



How nucleus and electron carry electric charge

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Abstract

In the existing concept electric charge is a separate fundamental property of matter. This author argues that mass and space are the only two fundamental entities in the universe, whereas the charge is the state property of the matter. In the new concept, matter in any domain is a mass-space integral system. A matter with non-equilibrium space holding in a locality of other matters having equilibrium space holding (mass proportionate space holding) is in charged state. If the space holding is less than the equilibrium space holding then the matter is positively charged and if the space holding is more than the equilibrium space holding then it is negatively charged. It becomes necessary to understand the mass-space structure of so-called fundamental particles to understand the presence of charge from its non-equilibrium mass-space structure. Following uniformity of nature, the author has modelled the internal structure of fundamental particles from the nature of internal structure of celestial bodies and shown how charge appears in nucleus of atom and electron.

Key words: *Fundamental property, Mass-space structure, Non-equilibrium structure, Charge derivation.*

Discussion

In the new concept, matter at any stage in any domain is a mass-space integral system. Due to mass-space attraction the mass of the nucleus forms its extra-nuclear space structure surrounding the nucleus. Neutral matters in the state of mass-space equilibrium in a locality hold mass proportionate space content where each matter has same space holding per unit of mass [1]. Matters behave neutral to one another in the state of mass-space equilibrium. If somehow any matter has less or more space holding than the equilibrium space holding of matters in the locality then, said matter becomes reactive to restore mass-space equilibrium in the locality. An atom in the state of mass-space equilibrium is electrically neutral whereas matter with less space holding than that in neutral state is positively charged and matter with more space holding than that in neutral state is negatively charged. The bare nucleus formed by removing the extra-nuclear space structure of neutral atom is positively charged implying less space holding per unit of mass i.e. mass rich particles are positively charged. The nucleus of a neutral atom being positively charged evidences that the extra-nuclear space structure of atom carries negative charge. The extra-nuclear space structure in the new concept has space density graded structure containing space matter particles and orbital



electrons. Each component of the extra-nuclear structure has higher space content per unit of mass compared to that of neutral atom thereby the components of extra-nuclear structure are negatively charged. In an alternative language, the mass rich nuclei carry positive charge and the space rich electrons carry negative charge. We need to understand how space is stored in nuclei of atom and electrons and further understand how the stored space per unit of mass of electron is much more compared to that of atomic nucleus in order to justify their respective charges.

It is relatively easy to perceive how space is stored in compressed form in extra-nuclear space structure of atom but difficult to comprehend how space is stored within the nucleus of atom, orbital electrons and space matter particles. The net space content of an atom is the algebraic sum of space contents present in different components of atom. We might get surprised when we come to know that the unnoticed space contents in the nuclei of atom and electrons far exceed the space content of equal volume of extra-nuclear space structure. We shall subsequently see the electrons hold more space content per unit of mass than that of neutral atom. Hence, attachment or detachment of an electron to/from a neutral atom can change the charge state of atom by changing the space holding per unit of mass of the atom. It is difficult to imagine the mechanism by which space is stored in nucleus of atom and electrons. To find the hidden-space present in fundamental and elementary particles one need to understand the internal structure of these particles. Prior to discovery of atomic matter, we were ignorant of the space pockets within a piece of iron, gold, silver or a solid oxide. When we came to know the structure of atom, we could know all forms of solid macro matter is made of atoms and the entire volume of matter is compressed space only leaving a tinny volume of the nuclei of atoms, electrons and less known space matter particles. Now in the new concept of compact space with different space-density (space content per unit volume) the space holding per unit mass of matter can be easily visualized. Hence, to understand the mass-space structures of atomic nuclei and electrons, need understanding of the constituents of these particles in micro-micro domain and their mass-space structures.

In the existing concept, the nucleus of atom is formed by nucleons where the nucleus and the nucleons are particles of micro domain. This author takes a different view on the structure of nucleus of atom and electrons. The solar system and atomic system are systems in two different domains yet both systems have some similarities. Both systems show similarities in respect of having nuclei and orbital bodies/particles. This author assumes additional similarity of internal structures of nucleus and orbital bodies/particles in both systems. It is relatively easy to study the constituents and internal structure of a celestial body (say the earth) but difficult to examine the constituents and internal structure of nucleus of atom and electron. **We find all celestial bodies are made of atomic particles. In other words, the centrally**



organized macro celestial bodies are constituted of micro particle which is one domain below the domain size of the celestial body. It is never seen; a large celestial body is made of smaller celestial bodies. This breed doubt on the existing structural model of atomic nucleus comprising nucleons both being particles of one domain. This author argues that the nuclei of atoms and electrons are composed of particles of one domain below the domain size of nucleus of atom and electrons. This is more so after the identification of matter value (rest mass) of light particles [2]. The light particles having mass in photonic mass units are micro-micro particles of matter and they too have extra-nuclear space structure similar to atomic structure due to mass-space interaction maintaining uniformity of nature [1]. We shall now examine how space is stored in the internal structure of the earth and then extend the same to structural mechanism of nuclei of atoms and electrons to understand the space holding in them thereby understand the nature of electric charge present in them from the new concept of charge.

How space is stored within the internal structure of the earth?

The earth is the nucleus of terrestrial system (the earth with its extra-nuclear space structure containing atomic & molecular space matter particles and the orbital moon). We know the crust of the earth is composed of atomic matter but not very sure on the state of atomic matter in deep interior. Atomic matter has dense mass in its nucleus and compact space in its extra-nuclear space structure. Therefore, atoms are storehouse of both mass and space in a space medium. Hence the crust of the earth, composed of atomic matter, is a huge store house of space. We also know the temperature within the earth goes on increasing from surface to the center of the earth. One perhaps cannot assume the interior atoms of the core of the earth to have the same number of extra-nuclear electronic shells as found in atoms of the crust. Due to thermal ionization, the inner atoms are expected to have reduced number of electronic shells. The temperature distribution in the internal structure of the earth cannot be ascertained by direct measurement as is not accessible to us. Therefore, the internal thermal structure of the earth is prepared by theoretical considerations using thermodynamic-laws experienced on the surface of the earth. The thermal model takes it for granted that the thermodynamic laws are extendable up to the core of the earth. The actual temperature profile of internal structure may be higher from the predicted values of the model. It may so happen that the core of the earth is not build up by atomic matter but by positive ions and for hot celestial bodies the core may have built up by bare nuclei of atoms in fused state. If one proceeds from surface towards center of a hot celestial body (hypothetical case), he would progressively notice neutral atoms, singly ionized atoms, doubly ionized atoms, triply ionized atoms and so on, finally finding the bare nuclei of atoms as the constituent of the inner core in fused state. The



interior atomic particles are positive ions in the terrestrial relative charge potential scale that assumes the charge potential of the surface of the earth as zero. However, the interior atoms are neutral atoms in their prevailing charge state of locality where the prevailing charge potential is taken as zero in respective relative scale. If an atom from the surface of a celestial body moves towards the core, then its outer electrons will be detached thereby exposing the electrons of inner electronic shell as valence electrons. Thus the physics and chemistry of matter forming the internal structure of a celestial body is different from that on the surface of the celestial body [2]. In any case the space holding per unit mass of atom goes on decreasing towards the core of the celestial body. Thus if an inner atom of a celestial body is abruptly brought to the surface, it would appear as positive ion. On the other hand, if a surface atom of a celestial body is abruptly taken deep into the celestial body, it would be identified as a negative ion in the new locality.

The internal structure of any celestial body, say our earth has core, outer core, mantel and crust. All celestial bodies including the stars have same kind of internal structure [3]. This author has shown elsewhere that the presently known gaseous/plasma sun, in reality, has internal structure similar to that of our earth but having different magnitudes (volumes) of its core, outer core, mantel and crust. The sun has a larger core and a thin crust but the planets have smaller core and thick crust. For simpler analysis of charge characterization of mass-space structure of celestial bodies, we may assume the internal structure of a celestial body comprises a core and a crust ignoring other intermediate shell-structures. The core matter of a celestial body has less space holding per unit of mass due to reduced electronic shells while the crust matter has more space holding per unit of mass due to additional extra-nuclear structure. The core as a whole carries positive celestial charge and the crust as a whole carries negative celestial charge in some charge relative scale. The net charge value of the celestial body is the algebraic sum of charges of core and the crust. In a relative charge scale, the charge of nucleus celestial body (the sun) is positive due to large size of core and thin crust and that of its orbital body (planet) is negative due to smaller core diameter and thick crust. Then what happens to the celestial charges of earth and moon in earth-moon system? The earth being the nucleus and moon as orbital body in earth-moon system, the earth is expected to carry positive celestial charge and the moon is expected to carry negative celestial charge. The moon has smaller core and thicker crust compared to that of the earth. Thus the space holding per unit of mass of the moon is more than that of the earth. Hence in a different relative charge potential scale the earth's celestial charge becomes positive and moon's celestial charge becomes negative. The mechanism of possessing charge in matters of different domains remaining same, the charge in micro Particles (atomic nuclei and electrons) is identified as electric charge. The particles/bodies of other domains possess different non-electric charges (photonic charge in light particles and celestial charge in celestial bodies). The



charges in particles/bodies of different domains are different because their interaction ranges and the strengths of interaction are different. We need to understand how the interaction ranges and strength of interaction are different for different nature of charges even when the cause of the charge remains the same?

How nucleus of atom is positively charged and electron is negatively charged?

Indian philosophy based on Vedic accepts assumed similarity of structure and features in different domains and achieved success in spiritual front. **One of the most central assumptions of the Hindu tradition is that the macrocosm, the entire Universe, and all its component systems and sub-systems (including the human body as the microcosm) are structured in the same way, and operate according to the same principles.** This author values the above tradition of Sanatan-Dharma (Hindu Dharma) which is derived from the doctrine of Vedic science. The author argues that the structure and features of nuclei of atoms and electrons have similarity with the structure and features of celestial bodies. Hence the structure of nucleus of atom and electron can be assumed similar to the structure of a celestial body (say the earth). By this hypothesis the structural constituents of atomic nuclei and electrons become particles of micro-micro domain (light particles) and the light particles have extra-nuclear space structure with orbital particles similar to atomic system and solar system. The author designates the orbital particles of photon as phoelectrons. Thus the light particles (photons) and orbital phoelectrons have nucleus and extra-nuclear space structures. Now it becomes easier to speculate the mass-space structure of nuclei of atoms and electrons in the light of the mass-space structure of the earth. Thus the atomic nucleus with less space holding than its equilibrium space holding becomes positively charged and the electrons having higher space holding per unit of mass become negatively charged following the new concept of charge in matter.

How the charge interaction ranges and strengths of electric and non-electric charges are different?

Larger domain bodies are many orders larger than smaller domain particles. Thus the dimension and mass contents of a higher domain body is many orders larger than a lower domain matter particle. Light particles, atomic and subatomic particle, stars and sub-stellar bodies and galaxies belongs to different domains. The maximum distance of mass-space interaction of a nucleus depends on the mass content of the nucleus. Hence the maximum interaction distance of a micro particle carrying electric charge is smaller by many orders from the maximum interaction distance of a celestial body carrying celestial charge. Similarly, the maximum interaction distance of a light



particle carrying photonic charge is smaller by many orders from the maximum interaction distance of micro particle carrying electric charge. On the other hand, the minimum interaction distance of any particle in any domain is limited to the radius of the particle/body. Thus the interaction ranges of charge bearing particle/body in different domains make big quantum jump. The strength of the inverse square forces increases by many-many orders when the dimension of the particle is reduced by many orders. The high density of matter is an additional factor in reducing the size of the particle hence increasing the strength of the force interaction.

Conclusion

Modern science deals with charge bearing particles and their properties and interactions but does not explore how charge appears in proton and electron. In the new concept charge is a function of mass-space association in non-equilibrium state. This paper explained how space is stored in nucleus of atom and electron by exploring into the fine structure of nucleus of atom and electron formed by micro-micro domain particles (light particles) similar to the structure of celestial bodies formed by atomic matter. The new structure of atomic nucleus and electron reveals how space is stored within nucleus of atom and electron. The different extent of space holding of atomic nucleus and electron enable them to carry positive and negative charge respectively following the new concept of charge. This new finding unifies matter (mass-space integral system) and the charge which opens up new scope of unification of mass bearing force (gravity) and the charge bearing forces. Further the new concept of charge from mass-space structure helps to identify other non-electric charges present in matters of other domains. Thus the new finding helps to establish additional evidences towards finding similarity between solar system and atomic system.

Reference

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