

Everything of the Universe is Made of Light

Mohammad Abul Hossain
Department of Chemistry, University of Dhaka, Dhaka-
1000, Bangladesh
hossainabul@yahoo.com

Article Info

Received: 5th March 2013
Accepted: 19th March 2013
Published online: 1st May 2013

ISSN: 2231-8275

© 2013 Design for Scientific Renaissance All rights reserved

ABSTRACT

Einstein's general theory of relativity is commonly used for the large-scale evaluation of the universe. Recent development of cosmology makes the astronomers busier to study the structure, shape, expansion, age, life, past and future, etc., of the Universe. Big Bang theory, combination of Einstein's general theory of relativity and cosmological principle, is the foundation of cosmology but not free from its limitations. NASA says that the Big Bang theory makes no attempt to explain how structures like stars and galaxies came to exist in the Universe. This paper presents the evaluation of the universe in a very small-scale of quantum level, using quantum theory and Einstein's special theory of relativity. Classically, light is a form of energy, which is the combination of different radiations. According to the quantum theory "radiations are quantized, independent particles of energy called photons". The transformation of light into massive particles is continuing in the earth by photosynthesis of plants. Again, Einstein's special theory of relativity shows that the mass is equivalent to energy according to the famous equation: $E=mc^2$, where m is the mass, E is the energy and c is the speed of light. The conversions of massive particles into light are going on, in the stars and galaxies by fusion process, and also in the earth as nuclear reactions. Thus we need to open our quantum eye to understand these processes and realize the construction of the Universe, is light. This is the reality of the verse "*Allah hu nurus sama wa-te wal-arth*" in Holy Qur'an (Sura: An-Nur, Ayah: 35).

Keywords: Universe, Elements, Quantum mechanics, Einstein's special theory of relativity, Nuclear science, Photosynthesis, Light.

1. Introduction

It is well known that there are 118 elements (Winter, 2012), which are the basic constituents of the universe. Atom is the smallest unite of each element. Depending on temperature, everything of the universe can be exists one of the three common states of matter: solid, liquid and gas. All types of matter are made of molecules, which are the combination of same or different atoms (Cotton et al, 1999). The difference between solids, liquids and gases has to do with how tightly the molecules are held together by

electromagnetic forces, which can be explained by the internal energy of substances, based on classical mechanics.

Atoms are generally electrically neutral in nature, as they have an equal number of positive charges protons in the nucleus and negative charges electrons orbiting the nucleus. However, electrically neutral, neutrons are also exists within the nucleus but have about the same mass as protons (Cotton et al, 1999). But, the nature of atomic particles: electrons, protons and neutrons, are strange, difficult to explain their behavior with light, using classical mechanics (Goldstein et al., 2001).

2. Historical Development

2.1 Classical and quantum mechanics

According Classical mechanics, Maxwell in 1878 described that, "light is a form of energy, which is the combination of different radiations of transverse wave with specific wavelength". But the Bohr spectral line of atom could not explain by those ideas of light (Goldstein et al., 2001).

In 1900, the development of Max Planck's hypotheses (Dirac, 1981) on radiation: "all electromagnetic radiations are quantized and occur in finite bundle of energy (E) known as photons which are proportional to the frequency (ν) of radiation like equation (1)", made a grate success to understand the atomic properties and is the foundation of modern quantum theory.

$$E = h\nu \quad (1)$$

where h is the Planck constant = 4.136×10^{-15} eV·s

In 1905, Albart Einstein's photoelectric effects (CHP, 2004): "the release of electrons from certain metals or semiconductor by the action of light," pointed out the particle nature of light, and the phenomenon was explained by the quantum theory. Thus, the quantum theory became more attractive, and the light quanta are considered as a particle having wave property.

Again, in 1924, Louis de Broglie's hypothesis and Germar's experimental results accompany with quantum mechanics showed that the atomic particle, electrons have particle and wave property like as energy quanta or photons of light (CHP, 2004; Sakurai and Napolitano, 2010). The energy quanta of electrons are the basis of the development of electronic devices, which are the key of modern science/world. But how much we use the quantum mechanics to realize the whole universe?

2.2 Einstein's special theory of relativity

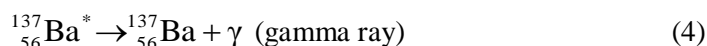
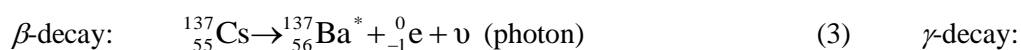
Einstein in 1905 introduced his special theory of relativity (CHP, 2004), "if a body emits a certain amount of energy, then the mass of that body must decrease by a proportionate amount," for very high speed particles specially for subatomic particles like electrons, and expressed the relationship between mass and energy in his famous equation (2),

$$E = mc^2 \quad (2)$$

where E is the energy, m is the mass and c is the speed of light $\approx 3 \times 10^8 \text{ m}\cdot\text{s}^{-1}$. This equation showed that the energy and mass are interchangeable and a very small amount of mass may be converted into a very large amount of energy and vice versa (CHP, 2004). This transformation of energy occurs mostly in the nucleus of atoms, which is the basic principle of the production of nuclear energy (Sakurai and Napolitano, 2010).

3. Conversion of Mass into Light

According to the Einstein's special theory of relativity (Clegg, 1965), the nuclear reactions involve a conversion of mass into (mainly) kinetic energy of the decay products. A large amount of energy (radiation) emitted by the nuclear decay process, which are also quantized. For example, the gamma (γ) decay occurs by emission of gamma particles (photons, or quanta of light). Gamma decay usually results when a nucleus became an excited state, with excess energy, after an alpha (α) or beta (β) decays. Equations (3) and (4) show the decay of cesium to barium in an excited state (Ba^*) by β -decay, and then the excited barium (Ba^*) decays by γ -decay (Clegg, 1965):



It was found that the mass of the decaying particle on the left hand side of these equations is greater than the sum of the masses of the decay products on the right hand sides. This loss in mass is a conversion into energy (radiation), which can be interpreted using Einstein's equation. Thus, the atomic nuclear mass converts into energy-quanta or light.

Not only in the nuclear power plan, are the conversions of mass to energy occurred for the enormous energy output of stars and galaxies (Clegg, 1965). Fusion reactions are the main source of energy (light) of the sun where two hydrogen atoms convert into a deuterium, isotope of hydrogen atom, by emission of radiation or photons like as equation (5), and are also used in certain types of nuclear weapons.



Thus, the masses of nucleus convert into energy, i.e. the rest mass is just as one form of energy. Therefore, high energy physicist says the mass of electron is 0.511 MeV, not in kg. According to the International Union of Pure and Applied Chemistry (IUPAC), the equivalent energy of different particles of atom is shown in Table 1 (Clegg, 1965). So, it is clear that all atomic particles are equivalent to energy or light, i.e. all atoms are made of light, which are the fundamental constituents of the universe as mentioned previously.

Table 1: Rest masses and energy equivalents of various particles of atom (Clegg, 1965)

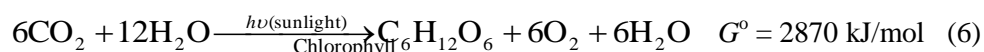
Atomic particles	Mass (kg)	Energy equivalent (MeV)
Electron	9.109×10^{-31}	0.511
Proton	1.6726×10^{-27}	938.28
Neutron	1.6750×10^{-27}	939.57

4. Light is the Constituent of Water

Water is the largest part of the earth; geographically about 3/4 of the earth is water. If we consider a molecule of water, we find two hydrogen atoms and one oxygen atom in that molecule. From the above discussions, the atomic particles: electrons, protons and neutrons, of each of the atoms (hydrogen or oxygen) are energy or quanta of light, i.e. the water molecules as well as the water in whole universe are made of light or energy quanta. In similar way we can find all animals, plants, mountains, soils, air, solar system systems, etc., i.e. everything in the universe is made by light.

5. Conversion of Light into Mass

Photosynthesis of plants is a well example for the conversions of light into mass in the natural systems of earth. In photosynthesis process (Whitmarsh and Govindjee, 1995; Blankenship, 2002), plants could use a large amount of light energy as photon to make carbohydrate from carbon dioxide and water like as well known equation (6). Here in the presence of charged particles, photons of light convert into chemical energy like carbohydrate.



The symbol G° is the stander free energy needs for synthesis of glucose. The transformation of quanta of light into mass is very informative to thinking the construction of the earth is from light.

6. Cycle of Light in Universe

The sun is the well known source of light. Plants produce mass particles from the photon of light by photosynthesis process. Mass particles converts into radiation and/or electricity by nuclear reaction. The electricity transfers through the metal wire and convert into photon by the fugue filament of electric bulb. As a whole the light cycle is presented in Figure 1.

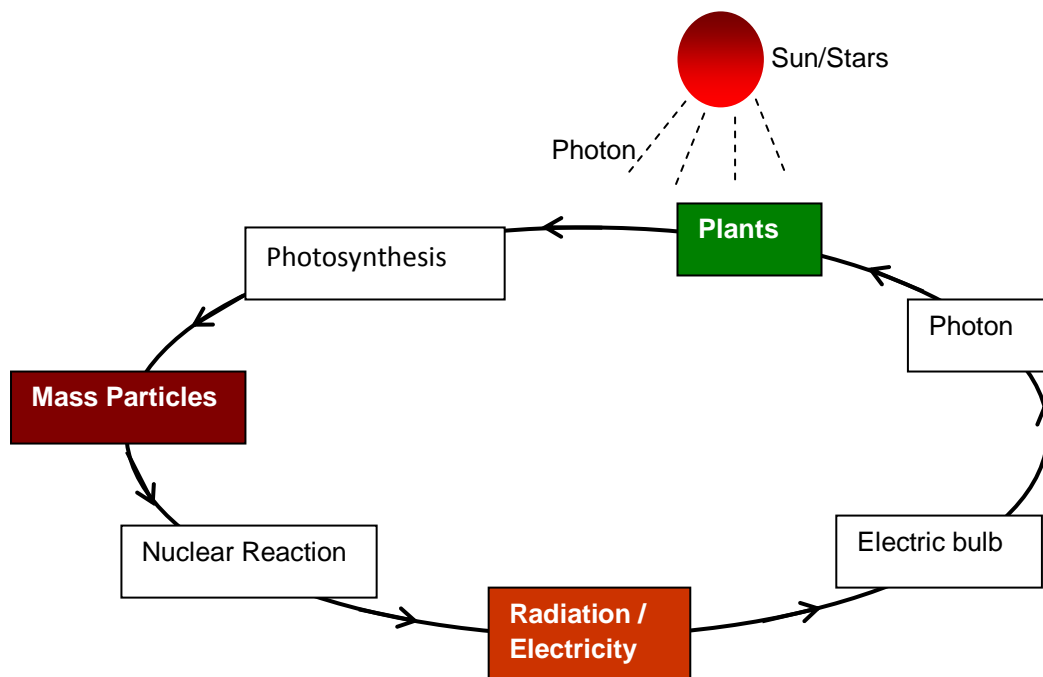


Fig. 1: Light cycle of the universe

7. Conclusion

From the above evidences of special theory of relativity, quantization of energy and photon like dual nature of atomic particles like electrons, protons and neutrons, it is clear that everything of the universe is made by bundle of light or photons. This is the output of modern science, which was pointed out in Holy Quar'an (Sura: An-Nur, Ayah: 35) about 1400 years ago. Again, Prophet Muhammad (SAW: peace be upon him) said, "I am from the light of Allah (SWT) and everything has been created from my light" (Hadith-e-Qurchi). We could not see anything of the universe without light, in our quantum consideration, except soul. May be soul is too much large energy quanta which is out of our detecting limits of frequency (γ -ray, $\geq 10^{20}$ Hz).

Acknowledgement

I am grateful to my father-in-law, Sheikh Shahzada Dr. Ahmed Peyara Bagdadi (R), Shahpur Dargah Sharif, Comilla, Bangladesh and my wife, Mrs. Takwa for their inspired to perform the research work.

References

- Blankenship, R. E. (2002). Molecular Mechanisms of Photosynthesis, Amazon Com.
 Center for History of Physics (2004). *Einstein-Inage and Impact*, American Institute of Physics.
 Clegg, A. B. (1965). High Energy Nuclear Reactions, Clarendon Press.
 Cotton, F. A., Wilkinson, G. M., Carlos, A. and Bochmann, M. (1999). Advanced Inorganic Chemistry, 6th Edition, John Wiley & Sons.
 Dirac, P. A. M. (1981). The Principle of Quantum Mechanics, Clarendon Press, 4th Edition.

GOLDSTEIN, H., CHARLES, P., POOLE, JR. AND SAFKO, J, L. (2001). CLASSICAL MECHANICS, 3RD EDITION, AMAZON COM.

Sakurai, J. J. and Napolitano, J. J. (2010). Modern Quantum Mechanics, 2nd Edition, Amazon Com.

Whitmarsh, J. and Govindjee, J. (1995). *Photosynthesis; Encyclopedia of Applied Physics*, Vol. 13, pp. 513-532.

Winter, M. J. (2012). The Periodic Table, Webelements Ltd., IUPAC.