

Universe Expansion In Integral Space

S. K. Srivastava, Former Professor of Physics, Devi Ahilya University, Indore, India; Patron & Founder Members Board, International Disordered Systems Associates Society (INDIAS), Allahabad, India indias_matri@yahoo.co.in

Abstract—In the last century the developments of two different theories (i) Steady State Theory (SST) (ii) Big Bang Theory (BBT) have enlightened the field of cosmology to understand our Universe and Nature. However methodologies were complicated. Recent success of Scientific Theory (2012-2016) for different systems in the form of Order- Disorder Transformations (ODTs) has revealed the fact that Nature (symmetry) and Universe (randomness) the two different radiation resources affect each event. Author's Unified Scientific Theory has been applied to discuss the Universe expansion problem. It has been observed that after Big Bang when the Universe began to move away from Nature, then due to their relative motion disorder develops. Disorder develops only when the value of entropy (Λ) lies between 0 and 1. At these values of entropy there is no universe expansion.

By finding the values of two new energy constants C_{Uni} and K_{Nai} we would be able to estimate the values of expanded energy of Universe at different timings and hence be able to predict the entropy of this Universe, which is increasing. After knowing the values of these constants many secrets of nature and universe may be unfolded. The study also reveals a fact that Universe expansion problem is associated with thermal diffusion phenomenon.

Keywords—Diffusion, Disorder, Disordered Systems, Universe Expansion, Thermal Diffusion Process

1. INTRODUCTION

The remarkable developments done in last century, in the area of cosmological investigation of Universe expansion problem, have been described in the beginning of this paper. The developments of two different theories (i) Steady State Theory (SST) (ii) Big Bang Theory (BBT) in the mid of 20th century enlightened the field of cosmology to understand our universe. SST emphasis was on the concept that the universe has always existed and will continue without any change while BBT focus about the creation of universe in a massive explosion-like event long ago. Further discovery around 1965 based on basic researches^{1, 2} about the idea of Cosmic Microwave Background (CMB) radiation focused on the beginning of universe in a hot, dense state and expanding of universe over time which confirmed the prediction of Big Bang Cosmology. Researches during last two decades of last century emphasized mostly on Cold Dark Matter with critical density in matter as evident in the Lambda Critical Density Model (λ - CDM) – a six parameterized Big Bang Cosmological Model³ including a cosmological universe constant (λ)

associated with dark energy and cold dark matter. This model assumes that GENERAL Relativity is the correct theory of gravity on cosmological scales and follows the observations of accelerating expansion. However, some alternative models such as Modified Newtonian Dynamics (MOND) Model challenged the assumptions of λ - CDM model.

Simultaneously to the idea of CMB radiation around same times the prominent contributions of Stephen Hawking independently and further along with his coworkers is remarkable. Hawking⁴ proposed the explanation of Big Bang Cosmology “by a union of the general theory of relativity and quantum mechanics “. Hawking along with his coworkers^{5, 6} focused that prior to the Planck epoch the universe had no boundary in space time ; before the Big Bang time did not exist. Further, in space-time continuum, the thought of Einstein “gravitation produces singularities’ was explained on the basis of the solutions of the Einstein field equation due to either of one of two things (i) a space- like singularity (ii) a time like singularity. That is to say, that the singularity in Einstein’s field equation at the Big Bang is only an apparent singularity, similar to the well known apparent singularity at the event horizon of a black hole. The survey of literature reveals that the above discussed methodologies are very complicated.

In recent years (2012-2016) author introduced Order- Disorder concepts to simplify the study of the systems of Universe and Nature. Nature and Universe may be considered two different radiation resources. According to scientific facts, creation of universe and life on earth are based on natural laws. As regarding the evolution of universe⁶ (a disordered entity) long ago the particles of very low mass (Higgs Boson particles) due to some huge explosion (during Big Bang) separated to different places and some force field, Higgs field was generated, by which those boson particles gained mass and moved away with certain velocity up to certain distance and then their free fall motion under gravity began.

The galaxies including Milky Way form building blocks of universe, which are found to be spread in non-linear way in random manner. The scientific facts of galaxies recession, points out to the separation of universe from nature, which reveals that the universe is expanding due to which the entropy of the universe is increasing.

The objectives of this paper are: (i) To evaluate the expanding facts of Universe (ii) To observe the validity of author's Unified Scientific Theory in case of universe expansion. Unified Scientific theory (SKS) has been described in brief in Section-2. The methodology used in this paper has been described in Section- 3, whereas the dynamics of universe

expansion, results and conclusion have been summarized in Section-4, 5, 6, respectively.

2. UNIFIED SCIENTIFIC THEORY

Recently the success of Unified Scientific Theory ⁷, a new quantum mechanical development in integral space has been experienced for the molecular systems (kinetic theory of gases, specific heats of solids). The theory has also reproduced successfully the different atomic system results of the pioneers such as Planck, Heisenberg, Niels Bohr, De Broglie, Einstein etc. by employing following Order – Disorder Transformations (ODTs) of integral space ^{7,8}:

$$\int \int f(T, t) \Delta T. \Delta t \approx \int \int f(E, t) \Delta E. \Delta t \approx (1/2 \pi) \approx \int \int f(D,O) \Delta D. \Delta O, (1)$$

where the symbols have their usual meanings.

Every event is affected by order (Nature: symmetry behaviour) and disorder (Universe: random behaviour) behaviour, which form the basis of Unified Scientific Theory. Actually the ODTs are relevant to understand the dual characteristics of matter and radiation in the form of an action (Theory of Action).

3. METHODOLOGY

We have followed the simple methodology of Unified Scientific Theory ⁷ based on Order- Disorder concepts. ODTs formula ^{7, 8}. eq. (1) has been employed in order to assess its validity in case of universe expansion.

In the order- disorder concepts, we consider disorder as a conceptual form of photon energy, $E_{ph} = h \nu = h / (Q_F t)$; while order as a conceptual form of energy for maximum quantization, Q_F , ($Q_F = \lambda / c t$: $Q_F \rightarrow 1$), $E_{ph} = h / t$. Q_F is a quantization factor, while the other symbols have their usual meanings. Time 't' is an invisible variable parameter, which describes natural order. Similarly, a Lifton having energy $E_L = e_T / t$ have been considered earlier ^{9,10} as the constituent particle of Bio- radiation. We call e_T as SYA constant ⁹. Here it is considerable that before Big Bang Nature and Universe were together, while after Big Bang universe probably separated from nature and hence galaxies separated from each other. That is to say, that the relative motion was developed between Nature and Universe. Our whole universe is filled up with matter and radiation. In view of relativistic concepts, the total energy of Universe and Nature can be represented by $e_{Un} = C_{Uni} / t'$ and $e_{Nat} = K_{Nat} / t$, respectively. Here C_{Uni} and K_{Nat} are energy constants in the units of erg sec as true for Planck's constant 'h' also.

4. DYNAMICS OF UNIVERSE EXPANSION

It is based on scientific facts that the beginning of our Universe is associated with Big Bang. After that our universe is expanding regularly and hence Entropy of universe is increasing, i.e., disorders are increasing day by day. Their control is essential to save life on earth. The dynamics of whole assessment of expanding energy has been described here by

pointing the fact that as universe began to move during separation from nature, the relative motion (relative velocity: v) concepts of Einstein involved in Lorentzian transformations are useful.

The distribution function f (E, t) used in ODTs – transformations of integral space, eq.(1) in present case is represented by

$$f(E, t) = e^{E/(C_{Uni}/t')} e^{(-K_{Nat}/t)/(C_{Uni}/t')} (2)$$

And thus, ODTs equation for present case is given by

$$\int \int e^{E/(C_{Uni}/t')} e^{(-K_{Nat}/t)/(C_{Uni}/t')} \Delta E. \Delta t \approx (1/2 \pi), (3)$$

where timings t' and t on using relativity concepts are related by

$$t' = t/a; a = 1 / (1 - v^2/c^2)^{1/2} (4)$$

Here c is velocity of light. Finally, the solution of eq. (3) under maximum quantization is given by

$$E = (1/2 \pi t) \lambda, (5)$$

$$\text{where } \lambda = e^{K_{Nat}/aC_{Uni}} (6)$$

The disorder factor λ of eq. (5) describes the magnitude of entropy in terms of generated disorder, whose value lies between 0 and 1, i.e., eq. (5) represents the general equation of universe expansion. Different ordered cases are described below.

Case – 1 : For minimum disorder the entropy is zero ; i.e,

$$\lambda = 0 (7)$$

And eq. (5) presents

$$E \rightarrow 0 (8)$$

Above equation reveals that universe and nature are close together. It is the case when there is no disorder, and such disorder is known as order; i.e., there occurs no universe expansion.

Case- 2: Let us see another case for $\lambda = 1$ (entropy is 1 ; disorder is maximum) .

Thus, eq. (6) gives

$$e^{K_{Nat}/aC_{Uni}} = 1 (9)$$

$$\text{or } K_{Nat}/aC_{Uni} = 0 (10)$$

The constant K_{Nat} can't be zero as it has some value. Therefore this case for universe expansion will be not possible. For entropy 1 the maximum disorder case becomes order case.

The other different cases of universe expansion may be compared by considering the value of λ between 0 and 1 in the left hand side of eq. (6); where in each case the value of relative velocity, v will be different. The value of v may be described from eq. (6) as given by

$$v = c [1 - \{ \log \lambda / (K_{Nat}/C_{Uni}) \}^2]^{1/2} (11)$$

Once the values of constants C_{Uni} and K_{Nat} are determined as the value of Planck constant 'h'

($h = 6.63 \times 10^{-27}$ erg-sec) was known earlier, the above equation will be helpful in finding the relative velocity v at different values of entropy λ lying between 0 and 1.

The separation of universe from nature develops situation of no resonance between universe and nature, and this generates disorder by which universe expansion takes place. The study correlates relative velocity v and disorder parameter λ . Eq. (5) is helpful in determining the expanding energy of the universe. This opens the path of estimating energy density, a valuable quantity.

When we evaluated expanded energy of the Universe 'E' from eq. (5), the estimated value of E for $\lambda = 1$ (say at maximum entropy) comes out 2.734×10^{-16} ergs; where 't' represents Age of the Universe; whose value we have used³ as 13.799×10^9 years = 4.35×10^{17} sec. In this way at different value of Entropy, the expanded energy of Universe may be estimated. It is obvious from eq. (5) that the energy of Universe expansion is in increasing order according to entropy increment.

The Boltzmann relationship of Entropy (λ) and probability W is described by

$$\lambda = k_B \cdot \ln W \quad (12)$$

Also Thermal diffusion energy ($E_{Diffu.}$) is given by

$$E_{Diffu.} = k_B \cdot T; T: \text{Temperature} \quad (13)$$

where k_B ($k_B = 1.38 \times 10^{-16}$ erg / °C) is Boltzmann constant and W is associated to Probability. It is remarkable that the obtained value of expanded energy of the universe is of the order of thermal diffusion energy $E_{Diffu.}$. Thus, we obtain from eqs. (5), (12) and (13)

$$E = (1/2 \pi t) \lambda$$

$$= (1/2 \pi \cdot \text{Age of Universe}) \cdot E_{Diffu.} \cdot (1 / \text{Temperature}) \cdot \ln W \quad (14)$$

Above equation reveals that more or less universe expansion problem is associated to thermal diffusion phenomenon. It is considerable that the thermally isolated system (assemblage of system and reservoirs in an adiabatic enclosure) constitutes the 'Universe' since it includes all systems and reservoirs that interact during the process under study. By considering universe in this way, we can say that for any kind of possible process

$$(\Delta \lambda)_{universe} \geq 0 \quad (15)$$

where equality sign holds for reversible processes and the inequality sign for irreversible processes.

This study of the application of Unified Scientific theory for the case of Universe expansion reveals following facts:

1 K_{Nat} and C_{Uni} respective constants associated to the radiant energy of Nature and radiant energy of universe possesses similar meaning as the Planck constant 'h' of Sun radiant energy. At present the value of 'h' is known only, while the value of K_{Nat} and C_{Uni} are to be known.

2 The estimation of relative velocity v is associated with the relative motion concept between Nature and Universe, which depends on the separation of Universe from Nature and points out that there is no resonance between them during expansion of Universe stage.

3 Once the value of K_{Nat} and C_{Uni} known for ever, only parameter remains to find out will be v in order to study universe expansion problem; i.e., this study becomes simple.

4 Universe expansion problem is associated to thermal diffusion phenomenon.

5. RESULTS

In case the values of energies constants K_{Nat} of radiation resource Nature and C_{Uni} of radiation resource universe may be known as we know the value of Planck's constant $h = 6.62 \times 10^{-27}$ erg – sec of sun radiation then multiple secrets of nature and our Universe may be understood, such as the variation of expanded energy with time. Present universe expansion theory is based on Unified Scientific Theory of author describes that at minimum and maximum disorder, the entropy becomes $\lambda = 0$ and $\lambda = 1$ and in these two cases the universe is not expanding. For other cases when λ will lie between 0 and 1, there will develop disorder due to separation of universe and nature and expansion will take place. The relative motion study correlates, separation of universe – nature, disorder and universe expansion. The study also reveals a fact that the universe expansion problem is somewhere associated to thermal diffusion phenomenon.

6. CONCLUSION

By finding the values of two energy constants C_{Uni} and K_{Nat} we would be able to estimate the value of expanded energy of universe at different timings and hence how much energy of the universe is increasing. It can be concluded that when the separation of universe from nature takes place, there develops relative motion between them, which develops disorder and causes universe expansion. Disorder develops only when the value of entropy (λ) lies between 0 and 1. It is concluded that author's Unified Scientific Theory – for the systems of Universe and Nature describes very well the problem of Universe expansion and this problem is associated to thermal diffusion phenomenon.

REFERENCES

- [1] A. G. Doroshkevich and Igor Novikov, entitled "Mean Density of Radiation in the Metagalaxy and Certain Problems in Relativistic Cosmology", Paper was presented in a Conference, 1964
- [2] Penzias, A.A.; Wilson, R.W. "A Measurement of Excess Antenna Temperature at 4080 Mc/s". *Astrophysical Journal*. 142:,1965. pp.419–421.
- [3]. Lambda- CDM Model- Wikipedia; https://en.wikipedia.org/wiki/Lambda-CDM_model
- [4] Hawking Stephen, " Properties of Expanding Universe" , Ph.D. Thesis , University of Cambridge, 1966
- [5] J. Hartle, Stephen Hawking "Wave Function of the Universe ", *Phys. Rev. D*, 28(12) 1983, pp 2960
- Hawking Stephen and Penrose Roger, "The Nature of Space and Time", Princeton University Press, 1996, ISBN: 0-691-03791-4
- [6] S. K. Srivastava, *Chiang Mai J. Sci.* , 40(1), pp. v-vii, 2013
- [7] S. K. Srivastava, Yashodhara Verma, Avinash Verma " *Unified Scientific Theory for the Systems of Universe and Nature:ODTs'* , Lap Lambert Academic Publishing (OmniScription GmbH & Co. KG), Saarbrucken, Germany, 2014
- [8] S. K. Srivastava, *Chiang Mai J. Sci.* , 39(3), pp. v-vi, 2012; *ibid.*, 39(4) , pp- iv-vi, 2012
- [9] S. K. Srivastava, Yashodhara Verma, Avinash Verma, *International Journal of Science And Engineering Research*, 5(2) , pp. 994- 997, 2014
- [10] S. K. Srivastava, Yashodhara Verma, Avinash Verma, *International Journal of Science And Engineering Research*, 5(2) , pp. 1590-1593, 2014