Antimatter. Hasty name and recognition.

Abstract. Two versions have been advanced, which explain "antimatter" as a rare quantum state of ordinary matter. Confirmatory arguments are given.

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How the myth of antimatter was born.

The name "antimatter" arose accidentally. At the beginning of the 20th century, gradually, physicists got acquainted with the achievements of each other, some new terms were adopted. Not necessarily it happened in chronological order. But after decades, the picture of the creation of the myth about antimatter is the following.

1923 year. Soviet physicist D. Skobeltsyn studies the interaction of gamma quanta with the electron shell of an atom. To observe the tracks of electrons, he first used a cloud chamber placed in a magnetic field. This method of recording allowed for the curvature of the track to measure the energy of electrons. The source of γ-quanta was located next to the cloud chamber. Analyzing the obtained photographs, Skobeltsyn first obtained a number of new results on the mechanism of the interaction of gamma quanta with an atom: he measured the cross sections for the interaction of gamma quanta with different atoms, and measured the ionization losses during the motion of a charged particle in the medium. However, much more interest was attracted by the trajectories of high-energy electrons not curved in the magnetic field observed in the Wilson chamber. The fact that these trajectories belong to electrons, D. Skobeltsyn concluded from the magnitude of ionization along the track of the particle passing through the Wilson chamber. Skobeltsyn concluded that these tracks belong to the electrons of cosmic radiation, but they do not warp, because have large energies. Soon this hypothesis was confirmed - the tracks did not disappear after the source of γ-radiation was removed. The energy of cosmic electrons according to Skobeltsyn's estimates was ~ 1 GeV.

Surprisingly, it turned out that not all particles deviated in a magnetic field in one direction. Some particles deviated as if they had a positive charge. Initially, these tracks were taken as positively charged protons. However, the nature of the ionization along the track was the same as in the case of electrons. In order to understand the nature of these particles, it was necessary to measure the direction of motion of the particles, to measure their energy.

- The young French physicist Paul Dirac, who in 1928 succeeded in deriving a general equation for describing the motion of elementary particles by means of the theory of relativity, came across an interesting feature of his solution. It followed that in addition to the ordinary elementary particles, in principle, there can exist also the same particles, but with a charge opposite in sign - peculiar mirror reflections. This often happens when the formula contains a square of something. For example, if the particle energy is $mV^2/2$, then it means that the particle can move both in the positive and negative directions. Apparently the square of the particle charge was in the formula.

The results of D. Skobeltsyn and his method of detecting particles of cosmic radiation aroused great interest among physicists all over the world. Several laboratories began to create similar installations. In the Cavendish Laboratory, P. Blackett and J. Okkalini were engaged in this, and in the USA experiments with the cloud chamber in a magnetic field were started by a young researcher K. Anderson, who worked under the leadership of the Nobel laureate J. Milliken.

As a result of the experiment (1932), the American physicist Karl Anderson, studying trajectories in the magnetic field of high-energy particles arriving to Earth from space, with gas molecules, as well as Skobeltsyn earlier, discovered on the photographic plate

traces left by particles having the same mass as and an electron, but as if charged positively. It was a trace of an anti-electron, later called a positron, of the first experimentally discovered antiparticle. Thus began the history of antimatter.

In those days, scientists were not too worried about the consequences of adding the prefix "anti-" and did not invest in it a particularly broad sense, except for the behavior of a particle with an opposite charge. However, scientists never really worried about the consequences of their discoveries. But what happened before and after was repeated many times. The writing fraternity, journalists, inflated the notion of "anti-matter" to an absolutely global meaning. Up to the point that romance novels fell between people made of matter and antimatter that could not touch each other to avoid an explosion. And the scientists did not have time and opportunities for a thorough analysis of the causes of such "anti-behavior" of particles and for refuting the conjectures of journalists.

Indeed, what else could K. Anderson suggest at a time when, even according to modern (2013) ideas of elementary particle physics, the electron is indivisible and unstructured (at least up to distances of 10^{-17} cm). No other hypotheses, except antimatter, on the assumption of a structureless electron simply can not exist. To this we can add that only in 1921 the spin and the magnetic moment of the electron were discovered. Quantum physics was just emerging. In 1926 the Schrödinger equation was invented. At about this time, the quantization of the projection of the spin and the magnetic moment on the direction of the magnetic field was discovered. All quantum phenomena, they still look quite strange and unnatural.

All the physics of elementary particles in the 30 years of the last century was still in its infancy.

Conservative and backward part of scientists love meaningful, lofty vocabulary. In addition, the law of obscurantism is known: as soon as it wins, creative processes cease; nothing new is created; and all existing creations of writers, scientists, artists and musicians turn into icons. They begin to cover with gilding and clever ranting sayings. In addition, the obscurantist part of scientists likes to duplicate terms. Each variation, each modification, every new step, every deviation immediately receives a new term. In addition, often all that just opened the scientists, under the pressure of just these scientists immediately inserted into the textbooks and presented to students as a dogma. Students begin their scientific life right away with the development of these new dogmas, which may turn out to be erroneous.

And that's what conservative scientists did about elementary particles and antimatter. The presence of an antiparticle in each elementary particle is confirmed by the principle of charge conjugation. Each particle, with the exception of a photon and a pion, corresponds to an antiparticle. (Gödel-Occam).

- There is CPT-invariance - it is supposedly the fundamental symmetry of physical laws under transformations involving simultaneous inversion of charge, parity and time. That is, randomly noticed coincidences, in questionable experiments and with a questionable interpretation of these experiments, immediately put on the form of global laws of nature!
- The possibility of the existence of antimatter follows from the "invariance of the laws of nature" with respect to the CPT transformation (see CPT Theorem).
- Due to the invariance of the strong interaction with charge conjugation (C-invariance), the nuclear interaction between antinucleons exactly coincides with the corresponding interaction between nucleons, which ensures the existence of nuclei from antinucleons ("antinucleus").
- The antinucleus has a mass and energy spectrum the same as in nuclei consisting of the corresponding nucleons.
- Electric charges and magnetic moments of antinuclei are equal in magnitude and opposite in sign to the electric charges and magnetic moments of the corresponding

nuclei.
- Due to the C-invariance of the electromagnetic interaction, electromagnetic transitions in the nuclei of matter and antimatter coincide.
- The electromagnetic interaction of positrons and antimatter nuclei should lead to the formation of bound states - antimatter atoms, where the antimatter and matter atoms should have an identical structure.
- Due to CP-invariance of the weak interaction, the mixing of atomic or nuclear states with opposite parity due to them is the same for matter and antimatter.
- The collision of an object consisting of a substance with an object from antimatter leads to annihilation of the particles and antiparticles entering into their composition.
- For a long time it was believed that, due to the similarity of characteristics, particles and antiparticles should take part in similar processes (complete symmetry). Later it was proved that this symmetry is characteristic only of strong and electromagnetic interactions, and for the weak one it is violated. It would be worthwhile to think about, but this was postponed until later and nobody doubted the existence of antimatter.

Ostensibly a positron.

The positron is an $e+$ elementary particle with a positive unit electric charge, an antiparticle with respect to the electron. The mass of the positron coincides with the mass of the electron.

On modern scientific installations, scientists have been able to accurately determine the mass of an electron and the so-called antielectron-positron. Here are these masses:
Electron: $9.1093829 \cdot 10^{-31}$ kg.
Positron: $9,1093826 \cdot 10^{-31}$ kg.
That is, the mass of a positron is equal to the mass of an electron with very high accuracy.
- Positron charge is +1. The charge of an electron is -1.
- The positron spin is ½. The spin of an electron is ½. As is known, the sign can only have the projection of the spin. And for unknown reasons, the comparison of the projections of the spin of an electron and a positron has not been investigated. Did not pay attention.
- The magnetic moment of the positron is equal in magnitude and opposite in sign to the magnetic moment of the electron.
- In a vacuum, a positron is a stable particle. When a positron collides with an electron, annihilation of the $e+$ and $e-$ pairs occurs with the formation of γ photons (usually two). In experiments on accelerators in beams of positrons and electrons dispersed towards each other, annihilation of $e+$ and $e-$ is observed with the formation of heavier particles (hadrons, pairs of photons).

Positronium.

When a slow positron collides with an electron, a bound atomic system-positronium-is most likely formed.

The atom of positronium was first synthesized by M. Deich in 1951.

Again a rather strange attitude of scientists towards positronium as to the atom. After all, in an atom, an electron by mass is thousands of times smaller than a nucleus. And in positronium, the masses of the electron and the nucleus are the same. Who is spinning around whom? Apparently, too, threw the term to journalists and stuck.

Positrons in nature

In space, positrons (supposedly) are produced by the interaction of gamma quanta and energetic particles of cosmic rays with matter, as well as the decay of certain types

of energetic particles. Thus, part of the primary cosmic rays are positrons, since in the absence of electrons they are stable. In some regions of the Galaxy, annihilation gamma lines of 511 keV have been detected, which prove the presence of positrons.

In the solar thermonuclear pp cycle (and also in the CNO cycle), some of the reactions are accompanied by positron emission, which immediately annihilates with one of the surrounding electrons; Thus, part of the solar energy is released in the form of positrons, and in the Sun's core there is always a certain amount (in equilibrium between the processes of formation and annihilation).

Some natural radioactive nuclei (primary, radiogenic, cosmogenic) experience beta decay with positron emission. For example, part of the decays of the natural isotope K occurs precisely along this channel. In addition, gamma rays with an energy of more than 1.022 MeV, arising from radioactive decays, can give birth to electron-positron pairs.

Annihilation of a positron and an electron.

Annihilation of a positron and an electron in positronium is the source of monochromatic γ-photons with an energy of 0.511 MeV. The main sources of positrons are: the creation of pairs of $e+$ and $e-$ gamma-photons of high energies and decay of nuclei (beta processes). The formation of positrons occurs in the reactions of the hydrogen cycle, as well as in the reactions of the carbon cycle. The formation of $e+$ and $e-$ pairs can be caused by the interaction of hard gamma radiation with the magnetic field of the pulsar. At a high temperature ($kT>m_Ec^2$), in the thermodynamic equilibrium with radiation, $e+$ and $e-$ pairs should be present, which is typical, for example, for the early stage (supposedly) of the evolution of the Universe.

The annihilation of slow electrons and positrons leads to the formation of gamma quanta, and the annihilation of slow nucleons and antinucleons leads to the formation of several pions. As a result of subsequent decays of pions, hard gamma radiation with a gamma quantum energy of 70 MeV is formed.

The process of collision of a particle with an antiparticle, as a result of which other elementary particles or photons emerge, was called annihilation. The first example of annihilation in physics was the interaction of an electron and a positron with the formation of two gamma quanta.

But conservative physicists love order and analogy. And since the theory of quarks (similarly expressed as a hypothesis, but picked up and inflated by journalists) is already generally accepted, according to which protons and neutrons consist of even smaller particles called quarks. Consequently, both antiprotons and antineutrons consist of antiquarks.

Antimatter. Generalizations of conservative physicists.

Atoms of antimatter have not yet been observed. In experiments with accelerators, the events of formation (supposedly) of light antinuclei in hadron collisions were recorded.

The particle and antiparticle have the same mass and lifetime equal in vacuum. Their charges are equal in magnitude and opposite in sign. Spin particles and antiparticles are the same.

The positrons and antiprotons observed in cosmic rays can be explained by their production in collisions of high-energy particles without invoking hypotheses about the existence of macroscopic antimatter regions. In favor of this indicates the absence of antimatter nuclei in cosmic rays. Direct astronomical observation of a remote cosmic object because of the identity of the spectra of electromagnetic radiation of atoms of matter and antimatter does not allow us to establish whether this object consists of

matter or antimatter. The astronomical manifestations of stars from matter and stars from antimatter should be the same.

There are very few experiments on antimatter. All results are obtained at the level of 1 element according to the periodic table. Not even the elements themselves, but only their nuclei. The interaction between different elements consisting of matter and antimatter has not been studied and not detected. That is, for example, the interaction between hydrogen and anti-lithium has not been studied.

Thus, all the results on antimatter, in principle, are fully understandable within the framework of ordinary physics, for example, by the existence of a pair of different quantum states of elementary particles, in which these particles are capable of mutually reacting and transforming into a pair of photons. These states are very, very rare, so they are rarely observed, but they are possible.

Excess of electrons.

Antiparticles carry a similar, but opposite in value charge, like their prototypes from ordinary matter, but have the same mass and are similar to them in all other respects. But scientists could not wait to generalize the picture.

And of course, scientists immediately assumed that in the universe there can be whole galaxies of antimatter. This assumption was picked up by the science fiction writers and, in general, the fiction about antimatter, gained universal recognition.

True, this equality of the quantities of matter and antimatter was not confirmed and caused scientists a strong headache and various fictions.

It was also suggested that antimatter in the universe may be even more than ordinary matter. Just to see the antimatter is impossible, as well as the objects of the ordinary world around us. It is not visible to the human eye. However, reflection shows that the interaction of antimatter with photons is exactly the same as ordinary matter. Therefore, you can see it. It's just nowhere to be found.

Absence of antimatter in the interstellar medium.

In the presence of stars from antimatter, various mechanisms of mass loss by stars would lead to the appearance of antimatter in the interstellar medium and its annihilation with interstellar gas. The absence of intense gamma radiation, which should be observed in such annihilation, imposes a strict limitation on the concentration of antimatter in galaxies (less than 10^{-15} of the concentration of matter) and in clusters of galaxies (less than 10^{-6} of the concentration of matter), i.e., observational data of gamma-ray astronomy indicate the absence of a significant amount of antimatter in the outer space surrounding us, up to the nearest galaxy cluster. The need to explain the absence of strong mixing of matter and antimatter in cosmic scales, smaller clusters of galaxies, is an essential difficulty of cosmological models suggesting an equal amount of matter and antimatter in the universe.

Antimatter and the "Big Bang".

Further, it was necessary to draw the theory of antimatter behind the ears to the theory of the "Big Bang". To observe the rule of unity of all theories. And also, as one Internet user joked, on the association with the yahve-like texts (the Bible, the Talmud, the Koran, the ZoAr, and so on ...). For example, it is obvious that the Big Bang hypothesis is nothing more than an association to the creation of the world of Yahweh.

In this case, it was necessary to dock with the Big Bang and an excess of electrons above the positrons. Therefore, it was accepted that in the first instants after the Big Bang the number of positrons and electrons in the universe was still approximately the same. However, since such an identity is not observed now, it was decided that during cooling this symmetry was violated. In order to explain these violations, various deceptions appear regularly in the press. Here is one property found in some particles,

then another, then the third, which could lead to a violation. And each time they forget that exactly the same property must also exist in antiparticles.

The process of violation of the equality of the quantities of electrons and positrons is described approximately in such words, which are by no means provable, but very naive. Say, while the temperature of the Universe did not drop to 1 MeV, thermal photons constantly maintained in the substance a certain concentration of positrons by the creation of electron-positron pairs (such conditions exist even now in the bowels of hot stars). However, after the cooling of the matter of the universe below the threshold of pair production, positrons somehow became annihilated with an excess of electrons. Where did the excess come from - it's not clear.

Is the field of an electron spherically symmetric?

True, it is rather strange that, having strong evidence of the presence of spin and magnetic moment of the electron, obvious signs pointing to the axial symmetry of the particle, its length and its rotation, no one seriously considered the structure of the electron. Apparently, the main reason was originally that there were no technical possibilities for studying the structure of elementary particles. In addition, a purely mechanical model of the electron gave values of the speed of rotation on the surface of an electron in the region of the velocity of light, which at that time did not receive an explanation.

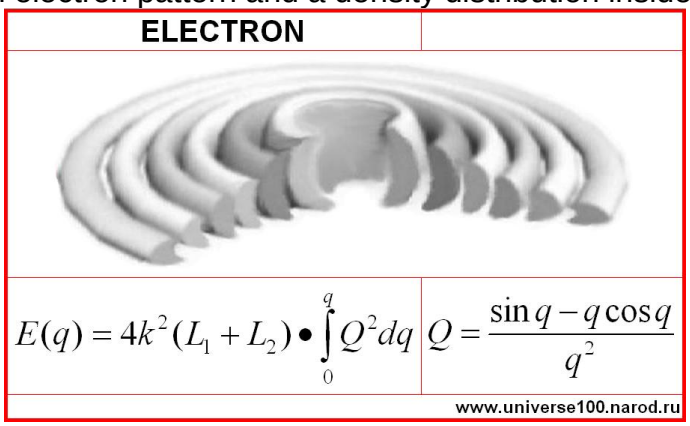
Thus, from the 20s to the 30s of the last century, it was historically established that the electron is point and structureless. And all its properties, charge, mass, spin, etc. - this is some magical, internal and inexplicable properties.

And everyone knows that breaking dogmas is not a thankful task. Even punishable.

What does the macroscopic field of an electron look like?

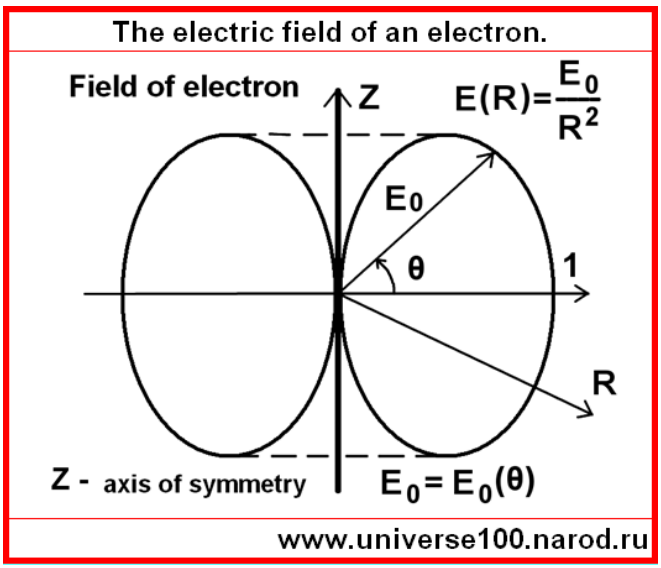
We have established that the electron is axisymmetric, but does not have spherical symmetry. The neutron possesses the same properties. The proton does not even have axial symmetry. It is more difficult to analyze a neutron, because its electric charge is zero and the external fields practically do not affect the trajectory of its motion. Therefore, such a powerful research resource as the trajectory of a particle in an external electric or magnetic field to a neutron turns out to be completely inapplicable. Next, we consider an electron.

Let us try to analyze the distribution in the space of the electric field of the electron. We already have an electron pattern and a density distribution inside it.



(43-1)

We have a fairly reliable hypothesis of the electric field distribution around the electron. Let (R,θ,φ) be spherical coordinates. The distribution of the macroscopic electric field does not depend on the angle φ and has the following form in the (R,θ) coordinates:



(43-2)

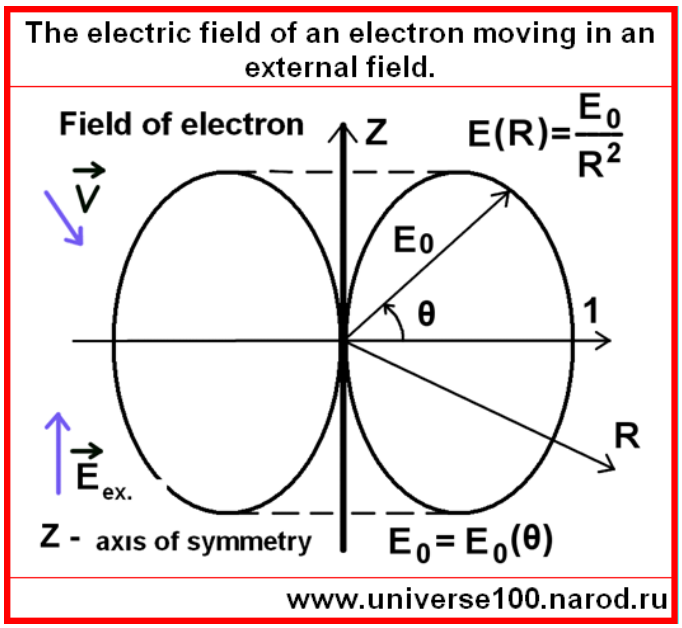
That is, according to the sign, the field (as generally accepted) is negative. And in absolute value varies depending on the angle θ. At θ=0^0 or 180^0, the field is assumed to vanish.

In terms of microscopic this field of an electron breaks up into a huge number of thin wave spherical layers. From layer to layer, the field changes. And within each layer the field is not uniform. Investigation of the electric field of an electron at the micro level is a separate task, here we do not touch this.

How does an electron behave in an external field?

How does a moving electron behave in an external electric or magnetic field? Because of its spherical asymmetry, the electron, in its motion, will always acquire a certain, quite specific orientation with respect to the external field. Namely, such that its potential energy is minimal. Or in other words, when the external force acting on it is minimal. This is the principle of mechanics.

Consider the same figure of the electron, but now moving at a speed V (see the figure below) in the external field of E_{ex}. (arrows on the left, in blue). Suppose that the optimal orientation of the electron is achieved precisely when the electron is oriented along the Z axis. In this case, the direction of the velocity of its motion relative to the vector of E_{ex}. can be very different.



(43-3)

Obviously, this is precisely the same orientation that the electron acquires in all experiments with an external electric field. A similar picture will also be observed when an electron moves in an external magnetic field. With the difference that you need to take into account the other direction of the magnetic field.

It is also evident that it was at this, and only at this, and always at this orientation, that the electron charge was measured and that Coulomb's law was verified.

But is another orientation of a freely moving electron in an external field possible? How to keep it in a different orientation? String on the needle as an apple and then turn? Unfortunately, such a focus is practically not feasible. And the electron as it was until now, will remain forever. And its charge, and its orientation, and Coulomb's law.

However, there is still an assumption. If the electron is steadily oriented in position as in the picture, then it has one more, though not very stable, equilibrium position. Namely - with the opposite orientation. Yes, what is there to invent, if according to the quantum theory, the electron simply has two projections of the spin on an external electric or magnetic field. In this opposite orientation, the electron can not appear in our experiment, because it is impeded by the thermal motion of the surrounding particles. But he may find himself in this unstable state if he flew from a distant cosmos. And it is quite possible that the configuration of all fields (including the field of the electron itself) is such that in some very small region of solid angle, the electron of opposite orientation possesses stability of this orientation. Moreover, since all the surrounding processes are macroscopic, nothing can extract an electron from such a locally stable position. In addition to some energy collisions with other particles. So he flies from a distant cosmos, with the opposite orientation, and nothing can take him out of this orientation, because all the fields around change smoothly, gradually, without jumps.

It is fairly obvious that the external magnetic field begins to act on the oppositely oriented electron in the opposite direction. And then how does an electron, with such an opposite orientation, start behaving when moving? He behaves like an oppositely charged electron. That is, as a positron.

True, it is not clear, but how such an oppositely oriented electron, the positron, will behave in the electric field? And were there such experiments?

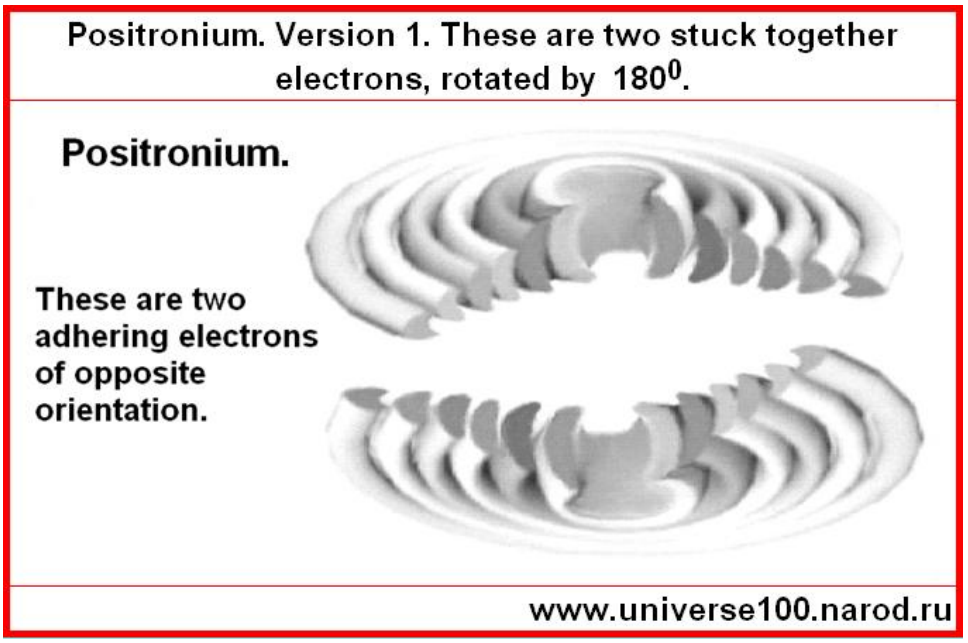
Two of our versions of the phenomenon of antimatter.

Version 1. Positrons are electrons rotated by 180^0.

However, on this surprise with the oppositely oriented electron do not end. In the

collision at low velocities of the motion of an electron with an oppositely oriented electron, their composite is possible, which is discovered in experiments and is called positronium. Positronium is a clutch of two electrons when they are turned, as if facing each other.

However, in conductors, it is more preferable, especially when applying an external electric voltage, when the electrons are aligned in a chain, like soldiers in a column, one after another. With such a system, not one or two (as in positronium) can be lined up in a column, but any number of electrons. In this case, if there is a small attractive force in positronium, then in the chain of electrons in the conductor there is a small repulsive force.



(43-4)

This is the first version of the explanation of the phenomenon of antimatter and all related paradoxes.

Version 2. Positrons = excited free electrons with increased spin.

It is generally accepted that elementary particles do not have energy levels in the free state. But we are going along unprotected routes. This version has already been considered by us in the chapter on the angular momentum of loks or elementary particles.

The possibility of spin levels for a free electron.

Let us consider a free electron. An investigation of the mechanical properties of a free electron as a wave object reveals an interesting possibility. Namely. The possibility (in principle) to increase the diameter of rotation of the constituent layers, without changing the total energy of all layers, that is, the entire wave object. That is, if we give the electron an additional torque of rotation, then in principle it can be so, all this torque will go to increase the size of the electron, but its mass will remain unchanged.

Let's see how it looks mathematically.

As is known, the moment of rotation of a physical body has discrete levels M_l. l = 1,2, ... For each such value of l, there exist (2l+1) solutions of the Schrödinger equation, which are spherical functions. The eigenvalues of the squared angular momentum operator are:

$$M_l^2 = \hbar^2 l(l+1)$$

(43-5)

l = 1, 2, …

That is, from the Schrödinger equation (which, as we know, is equivalent to the wave equation) necessarily follows the discreteness of the square of the angular momentum of the object, regardless of the appearance of this object. In particular, these objects can be loks.

Further

The moment of the pulse expressed through the moment of inertia and the angular velocity of rotation.

$$M = I \bullet \omega = (k \bullet m) \bullet \frac{2\pi R}{c}$$

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(43-6)

k is some coefficient that takes into account the shape of the body. Not to be confused with the previously used designation of the wavenumber. We assume that the value of k varies little with changing l. That is, k_l=k=const. That is, the shape of an electron under such spin excitation changes little. How is it that in reality is difficult to say for the time being. But here is set out a certain general view, which reflects the essence of what is happening. In reality, the shape may change slightly, the size may change slightly, the density may change slightly. So that in sum the energy (mass) of the electron does not change under spin excitation.

Then there is a constant in parenthesis and it becomes obvious that to execute the original formula it is sufficient that $R(l)$ also change as M_l. I.e:

$$R(l) = R_0 \cdot l \cdot (l+1)$$

(43-7)

Where R_0 is the Compton radius of an electron:

$$R_0 = \frac{\hbar}{2\pi m_e c}$$

(43-8)

How do the values of $R(l)$ for the first two values l=1 and l=2 correspond, for example? It is easy to calculate that this ratio is equal to 2(2+1)/1(1+1)=3. That is, roughly, the first excited state (by the moment of the pulse) of the electron has a moment of inertia 3 times greater than that of the unexcited electron. But since at the moment of inertia the size enters the square, the linear size of the "excited" electron is about 1.7 times larger than that of the ordinary electron.

Again, here, at first glance, there is a contradiction with the generally accepted opinion that elementary particles do not have energy levels in the free state. But we are following unprotected routes, which refute many dogmas.

A free electron, according to the conventional wisdom, can not absorb a photon, since in this case the laws of conservation of energy E and momentum p can not be observed

at the same time. For example, for the optical transition of a free electron from the state E_1,p_1 to the state E_2,p_2 in the absence of the third body (condensed matter, atom or scattered photon), the conservation of energy and momentum $E_1-E_2=\hbar\omega;\ p_2-p_1=\hbar\omega/c$ are incompatible for any electron velocity $u<c$.

And with this, they all sort of resigned themselves. But we forget that all these statements are correct under the assumption that the electron is pointlike. And if not? If it is a very complicated localized wave vortex at all? If he can change the size, shape? And what if the third particle is in the right place at the right time?

Suppose that with the help of a third particle, an electron will absorb a photon.

For example, such a process. The third particle interacts temporarily in a triple collision, but at the same time it takes the photon energy itself, and it transmits some torque. As if beats casually, on a tangent. And in principle, with triple collisions, an increase in the angular momentum is possible without increasing the electron energy.

Electron is a wave localized formation. Consisting in the normal state from the system of wave rings. Suppose that an electron has obtained a minimum possible quantum of the angular momentum without changing the total energy. What kind of an electron will be acquired after this? It converts the electronic layers in such a way that the internal "hole" is somewhat expanded and all the layers are shifted somewhat. Here's what a "free-excited" electron becomes:

(43-1-a)

(43-9)

If we recall that the spin of an electron, and with it the charge of an electron, is the result of the rotation of the depicted wave rings (and the neighboring rings rotate in different directions), then it is easy to see that both the spin and charge of the "free-excited" electron change the sign to the opposite. Which will correspond, ostensibly, to the positron. In fact, it's just a "free-excited" electron. And nothing more. However, since experiments comparing the orientations of the electron and positron spins have not been carried out, then we have no right to deny this possibility.

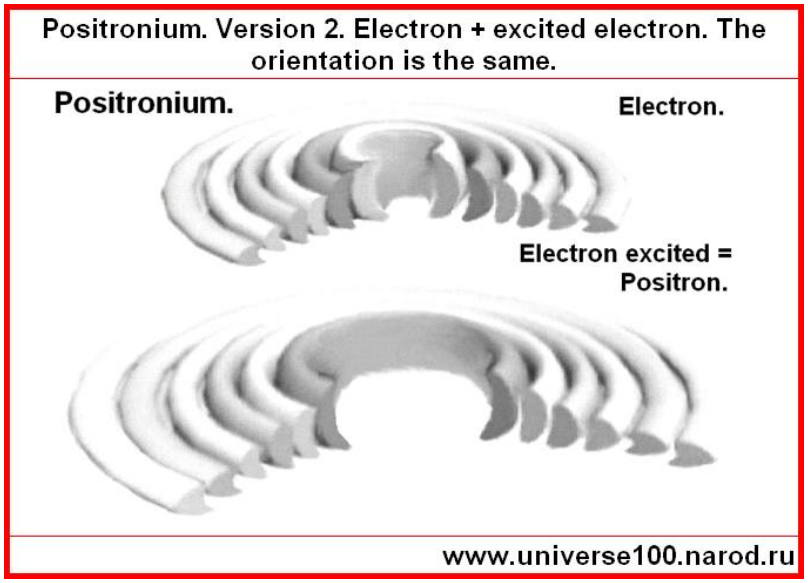
- Yes, a "free-excited" electron will annihilate with a normal electron, because their wave rings are displaced and, when applied, it may turn out that they rotate in opposite directions.

- Yes, this "rotationally-excited" state of the electron is very rare in nature and difficult to obtain in experiments. And the fact that we draw in the figures, the production of

electrons and positrons when passing gamma quanta through a lead plate, does not correspond to reality. Because the beam of the resulting electrons is a thousand times thicker than the beam of resulting positrons.
- And for this very reason, supposedly positrons in space are extremely small. In general, antimatter in space is not enough for the reason described here. And do not invent anything, all sorts of standard models and so on. This is a delusion of world physics.

Positronium. Version 2.

For clarity, an electron is shown on top and an excited electron - that is, a positron - from below.



(43-10)

That is, when a free electron is excited, which according to traditional physics can not be excited, but in fact can, a positron is produced. With a soft rapprochement between them (and with the appropriate orientation), their connection is formed, which is always called positronium. With a rigid approach, their turns, which are shifted along the radial coordinate, mutually annihilate and form two photons.

Why is antimatter in the universe so small.

The reason is simple. Antimatter is a rare (quantum) state of ordinary matter. Therefore, the percentage of positrons in cosmic radiation is very small.

The essence of annihilation.

- Annihilation is a process of merging a particle + the same particle, oriented towards, or excited. When all the turns of localized wave formations straighten out at once, they turn into directly flying photons. Naturally, in different directions.

The existence of annihilation signifies the possibility of an inverse process, the fusion of two photons in a collision, and the formation of a pair of two elementary particles in different quantum states. In further collisions with surrounding particles, the particles obtained lose the opportunity for reverse annihilation. That is, it can be argued that globally in the universe, thus, an equilibrium is achieved between the amounts of photons and elementary particles.

Is the mathematical description of the positron possible?

It is possible that we have not received all the basic solutions of the wave equation leading to an electron. It is possible that there is another solution that gives another form of an electron, but exactly the same energy of the new object that is integral in

space.

- How can this new object look? It must have the same spin, ½$\hbar$, like the electron. It must have the opposite charge. As we have previously established, the charge distribution correlates with the spin distribution. As can be seen from the graph of the spin density distribution in an electron, the spin sign determines the first wave of an electron. As it goes right down, so the spin becomes negative and the charge of the electron becomes negative.

It is not excluded that the excited state of an electron is described by some solution from the spectrum of general solutions.

As we know, the basic solution of the wave equation, the solenoidal solution that gives all the elementary particles has the form:

Solenoidal solutions. In such a wave all energy moves around the axis. This class of solutions defines elementary particles: a proton, a neutron, an electron, mesons, etc.

$$W(r,\theta,\varphi,t)=\frac{C_j}{\sqrt{r}}\bullet J_{j+\frac{1}{2}}(kr)\bullet P_j^m(\cos\theta)\bullet \bullet\sin(m\varphi-\omega t)$$

k - Wave number. i=1,2,3 (cartesian); j,m - integer;

C_j - Arbitrary; $\omega=c\bullet k$; c - Speed of light.

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(5-12)

However, if we return to the sequence of obtaining this decision and the portrait, it becomes obvious that this decision, although it is allotted, is important, but not the only one. The solution (5-12) can contain arbitrary constants, linear functions of the spherical coordinates (R,t,θ,φ). And also new special solutions of the wave equation that are not included in formula (5-12) are possible.

What will physically mean all significant or not significant changes in the main decision (5-12)? And physically this can mean that the shape of the electron, determined by the new solution, may differ from the original, basic form.

Our opinion.

There is no "antimatter" in the current generally accepted understanding. Too hurried with the title and too soon told reporters. And they fanned.

Entangled particles. Rave of theorists.

This legend arose from the observation of photons. Allegedly, pairs of photons are formed that are "linked". And regardless of the distance between them, everything that happens with one photon is instantaneously transmitted to another photon.

The cause of this legend is completely transparent.

- First, physics is full of legends and fables. The active participation of the church in the life of society contributes to this.
- Secondly, it is the pair appearance and exactly the same photons that gives rise to a riddle inexplicable in the framework of traditional physics. That is, the effect of "cohesion" at birth is obvious.
- After that, it remains only to slightly embellish the situation and introduce an extension

of this coupling for the rest of the life of photons. And throw them to the journalists.
- Well, the most zealous dreamers expand the already fictitious "cohesion" of photons and other particles. It turns out just scientific "novels." Who will pervert whom.

The paradox of Einstein-Podolsky-Rosen (EPR paradox) is an attempt to point out the incompleteness of quantum mechanics with the help of a mental experiment that involves indirectly measuring the parameters of a microobject without directly affecting this object. The goal of such an indirect measurement is to try to extract more information about the state of a microobject, than to give a quantum-mechanical description of its state.

According to the Heisenberg uncertainty relation, it is impossible to simultaneously measure the particle's coordinate and its momentum. The reason for the uncertainty is that the measurement of one magnitude introduces essentially unavoidable disturbances into the state and values of another quantity. However, we propose a hypothetical method by which the uncertainty relation can be circumvented.

Suppose two identical particles A and B were formed as a result of the decay of the third particle C. In this case, according to the law of conservation of momentum, their total momentum p_A+p_B should be equal to the initial momentum of the third particle p_C. This makes it possible to measure the momentum of one particle (A) and calculate the momentum of the second (B) by the law of conservation of momentum $p_B=p_C-p_A$, without introducing any perturbations into its motion. Now, by measuring the coordinate of the second particle (exactly), it is possible to obtain for this particle the values of two immeasurable quantities simultaneously, which is impossible by the uncertainty principle. Thus, the uncertainty relation is not absolute, and the laws of quantum mechanics should be somehow refined.

If the laws of quantum mechanics are not violated in a given experiment, measuring the momentum of one particle is equivalent to measuring the momentum of the second particle. What creates the impression of instantaneous action of the first particle on the second in contradiction with the principle of causality.

Einstein insisted on the preservation in quantum physics of the principles of determinism of classical physics and on the interpretation of measurement results from the point of view of an "unconnected observer" (English detached observer). On the other hand, Bohr insisted on the nondeterministic (statistical) nature of quantum phenomena and the unavoidable effect of measurement on the state itself. As the quintessence of these disputes, Einstein's dialogue with Bohr is often cited. Bohr: "God does not play dice." - Einstein: "Do not tell God what to do." And also Einstein's sarcastic question: "Do you really think that the Moon exists only when you look at it?"

Schrödinger considered particles to be confusing, only while they physically interacted with each other. When removing beyond the bounds of possible interactions, entanglement disappeared. That is, the meaning of the term in Schrodinger differs from that implied at the present time.

Our opinion. Now, on a new look at quantum physics, we understand how far these disputes of the "coryphaeuses of physics" are far from reality. Entanglement does not exist.

How the universe was created.

Why are protons and electrons in the universe the same?

In nature, there are processes of particle annihilation. Consequently, there is a likelihood of inverse processes, especially in the light of Gukuum theory. That is, a collision at one point of a pair - three of some wave objects or other wave processes can give birth ... What? The following arguments make sense.

As a result of double-triple interactions of waves or other processes, twisted waves appear that, according to the law of winding, form localized objects. The properties of Gukuum and mathematical formulas miraculously are such that it is the pair - a heavy small center and a light surrounding cloud - that are best able to absorb any extended swirling wave. Because it is not easy, because the laws of the wave equation are discrete laws. The proton is formed small and heavy - these are the laws of mathematics. He captures a huge mass, but having a small size can not have a big spin. This spin remains in the light surrounding cloud. But again, miraculously from this cloud an electron is formed, which has a huge (relative to its mass) spin and great freedom over energy levels. This allows us to settle all the equalities of energy, momentum, and all this in a discrete expression when the hydrogen atom is formed. Due to the properties of Gukuum, all infinitely long ago, the originally formed objects were identical and they were hydrogen atoms. Their more dense relatives - neutrons were most likely formed later, in nuclear reactions. The only way. Here is the answer to question №1. The confirmation is that until now hydrogen is 90% of the total mass of the universe. All the other elements arose in the nuclear furnace of stars.

More later. We have mentioned just above that all electromagnetic formations, including photons and even radio waves, have a localized nature. This circumstance strengthens the reasoning. Because even the collision of two radio waves is a collision of localized objects.

Here's another question. The masses of an electron, a proton and other particles - why exactly these? At the beginning of the article, there was already a response about the particle size. Everything is determined by the mechanical parameters of the gukuum and its Majesty Mathematics. Here is the same answer.

Loks with large (j,m) are also allowed. And they need research for existence in reality.

But is not ball lightning converted at its final collapse into several million hydrogen atoms ?! This just simulates the formation of the universe, matter. The unstable ball lightning turns into stable hydrogen atoms. Hence the explosion, cotton - an increase in volume.

Conclusions.

The study of localized solutions of the wave equation opens up an abyss equal to the universe. All that exists in the universe exists in the theory of loks. The converse is also true. Now an electron, a neutron and a proton are practically identified. There were no obvious contradictions with the experimental and generally accepted formulas. All orders of magnitude converge, and in most cases the quantities themselves. The phenomena previously unclear were received. New relationships between world constants have been obtained.

The final victory will be achieved when the charge of elementary particles is theoretically determined and identified. While this is a riddle - something like a spin, absolutely identical for a proton and an electron and exactly equal to zero for a neutron. Other elementary particles also need identification: mesons, etc. The results achieved will be the basis of axiomatic physics. This is no longer a dream, but a harsh reality.

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