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In remembrance of outstanding Russian scientist Dmitrii Ivanovich Mendeleev, who discovered the periodic law of properties in the system of chemical elements

Water is Everywhere. It Holds Everything, Even a Key to Understanding the Universe. D. I. Mendeleev's Law is the Prototype of the Universe Constitution

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Abstract—Principles of the world origin and structure in relation to the Mendeleev's periodic law are presented in this paper. Our Universe consisting of hydrogen (88.6%), helium (11.3%), and other chemical elements (0.1%) has created very favorable conditions for life on the Earth, including the much-needed water—a unique substance with all its anomalies. Special attention is given to hydrogen, the first element of the periodic table, from which the formation of our solar system began. Moreover, hydrogen is a basic building material for all the other elements. It is shown that a fundamentally important fact implies that all the worlds consist of the same chemical elements of the periodic table; today the total number of the known elements in this table amounts to 118, including the artificially produced ones. There are no new elements in the Universe. And herein lies the genius of Mendeleev as the author of the periodic law and the whole grandeur of the law of understanding the world, in which the humanity lives, making it possible to predict the existence of new planets and the existence of unknown chemical elements in the periodic table that were not discovered earlier. The second unique substance on planet Earth is water, because it can simultaneously exist in three phase states: liquid, solid and gaseous with a multitude of various physical, biological and other anomalies violating the generally accepted laws of nature, but owing to which life exists on our planet. Indeed, it is just the entropy changes of the process that make a decisive contribution to all energy characteristics of transformation of some substances into others. The essence of all chemical processes occurring on earth in accordance with the laws of non-equilibrium thermodynamics consists in an infinite sequence of self-organization processes. Due to these laws, new types of structures can spontaneously arise that are characterized by a transition from chaos and disorder to the order and strict organization. Despite an enormous progress in the study of the Universe, its structure remains to be no less mysterious. It remains to find scientific evidence that there is a Supreme Being that generates the intellect inherent only to Human Being.

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In 2019, the whole world commemorated the landmark event for mankind, the 150th anniversary of the greatest discovery of Russian scientist Dmitrii Ivanovich Mendeleev: periodic system of chemical elements, representing a fundamental law of nature. This law is a fairy key to understanding the world structure: macrocosmic, terrestrial (in which we live), and microcosm. The most mysterious chemical elements of outer space world are hydrogen and helium, of which the whole outer space visible by humans is made. The Universe consists of hydrogen (88.6%), helium (11.3%) and other chemical elements, the share of which amounts to only 0.1%. These elements are the building material for all space objects. It is with the location of hydrogen in the periodic table that Mendeleev had the largest issues and problems. Even today, 150 years later, different scien-

tific schools place hydrogen in different graphic combinations. After all, the formation of not only our solar system, but also the rest of visible to us infinite multitude of stars, their satellites, planets, and other space objects began with hydrogen. Hydrogen consists of two stable isotopes: most widespread protium (99.984%) containing only one proton, and deuterium (0.0156%) having besides proton, a neutron, and the radioactive tritium with half-life period (12.32 ± 0.02 year) containing, besides proton, two neutrons. The hydrogen is known as a product of artificial nuclear reactions with three (^{4}H), four (^{5}H), five (^{6}H), and six (^{7}H) neutrons that are very short-lived isotopes ($T_{1/2} = n \times 10^{-23}$ s) [1]. Hydrogen is the source of thermonuclear processes occurring at our Sun, other stars and planets. At present, there are 8 isotopes known for helium, but only two of them are stable. The natural helium consists of stable isotope ^{4}He (99.99986%) and much more rare ^{3}He (~0.00014%), there are also known its six radioactive isotopes ($^{5-10}$He) that are also the products of artificial nuclear reactions.

Water is the most mysterious substance, due to which life appeared on earth and, possibly, on other planets [2]. Water can be simultaneously found in three phase states: liquid, solid and gaseous. In the presence of hydrogen isotopes (^{1}H and ^{2}H) and three oxygen isotopes (^{16}O, ^{17}O and ^{18}O) the chemical, physical and biological properties of water vary in very wide range. It is the combination of such unique characteristics of water that led to the emergence of most diverse living forms that are as complex and diverse as the cosmos we observe.

The miracle is not the emergence of proper matter and multifarious elements in Mendeleev's table with unpredictable properties, but the emergence of biological life with unique properties, ability of self-cognition—reasoning power and what is the most unpredictable: the emergence of intellect capable of not only world cognition (understanding the world), but also its transformation. Heisenberg, the physicist and Nobel Prize winner, wrote, "It appears that someone has initially carried out perfect calculations before creating the Universe".

The structure of the Universe is strictly balanced and correlates with the structure of elements and their arrangement in Mendeleev's table that performs the function of a guidebook in our boundless world, and each element is a peculiar prototype of celestial systems in a specific outer space structure. As might appear, the orbits of space objects, their shapes and configurations are not random and chaotic, but rather optimal in terms of mutual influence on one another, and with a nucleus–center of attraction of each galaxy. Outer space (cosmos) is the self-regulating structure of stars and planets (similar to nuclei and outer orbits of electrons of specific chemical elements) with the system of optimization of stimuli forces: origination–development–transformational change into a new system on the basis of a new balance of masses and energies of interaction. This is a continuously restructuring system staying in high-power electromagnetic force fields of the surrounding world of atoms, molecules, nuclei and elements of the environment that possesses the ability of self-organization and self-regulation in enormous domain of Outer Space. It is similar to processes of chemical transformation of one set of substances into the other at different phase states.

Individual components of outer space can be both flat and spherical, same as atoms of various elements having different structure: from simple, such as hydrogen, helium and lithium, to most complex transuranium elements, which are stable, radioactive and quasi-stable transforming into lighter elements.

Mendeleev's law of periodicity of properties of chemical elements is a prototype of the structure of the whole galactic world. The structure of elements features a conceptual character reflecting the general global picture of the Universe. The whole world consists of these chemical elements, and no other elements can exist. The observable (by humans) micro- and macro-dimensional world have the same nature. Galaxies observed in outer space are nothing other than different elements of periodic table in all their diversity. The elementary example implies that the basic element of everything and of which began the Universe and of which now consists the outer space at large is hydrogen that has been studied insufficiently. This is both protium and deuterium, as well as tritium with ortho- and parastates. Depending on the temperature and pressure, hydrogen can be in gaseous, liquid, and solid states.

Hydrogen is the basis for helium synthesis. This thermonuclear reaction can be written as follows: $^2_1\mathrm{H} + {}^3_1\mathrm{H} \rightarrow {}^4_2\mathrm{He} + {}^1_0n$.

Accepting one more proton, hydrogen at high temperatures transforms into helium and serves as practically inexhaustible source for proceeding of thermonuclear processes observed at our star Sun that releases an enormous amount of energy in the process of its burning in the form of light quanta of full spectrum. This process is much similar to the radioactive decay of tritium ($^3_1\mathrm{H} \rightarrow {}^3_2\mathrm{He}^{1+} + e^- + \tilde{\nu}_e$), which is not plentiful on earth, but it is never exhausted being constantly generated in the Earth core. Electron on its own is an infinitely complex system. Being fully incognizable, electron can be both a particle and a wave. Each material substance

represents an infinitely complex compound having the electromagnetic structure. All the elementary particles, atoms and molecules possess a charge; they are in constant motion and, therefore, generate an electromagnetic field.

Elementary particles (electrons, protons, and neutrons) formed a unique and most widespread triune substance in outer space that is hydrogen: protium–deuterium–tritium! It is just the basic building material for the synthesis of all elements in Mendeleev's table. All outer space objects began the process of formation of stars, planets, comets, and other celestial bodies just by using hydrogen that has the optimal nucleus, nucleon. Hence, hydrogen was used to form our Solar System. The hydrogen nucleus is not only a combination of proton and neutron, but it is the most stable formation of matter in outer space.

Despite the fact that the half-life period of tritium amounts to about 12.32 years, its concentration on our planet remained invariable for thousands of years, and it increased in the last half-century only due to human activity, mostly owing to nuclear power stations and nuclear reactors [3]. The hydrogen structure is the prototype of the whole galaxy structure. The big bang theory is nothing else than one of the episodes of transformation of one state of substance into other, similar to the theory of thermonuclear processes in our world. A giant (by our standards) aggregation of energy exploded, and smaller worlds were formed, such as our galaxy and our solar system.

Our belief implies that nuclei of all outer space objects consist of solid hydrogen nucleon, i.e., a kind of high-density plasma possessing a high-power magnetic field.

The properties of solar core and all our planets have the same nature. It is a powerful thermonuclear reactor of gigantic internal density and pressure. Due to attraction force, i.e., gravitation, it cannot explode. Powerful electrokinetic processes of synthesis of heavier nuclei of elements in periodic system take place just around solid core in liquid mantle. Depending on the size of planets, i.e. on internal planetary pressures and temperatures, all chemical elements are formed in different proportions, and the nuclear synthesis of substances takes place. Since all of them have a significantly larger volumes than hydrogen, the processes of transformation of dense energy into more voluminous substances with smaller specific density occur that leads to increasing dimensions of the Sun, Earth and all other planets. This is the natural normal process of synthesis, when reactions proceed with an increase of volume of products obtained.

Exactly the same processes occurred on Earth: spontaneous transformation of some elements into others, e.g., decay of uranium isotopes $^{238}U \rightarrow {}^{206}Pb$ and $^{235}U \rightarrow {}^{207}Pb$ that now provides energy for mankind. The microworld exists inside and outside us, and the macroworld exists in parallel with us in the air, in water and under the ground. Moreover, naturally, we, inhabitants of the planet Earth, are not a unique phenomenon in outer space. There might be other worlds with the intellect similar to ours, more and less developed in comparison with ours. However, the fundamentally important point is the fact that all the worlds, living and nonliving from our viewpoint must have the same material basis. It must be only elements of Mendeleev's periodic system, the number of which as of today is only 118 (including the ones produced artificially).

It should be re-emphasized that hydrogen is the basis for synthesis of all elements, since all the outer space consists of hydrogen. The ordinary nuclear and thermonuclear synthesis of elements takes place inside the star and planetary formations. The solid core, liquid mantle and solid shell are formed due to the powerful electromagnetic forces. In this way, e.g., carbon is formed: core, electronic shell, and a particle of solid substance with amorphous or crystalline lattice. One of the most amazing substances that is discovered at almost all space objects is water. It can be liquid, solid and gaseous; water is a universal solvent and medium for the formation and development of biological life. The heterophaseness of liquid water [2] is stipulated by the presence of clusters in water. Unfortunately, the universal model of water has not been created that could have explained all its properties. Only on our planet (Earth), in water containing ~150 ppm deuterium, the conditions are created for formation of clusters comparable with the size of living cell.

The entire ambient world (in which we live) occupies a certain volumetric conventional space with specific length–width–height that is usually considered three-dimensional, omitting the fourth factor, time. It features conventional character and is not a constant value, same as in famous Einstein's equation, where the energy of arbitrary substance is the function of the mass and light speed: $E \leftrightarrow mC^2$, where all three components are variable and represent the time function. In implicit form, it determines the speed of light that, in turn, depends on the medium, where it is measured. The principle of uncertainty introduced by Heisenberg and Bohr changed all our conceptions about the world that we can consider as an aggregation of both material particles and waves, i.e., as wave-corpuscular state. That is what represents the basics of Einstein's general theory of relativity. However, one hundred years ago physicist Theodor Kaluza proposed to consider the theory of relativity in the five-dimensional space, i.e., what is oscillating in outer space, if it represents electromagnetic oscillations that can be used to explain the Laws of universal gravitation and oscillating rhythms and instantaneous interactions?!

All these outer space phenomena can be integrated into a single Law of interconnected transformations: energy–matter–wave–field–charge–electromagnetic interactions–... .

It is just the process of energy transformation into mass of substances in accordance with the fundamental Einstein's equation $E \leftrightarrow mC^2$. Therefore, during the existence of Solar System, the volumes of the Sun and all its planets increase (solar prominences and the volcanic activity of the Earth and other planets of our Solar System).

The multidimensional world predicted by Hawking and others is also as real as our world: from microflora, bacteriophages, single- and multi-cellular organisms, including human organism; and they function in accordance with common principles and laws.

Atoms, molecules and various elements consisting of different (stable and unstable) nuclei with their electronic shells rotating in different orbits with electromagnetic interactions are a prototype of our outer space objects. In a similar way, Mendeleev's table can be considered in depth from the structure and properties of nuclei with their zone of nucleon stability to large galactic formations, their explosions and syntheses of intergalactic systems.

Theoretical physicists should look for the common features of observed regularities associated with black holes, where the synthesis of new gigantic (from our viewpoint) formations and the formation of supernovas and galaxies take place, while we are just a point-observer in micro- and macrosystems. There will be no new elements and elementary particles by their nature, all the laws of the Universe fit into one Mendeleev's law of periodicity of the properties of elements. Mendeleev discovered this Law and provided us with the possibility of using this law with intelligence and comprehension. This is just the great law of biological intelligence and cognition of the world, in which we live, prediction of new planets and the elements in Mendeleev's periodic table that were not discovered earlier.

Perceiving the history of origin and development of life on earth, we can comprehend the future of our life and the possibility of a meeting with other civilizations that, probably, already existed on our planet and left the traces of their presence here in the form of Artefacts and Epistles of Gods described in Bibles.

The multilayered world in infinitely multivariable dimensions, especially in spiritual context, is an absolutely new quality of matter: from inanimate to living and next to spiritual level. The greatness of Mendeleev is just in this: from a relatively small number of elements (when Mendeleev discovered the periodicity law, only 63 elements were known, and from that time the table increased almost twofold and today the number of known elements amounts to 118) to infinite combinations of matter from inorganic-organic and to living matter and up to spiritual state.

The transition from the inanimate to living matter involved the need for existence of the main and key component: life environment. This is Water [2] representing a perfectly unique creation of nature. Only water can simultaneously be found in three phase states: liquid, solid and gaseous with infinitude of various anomalies: chemical, physical, biological and functional that violate the generally accepted laws of nature.

Compounds of hydrogen with carbon (hydrocarbons) compatible only with water possess similar properties. Over-unique compositions appeared having no analogues in nature and representing compounds of hydrogen with oxygen and carbon. From this moment on, a new era began featuring changes on the Earth and in Outer Space at large.

The expanding Universe that is registered by astronomers evidences both the single principle of the development of material world and the increasing volume of the Sun and Earth and other outer space objects. The visible (to us) Universe has neither the beginning nor the end, and life is continuing.

The first large extinction of biota occurred in the Ordovician-Silurian period. Prokaryotes, anucleate cells, originated a new biological life on our planet. Cyanobacteria began their development in the reducing atmosphere of Earth, and then a new era began in the atmosphere of oxygen: eukaryotes appeared. A significant quantity of oxygen in atmosphere emerged as a result of its synthesis inside the Earth and also as a result of photocatalytic decomposition of water under exposure to ultraviolet solar light in the presence of ions, for example, iron as a catalyst, and other components and composites. From this moment, the processes of oxygen photosynthesis began to develop rapidly; and eukaryotic cells and multicellular organisms appeared. Thus, the history of Earth can be divided into stages. The Katarchean and Archean are referred to the preoxygen stage. Then the Proterozoic era begins; this is the era of rapid development of aquatic and supraaquatic biota. The time factor here is conventional, because the time is measured in years with respect to the period of the Earth rotation around the Sun. However, it is known that at that period of time (conventionally 4.5 billion years ago) the Earth made one revolution around its axis in 6 hours, while some time later this period increased to 15 hours, it grew to ~22 hours, at present, the full day amounts to 24 hours, and after a specific number of years, the rotation period will be ~30 hours. This fact implies that the Earth volume is ever-increasing together

with its mass. During the specified time interval, the size of Earth increased approximately by 2/3 of its previous size that is indicated by the fact that continents move apart.

The Sun also changes its parameters. It inflamed spontaneously when a certain critical pressure was achieved and hydrogen self-ignited. What is now called thermonuclear process with gradual release of gigantic energy is a self-regulating thermonuclear synthesis. However, due to the gigantic attraction force in the center of Sun, it will burn approximately as long as it burned until now, while expanding in volume. At about the same period of time the thermonuclear reaction began at the center of Earth, where its solid core represents a bunch of protons and neutrons engendering the elements, which our planet is made of. These processes are the normal, energetically-stipulated geological phenomenon of self-generation and improvement of synthesis of inorganic and organic matter.

The Katarchean and the next Archean periods are the time of emergence of the Earth as a planet, transformation of outer space energy into hydrogen and the latter transformation into subsequent elements.

Hence, it logically follows a conclusion, according to which all the outer space objects begin their history from aggregates of hydrogen in specific electromagnetic geocentric force lines in outer space, and then the outer space synthesis of subsequent elements He, C, O, Ne, Mg, Si, S, Ar, and Ca takes place in accordance with Mendeleev's law. The share of such isotopes in the Earth crust amounts to 86.81% of the Earth crust mass.

When scientists first deciphered the Sun and Earth spectra, they proved to be identical in terms of the composition and properties. It was the unique case, when the spectra analysis revealed an unknown at that time element on earth that was called helium (from word Helios meaning Sun in Ancient Greek).

The structure of Universe is not random and is not chaotic; it is well balanced with respect to the stimuli forces. The orbits of outer space objects, as well as the electronic orbits of elements in Mendeleev's table are not random, but optimal in terms of mutual stimuli, while the Big Bang Theory is ephemeral. The world has neither beginning nor end; there is no exact reference point, however, there is a continuous process of transformation of energy into matter of any form of existence and vice versa. Vernadsky made an outstanding foresight about the world structure [4]. At the beginning of the last century, he noted, "the radioactive decay of chemical elements, i.e., transformation of one isotope into another, is not a particular case, but the general property of earth matter. All chemical elements of the Earth undergo the radioactive decay. This is the basic physicochemical process lying at the heart of all geological processes".

The synthesis of chemical elements in stellar interior is continuing now, while some elements, for example, technetium just "ended up" on the Earth. As regards promethium, it has not been found in both outer space and earth; in fact, it was synthesized artificially.

The process of synthesis-decay runs continuously. The synthesis of radioactive and all other elements from Mendeleev's table proceeds in the terrestrial biosphere as a secondary process after their formation in solid core as in quasi-liquid thermonuclear reactor at temperatures of about 6000 degrees.

The similar processes proceed at all other objects of our galaxy. Our star, Sun, is the only object where the temperature of nuclear synthesis reaches millions of degrees, and the energy of light is formed from plasma. This process is just the source of energy, from which all the known chemical elements are produced. There was not and could not be other substances in outer space, except an enormous amount of elementary particles that fill our galaxy. This is just the process of evolution of substance both on our Earth and over the entire outer space. It is the Law of energy transformation into physical substance that will lead to an increase of mass and volume of substance, expansion of the Earth until the force of attraction-gravitation becomes equal to the force of repulsion. Then, an explosion occurs at the Sun and its satellites, and a new stage of the other world construction will begin. Note that this process will be infinite.

The history of our Earth testifies to the presence of mechanism of its pulsating expansion. The direction of the process and measure of its randomness can be estimated only by one thermodynamic characteristic, entropy. It is the direction of entropy variation that indicates the course of process from chaos to ordered structure or in the opposite direction: from the well-organized structure to chaos.

The third law of chemical kinetics representing the compensation effect law was first laid down in the work [5]. The quantitative relationship between the kinetic characteristics of chemical processes and their thermodynamic parameters was established. It is the variations of process entropy that make a crucial contribution to all the energy characteristics of transforming certain substances into others. The essence of all chemical processes proceeding on the Earth in accordance with the laws of nonequilirium thermodynamics discovered by Prigogine [6] consists of infinite sequence of self-organization processes. Due to these laws, new types of structures can spontaneously emerge that are characterized by the transition from chaos and disorder to order and strict organization.

The outer space is a self-regulating structure with the system of optimizing the forces of stimuli–production–development–reconstruction into a new system based on the new balance of masses and interaction

energy. This is a permanently restructuring nonvanishing system self-regulating in gigantic space of the Universe.

Intellect gives rise to its new state—spirituality that is intrinsic only to the highest forms of intellectual activity, its manifestation and implementation of the level of collective intelligence.

Divinity is the highest form of intellect and its function. God is the embodiment of the highest form of spiritual life.

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