to the doubled rotational energy of the three rings of the muon neutrino. The "amount of matter" in a muon is 6 times greater than in an electron. However, its measured mass is greater 206.77 times.

The front neutrino has dimensions and mass close to the size and mass of the neutrino in the electron. The average neutrino is similar to the rear neutrino in the photon tone. To pass through the front neutrino, it reduces its size by a factor of ten. Accordingly, its mass will increase (formula 3.8). The rear neutrino must reduce its size by a factor of hundreds in order to pass simultaneously through the inner hole of the front and middle neutrino. At the same time, its relativistic mass will increase hundreds of times. There is possible version of the mass ratio of the neutrino: 1: 14: 196.

### Proton mass

The nonrelativistic proton mass is the sum of the masses of three rotating muons (3·206.7 = 620.1). Relativistic mass is proportional to the internal energy of the body. Unlike a photon, here each neutrino is a "rear". Muon neutrino rotate more vigorously in comparison with a muon. It is logical to assume that the energy of a particle increases linearly with a decrease in the angular distance between the "spokes" of the constituent particles. In the muon, this angle is 180 degrees, and in the proton, the angle is 60 degrees. Therefore, one can estimate the relativistic proton mass as (3·620,1 = 1860.3), which is not far from the truth (1836).

### Neutrino mass

A similar consideration of the structure of neutrinos makes us admit that they have unobservable transverse inertness. In particular, for electron neutrinos and antineutrinos, the transverse inertness value should be close to half the electron mass $m_e/2$.

**Brief conclusions**

1. The attached own electromagnetic field determines the parameters of the particles. The vortex field flow, rotating with the speed of light, determines the magnetic field of the electron. The outgoing radial flux determines the electric field of the electron.
2. Mass manifests itself in inertia and the ability to create a weight and weight. The kinetic energy of the neutrino determines the inertial mass. The mass of gravitons in the own field determines the gravitational mass of the particle.
3. The mass of the outgoing flow of its own field in one second (kg/s). determines the charge of a particle
4. The momentum of the own field, referred to one second, determines the magnetic moment of the electron.
5. The mass of the photon manifests itself in transverse inertness, in the presence of momentum and energy. Photons can transfer angular momentum between particles of a substance due to the presence of angular inertness.
6. The energy of the annular rotation of photons determines the color of light.

## 4. Photon simulation

### 4.1. Momentum transfer

The accelerated electron "falls" into a proton when the recombination of hydrogen atom. In this case, the neutrino rings untwisted proportionally linear velocity. Who transferred the electron energy to accelerate? Proton has nothing to transmit - it accelerates to the electron itself. The source of energy is the external environment of the electromagnetic field. The electromagnetic field "pushes" particles from the outside to each other [12].

After stopping it, neutrino rings still are rotating. The kinetic energy of the excited state manifests in the form of pressure on the electron barrier. Photons carry away this energy in the form of "radiation".

Consider now the interaction of electrons with the photons in details. Now commonplace assertion that the absorbed photons are "disappear". On the other hand in the emission of light by atom photons are "born". Where in the atom the photon is before birth and where it place after absorption? However, photons do not die. When they say that the photon has devoted its whole energy, it means only that the photon is in the ground, not in an excited state.

There are $10^9$ photons at each electron in the Universe. Therefore, flying at a speed of light photons with different energy surround the electrons on all sides. Electrons to light photons are an obstacle: the size of the particles of the same order.

Suppose that an electron in a hydrogen atom approaches the photon is located in the ground state. Then the ring in the electron neutrino by the force perpendicular to the plane of the ring expands (figure 2.5). Photonic rings, on the contrary, under the action of the vortex flow of electrons consecutively reduce its size and pass through the inner hole of the ring neutrino — «game vortex rings» (figure 4.1).
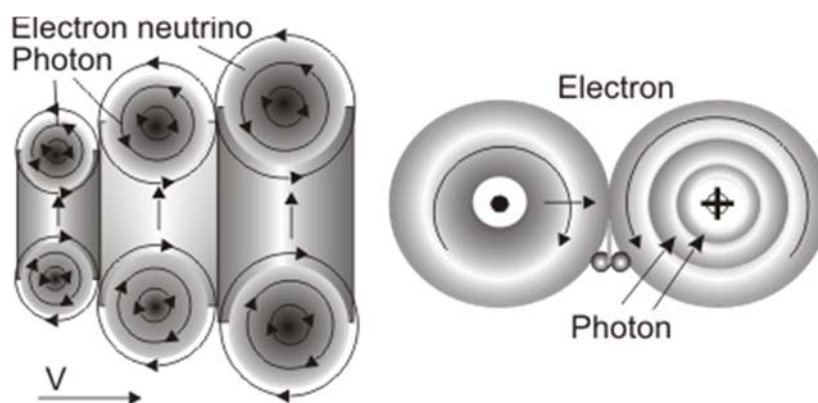


Figure 4.1. Transfer moment from the electron to the photon

The figure shows the left screw photon flying in pursuit of the electron. The right screw photons will also attract the electron, unless they are flying towards each other. Photon gets inside of neutrinos in a rotating environment — attached to the neutrino vortex field. Photon unwinds in this vortex by a field of electron neutrino. Energy is transferred by the principle "from hot to cold", i.e. while their velocity is not equal. Impulse not transmitted and momentum, so that the photon increases its transverse energy — ring frequency only. Longitudinal motion of the photon does not change.

Similarly, the process of excitation of an electron by energetic photon. Photon transfers angular momentum to the electron neutrino. More energetic, and therefore smaller in size gamma rays interact not with the valence, and with deep electrons and nucleons. Photons have a huge energy range from infrared to hard gamma radiation. Accordingly resize them. Photons are "carriers" of the thermal energy, angular momentum, relativistic mass. Photons are the main "carriers" of thermal energy from the Sun to the Earth.

## 4.2. Particle Diffraction Simulation

Each physical phenomenon is inherently mechanistic, based on the mechanical properties of physical objects. If the particles were infinitesimal point, then there were no diffraction. However, the particles have finite dimensions. It is the reason particles bypass obstacles (figure 4.2 left). Those particles that are "fit" in the size of the hole pass the hole on the line. If the edge touches the barrier, the particle turns around and goes for the hole at an angle $\alpha$ to its original direction. The deflection angle depends on the energy of particles in the incident beam and the size of the hole [13].

If the size of the hole is almost equal to the size of particles, almost all the particles will be rejected (the screen will be observed "hemispherical wave"). In this case, the angle of the particle $\alpha$ can reach up to 90º.
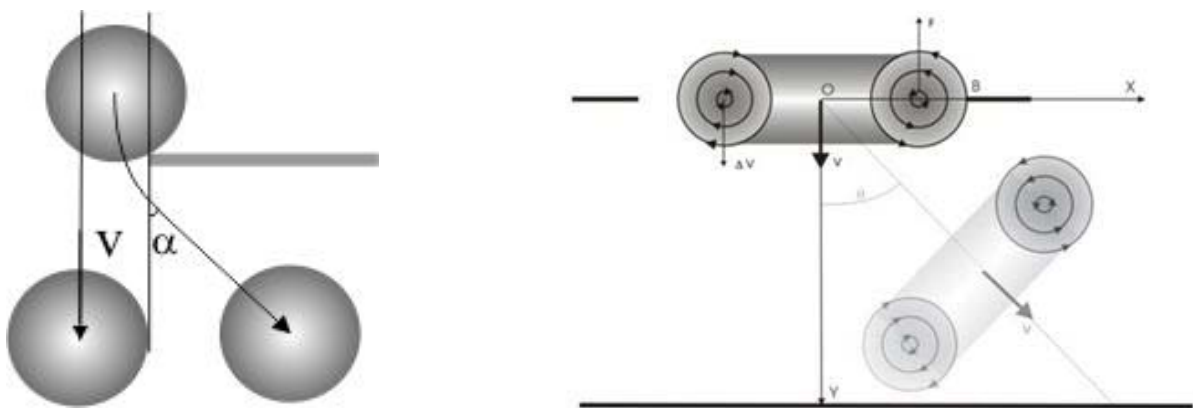


Figure 4.2. Particle diffraction

Consider the incident photon flux (or electrons) in the hole (Figure 4.2 right). The diffraction pattern occurs when interaction a vortex photon with an edge of barrier. As usual, set the hole size commensurate with the size of the particles and small compared to the distance from the obstacle to the screen.

The incident photon has a directed impulse $p_y$. The collision with the edge barriers by the elastic force F vortex begins to rotate around the point B, varying the initial moment. The position of the vortex after passing holes shown. Moment acquired component along the x-axis and became equal p. According to the law of conservation of angular momentum rate of change of the moment M is the moment of acting forces:

$$\frac{\partial \vec{M}}{\partial t} = \vec{N} = [\vec{D} \times \vec{F}].$$

Where D — diameter of the ring axis photonic vortex. Rewrite the equation in the form

$$\Delta M = D \cdot F \cdot \Delta t = D \cdot \Delta p = D \cdot p_x.$$

There is changing of momentum due to a change impulse of the particle. Impulse $p_y$ we believe the same, but the momentum change is the addition of component $p_x$. However, the moment the photon is quantized vortex: $\Delta M = hm \quad (m = 1, 2, \dots)$ And $p_x$ = P sinθ. Finally, we write the condition of maximum lateral

$$sin\theta = \frac{hm}{Dp},$$

where m = 1, 2,…, p — longitudinal impulse of the particle, D — diameter of the torus. The expression we can write in the waveform, given that λ = 2πh/p:

$$sin\theta = \frac{\lambda m}{2\pi D}.$$

There is the diffraction of particles due to the quantization of their impulse interacting with the edges of obstacles. The same mechanism of interaction with the edges of the obstacle explains the diffraction of particles in the "double-slit" experiment.

## 4.3. Refraction of light

The phenomenon of light refraction we usually consider from the point of view of geometrical optics. But why is the flow of vortex photons refracted?

Figure 4.3 shows a diagram of the refraction of a beam of light at the interface between two media [11]. Refraction also occurs due to the finite photon size. In the diagram, photons pass from optically less dense medium A to optically denser medium B. The velocities of photons in these media are different. If the angle of incidence is not zero, then for some time one part of the photon still moves in medium A, and the other part of the photon moves already in medium B. At the same time, medium B "brakes" the photon, so that it

rotates around the point braking. Small photons (purple) have time to turn faster than large photons (red).
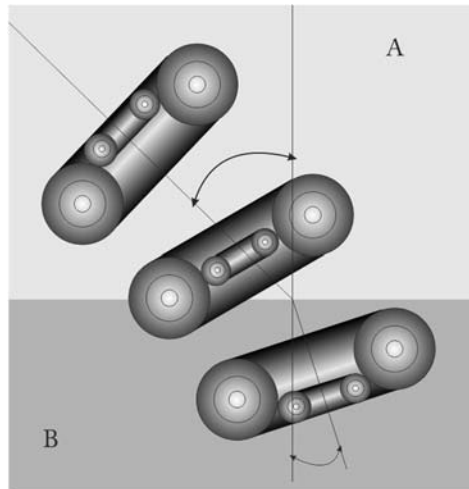


Figure 4.3. Refraction of light at the interface of two media

Thus, many optical phenomena become clearer and visual if one accepts that photons are vortex particles of matter with a certain size and structure.

## 4.4. Photon motion with superlight speed

Phenomena with photons moving in a field medium are in many ways similar to the movement of macro bodies in the air. The formulas determine the speed of sound V in a homogeneous liquid or gas and the speed of light C:

$$V = \sqrt{\frac{1}{\beta \cdot \rho}}; \qquad C = \sqrt{\frac{1}{\varepsilon \cdot \varepsilon_o \cdot \mu \mu_o}}.$$

where $\rho$ – liquid or gas density, $\varepsilon \varepsilon_o$ – electromagnetic field density,

$\beta = \frac{1}{\rho} \frac{d\rho}{dp}$ – adiabatic compressibility.

Then the value of $1/\mu\mu_o$ we can take for the modulus of elasticity of the field.

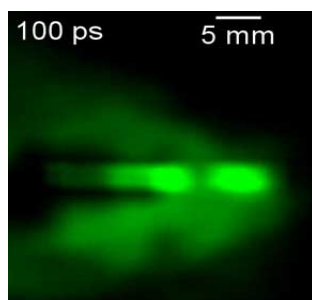For illustration, here is a photo of a recent experiment (Figure 4.4).



Figure 4.4. Shock cones of photons and aircraft

When a photon moves with superluminal velocity in a given medium, a shock cone arises. Figure 4.4 shows a picture of the motion of light pulses with a duration of 7 ps in a tunnel filled with dry ice. The tunnel had the walls made of silica and alumina. For comparison, on the right a photograph of the impact cone of an airplane overcoming the sound barrier is.

Of great interest are the ideas of this work on the rotation of photons. This property leads to the polarization of light and self-focusing of powerful polarized light rays.

## Brief conclusions

1. Photons carry angular momentum due to the presence of transverse inertness.
2. The photons receive or transmit the angular momentum to the atoms of matter as the photons pass through the inner holes of the neutrino in the electron. In this case, the angular velocity of the annular rotation of the photon and the neutrino in the electron change their values.
3. Quantization of the angular momentum of a photon when interacting with the edges of the slit causes diffraction.

## 5. Experimental models of vortex particles

The considered particle vortex models originate from the work of Louis de Broglie on the neutrino theory of light. Louis de Broglie assumed that photons - light quanta - are pairs of fused neutrinos. A neutrino has no electric charge, its rest mass is zero and the spin is ½. When merging, two neutrinos can form a neutral particle with zero mass and spin 1, i.e. with photon characteristics. The neutrino theory of light was the first in a series of models of composite particles. The E. Fermi model considered the pi meson as a bound state of a nucleon and an antinucleon. In the model of Sakata, M.A.Markov, and L.B. Okun, three fundamental particles created all strongly interacting particles.

A model is a simplified representation of a real object. The model usually reproduces only those properties of the object under study that we intend to study. A particle is a dense body, rotating at the speed of light. The body entrains in rotation the adjacent layer of the external environment. This layer we call the magnetic field. If we want to consider only the shapes of the intrinsic magnetic fields of particles, then we can compose models of particles from ring magnets.

## 5.1. Models of composite particles of ring magnets

More recently, even the very idea of modeling particles was seditious and anti-scientific. We imagined the quantum world closed and mysterious. In this world, ordinary laws did not work, and ordinary ideas were false. However, this time has passed. Today we have to show the unity and integrity of nature in the micro world, the macro world and in the system the electromagnetic field - substance.

The flat ring magnet (Figure 5.1), magnetized along the axis, is a visual mechanical model of the neutrino. The magnet creates its own magnetic field, which ensures its interaction with other magnets.

Consider a few combinations that it is possible to make of magnetic rings. If the two rings to bring together by opposite poles, then they will firmly attract each other. So neutrino pairs form photons. We note the great strength of this structure. In fact, we have one big magnet. Real rings in a photon rotate and continuously pass through each other.

Spread the photon rings by rotating around one of the ends of the diameter. When the rings are in the same plane, they will create a stable structure - the model of the electron. In the figure, the model hangs on the top ring. In reality, the neutrino rings rotate around the point of their contact: the upper ring moves from the reader, and the lower ring moves to the reader. In addition, each ring rotates around its own axis.
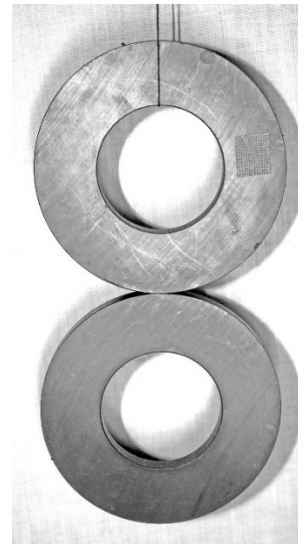
Add another ring to the electron model. We get the u-quark construction. It is statically unstable and can exist only with fast rotation. The last figure shows how an energetic small photon transmits its moment of neutrino in an electron. The moment transfer goes from "hot" to "cold". As the energy changes, the particle size changes too.



Neutrino model             Photon model             Electron model



u-quark model                    Moment transfer

Figure 5.1. Simulation of particles of the first family

Let us connect three magnets to each other (Figure 5.2 on the left). This construction can serve as a model of a muon neutrino. It continues the chain of neutrinos — photon. In reality, the "game of vortex rings" is constantly taking place here: the rear neutrino rings reduce it size and pass through the front ones. The sun emits muon neutrino fluxes. Particles are unstable; they break up into neutrinos and photons already in the solar wind streams. This phenomenon we call "neutrino oscillations".

Let us connect two blocks of muon neutrino models. We will get the model of the muon (Figure 5.2 on the right). The muon model is similar to the electron model. They differ only in the mass of elements. Static muon model is stable.
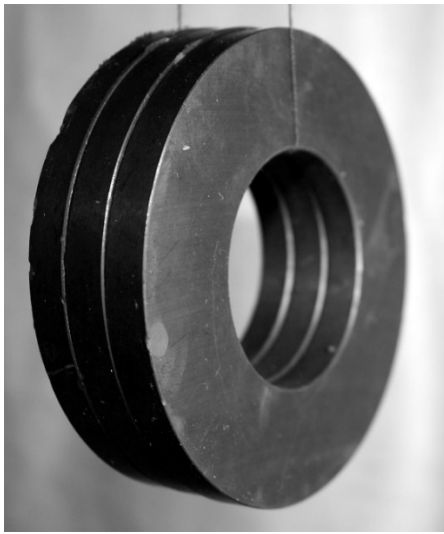


Muon Neutrino Model                                    Muon model

Figure 5.2. Simulation of particles of the second family

If we add one more muon neutrino to the muon model, then we obtain a c-quark model. It is statically unstable and can exist only with fast rotation. The fusion of two rapidly rotating c-quarks gives a proton. Figure 5.3 shows a simplified proton model. We can say that a proton consists of three muons or two pi mesons (pions).



Figure 5.3. Proton model

Thus, there are two possible mutual arrangements of the neutrino rings in the composite particles. First, they can closely adjoin each other the entire plane of the rings. These are bosons. Such is the structure of the photon, the muon neutrino and, apparently, the tau

neutrino. Their parameters: "the game of vortex rings", summation of spins, transverse inertness.

Second, in fermions, a pair of neutrino rings (or an ensemble of three neutrinos) lie in the same plane and touch each other at one point. The electron and the muon have particles in one plane; the proton has particles in three planes. The rotation of the planes with particles creates a moment (spin) of the electron, muon and proton. This rotation is stable when its minimum value is ½.

## 5.2. Vortex Engine Model

The vortex ring cannot remain stationary. It will move in the direction perpendicular to the plane of the ring, in the direction in which the liquid flows from the ring. This movement will be faster, the greater the intensity of the vortex and the smaller the ring size. The ring will move evenly, carrying all the liquid rotating around it.

Vortex ring can be compared with itself eversible bagel. It has its own "mover" in the form of toroidal rotation. Attached layer engaged with free gravitons. At the same time, vortex graviton flow resist compression and shift. Gravitons offset occurs perpendicular to the acting force, i.e., work of force is zero. In other words, the body moves in a vortex-free medium without "friction". This also applies to photons, and to the planets at the same

Vortex motion in a field we can compare to the way we walk through the land. Foot repulse land back, and the force of static friction feet on the ground pushes us forward. The movement of the wheel or tracked vehicles will close analogue. The outer part of itself eversible vortex is "rolling" on the outer tubular layer of an attached field (figure 5.4 on the left).

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

When moving the outer layer of the field is set back and the inner layer of the field is set forward. The area of the outer layer is larger than the area of the inner layer. The difference between these areas provides a vortex pulse.

The considered mechanical models in the form of permanent magnets are static. However, all systems existing in nature are exclusively rotational — they all rotate. The fundamental principle of all matter, the neutrino, is a field vortex. The screw rotation of the graviton flux in it can be divided into ring and toroidal. Toroidal rotation provides the movement of neutrinos and photons in the field environment with the speed of light.

The toroidal field vortex spontaneously moves along its axis. This may see at simple experience. The experience is to create a helical flux of the electromagnetic field. Figure 5.5 (on the right) shows a setup diagram for demonstrating the effect.
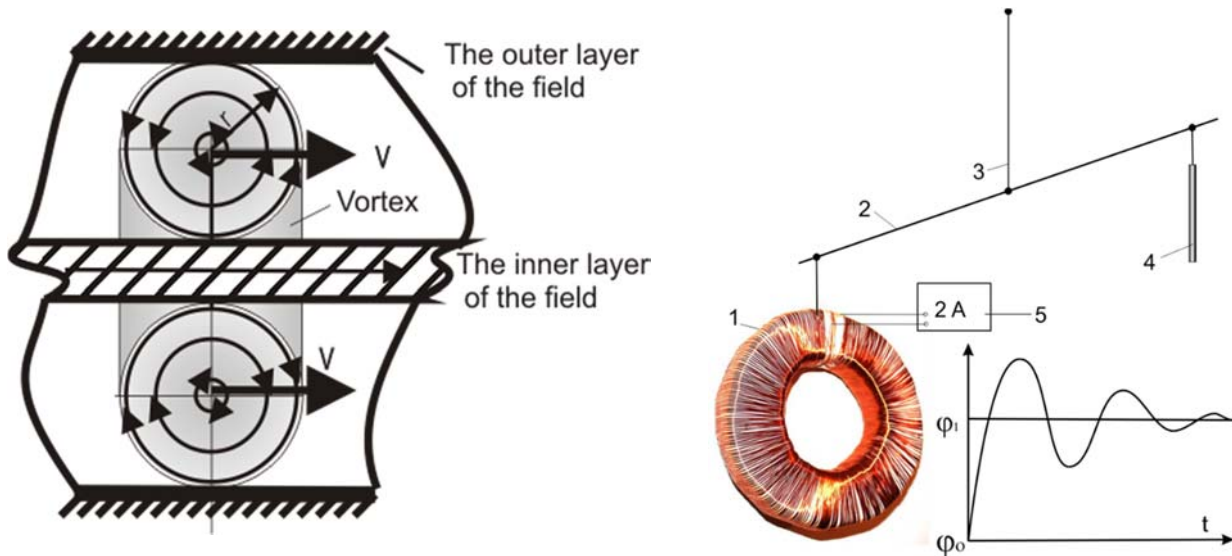


Figure 5.4. The motion of a toroid vortex in the viscous-pipe and set to simulate

The vortex simulator 1 hangs on a rod 2 torsion scale with a suspension 3. At the other end of the rod 2, a counterweight 4 hangs. The vortex simulator 1 has contact with a power source 5. The simulator weighing 275 g has the following dimensions: outer diameter 260 mm, inner diameter 115 mm, height 50 mm. 350 turns of copper wire 0.5 mm in diameter place on the core of the polyurethane simulator.

We conducted the experiment as follows. After damping all the oscillations, we swich on the power supply and set the current to 2 A. After a few dozen seconds, the rod 2 began to turn around the suspension 3. The maximum deviation from the equilibrium position was ~ 30 °. Then the rod 2 began to rotate in the opposite direction. It is obvious that the action of the restoring force of the suspension 3 on the inertial simulator 1 causes oscillations. After several oscillations, the rod comes in the new equilibrium position. The graphic of figure 5.4 (right) shows the approximate trajectory of movement of the vortex simulator.

When current flows through a conductor, the field graviton flux flows outside the conductor in the direction opposite to the electron flow. The simulator has in an invisible cloud of its own rotating field flows. The medium due to its viscosity pushes these flows. The simulator moves in the opposite direction to the flow of gravitons on the outside of the torus. Experience clearly demonstrates the mechanism of motion of vortex particles in a field environment.

In the described experiment with a torus, the flux of the vector potential (along the direction of the current) moves the ring. However, this stream is weaker than the magnetic flux, which moves at the speed of light. More efficient will be engines using solenoids or permanent magnets.

**Brief conclusions**

1. The simplest models of composite particles can be made of ring magnets. On these models, one can study the shape of the particle's own magnetic field.
2. The principles of particle motion in a field environment can serve as the basis for the development of electromagnetic engines for space objects.

## Conclusion

The past century has been the triumph of formal mathematical methods in physics. To establish quantitative relations, writing equations for this case considered the ultimate aim of study. Strange phenomenon due to the introduction of new fields and virtual particles with even more unclear properties. For example, you can specify the properties of quarks and gluons in the explanation of the strong interaction. Therefore, the beginning of the twenty-first century, the physical picture of the world appears to us in the form of fragmented mosaic of knowledge, half-knowledge and science fiction.

The world, however, is much more solid, deep and complex than it describes the Standard Model. Integrity of the world is in the fact that it originated from a single source - the primary Pre-mothers. The depth of the world lies in its multi-level, nested energy states. The complexity of this is the fact that the world is not static objects are continuously changing and interact with each other. Moreover, physics is to answer the question: how this world in all its diversity.

Today, it is clear that formal methods in physics have exhausted themselves. Over the past 30 years, any major new ideas and any breakthrough do not make. Requires a turn to qualitative rethinking enormous amount of experimental material. We cannot do it without a return to the roots, without reference to the issues of our fundamental conceptions. No mathematics can replace understanding of nature.

All the diversity of the world around us is a manifestation of a few basic principles. Proposed in this paper the system of levels of matter and the vortex model of the micro world can extend the physical representation of the outside world. There is only one hypothesis in the work: the vortex structure of quantum fields and elementary particles that fill the space of the universe. Vortex model is the development of the ideas of Descartes, M. Faraday, J. C. Maxwell, G. G. Thomson, W. Kelvin, Louis de Broglie and others. In this model, the field and the substance is only different forms of a single vortex motion of matter. The transition from one form of motion to another due to the vortex energy. The initial energy is stored in the vortices since the Big Bang

The beginning of our universe put an explosive expansion Pre-matter — super compressed superfluid substance. Pre-matter fills White Holes that are at the core of Black Holes. It has a maximum entropy at T = 0 K. Pre-matter has antigravity properties: it can only grow simultaneously at all points. In this case, due to the super fluidity it is homogeneous and isotropic in occupied volume.

In the process of cooling medium in the expansion a hierarchical system of nested quantized energy levels of matter had formed. At the end of the inflationary phase, laminar expansion of Pre-matter replaced the turbulent regime to form a plurality of energetic vortices gravitons. Vortex gravitons are quanta of the electromagnetic field.

Large-scale vortex condensations of an electromagnetic field form a halo of galaxies — "Dark Matter". This is a rotating gravity funnels for the formation of future galaxies with stars and Black Holes.

The substance occurs in the process of partial condensation of gravitons environment in the vortices neutrinos. Neutrino is the only elementary particle. The neutrinos formed composite particles grouped then in atoms and molecules. Further interaction of the elements the substance leads to the unification of its fragments into planets, stars and galaxies. They maintain the vortex formation. The medium of the electromagnetic field surrounds any fragment of the substance. The motion of particles the substance in this environment takes place without work.

In unfolding in front of us picture of the structure of matter, we cannot overlook analogy in extreme it states — in the world of elementary particles and in the world of galaxies. First, it is rotating vortices as the main form of movement. Further, in the world of the particles the primary elements — neutrinos — are forming composite particles and crystalline structures. In the world of galaxies, we observe constituent clusters up to the cellular structures of super clusters. These analogies allowed us to conclude that the formation of the substance stability preserved vortices with minimum and maximum values of angular momentum. First, we know as neutrinos, the second - as galactic Halo. Always and everywhere, we see surprising fractal in nature.

Analysis of the structure of the electron revealed the model essence of the concepts of mass and charge. The charge represents the mass of gravitons emitted by an electron in one second. Inert, active and passive gravitational mass determined by the number of gravitons in their own field layer attached particles, which corresponds to the total energy of the particle. The paper shows the difference of longitudinal and transverse inertness of vortex particles. In this regard, we approve by the presence of the mass of the photon, which manifested in his energy, momentum, angular momentum and transverse inertness. Because of this, photons are carriers of energy between material objects of substance.

Consideration of the vortex model has allowed a new interpretation of the experimental data on the micro-world, as well as to offer some of the new provisions:

1. The matter of our Universe is in three phase states of dispersed media: Pre-matter, electromagnetic field and substance. Black Holes and quasars perform phase transitions between states.

2. Expansion is the mechanism of the phase transition from the anti-gravity Pre-matter to the electromagnetic field and further to the substance. Compression is the mechanism of the phase transition from substance to the Pre-matter.

3. The primary elements of a substance, electron neutrinos and antineutrinos, are vortices in an electromagnetic field environment. Neutrino and antineutrino form the remaining particles.

4. Own streams of an electromagnetic field surround a particle or a fragment of a substance. Stream parameters determine particle properties.

5. The mass of the own field determines the relativistic mass of the particle.

6. The mass of the outgoing field flow in one second determines the charge of the particle.

7. Photons transfer the angular momentum between the particles of a substance due to the presence of transverse inertness.

8. The quantization of the angular momentum in the interaction with the edges of the obstacle determines the diffraction of particles.

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