Some words about fundamental problems of physics

Part 4: Atomic nucleus

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I think that many of those who have read three previous Parts of the article were shocked by conclusions reached by the author. However, the worst is still to come; this is nothing compared with what is to come. Undoubtedly, I will again upset the readers if say it frankly that there is no solid nucleus in an atom. Every knows, according to modern physics, almost all mass of an atom is concentrated in its superdense nucleus, a tiny spherical volume with a radius of an order $10^{-13}\ cm$, surrounded by electrons. Our studies conducted in last years have shown that it is a myth, like the fact that the average density of nuclei is a huge amount of about $4\times10^{14}\ g\ /\ cm^3$. Thus, the nuclear model of the atom is wrong.

But how so, you can ask, so much progress has been made in atomic and nuclear physics, as every knows, resulted in the use of atomic (nuclear) energy, both in civilian and military areas, etc., and all thanks to the physicists – specialists in atomic and nuclear physics! An answer is simple: it's all experimental achievements, an engineering use of the discovered phenomenon of radioactivity. The similar enormous advances were achieved owing to use of the discovery of electricity, at all despite the fact that nobody so far knows, what the electric charge is, and what is an electron. An introduction of a unit of electric charge, Coulomb, in the SI system (made to get rid of fractional units that exist in the CGS system) did nothing add to the understanding of its nature [1]. We can name the unit of charge as we want, whether Peter or Bob, but still the name will remain only a fig leaf covering the gap in the knowledge of its true dimension. Actually, in the objective units of matter, space and time (g, cm, s), the dimension of the charge has not changed with introduction of SI and still remains absurd, in essence, as expressed in fractional units of gram and centimeter ($g^{\frac{1}{2}}cm^{\frac{3}{2}}s^{-1}$). Indeed, what are \sqrt{g} and $\sqrt{cm^3}$? No one can explain, because such mathematical constructs do not exist in nature as physical objects.

As before, following Rutherford, the charge is treated in modern physics as "distributed" uniformly (or nonuniformly) on a surface of particles. But in the Universe there is only a matter in the form of fields and particles that are in constant motion in the broadest sense of the word. So what is this something that is "distributed" (as usually written in scientific papers on physics), called the charge? Is it unknown form of matter or the same matter of which all things around us are made? Or perhaps nothing is "distributed"? Official physics, on the basis of mainstream theories, cannot answer to these questions. Resting upon new

fundamentals of physics that we have developed for the last 2 decades, this problem has been solved by us. Our answer to the above questions one can found, for example, in [2]. But let us turn back to the origin of the modern view on the structure of the atom and its nucleus.

The concept of a single tiny nucleus, in which the whole mass of the atom is concentrated, came from Rutherford. He found in his experiments on alpha particles scattering a relatively small number of backscattering acts, and ascribed this phenomenon to the reflection of a falling particle, under the central impact, from the positively charged region (the nucleus) where the majority of the mass of the atom, as he assumed, was concentrated. Other possible options to explain the phenomenon of backscattering he did not consider.

Having taken as a result the nuclear model of the atom for a basis, Rutherford and his followers were forced to admit that in this case nucleons, protons and neutrons, being inside the nucleus, must have dimensions not exceeding a size of the nucleus itself, i.e., they must have a radius of the same order, $10^{-13}\ cm$, or less. The size of the electron is known to be generally ignored by theoreticians; they consider it in their works as a point-like particle. As a result, the development of atomic and nuclear physics has gone on way to develop the ideas put forward by Rutherford; and in this way physics continues to move now. In-depth analysis shows, however, that Rutherford's interpretation of the experiments on scattering of $\alpha-$ and $\beta-$ particles (1911) that led to a modern nuclear model of the atom was not convincing. Moreover, it was not an only possible one. What was overlooked by Rutherford and his followers in their reasoning while treating the experimental data?

First, the most important of the shortcomings was the concentration of their efforts exclusively on one of the possible models of atomic structure. Namely, the atom was considered only as a spherical (and, hence, one-center) microobject with a nucleus in the center. Although, it is not implied from Rutherford's experiments that the atom has only one scattering center [3].

As it turned out, in fact, the atoms remind of molecules consisting of the paired nucleons. The latter are in nodes of atomic spherical wave shells, according to the shell-nodal (or shell-wave) structure of the atoms [4]. Various atoms differ from each other by the different number of the nodes and unique for each atom the structure (configuration) of their external spherical shells, in which these external nodes are located. Molecular-like atoms of the shell-nodal atomic model have the multinodal or multicentric structure. Each pair of nucleons in one node is bound by strong bonds (called also as "nuclear") with neighbouring pairs of nucleons of neighbouring nodes in the same atom [5]. Therefore, the collision of α -particle from an alpha radiation beam, falling on the metal foil, "head-on" with one of the nucleons of one from all nucleon nodes of the atom, is equivalent to the collision of α -particle with the whole mass of the atom. Note that in Rutherford's experiments a natural

source of α -radiation has been used. It is characterized by relatively low energy of alphaparticles compared with the binding energy of nucleons in the atom.

Second, the following question should be thoroughly discussed also: what is the mechanism of the process itself of scattering at collisions, the more that elementary particles show duality, behave as particles and as waves? And according to this, why the scattering volume must be incredibly dense and hard? Unfortunately, the aforementioned questions were not put and, hence, were not considered. To all appearances, a purely mechanical approach to atomic structure was dominated at that time.

From our studies it follows that a very tiny scattering volume, accepted by Rutherford for a compact superdense atomic nucleus, is a diminutive central region of the volume of intranucleon space, "swept" by the oscillating center of the mass of the nucleon. The latter is strongly bound with other nucleons in the atom which behave themselves identically. Frequency of the oscillations turned out to be equal to $\omega_e=1.869\times10^{18}~s^{-1}$. Other new revealed parameters are the following. The size (radius) of the proton is $r_p=0.5284\times10^{-8}~cm$, that is slightly less than the Bohr radius. The radius of the electron is $r_e=0.417\times10^{-9}~cm$, that is about 10 times smaller than the radius of nucleons. The mass of the particles has a wave associated character, and the mass density is only $3~g/cm^3$.

The new results presented above were obtained on the basis of rigorous solutions of the wave equation. Their validity is fully confirmed by all course of the development of new theories [4]. As one of the last direct evidence of the validity of such fundamental findings, one can serve the experiments carried out on monatomic layers of graphite - graphene. A two-dimensional hexagonal crystal lattice of carbon atoms in graphene is an ideal material for the verification of validity of the shell-wave (or shell-nodal) internal structure of the carbon atom and, consequently, all atoms of the periodic table [6]. But first things first.

An existing quantum mechanical (QM) model of the atom in full sense is abstract and mathematical. No one abstractionist till now dared to draw at least any image of an atom in full agreement with the QM concepts. If, for example, one images that the size of this page of the A4 format is assumed to be coinciding with the dimension of the atom, then its nucleus should be 100,000 times smaller, i.e., an order of 1 μ m. But such a point in the middle of this page will invisible to the naked eye. And further, how can depict the electrons, which in accordance with the QM do not move along closed trajectories, but obeying the probabilistic laws they move somehow (undefined how) within the space bounded by the mythical electron orbitals (see Part 1) corresponding to the so-called electron shells. For example, where and how on this clean sheet around an invisible center (nucleus) one can paint all 28 electrons of the nickel atom in full compliance with the so-called electron configuration of the atom. This problem is unsolvable. And it is because we are not dealing with the physical, but with an abstract, mathematical (QM) model. The latter was developed

first of all in order to somehow describe experimental results obtained from the study of emission and absorption spectra of excited atoms, leaving aside (and then forgetting) the main aim - cognition of the nature of matter, how it is arranged at the atomic level.

Because of its absolute abstractiveness, the QM atomic model is extremely flawed; hence, the possibilities of such a model are limited. In general, it cannot be even regarded as a model of the atom, in the full sense of the word, since the necessary and sufficient conditions of integrity of elementary conceptions about the atom are absent in it. In particular, that is a very important point; an existence of atomic isotopes found experimentally for all atoms does not follow, at all, from the QM atomic model. This model, which deals mainly with the description of an electron structure of atoms, does not say anything about features and an internal structure of a central part of the atom, where its main mass is concentrated, i.e., no information about its nucleus is there. This part of the atom is considered separately in another branch of physics, nuclear physics. With this, there is no single model of the nuclear structure. Hence, to describe the diversity of properties of atoms, continuously found experimentally, the various hypotheses on the structure of its nucleus are put forward up to this day. The most famous of them are the drop model of the nucleus (proposed in 1936 by Niels Bohr); the shell model (proposed in the 30th years of the 20th century); the generalized model of the Bohr-Mottelson; the cluster model of the nucleus, the model of nucleon associations; the optical nuclear model; the superfluid nuclear model, a statistical model of the nucleus, etc.

The modern theory of atomic structure is abstract and imperfect in such a high extent, that none of the sober-minded physicists does not doubt in the need as soon as possible to replace the existing abstract mathematical model of the atom with a clear physical model. The new atomic model must be based on postulates that reflect reality, the real regularities in nature.

On the basis of the Dynamic Model of elementary particles (DM) [2], that revealed the nature of electric charge and the origin of mass, and the Shell-Wave (or Shell-Nodal) atomic model (SWM) [4], the theory of scattering by a substance of particles and waves incident on it has received its new resolution [3]. In accordance with the DM, a center of the mass of the nucleon, which is considered as a wave spherical pulsating microformation in space, performs the radial oscillations with amplitude of the order $1.4 \times 10^{-13}~cm$ and frequency of $1.869 \times 10^{18}~s^{-1}$. This leads to the formation of a dynamic spherical volume with a radius equal in magnitude to the amplitude of these oscillations. Just this dynamic volume was found in scattering experiments by Rutherford and was perceived mistakenly for a superdense nucleus of the atom. According to the DM, the nucleon mass has a wave nature and is associate. The scattering volume ("nucleus") of any nucleon in an atom is at the same time the scattering volume ("nucleus") of the atom as a whole, since all nucleons in the molecular-like atom (according to the SWM) are linked by strong bonds. Therefore, a

collision with one of the nucleons is equivalent to the collision with all nucleons of an atom, i.e., with the atom as a whole.

A new view on the atomic structure naturally affects on our concepts lying in the fundamentals of chemistry. Indeed, the first analysis conducted in the framework of the SWM has shown that the main role in the formation of the geometric structure (spatial shape) of all molecules composed of atoms belongs to nucleons rather than electrons as is commonly believed until now. Electrons are responsible only for the strength of these bonds, but not for the direction. A concept of hybridization of atomic orbitals accepted in modern physics and chemistry (see Part 1) has turned out to be erroneous as well.

An apogee in studying substance was a creation of Large Hadron Collider (LHC), built primarily in order to find a mythical particle, the Higgs boson, and hence to make ends meet in respective speculations of QED theorists in the field of the so-called electroweak interaction. The Higgs boson as believed is responsible for the origin of the mass of elementary particles. Make no doubt, the Higgs boson will be "found" as up till now all that was needed for the validation of all theories put forward by theorists was "found" without fail. And then all media together, in chorus, will loudly report about this as about a great discovery. Just as they have hammered into the innocent people heads (and still do it) a validity of the mythical "Big Bang" hypothesis; so that the latter is perceived by "zombie" not as a myth, but dogmatically (like religious dogmas), as a matter of course, actually happened in the past fact; and they almost reached this goal.

Actually, as follows from our studies, the rest mass, as such, of elementary particles does not exist. The mass of the particles has an associate wave character [2, 7]. Therefore, there is no need to seek not existing mythic Higgs bosons. As a result one can save the giant funds consumable on the maintenance of the LHC. In this connection it makes sense analyzing thoroughly enough the results presented in this article and in References. The validation of them (about that we have no doubt) will confirm the uselessness of further use of the LHC. The latter might be remade so that its circular torus could serve for people, for example, as a transport tunnel. Is the Game worth the candle?

Thus, figuratively speaking, the 4th Part of the article has led us to the "Tower of Babylon" over unfinished stump of which a unique toroidal crown in the form of the LHC of about 27 km long was found suspended there. That's really, indeed, there is no limit of human imagination, as well as to a boundless blind faith of politicians in any advertised ("credible") scientific authority and their "projects".

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