Major shortcomings of modern cosmology and to unify the atomic, nuclear and cosmological physical constants

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Abstract: Authors made an attempt to highlight the 6 major shortcomings of modern cosmology. Observed cosmic redshift can be considered as a measure of age difference of our galaxy and observed galaxy. It can be suggested that - during cosmic evolution, as age of the hydrogen atom increases, emitted photon energy increases.

1. Major shortcomings of modern cosmology

A) If light is coming from the atomic matter of the galaxy, then redshift can be interpreted as an index of the galactic atomic matter 'light emission mechanism'. In no way it seems connected with 'galaxy receding'.

B) If cosmic expansion is continuous and accelerating and redshift is a measure of cosmic expansion, 'rate of increase in redshift' can be considered as a measure of cosmic 'rate of expansion'. Then there is no possibility to observe a 'constant' red shift. Merely by estimating galaxy distance (instead of estimating galaxy receding speed) one cannot verify the cosmic acceleration.

C) 'Drop in cosmic temperature' can be considered as a measure of cosmic expansion and 'rate of decrease in cosmic temperature' can be considered as a measure of cosmic 'rate of expansion'. But if rate of decrease in temperature is very small and is beyond the scope of current experimental verification, then the two possible states are: a) cosmic temperature is decreasing at a very slow rate and universe is expanding at a very slow rate and b) there is no 'observable' thermal expansion and there is no 'observable' cosmic expansion.

D) If 'Dark energy' is the major outcome of the 'accelerating universe', it is very important to note that - in understanding the basic concepts of unification or other fundamental areas of physics, role of dark energy is very insignificant.

E) So far no ground based experiment confirmed the existence of dark energy. There is no single clue or definition or evidence to any of the natural physical properties of (the assumed) dark energy.

F) Dimensionally it is possible to show that, the dimensions of Hubble's constant and angular velocity are same. If so considering Hubble's constant merely as an expansion parameter may not be correct.

2. About the galactic redshift

At present, if redshift (z_0) is directly proportional to the age difference (Δt) of our galaxy and the observed galaxy then,

$$z_0 \cong H_0 \Delta t \cong \frac{\lambda_G - \lambda_0}{\lambda_G} \le 1 \quad \text{but not} \quad z_0 \cong \frac{\lambda_G - \lambda_0}{\lambda_0} \tag{1}$$

In this way H_t can be incorporated directly. Here λ_G is the wave length of light received from observed galaxy and λ_0 is the wave length of light in laboratory. Please note that, when red shift is very small,

$$\frac{\lambda_G - \lambda_0}{\lambda_G} \cong \frac{\lambda_G - \lambda_0}{\lambda_0}. \tag{2}$$

Our galaxy and observed galaxy age difference can be expressed as

$$\Delta t \cong \frac{z_0}{H_0}. \tag{3}$$

If $c\Delta t$ is a measure of present distance between our galaxy and the observed galaxy, then

$$c\Delta t \cong z_0 \cdot \frac{c}{H_0}. \tag{4}$$

In this way in a simple and unified approach, Hubble's law can be obtained without any difficulty. Thus at present

$$H_0 \cong \frac{z_0}{\Delta t} \tag{5}$$

By measuring the galaxy redshift and age difference our galaxy and the observed galaxy H_0 can be estimated. Thus at present, it is possible to say that, in no way redshift seems to be connected with 'galaxy receding'.

3. Aged hydrogen atom and energy of the emitted photon

It can be suggested that, during cosmic evolution 'aged' Hydrogen atom emits energetic photon. Clearly speaking, as age of the hydrogen atom increases, emitted photon energy increases. Emitted photon energy can be obtained in the following way.

Step-1: At any given cosmic time, cosmological Planck's constant (h_t) can be expressed as

$$h_t \cong \left(\frac{R_t}{R_p}\right) \cdot \frac{4\pi G m_p m_e}{c} \cong \frac{4\pi G m_p m_e}{R_p H_t} \tag{6}$$

where $R_t \cong (c / H_t)$ and R_p is the 'rms' radius of proton. H_t can be considered as the characteristic cosmological atomic frequency. With this proposal, at present, Planck's constant can be expressed as

$$h_0 \cong \frac{4\pi G m_p m_e}{R_p H_0} \tag{7}$$

Accuracy depends only on the magnitude of the rms radius of proton and the present Hubble's constant. The two best quoted values of the rms radius of proton are 0.87680(690)fm and 0.84184(67) fm . Some may say – this is very interesting and some may say- this is a play with fundamental physical constants. But most of the modern physicists and cosmologists may not be interested in accepting this strange and bitter coincidence. Why because its consequences seem to be reverse to the existing concepts of quantum mechanics. If electron revolves round the proton having a size close to its 'rms' radius and (electron & proton) are the elementary or characteristic massive particles of the observable expanding universe, then above relation may be given some importance in unification program. The famous uncertainty relation can also be expressed as

$$\frac{h_0}{4\pi} \cong \frac{G m_p m_e}{R_p H_0} \tag{8}$$

Please note that, no arbitrary parameter is involved in this expression. Another very interesting condition or concept is

$$h_t H_t \cong h_0 H_0 \tag{9}$$

Thus with reference to atomic and nuclear physical constants, present Hubble's constant can be expressed as

$$H_0 \cong \frac{4\pi G m_p m_e}{R_p h_0} \tag{10}$$

Accuracy depends upon the magnitude of the 'rms' radius of proton. If $R_p \cong 0.84184(67)$ fm, obtained value of $H_0 \cong 70.69132$ km/sec/Mpc. If nuclear mass is directly proportional to number of massive protons then the famous Planck's quantum hypothesis can be expressed as

$$n.h_0 \cong \frac{4\pi G (n.m_p) m_e}{R_p H_0} \tag{11}$$

where n = 1,2,3,.. Thinking positively, $\frac{d(h)}{dt}$ can be considered as a measure of cosmic rate of expansion.

Note that, Einstein, more than any other physicist, untroubled by either quantum uncertainty or classical complexity, believed in the possibility of a complete, perhaps final, theory of everything. He also believed that the fundamental laws and principles that would embody such a theory would be simple, powerful and beautiful. Physicists are an ambitious lot, but Einstein was the most ambitious of all. His demands of a fundamental theory were extremely strong. If a theory contained any arbitrary features or undetermined parameters then it was deficient, and the deficiency pointed the way to a deeper and more profound and more predictive theory. There should be no free parameters – no arbitrariness. According to his philosophy, electromagnetism must be unified with general relativity, so that one could not simply imagine that it did not exist. Furthermore, the existence of matter, the mass and the charge of the electron and the proton (the only elementary particles recognized back in the 1920s), were arbitrary features. One of the main goals of a unified theory should be to explain the existence and calculate the properties of matter. Thinking in this way, revolving electron's discrete angular momentum can be expressed as

$$n.\left(\frac{h_0}{2\pi}\right) \cong \frac{2G\left(n.m_p\right)m_e}{R_p H_0} \cong n.\hbar_0 \tag{12}$$

Step-2: With usual notation and with reference to present Hydrogen atom, at any given cosmic time photon energy can be expressed as

$$E_p \cong \left(\frac{h_t}{h_0}\right)\cdot\frac{me^4}{8\varepsilon_0^2 h_0^2}\cdot\left(\frac{1}{n_1^2}-\frac{1}{n_2^2}\right) \cong \left(\frac{H_0}{H_t}\right)\cdot\frac{me^4}{8\varepsilon_0^2 h_0^2}\cdot\left(\frac{1}{n_1^2}-\frac{1}{n_2^2}\right) \tag{13}$$

where (h_t) is the Planck's constant at time t and (h_0) is the present Planck's constant.

4. Relation between cosmic temperature and the cosmological fine structure ratio

At any given cosmic time, if (a) is the radiation energy constant and (b) is the Wein's displacement constant , total thermal energy in the present Hubble volume can be expressed as

$$\left(E_T\right)_0 \cong aT_0^4\cdot\frac{4\pi}{3}\left(\frac{c}{H_0}\right)^3 \tag{14}$$

$$\text{Here, } a \cong \frac{8\pi^5}{15}\frac{k_B^4}{h^3c^3} \cong \left(\frac{8\pi^5}{15\times(4.96511423)^3}\right)\cdot\frac{k_B}{b^3} \cong 1.3333991714\cdot\frac{k_B}{b^3} \cong \frac{4}{3}\cdot\frac{k_B}{b^3}. \tag{15}$$

Wien's law is based on the classical approach. With reference to Wein's displacement law, it can be understood that, for any black body, most strongly emitted thermal wave length is inversely proportional to its absolute temperature. Thus in a classical approach**,** independent of the Planck's constant, radiation constant (a) can be expressed in terms of (k_B, b) and can be considered as a constant throughout the cosmic time.

$\left(\frac{c}{H_0}\right)$ can be considered as the present electromagnetic interaction range. Then present characteristic cosmological electromagnetic potential can be expressed as

$$\left(E_e\right)_0 \cong \frac{e^2}{4\pi\varepsilon_0\left(c/H_0\right)} \tag{16}$$

Now inverse of the present fine structure ratio can be fitted as follows.

$$\left(\frac{1}{\alpha}\right)_0 \cong \ln\sqrt{\frac{\left(E_T\right)_0}{2\left(E_e\right)_0}} \tag{17}$$

Here, in RHS, denominator '2' may be a representation of total thermal energy in half of the Hubble volume. Thus at any cosmic time,

$$\left(\frac{1}{\alpha}\right)_t \cong \ln\sqrt{\frac{\left(E_T\right)_t}{2\left(E_e\right)_t}} \tag{18}$$

From this coincidence, inverse of the (present) fine structure ratio can also be considered as a cosmological variable physical parameter and the observed present CMBR temperature can be fitted accurately. $\frac{d}{dt}\left(\frac{1}{\alpha}\right)$ can also be considered as a measure of cosmic rate of expansion. These coincidences seem to be speculative but at the same time very interesting. Anyhow in this way also from atomic and nuclear inputs, characteristic cosmic physical parameters can be fitted. From unification point of view these coincidences may be given some consideration.

5. Discussion and Conclusion

In physics history, for any new idea or observation or new model - at the very beginning – their existence was very doubtful. The best examples were : 1) Existence of atom 2) Existence of quantum of energy 3) Existence of integral nature of angular momentum 4) Existence of wave mechanics 5) Six quarks having fractional charge 6) Confusion in confirming the existence of muon/pion 7) Existence of Black holes 8) Black hole radiation 9) Einstein's cosmological Lambda term 10) Cosmic red shift 11) Discovery of CMBR and 12) Accelerating universe and so on.

The present study is a major step forward in this new direction. Even though there were a number papers/books published on cosmology, the attempt for a comprehensive study on this subject, coupled with comparative studies with the modern cosmology on one hand and with the modern atomic physics on the other, was not made by anybody so far. Thus, the present study can be termed as a ' pioneer project' in this field. Cosmological observations through ground telescope or satellite telescope is a normal practice. In this paper under consideration, current cosmological changes can be understood by studying the atom and atomic nucleus through ground based experiments. It is an interesting part of the study of cosmology and fundamental interactions. This is quite unique and the openness in the subjects of cosmology and fundamental interactions can be eliminated. Thus 100 years of atomic, nuclear and cosmic physics can be refined and unified.

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