Biocosmological Role of Gauge Particles in the Origin of Chiral Life and the Inflationary Origin of Matter-Antimatter Asymmetry in Semiclosed Friedman Universe

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I. Introduction

In 1860 L. Pasteur[1] wrote: "Life as manifested to us is a function of the asymmetry of the Universe. I can even imagine that all living species are primordially in their structure, in their external forms (like left-right chiral asymmetry) of a function of the Universe." A. Salam[2] later wrote that Pasteur was prophetic in the unification of biology and cosmology. We here discuss the biocosmological role of the chiral Z^0 boson predicted in 1968 in the origin of chiral life, and the cosmological role of the Higgs boson H^0 discovered in 2014 in the inflationary origin of matter-antimatter symmetry in the semiclosed Friedman universe.

II. Biocosmology

A. Salam[2] summarized the presently accepted view of the origin of life as occurring in three stages: cosmic, previotic chemical, and biological:

1) The cosmic stage concerns itself with the early history of the universe, where electroweak forces made a phase transition into electromagnetic and weak forces 10^{-12}s after the universe was born. The radius of the universe was then extended from Planck scale $\sim 10^{-33}$cm to 10^{-2}cm; the temperature was 250Gev $\sim 10^{12}\kappa T$; and the carriers of the neutral weak force of Z^0 boson acquired the mass by Higgs mechanism.

2) Chemistry became important after the planets were formed, some 10 billions years later, though it may have played a role in the presolar epochs as well (long after the quarks of the early cosmic era had condenced into protons and neutrons and much after the recombination with electrons, taking place some 10^5 years following Big Bang). Molecules of future life could thus have formed before the origin of the Earth.[3]

3) The biological era concerns itself with the replication of nucleic acid polymers and protein synthesis. The biological era may have started some 4 billlion years ago.

III. Z^0 Boson and Chiral Life

It is known that all amino acids and proteins utilized in living systems are of the L (left-handed) type. Salam emphasized the role of the chiral Z^0 interaction as its weak interaction works as a contact interaction in biochemical process (zwitterionic process).[2] Then, starting from Z^0 interactions,[4] the quantum mechanical cooperative and condensation phenomena[5,6] could give rise to second order phase transitions from D (right-handed) to L type occurring generally at low temperatures bellow a critical point T_C, known as $T_C << T_B = 3K << T_E \sim 300K$, where T_B is the ambient cosmic background radiation temperature at the present epoch of the expanding universe. T_E is the Earth's present surface temperature. There the crucial problem is that of amplification of the electroweak advantage over the course of time so that, fo example, the 20 amino acids convert almost entirely from L to D type.

We are thus led to look for the origin of the chiral life in more distant and cooler parts of the universe,[7,8,9] arriving at the semilosed Friedman model of the extragalactic radio source where the evolutionarilly earlier upper hemisphere of the universe is filled with negative dark energy causing large mass defect.[10,11]

IV. Planckeon-H^0 Boson Composite

In his 1963 paper: Semiclosed Worlds in the General Theory of Relativity Zel'dovich[12] wrote: "A class of Friedman solutions of general relativity equation is found in which, as we approach the matter from infinity, we reach a singularity at the graviational radius. But beyond this point the metric is continued in an unusual way—the radius decreases again and goes to zero only after passing through a maximum" (Novikov's similar work[13] noted in proof). Andreev, Stanyukovich and

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others[14,15] found related solutions showing the possible existence of a gravitationary closed point particle with Planck mass m_{pl} and radius l_{pl} moving with light vlocity which they called maximon or Planckeon. These particles can emit radiation only if they collide with massive object, but the radiation is unobservable by the Doppler effect.

We here propose a gravitationally bound Planckeon-Higgs boson composite[10,11] creating negative attractive potential and positive rest mass energy:

$$-Gm_H m_{pl}/l_{pl} = -G(m_H/m_{pl})m_{pl}^2/l_{pl}$$

$$= -10^{-17}Gm_{pl}^2/l_{pl} < 0, \qquad (1)$$

$$10^{-17}m_{pl}c^2 = 10^{-17}(\hbar c/l_{pl}) > 0, \qquad (2)$$

filling the evolutionarilly earlier upper hemisphere as dark energy and evolutionarilly later lower hemisphere as dark matter of the closcd Friedman univese. Here we have used $m_H = 10^{-17}m_{pl} = 10^{-22}$g. On the equator separating the two hemispheres we have

$$10^{-17}(m_{pl}c^2 - Gm_{pl}^2/l_{pl}) = 0, \qquad (3)$$

where the mass energy is absorbed by the attractive potential.

V. Evolutionary History of Friedman Universe

We extend the Friedman metric in Lorentz-Friedman-Reissner-Nordström form[10,11]:

$$ds^2 = c^2 g_{tt}dt^2 - g_{rr}dr^2,$$

$$g_{tt} = g_{rr}^{-1} = 1 - r^2/r_g^2 + L_\theta^2 l_{pl}^2/r^2 \qquad (4)$$

Here $r_g = 2GM/c^2$ is the gravitational radius of the universe having Newtonian mass M and radius $R \geq r_g$, and

$$L_\theta = \hbar l_\theta/2\pi, \quad l_\theta = \text{integer.} \qquad (5)$$

is the quantized angular momentum.

The evolutionary history of the Lorentz-Friedman black hole is contained in the integral

$$l_{pl} = \int^R g_{rr}rdr$$

$$= \int^R rdr(1 - r^2/r_g^2 + L_\theta^2 l_{pl}^2/r^2)^{-1}. \qquad (6)$$

giving the unitary and holographic information content (entropy)[16] of the black hole acquired by an observer approaching the matter distribution through empty space from infinity:

$$(R/l_{pl})^2 = (10^{28}/10^{-33})^2 = 10^{120}. \qquad (7)$$

VI. Superluminal Inflation and Subluminal Evolution

The light velocity is obtained by solving $ds^2 = 0$ as:

$$dr/dt = c(g_{tt}/g_{rr}) = c(1 - r^2/r_g^2 + L_\theta^2 l_{pl}^2/r^2)$$

$$> c \text{ at } r \sim l_{pl} \text{ and } r \sim r_g - l_{pl}$$

$$= c \text{ at } r = r_C = (r_g/l_{pl})^{1/2}$$

$$= c \text{ in between } r_C < r < r_C = c \text{ and } r \sim r_g - l_{pl} \qquad (8)$$

Eqs.(8) show that, starting from quantum fluctuations of preexisting metric for $0 < r < l_{pl}$, the light velocity is superlumnal at $r \sim l_{pl}$ and $r_g - l_{pl}$. After Big Bang at temperature $T_B = 10^{27}$K, dr/dt decreases with the increse of r towards $r = r_C = (r_g/l_{pl})^{1/2} = L_\theta^2 10^{-2}$ cm for $r_g = R = 10^{28}$cm.

During the superluminal and inflationary epoch of electroweak and grand unification of gauge fields by Higgs mechanism, a causaly related small region extends from $r \sim 10^{-25}$cm to $r \sim 10$cm, followed by a brief interlude of reheeting, retuning to the pre-inflatioonary temperature of the universe. Further evolution is described by standard Friedman universe starting the radiation dominated phase of Hubble's evolutional history expanding with subluminal velocity. Hubble constant H relates the velocity v of a massive extragalactic object to its distance d from the Earth:

$$H = v/d \qquad (9)$$

The COBE astronomical observations of the large-scale homogeneity of the distribution of matter and galaxy formation on the scale of 10^{10}cm light years can be explained by the superluminal and bi-directional EPR causal connection between radius $r = l_{pl}$ and $r = r_C$, while stars, clusters of galaxies, voids and other structures larger than 10^8 light years seem to indicate the angular momentum (5) $l_\theta \sim 10^3$ so that $r_C = l_\theta 10^{-2} \sim 10$cm, the high l_θ value indicating the multi-directional inflation.

VII. H^0 Boson and Inflation

H^0 boson has non-vanishing vacuum expectation value which spontaneously breaks electroweak gauge symmetry and which, in turn, gives rise to the Higgs mechanism capable of giving mass to the gauge bosons.

The PC and T symmetric Klein-Gordon equation

$$[\partial^2/\partial^2/(ct)^2 - \partial^2/\partial^2/r^2 + (\hbar/mc)^2]\psi = 0 \qquad (10)$$

obeyed by the Higgs boson wave function $\psi(r, t)$ can be decomposed into two-component Dirac form:

$$(\partial/\partial ct - \partial/\partial r + \hbar/mc)\psi_+ = 0,$$

$$(\partial/\partial ct + \partial/\partial r + \hbar/mc)\psi_- = 0, \qquad (11)$$

where $\psi_\pm$ represent the positive and negative energy states of the Higgs boson going forward and backward in time.

During the inflation, starting at $r = l_{pl}$ and ending at $r = r_C$, the light velocities $(dr/dt)_\pm$ are given by

$$(dr/dt)_+ = c[(1-r/r_g+L_\theta l_{pl}/r],$$
$$> c \ \text{at} \ r = l_{pl}$$
$$= c \ \text{for} \ r = r_C = (L_\theta l_{pl} r_g)^{1/2} \qquad (12)$$

and

$$(dr/dt)_- = c[(1 + r/r_g + L_\theta l_{pl}]$$
$$> c \ \text{at} \ r = r_g - l_{pl}$$
$$= c \ \text{for} \ r = r_C = (L_\theta l_{pl} r_g)^{1/2}. \qquad (13)$$

The CERN high energy proton-proton collision experiment creating H^0 boson, immediately decaying into a counter-propagating pair of photons, seems to tell the preference of H^0 boson, going forward in time, to its antiboson, going backward in time, by the present universe expanding forward in time.

VIII. Matter-Antimatter Asymmetry

Matter-antimatter symmetry required by quantum theory and relativity is largely violated in cosmic scale outside high energy laboratory experiments. As there were equal amount of gauge matter and antimatter, immediately after the moment of the hot Big Bang at $r = r_C$, we here propose to consider that the probability of collision between H^0 boson and the gauge matter, comoving forward in time, dominates over the collision between H^0 boson and antimatter, counter-propagating backward in time during inflation expanding forward in time.

IX. Cosmological Double-Slit Experiment

In his positron theory Feynman extended Jordan-Paulil propagator

$$D(r, t) = t/|t|\delta(c^2 t^2 - r^2)$$
$$= D_{ret} - D_{adv} \qquad (14)$$

To

$$D = D_{ret} + D_-$$
$$= D_{adv} + D_+. \qquad (15)$$

Here D_{ret} and D_{adv} are the retarded and advanced propagators. $D_\pm$ are the Fourier contributions from positive and negative frequency sheets. At the Chicago meeting Pauli criticized Feynman's D_F by applying it to the single electron double-slit experiment. Feynman[17] replied Pauli by showing a delayed-choice double-slit equipped with time-dependent shutters creating Λ + V = N shaped electron-positron pairs, zigzagging in time.

A matter-antimatter symmetric cosmology is conceivable by replacing the shutter by the Big Bang and the slit by the 3-diensional Lorentz sphere: $(ct)^2 - r^2 = l_{pl}^2$ filled with point-like Planckeons and joind onto Friedman universe at $r = r_c$, allowing a topological (non-Hausdolff) worm hole where the timelike 3-vectors is undefined.

X. Early Comment on Gauge Theory

After C. N. Yang's keynote address: "Gauge Fields, Electromagnetism and the Bhom-Aharonov Effect" at the 1983 Tokyo symposium on the Foundations of Quantum Mechanics (ISQM),[10,11] Greenberger asked: Why is that we do not have a gauge theory of gravity that works in this simple and beautiful way in the Bohm-Aharonov experiment using electron holography? Yang[18] answered: "All gauge theories are related to connection on fibre bundles. In the case of gravity the bundle is a special one, the tangent bundle. That is why, in the final analysis, gravity is different from other gauge theories."

References Références Referencias

1. L. Pasteur, Researches on the molecular asymmetry of natural organic products, Alembic Club Reprint no.4, London (1980).
2. A. Salam, The Role of Chirality in the Origin of Life. Journal of Molecular Biology. **33**, 105 (dictated and typed) (1991).
3. J. Orò et al. The origin and early evolution of life on Earth, Ann Rev Earth Planet Sci. **18**, 317 (1990).
4. K. Kondepdi and C. Nelson, Weak neutral currents and the origin of biological chirality. Nature.**314**, 438.(1985).
5. A. Leggett, In P. Davis (ed) The New Physics. Cambridge University Press p.276 (1990).
6. A. Salam et al. Chern-Simons Super Conductivity at finte temperatures. Nucl. Phys.**B340**, 403 (1990).
7. J. Orò, Comets and the formation of biochemical compounds on the primitive earth. Nature **190, 389.** in (1961).
8. C. Ponamperma and P. Molten, Prospect of life on Jupiter, Space Life Sciences 4 32 (1973).
9. M. Okamoto et al. Polarized Radio Emission from Extragalactic Source, Phys. Rev. **B6**4. 03303 (2007).
10. N. Hokkyo, Physics and Space Science **15** (6)(2015).
11. N. Hokkyo, Physics and Space Science **16**(5) (2016),
12. Ya. B. Zel'dovich, Sov. Phys. JETP **16**(3) 732.(1963)
13. I. D. Novikov, Delayed Expansion of a Part of the Friedman Universe, and Quasers.Soviet Astronomy **8**(6) 857(1963).

14. A. F. Andreev, Macroscopic Bodies with Zero Rest Mass, Sov. Phys. JETP **38**(6) 648.(1974).
15. Yu. N. Babanenkov et al., Geometric Model of Radiation Plancken, Sov. Phys. Dokl. **26**(9). 856.(1974).
16. S. W. Hawking, Information Loss in Black Holes. Phys. Rev. **D72,** 08401 (2005),
17. R. P. Feynman, The Theory of Fundamental Processes. Fig.18.2. Addison-Wesley, New York (1961).
18. C. N. Yang, Gauge Fields, Electromagnetism and the Bhom-Aharonov Effect, Proc. Int. Symp. Foundations of Quantum Mechanics, Physical Society of Japan (1963) p.9.