ORDER IN THE MICROWORLD
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There is an ultimate point

The bodies of what is no longer divisible into parts ...

... Followed by others like her, in order

Having united in a closed formation, they form a bodily essence ...

... The beginning of things, of course, completely involuntarily

Everything is witty in such a harmonious order

And they did not agree on their movements earlier, of course,

But repeatedly changing their positions in the world,

From endless times to constant shocks,

All kinds of combinations and different movements,

They finally get into the locations, from which

The whole set of things turned out in its present form.

Titus Lucretius Kar "On the nature of things"

One often hears that the microcosm is a world of chaos, disorder, where confusion reigns, random throwing and decay of particles. A similar impression would have been produced by a metropolis at rush hour: "accidentally" rushing pedestrians, insane streams of people and cars, noise, din, accidents. But it is worth climbing a hundred or two meters above the city, and this "chaos" reveals order and rhythm, regular movements of cars and people released by some buildings and absorbed by others, a crystal-clear grid of streets, periodic cells of blocks of polygons of buildings, rectilinear chains of lamps etc. And along the edges of the city we will see a slow crystallization of new buildings. So, the microcosm with its particles when viewed from a height is an example of order and crystal clarity. Ideally similar atoms, nuclei, and elementary particles resemble typical polyhedron buildings with wall edges studded with a periodic lattice of windows. Like houses built according to the same plan, particles of the same type have identical characteristics: size, shape, mass, lifetime (estimated service life) and other properties. How can we explain this ideal order of the microworld, bordering on "chaos" and "random" behavior of particles?

This question was answered long ago by the atomists of Ancient India, who believed that the smallest elementary particles (electrons and positrons) combine in pairs, and then these pairs merge into larger conglomerates, forming periodic structures in the form of new particles [1]. The multiplicity of the charge of any particle to the electron charge e means that it is from electrons e^{-} and positrons e^{+} that any particle is composed, and its charge is associated with the excess of some over others, or is equal to zero if their number is equal. The fact that electrons and positrons escape from particles during decay or impact proves that all particles are built from them. This is the crystalline structure of building particles, assembled from a standard number of similar bricks, and sets their standard properties (charge, mass, size, shape, strength, lifespan). In ancient Greece, Plato also considered atoms-elements to be standard bodies in the form of regular polyhedrons, crystallizing from the smallest particles of two types. And Democritus, Epicurus, Lucretius explained the characteristic properties of atoms by their standard shape and weight, for each atom is recruited from identical point particles-amer, arranged in clear rows. The same views were defended by M.V. Lomonosov. Speaking about the standard of the shape and weight of particles of this type, he even anticipated the discovery of isotopes and isomers: "I call homogeneous those corpuscles that are equal in size and similar in shape ... they may have some dissimilarity of shape and inequality, but so insignificant that they can be neglected and ignore them when looking for the cause of the perceived difference in grip. For example, if the mass of one corpuscle is related to the mass of another, as 1000 to 999, and in relation to the figure - if two corpuscles have the figure of a pyramid standing on a square base, and one has an angle to the base equal to 52° 31', and the second is 52° 30'[2] ". Likewise, J. Thomson, who discovered electrons - atoms of electricity, believed that atoms and other particles are formed from thousands of electrons and oppositely charged particles (positrons), bound in pairs and forming spatial crystalline complexes [3].

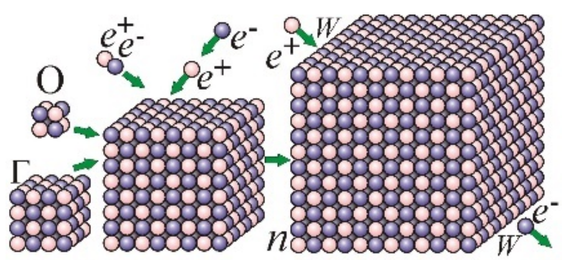

Рис. 1. Блочное нарастание частиц из электронов, позитронов, октонов О и гаммонов Г до предельного размера нейтрона, при котором начинается распад.

Fig. 1. Block growth of particles from electrons, positrons, octons O and gammon G to the limitingthe size of the neutron at which decay begins

That is, atomists have long understood that the identical properties of atoms, elementary particles are due to their correct crystalline structure and similarity of forms. So also, simple crystals have not only identical physical, chemical, optical properties, but also the equality of the shapes and angles of the faces. In a placer of crystals we find the same hundreds of twins as among standard atoms and particles (for example, protons). However, some crystals have wider facets, others have others, crystals can be grown of different weights and sizes, while elementary particles and nuclei have fixed masses. It would seem that since they are formed by positrons e^+ and electrons e^-, bound by Coulomb forces into crystals (like salt crystals from Na^+ and Cl^- ions), then why do they grow only to a fixed size (Fig. 1)? The fact is that at a certain critical size, the particles become unstable, like nuclei heavier than uranium, which are absent in nature. Heavy nuclei are unstable due to the strong Coulomb repulsion of their parts. The same is true for elementary particles. If a particle is stable, stable, then when it is taken out of equilibrium, say, when fission from a push, its parts will again stick together due to attraction. And if the particle is unstable, then during its division, the parts fly away further and further due to repulsion. Everyone is familiar with the role of stability since childhood: when they built a tower from cubes, it collapsed, reaching a characteristic size, after exceeding which it lost stability. Therefore, in a town built by a child, all buildings are of limited size. We see the same thing in the world of particles, where the function of gravity, destroying too large houses, is performed by a weak interaction.

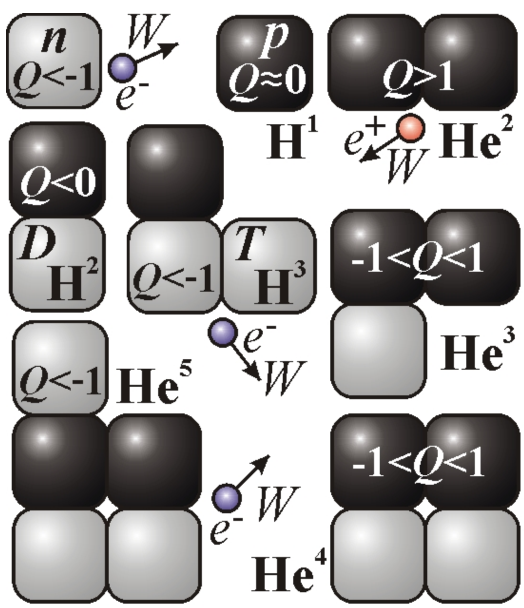

Рис. 2. В зависимости от величины эффективного заряда Q, частицы и ядра выталкивают электроны (Q<-1), позитроны (Q>+1), либо будут стабильными (при -1<Q<1).

Fig. 2. Depending on the size effective charge Q, particles and nuclei push out electrons (Q <-1), positrons (Q>+1), or will stable (at -1<Q<1).

Take, for example, neutron n. It would seem that since it is neutral, its parts should not repel. But if a neutron contains 920 electrons and 920 positrons (in the sum making up the neutron mass ~ 1840), then they can be repelled with a small asymmetry of interactions [4]. So, if an electron repels another electron with a force of only 0.11% greater than the force F of attraction of an electron to a positron, then 920 electrons and 920 positrons, forming a neutron, reject an electron with a force $W = 920F \cdot 0.0011 = 1.012F$. If one of the neutron electrons separates, then the excess positron from the remaining $920e^+$ and $919e$–, attracting an electron with a force F, will not be able to hold it: the repulsive force $W = 1.012F$ is greater than the attraction by $0.012F$. That is, the neutron is unstable and decays on average in 15 minutes into a proton and an electron (Fig. 2). It is clear why the neutron mass is rigidly fixed. If the weight of a neutral particle is less than that of a neutron, for example, 1820, and it contains 910 electrons and 910 positrons, then the ejected electron will be attracted back with a force of $910F – 909 \cdot 1.0011F = 0.0001F$. Therefore, a neutral particle does not lose, but increases its mass, attracting more and more positrons and electrons, until its mass reaches the mass of a neutron, after which the particle begins to decay (Fig. 1). Moreover, a heavier neutral particle, for example a Λ^0-hyperon, with a weight of 2184 and a lifetime of $2.6 \cdot 10^{-10}$ s, should decay, and much faster.

And why is a proton p stable with a mass almost like a neutron n? It's just that the proton charge is positive (it contains an extra positron, having the composition: $920e^+$ and $919e^-$), and if an electron leaves it, then two excess positrons will pull it back with a force $920F – 918 \cdot 1.0011F = 0.99F$. For a positron, the force of attraction to an electron is already 0.11% greater than the force of repulsion from another positron [4]. Therefore, if a positron suddenly breaks away from a proton, then the remaining neutral system of 919 electrons and 919 positrons will attract it with the force $W = 919 \cdot 1.0011F – 919F = 1.011F$. This is the reason for the stability of the proton and the asymmetry of our world, where there are many protons and electrons, but there are almost no antiprotons and free positrons. All positrons are bound. Attracted by neutral particles, they form stable positive protons and nuclei. But electrons are repelled by neutral particles, that is, antiprotons containing an excess electron are unstable. That's why there are so many free electrons. Nuclear physicists did not notice the instability of the antiproton, because they did not observe it for the seconds required for decay. Antiprotons, born in accelerators, fly at great speeds and immediately perish in collisions with protons, without having lived their time.

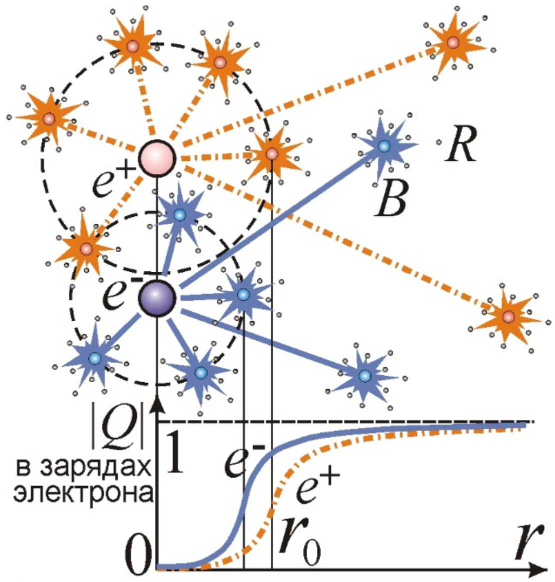

Рис. 3. У электрона характерный радиус r_0, на котором испущенные бластоны *B* начинают взрываться каскадами реонов *R*, чуть меньше, чем у позитрона. Поэтому эффективный заряд |Q| электрона чуть больше заряда позитрона.

Fig. 3. The electron has a characteristic radius r_0, on which the emitted blastons B begin explode with cascades of R rheons, a little less, than the positron. Therefore, the effective charge |Q| electron is slightly more than the charge of the positron.

Excessive forces of repulsion of electrons and attraction of positrons by neutral particles are called the forces of weak interaction *W*, although they are ordinary electric forces caused by a small asymmetry of the impacts and growing together with the mass of the particle. What is the reason for this asymmetry? According to the ballistic theory of Ritz [4], electric attraction and repulsion is caused by the impact of microparticles - rheons *R*, shot by electrons, and arheons, shot by positrons (Fig. 3). Then the charge is the total flow of matter from the source of the field, that is, the number of rheon particles emitted by it, crossing the sphere surrounding the charge per unit time. The strength of the electric field is the density of this flux: the number of particles that penetrate a unit area of this sphere every second. The total flux of particles from an electron and a positron is the same: their charges are equal in magnitude, but opposite in sign, since the electron emits matter (rheons), and the positron emits antimatter (arheons). But this is the case if the dimensions of the electron and positron are pointwise. Their real size r_0 is about 10^{-15} m: their charge is, as it were, smeared over a sphere of radius r_0. This is possible if the electron throws out not individual rheons, but collected in packs-blastons *B*, like fragmentation, cluster projectiles, exploding at a distance r_0 from the electron in cascades of rheons (so the projectile of a fireworks throws out fragments that flare up in the distance as a sparkling sphere). But for an electron and a positron, the radius r_0 of the blaston decay sphere may differ slightly. That is, the charges of the electron and positron are "smeared" within the spheres of different radii r_0. And at a distance of the order of $r_0 = 10^{-15}$ m, the fluxes, impacts from the electron and from the positron slightly differ, as if the effective charge Q of the electron is greater than the charge of the positron by 0.11% (this estimate can be corrected with more accurate analysis).

Then the neutron, where there are equal parts of electrons and positrons, has a negative effective charge Q: its parts are repelled, and it decays, ejecting an electron. But the proton, where there are one more positrons, has almost zero effective charge Q: its parts are attracted, so the proton is stable. So, in chemistry there are stable, stable compounds, and there are unstable ones. For example, hydrogen, due to its reactivity, is found only in a bound form, like positrons trapped in protons. But in nature there is a lot of free oxygen, which envelops the Earth in an atmosphere, like the atmosphere of electrons around an atom. Also, many oxygen ions O^{2-} and hydrogen H^+ are bound together in water molecules, like electrons e^- and positrons e^+, bound in pairs, forming an ocean of elementary particles.

The inequality of the electron and the positron explains not only the asymmetry of the world, the nature of the weak interaction and decay of the neutron, but also the acquisition of stability in nuclei. Thus, by combining a neutron with a proton, we obtain a stable nucleus of deuterium H^2, where the neutron is stable (Fig. 2). If an electron is accidentally separated from the nucleus, then two excess positrons will attract the electron with such a force that it will again fall on the nucleus (this is how the Λ^0-hyperon acquires increased stability in the nucleus [5]: the positive charge of the nucleus keeps electrons e^- and pions π^- in hyperone). If we add another neutron to the deuterium nucleus, then the resulting tritium nucleus H^3 will receive a negative effective charge Q <-1, which will push the electron out of the neutron. But if we add another proton to the tritium, forming a helium nucleus He^4, the neutron will stabilize again.

If the neutron gains stability in the nucleus, then the proton, on the contrary, can lose it due to the repulsion of positrons by the positive nucleus. So, combining two protons, we get an unstable nucleus of helium-2, which immediately loses one positron from the decay of a proton, and becomes a deuterium nucleus (Fig. 2). But, adding two protons with a neutron, we get a stable nucleus of helium-3, since the additional attraction W of the positron by a neutron will not allow it to fly away. Even more stable is the helium-4 nucleus of two protons and neutrons that hold the positrons tightly in the nucleus. And the positive charge of two protons keeps the electrons in neutrons, effectively resisting their repulsion W. But if we add one more neutron to the nucleus, then the attraction of the He^5 nucleus will no longer be able to overcome the repulsive force W of the electron by five nucleons. Likewise, in subsequent elements, the stability of the nucleus is determined by the balance of the forces of electric attraction and repulsion. That is why each element has only a limited number of stable isotopes: a noticeable imbalance in the balance of forces, the balance of neutrons and protons, leads to the separation of electrons or positrons from the nucleus. Only those nuclei are stable for which, like a proton, the effective charge Q on the surface is close to zero, not exceeding unity in absolute value (the electron charge is taken as a unit charge in nuclear physics). Unstable nuclei have an effective charge of about unity or more. This explains why the energy of electrons and positrons emitted from these nuclei is of the order of MeV [6]: this is the interaction energy $E=e^2/4\pi\varepsilon_0 r$ of two unit charges e at a distance of the order of the nucleus radius $r\approx 10^{-15}$ m. That is, approximately the same energy should be imparted to the escaping electron or positron by the Coulomb repulsion of a nucleus with a unit effective charge Q.

The exact calculation of Q values and nuclear stability is difficult. After all, they are set not only by the composition of the nucleus, but also by its geometry and shape, since the Coulomb forces F decrease in proportion to the square of the distance, and the forces W of weak interaction decrease much faster (this is why the interaction is called weak, that even at a distance r_0 it is only 0.11% of the Coulomb, and at a distance it is generally lost against its background, becoming billions of times weaker [6]). The asymmetry of the elementary forces of attraction and repulsion quickly disappears with distance: the forces are leveled. After all, at some distance, all the emitted blastons will explode, and the total fluxes of particles from the electron and positron will equalize and stop changing with distance (Fig. 3). That is why, even on atomic scales, this asymmetry is not noticeable, the neutron does not affect the charges (its effective charge Q is zeroed), and the effective charge of the proton grows to unity. Only at distances of the order of nuclear distances is this asymmetry essential, and therefore the mutual arrangement of nucleons in the nucleus is very important. The closer the protons are to the neutron, the greater the Coulomb force F, which holds the electron there, but the repulsive force W grows even faster. And the neutrons, the closer to the proton, the more firmly they hold the positron in it, repulsed by other protons. That is, the placement of nucleons, especially in the outer layers of the nucleus, strongly affects its stability. That is why there are isomer nuclei that have the same proton-neutron composition, but differ in stability and half-life due to the different shape and geometry of the nucleus [6-9].

The geometry of particles also explains why the energy of electrons emitted during beta decay of nuclei and neutrons is not constant, but forms a continuous spectrum. It's just that electrons are separated from different parts of nuclei and neutrons. So, if a neutron has the shape of a cube, then different energy is needed to split off a particle from it from the corner-top, from the edge, or from the face. With a change in the distance to the center of the cube, the repulsive force also changes, accelerating the electrons to different energies, up to a certain limiting value. There are even more options for separating an electron in a nucleus with a complex shape. That is, a continuous spectrum of electron energies is obtained without the hypothesis of a neutrino, allegedly carrying away part of the electron's energy. After all, if an electron is separated from different parts of the nucleus, taking different energies, then the energy remaining in the nuclei is different: the nuclei remain in an excited state. When the nuclei are rearranged into the lowest energy state, this excess energy is released as gamma rays, which have a high penetrating power. It is possible that this gamma radiation is mistaken for the neutrino emission of beta decays [6].

So, nuclei from the beginning of the periodic table decay mainly due to the separation of electrons and positrons. And the nuclei from the end of the table decay into two nuclei under the action of the forces of Coulomb repulsion. In this case, nuclei are formed from the middle of the periodic table, or a helium nucleus is separated, leaving a nucleus with a charge and number two units less than the original. And sometimes separate protons (hydrogen nuclei), or neutrons, sometimes bound in pairs [6], fly out of the nuclei. There are also a number of stable, stable nuclei. Such stability with dimensions much larger than that of a neutron is explained in the same way as the stability of buildings made of cubes, if they are stacked not one on top of the other, but a pyramid, increasing the area of the base. Then the height of the towers can be increased significantly. It is these pyramids, composed of cubes-nucleons, that represent the nuclei of atoms according to V. Manturov's hypothesis [7, 8].

Fission of nuclei occurs when the Coulomb repulsive forces exceed the nuclear forces of attraction of parts of the nucleus. Nuclear forces are also electrostatic in nature and are due to the periodic crystal structure of particles-nucleons - protons and neutrons [7-10]. The electrons and positrons that form them, arranged in a checkerboard pattern, stand against each other when the nucleons touch their faces. Electrons and positrons, lined up in regular rows and exchanging shots of rheons and arheons (like batteries of cannons of two galleons before clutching in a boarding battle), generate the nuclear forces *H* of cohesion of two nucleons (Fig. 4). This is what allows the proton to keep an uncharged neutron and a similarly charged proton near itself. The same force binds two neutrons together despite their neutrality. This nuclear bond resembles the hydrogen bond of water molecules, which, although neutral, also stick together. Just a water molecule containing positive H^+ ions and a negative O^{2-} ion is an electric dipole that attracts H_2O molecules for hydrogen ions at one end, and for oxygen ions at the other end. It is these hydrogen bonds that build the water molecules into graceful ice crystals of snowflakes. So, the nuclear forces of interaction of nucleons arrange them into clear crystals of nuclei. It is strange that physicists, having built a droplet model of the nucleus on this analogy of nuclear forces and cohesion forces (cohesion) of water molecules [5], did not realize that nuclear forces are caused by the attraction of electric dipoles from electrons and positrons, which form elementary particles. And only V. Manturov explained on this basis all the features of nuclear forces [7]. Thus, in water molecules, attraction is noticeable only at a distance of the order of the size of a dipole molecule and rapidly decreases with distance. This is the reason for the short-range action and saturation of nuclear forces: each nucleon attracts only the nearest, adjacent neighbors.

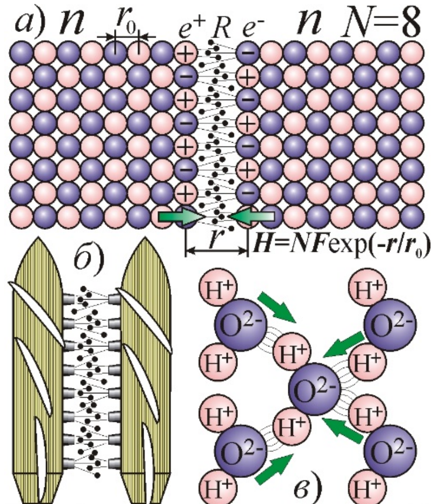

Рис. 4. Ядерная сила притяжения нуклонов (*а*) возникает от электропритяжения образующих их электронов и позитронов, выстроенных в батареи, подобно пушкам на кораблях, ведущих морской бой (*б*). Той же электродипольной природы и водородная связь молекул воды (*в*).

Fig. 4. Nuclear force of attraction of nucleons (a) arises from the electric attraction of the generators their electrons and positrons, lined up in batteries, like cannons on ships leading sea battle (b). The same electric dipole nature and hydrogen bond of water molecules (c).

This explains the enormous magnitude of nuclear forces capable of holding two or more protons together. At a distance r close to the electron radius r_0, the bond strength H of two faces formed from N electrons and positrons is of the order of $NF=Ne^2/4\pi\varepsilon_0 r^2$ and decreases exponentially with the removal of the faces [8]. Therefore, the force H effectively resists the Coulomb repulsion of two protons $F=e^2/4\pi\varepsilon_0 r^2$, even when the distance between them is about $5r_0$. After all, if a proton is composed of 1836 electrons and positrons, forming a cube with dimensions of approximately 12x12x12 particles, then each face contains $N\approx 12\times 12 = 144$ particles. Almost as many times (by two orders of magnitude) are nuclear forces more intense than Coulomb forces, as experience has shown. This means that nuclear energy is the usual energy of electrical interaction. When nuclei are combined, fusion, electrostatic energy of attraction of the faces of nucleons is released, and if nuclei are fission, then electrostatic energy of repulsion of charged nuclei is released. Coulomb repulsion also accelerates nuclei, giving them energy in nuclear explosions and reactors [10].

Since nuclear energy is electrical in nature, then why are we taught that energy is formed from mass M according to the formula $E = Mc^2$? It turns out that Einstein misinterpreted the meaning of this classical formula, found long before him by J. Thomson [3], Lorentz and Heaviside. In the theory of relativity, the formula began to express the equivalence of mass and energy, as if a body with an increase in speed and energy increases its mass. In fact, the formula $E = Mc^2$ only expresses the relationship between the electromagnetic energy E and the so-called electromagnetic mass M: this is where the factor c^2 is - the square of the speed of electrical influences. Even Lorentz showed that the inert mass M of an electron can be of an electromagnetic nature: when accelerating a, like-charged parts of an electron (Fig. 5.a), unequally repelling each other, generate a braking, inert force $F_{эм}=Ma$ [11, 12]. From this, we found the classical radius of an electron $r_0=e^2/4\pi\varepsilon_0 Mc^2$, which specifies its mass M, the size of nucleons, nuclei and the radius of action of nuclear forces. And the energy released when an electron and a positron approach a distance r_0 is the energy of their electrical interaction $E=e^2/4\pi\varepsilon_0 r_0=Mc^2$, and not the energy of "matter annihilation" [7, 10-12]. The particles did not disappear, but merged into a neutral pair of two linked opposites, as in the sign of Yin and Yang (Fig. 5.c). But the electromagnetic mass of such a pair will indeed decrease by the value ΔM, which is proportional to the released energy E, because during the acceleration of the $e^+ e^-$ system, the difference in the attraction forces of opposite charges no longer slows down, but pushes the pair towards acceleration, underestimating the value of the inert mass of the pair [11].

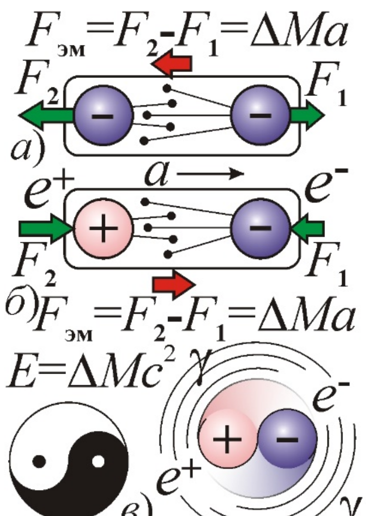

Рис. 5. Ускорение пары одноимённых (*а*) или разноимённых (*б*) зарядов порождает избыточную тормозящую или ускоряющую силу, воспринятую как "дефект" массы ΔM, пропорциональный энергии E, выделенной при сближении и слиянии зарядов в пару (*в*).

Fig. 5. Acceleration of a pair of the same name (a) or opposite (b) charges generates excessive braking or accelerating the force perceived as a "defect" of the ΔM mass, proportional to the energy E released when the charges approach and merge into a pair (c).

This explains why in the fusion of two nuclei, say deuterium, the mass of the nucleus formed is less than the sum of the initial masses, and the "missing" mass ΔM (mass defect) is proportional to the released energy $E = \Delta Mc^2$. It's all about the electromagnetic mass. When two nuclei are connected by the faces of their nucleons, so that the electrons of one face will stand next to the positrons of the other (Fig. 4), the attraction of opposite charges of the two nuclei will generate a small force $F_{эм}=\Delta Ma$, pushing the nucleus towards acceleration and causing an imaginary decrease in its inertial mass by ΔM (Fig. 5.b). The mass defect is just imaginary, since in fact the amount of matter did not change in the reaction: the number of nucleons, electrons and positrons was preserved. And the "mass defect" ΔM is indeed associated with the electrostatic energy released in the reaction, $E = \Delta Mc^2$, since the charges converge up to a distance r of the order of the electron radius r_0. That is, mass, as a measure of the amount of matter, did not disappear, and the released energy is not the energy of mass destruction, but the electrostatic energy of the interaction of charges. Such classics of electrodynamics as Thomson, Lorentz, Heaviside, Ritz understood this perfectly when they derived the formula $E = \Delta Mc^2$, applicable only to electromagnetic mass and energy. Einstein's "merit" is only in the fact that he "privatized" this formula, distorting its meaning and adjusting it to fit his theory of relativity. It is not for nothing that Rutherford, to whom we owe the discovery of nuclear reactions, studied them without the help of SRT, considering it senseless and useless. The head of Rutherford, J. Thomson, who supported Ritz's ballistic theory [3], also spoke about the same. And Rutherford himself was the first to use the ballistic analogy in nuclear physics, likening the particles and nuclei emitted during decays to projectiles. Helium nuclei fired by atoms, just like cannon nuclei, hit targets-atoms. Although the mass of elementary particles and nuclei is small [13], their velocities are enormous, so the comparison of particles with projectiles is not only natural, but also visible, if we recall the gigantic energy of a nuclear explosion, in fact, the kinetic energy of scattering microparticles.

It turns out that all the successes of nuclear physics are associated exclusively with the use of the classical formula $E = \Delta Mc^2$, but not with the theory of relativity or quantum mechanics, which have not yet explained clearly what elementary particles are made of, why their mass, charge and other characteristics are exactly the same, and not others. Quantorelativistic theories, contrary to popular belief [13], do not explain the microworld, but give only a formal and incomplete description of what is already known [5]. But the ballistic theory offers a mechanical explanation of all the phenomena and mysteries of the microworld, including the stability of particles. Particles, nuclei, atoms, molecules are stable for the same reason that they do not collapse upon impacts of a model of molecules from balls of a chemical set: the strength of the particle bond is greater than the impact forces, but if it is exceeded, the particles divide: quantum laws have nothing to do with it. This conditional indivisibility of atoms was apparently accepted by the ancient atomists, since they considered the atom to be composed of even smaller particles-amer, which is problematic to separate.

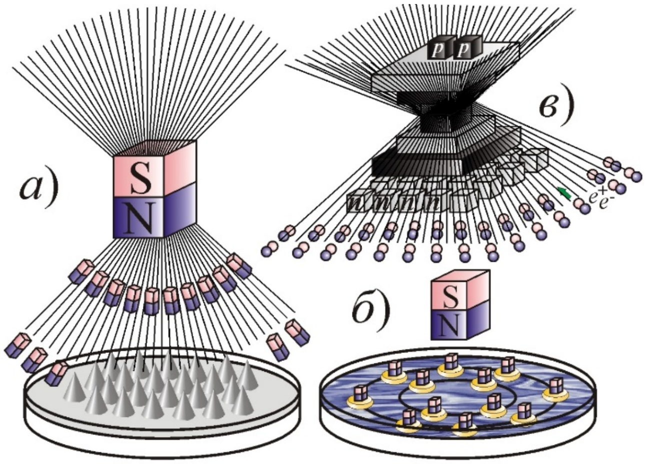

Рис. 6. Обрастание магнита “бородой” из опилок, выстроенных по его силовым линиям (*а*), и формирование магнитом чётких структур в магнитной жидкости и у магнитных поплавков в опыте Майера (*б*). Так и электромагнитное поле ядра формирует слои нуклонов и ”бороду”-каркас из электрон-позитронных пар (*в*).

Fig. 6. Magnet fouling with a beard made of sawdust along its lines of force (a), and the formation of clear structures in a magnetic fluid and magnetic floats in the experiment of Mayer (b). So, the electromagnetic field of the core forms layers nucleons and a "beard" -framework of electron-positron pairs (c).

So, the fulfillment of the electrodynamic formula $E = \Delta Mc^2$ in nuclear reactions proves not the theory of relativity, but the electrical nature of nuclear forces and energies E, and the mass defect ΔM is caused not by the intrinsic mass of nuclei, but by the electromagnetic mass from the interaction of their parts. The smallness of the mass defect proves that it is connected precisely with the method of measuring mass - this is a defect of the weights, and matter is preserved. However, there are also reactions such as the decay of pions, muons, where a noticeable or all mass is "lost" [9-12]. But here, too, the loss of mass is imaginary if it is carried away by neutral, elusive particles. This idea was attracted by Van den Bruck and Rydberg to explain the nuclear mass defect [10], but it seems that the main reason is still in the interaction of electron-positron lattices of nuclei, and the additional mass of the nuclear framework is not significant. The bipyramidal nuclear framework itself clearly exists. Even if it does not make a noticeable contribution to the mass of nuclei, it plays an important role in the formation of nucleon layers [8, 9]. These layers, alternately filled with protons and neutrons (Fig. 6, 7), are actually revealed in the form of inhomogeneities of the nucleus [5]. The nuclear framework is formed by electron-positron pairs that have lost weight due to interaction (Fig. 5.c).

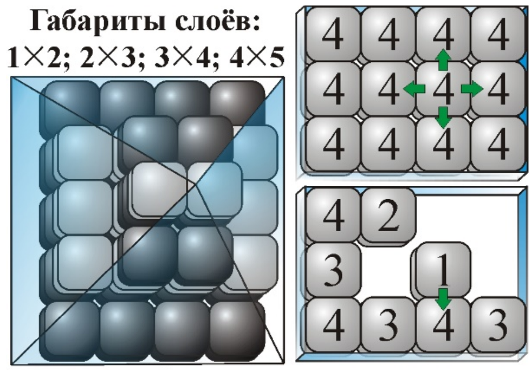

Рис. 7. Послойное заполнение пирамидального ядерного каркаса этажами протонов и нейтронов. Крепче связаны нуклоны в целиком заполненном слое, где число связей (подписаны) максимально.

Fig. 7. Layer-by-layer filling of the pyramidal nuclear framework with floors of protons and neutrons. The nucleons are tighter bound in a completely filled the layer where the number of links (signed) is maximum.

Mayer's experiment with magnets floating in water can be cited as an answer to the question of the formation of a nuclear framework [13]. Around the large magnet, the magnetic floats are assembled into standard configurations in the form of polygons arranged by shells (Fig. 6). Already J. Thomson cited this experiment as an illustration of the formation of standard electron shells of the atom [3]. Likewise, nucleons form clear successive layers with a given number of particles in the layers. The nucleus, with its electromagnetic field, crystallizes around itself a bipyramidal framework of electron-positron pairs floating around. Similarly, a magnet placed under glass or in a liquid with iron filings forms at the poles two conical "beards" of sawdust, reminiscent of two bell-shaped pyramids of the core. The charged protons tend to be located as far away from each other as possible and therefore symmetrically fill both sockets. Under the influence of nuclear forces, the particles, like the atoms of crystals, line up into clear rectangular and square layers, and therefore a double pyramid is formed instead of a double cone. In turn, the bipyramidal framework affects the placement of nucleons, which is why they crystallize in expanding layers, like tiers of a pine tree or a Christmas tree that have grown from a conical cone-frame and an enclosed seed-nucleus. So, the nuclear framework grows far beyond the nucleus, defining a layered bipyramidal structure of the electron layers. The formation of periodic lattices has been observed more than once in experiments with magnets, say, when acting on a magnetic fluid, or in a superconductor in the form of a crystal lattice of Abrikosov vortices of a magnetic powder. The fact that the particles in the nucleus are arranged in an orderly manner, always occupying the same positions, given by the scale of the crystal lattice of the nuclear framework, is also confirmed by the standard gamma spectra of excited nuclei. The fixed frequencies of these spectra are set by the natural frequencies of vibrations of the charged particles of the nucleus (electrons and protons) in its magnetic field, which has a characteristic value at each lattice site. Likewise, the magnetic floats in Mayer's experiment, with a small deviation, each oscillate with its own standard frequency. This magnetic mechanism was presented by J. Thomson and W. Ritz as a model explaining the standard atomic frequency spectra [3, 8].

The electrical nature of nuclear energy makes it possible to understand why nuclei with magic numbers of nucleons are the most durable and stable, and why the highest energies and "mass defects" are obtained during their synthesis [8, 9]. When protons and neutrons form close packings with the smallest surface, the number of bonds *N* of each nucleon is maximum (Fig. 7). Such nuclei are the most durable and stable: the nucleons in them are tightly bound, forming completely complete nucleon layers without protrusions and gaps, with a minimum free surface and a maximum contact surface proportional to the total number of bonds *N*, which increases the energy of nuclear bonds $H = NF$ and " defect "mass. That is why magic nuclei, where there are most of such bonds, have large mass defects and released energies, as well as strength. Something like this, a window opening, filled with bricks, is most difficult to break through if the bricks fill it entirely, since each brick is firmly clamped, and is connected on all sides with cement (the contact area is maximum). But if the masonry is chipped and only one brick is missing, it is much easier to break it. By the way, even Lomonosov showed that elementary particles are bound the stronger, the larger the contact area of their faces, and the forces of their cohesion were explained by pressure, impacts of microparticles [2].

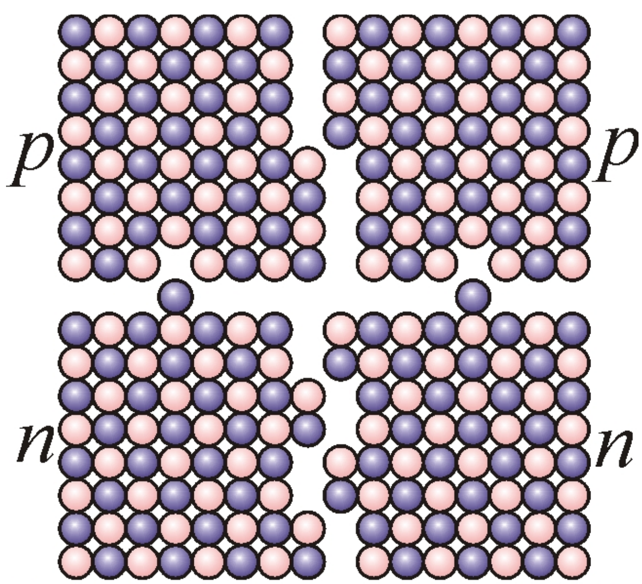

Рис. 8. Попарное стыковое соединение граней протонов и нейтронов обеспечивает высокую прочность их связи, особенно в ядре гелия-4.

Fig. 8. Pairwise butt joint of faces protons and neutrons provides high the strength of their bond, especially in the helium-4 nucleus.

So, the correct shape of nucleons and complete nucleon layers maximizes the binding energy and explains their high stability. This is the same reason for the stability of nuclei with an even number of protons and neutrons, which probably have the shape of not quite ideal cubes, but with micro-protrusions and depressions on the edges, which binds them even more tightly to each other, like a spike connection of wooden parts (Fig. 8). The protrusions of one neutron fall into the slots of the other. The same is true for protons equipped with projections of a different shape. In this case, the contact area, the number *N* of bonds and their total strength *H* = *NF* grow, and electrons and positrons on these protrusions lose their ability to easily detach, being trapped between nucleons. This explains why protons and neutrons combine in pairs, why they form separate layers with increased strength. Protons can also have protrusions for docking with neutrons. So two protons and two neutrons can interlock, like 4 puzzles from the "Microsoft Office" logo, forming an even square with a minimal surface, devoid of protrusions from which electrons and positrons usually "jump out", and therefore has the highest binding energy, strength and the smallest mass. It is not for nothing that such combinations of two protons and two neutrons that form a helium-4 nucleus are the strongest and retain this connection even inside larger nuclei, separating during decay as a whole, in the form of an alpha particle (Fig. 9). The presence of protuberances and depressions on the nucleon cube is understandable if it is formed not only by 27 = 3x3x3 cubes-gammon G, but also by 6 particles-octons O (Fig. 1), forming layers on its faces [9]. So, in nucleons, where each electron has its own positron, the bond is arranged according to the principle of "electromagnetic key-lock", which was long discovered in structural chemistry. This is how the chains of nucleotides in the DNA molecule, matching each other in shape, are linked in pairs by electrostatic forces.

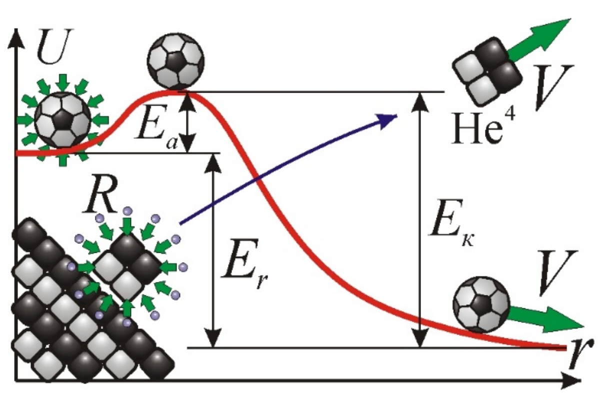

Рис. 9. Подобно тому, как мяч, лежащий в лунке на горе, может от случайных малых толчков скатиться оттуда, набрав большую скорость, так и альфа-частица под ударами реонов может отделиться от ядра и, вылетев из потенциальной ямы, набрать большую энергию.

Fig. 9. Just like a ball lying in a punk on grief, it may slide down from random small shocks from there, gaining great speed, and the alpha particle under the blows of rheons, it can detach from the core and, after flying from the potential hole, gain more energy.

Let us now study the role of form and "mass defect" using the example of a neutron (schematically shown in Fig. 10), with its mass of 1838.6 electron masses. Why is there a proton with a mass of 1836.1 electron when an electron is separated from a neutron? It would seem that since only one electron is separated, the mass should decrease by one unit (up to 1837.6), and it falls by 2.5 electron masses. In fact, the inert mass decreases not only due to the removal of the electron, but also due to the fact that it has ceased to interact with electrons and positrons that form a neutron. In sum, this interaction is repulsive (Fig. 1), that is, it overestimates the inert mass of the neutron (Fig. 5.a). This means that the electron introduces into the neutron, in addition to its own inert mass, an additional electromagnetic mass ΔM caused by its interaction with the elements of the neutron. And during decay, the mass of the neutron decreases both by the unit mass of the electron and by the electromagnetic addition of mass caused by it. So in the electrical circuit, the energy $E=Cu^2/2$ and the total capacity C is made up not only of the self-energies and capacitances of the capacitors, but also of the small mutual energies and capacities ΔC (also called parasitic ones) due to the interaction of the plates of each capacitor with others. Removing one charged capacitor of unit capacity reduces the total energy and capacity of the circuit by more than one. This interaction energy, which disappears when the capacitor separates, is released in the form of its kinetic energy and heat, and it is proportional to the "disappeared" parasitic capacitance ΔC. Here the capacity C is the exact analogue of the mass M.

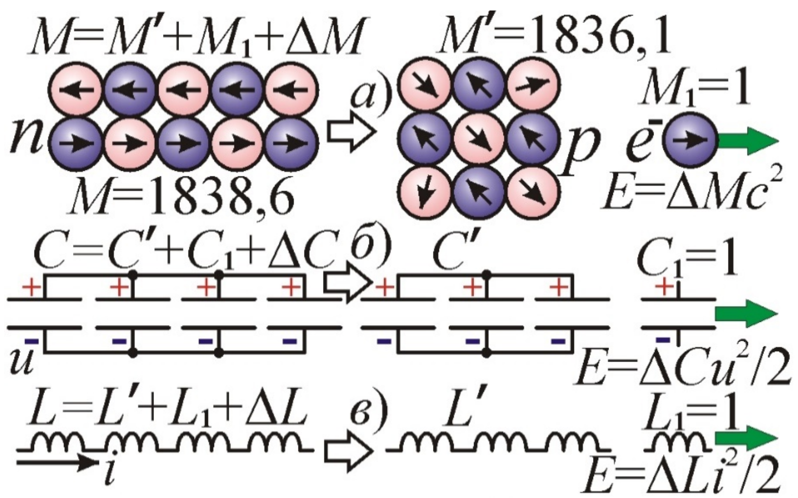

Рис. 10. Отделение электрона (*а*), конденсатора (*б*) или катушки (*в*) от батареи элементов снижает общую массу M, ёмкость C или индуктивность L более чем на единицу, а выделенная энергия пропорциональна “дефекту” Δ меры инертности.

Fig. 10. Department of electron (a), capacitor (b) or coil (c) from the battery of cells reduces total mass M, capacitance C or inductance L by more than one, and the released energy proportional to the “defect” Δ of the inertia measure.

The same is true for a circuit where the total inductance L is the sum of the self and mutual inductances of the coils, and the total energy of the circuit $E=Li^2/2$ includes the interaction energy of the coils, which is proportional to the parasitic inductance ΔL and is released when one of the coils is removed. It is not for nothing that the inertial role of the capacitance C and inductance L in the oscillating circuit has always been compared with the role of the mass M of a load oscillating on a spring. When an electron is separated from a neutron, it, having become a proton, also changes the shape and the interaction energy of the electrons and positrons that form it, and hence the energy caused by this interaction and the electromagnetic addition of mass (similarly, removing a capacitor or coil changes the distribution of voltages u and currents i in the chain). The fact that a neutron, having become a proton, rearranges the structure, is evident from the fact that their magnetic moments differ by a factor of 1.5. That is, the distributions of electrons and positrons, the orientations of their magnetic moments, which add up to the magnetic moment of the nucleon, differ (Fig. 10).

As is known, the magnetic moment of an electron is about a thousand times greater than the moment of a proton and a neutron, which is caused by the mutual compensation of the magnetic moments of electrons and positrons [10]. The slightest shift of electrons and positrons in the crystal lattice of a nucleon, and even more so the removal of one of them, noticeably changes this balance, even if the electrons and positrons shift or rotate by a negligible amount. The fact that nucleons consist of hundreds of electrons and positrons, the magnetic moments of which are compensated, confirms the discovery of large magnetic fields of a nucleon at the moment of destruction (when its parts are separated, neutralizing each other's magnetism, see "Engineer" 2009, No. 2, p. 4) , as well as neutron scattering by ferromagnetic samples, where neutron "magnetization" was revealed [7]. The external field orients the co-directional magnetic moments of electrons and positrons, forming a neutron, which is why it noticeably increases the magnetic moment. This is how a piece of iron with negligible magnetism is magnetized by an external field, since the magnetic moments of atoms, usually neutralizing each other, are set in parallel. But over time, the magnetization disappears due to the thermal vibration of iron atoms, which randomizes their magnetic moments. The magnetic moments of electrons, positrons vibrating under the impact of rheons also mismatch in the neutron.

The same impacts of rheons cause decays of nuclei and particles. Indeed, under the impact of rheons, electrons and positrons vibrate like ions in a crystal of salt. This "thermal" jitter of particles resembles the quantum uncertainty of their positions, but has a classical nature. Similar thermal vibrations of atoms, nuclei and electrons under the influence of impacts of microparticles scurrying at the speed of light were cited by Maxwell and Poincaré as an argument against the theories of Le

Sage and Ritz [14]. But, if the size of the rheons is small, these fluctuations are also small, due to the averaging of beats. In addition, the electron under the impact of rheons does not increase its "thermal" vibrations indefinitely, because not only absorbs energy together with the rheons, but also gives up the same amount when it emits them back. But the "thermal" vibrations of electrons under the impact of microparticles easily explain nuclear decays, as shown by J. Thomson [3], and the "tunnel effect" by the classical interpretation of the uncertainty principle [10].

"Uncertainty", "randomness", "spontaneity" of nuclear decays - this is an imaginary thing and is of a classical probabilistic nature. Decays are strictly determined, predetermined. So, if you build on the floor a lot of the same type of pyramid houses made of cards or cubes, then they will also fall apart, one after another, seemingly spontaneously, at random moments, according to the same exponential law as the nuclei. But in reality, each decay of a house or core is associated with external influences (vibrations, gusts of rheon wind), which are of a random nature and, at the time of strong surge-fluctuations (exceeding the strength of the house or core), destroying it. Stronger types of houses have a longer lifetime and half-life, and in a calm environment they will stand for centuries, but still one day they will collapse from rare, but strong fluctuations in the form of earthquakes, hurricanes, etc. Likewise, the nuclei are subject to "accidental" blows of fate (the most durable nuclei wait for a fatal accidental shock for billions of years), and elementary particles disintegrate under the impact of rheons and arheons at the moment when the ultimate strength of the particle is exceeded. Moreover, not only unstable particles with a mass greater than the mass of a neutron decay, but also particles-mesons, the mass of which is lower. After all, the smaller the particle, the fewer N bonds in it, the easier it is to break them. And even the electrons themselves, positrons and blastons emit rheons and arheons in the course of decay under the impact of rheons and arheons coming from all directions.

The "tunneling" effect in alpha decay is of the same nature. There is no need to consider the escaping α-particle as a wave, introducing the uncertainty of its position and energy in the nucleus. The activation energy required for the separation of the α-particle is imparted by random impacts of rheons, forcing parts of the nucleus to twitch, like Brownian particles. Likewise, in chemical reactions, the activation energy is usually imparted to molecules by random impacts of atoms, causing thermal vibrations of molecules, at times breaking them. Similar thermal vibrations of particles under impact of rheons, predicted by Ritz [14], impart activation energy to nuclear decay reactions. When the total energy of impacts exceeds the activation energy E_a, the α-particle will be torn off and its further acceleration will be produced by the Coulomb force, which gives up the potential energy E_κ. A nucleus escaping from a potential hole under the influence of random strikes resembles the behavior of a ball lying in a shallow hole on a mountain and at a "random" moment of time flying off a mountain under the influence of "chaotic" gusts of wind (Fig. 9). According to the laws of statistics, the probability P of obtaining the activation energy per unit time by the nucleus sharply decreases with increasing this energy P~exp($-E_a/E_0$). This resembles the Maxwellian distribution, where the role of the average thermal energy kT of atoms is played by the average energy of rheons E_0. If the activation energy E_a is high, then decays occur extremely rarely: nuclei have a long half-life $T_{1/2}$~$1/P$~exp(E_a/E_0). Since for nuclei with similar charges the Coulomb energy E_κ is almost the same [6, 10], then with a decrease in the activation energy E_a, the energy released in the reaction $E_r=E_\kappa-E_a$, obtained by the alpha particle, increases. A negligible increase in the energy of α particles from a decrease in E_a will cause a strong decrease in the half-life $T_{1/2}$. Thus, he found a simple classical explanation for the experimentally discovered Geiger-Nettall law $T_{1/2}$~exp($D/E_r^{1/2}$), without invoking the quantum theory of Gamow's α-decays [6].

Thus, as the ancient atomists correctly noted, headed by Democritus, everything in the world is natural, subject to a strict order. Decays only seem to be chaotic, occurring at a random moment in random nuclei. In reality, the moments of decay and the victims of decay are predetermined and even predictable if the distribution of rheons is known. Approximately so, and the "chaotic" motion of Brownian dust grains is caused, according to Democritus, by the impacts of atoms, which means that it is also predictable if the distribution of atoms and their velocities is known. So, contrary to quantum mechanics, the same strict order and determinism reigns in the microcosm as in the mechanics of our everyday world. Only ignorance of the nature and conditions of decays, as well as their statistical nature, gives rise to the illusion of randomness. But the consistent application of classical physics allows you to put things in order in the microworld.

S. Semikov

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