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A UNIFIED CONCEPT OF REALITY: ADDING ANOTHER DIMENSION TO EINSTEIN'S FIELD EQUATION

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ABSTRACT

The multifarious explanations to unravel the mystery of the origin, the evolution and finally the cessation of the universe, our existence, and everything within this universe as a whole - have eluded scientists since time immemorial. An attempt is made to logically expound a few fundamental aspects of this unfathomable cosmology. This, in turn, will throw a new light on our understanding of the universe. These explanations hinge on 3 central theories viz., (i) modifying and rebalancing Einstein's field equation of General Relativity using the Energy-Momentum tensor generated by the Like-Potential Energy (LPE) state, a particular energy state postulated by the author, (ii) proposing a particular state beyond the state of all forms of energy and matter, justified to be the state of Consciousness Principle (CoP), the real unifying factor, and, (iii) bridging the overwhelming gap in understanding vacuum catastrophe, using LPE.

KEYWORDS : Consciousness Principle - General theory of relativity - Reality of Universe - Unification theory - Vacuum Catastrophe - Vibration.

1. INTRODUCTION

This work began when the author conceived that the results of an earlier publication on the "Like-Potential Energy" (LPE) state [1] could provide answers to several underlying mysteries and unsolved questions pertaining to the reality of our universe. An effort is pape to extend these findings and provide further explanation to deepen our understanding of the reality of cosmos (by modifying the General Theory of Relativity (GTR) and accommodating this LPE tensor).

The author thus offers a slightly modified use of Einstein's Field Equation (EFE), (i.e., the set of 10 equations in the Einstein GTR that describe the fundamental interaction of gravitation as a result of space-time being curved by mass and energy). According to EFE, any energy-body - massive or massless - produces a gravitational effect on its surroundings by warping space-time. The anomaly known as the Vacuum Catastrophe is then demystified by augmenting this dynamic equation, obtained from LPE

The presence of an all-pervading Consciousness Principle (CoP), is proposed by the author as the quintessence state of the universe. Building the theory proposed previously [1], as vibration becomes smaller and smaller with the increased energy, the conventional state of energy becomes the proposed LPE state and therefore does not produce any gravitational effect (despite containing enormous energy). Hence it is offered to add vibration as another dimension to make EFE a 5-vector continuum.

Further, the paper explains a state (postulated as the CoP), as the very basal state that is all-pervading and verily the most latent or actual root cause of all the energy dynamics observed in our universe.

The paper stipulates that when the LPE goes to infinity, the state becomes absolutely still. This infinite energy with zero vibration state is termed by the author as an Absolute LPE (ALPE) state, which is the very CoP when vibration is absolute 0. The difference between ALPE and CoP will be clarified later in this paper.

The various aspects of CoP are taken up and explained in this paper to show how the real unification of all forces and matter is possible only in the CoP, and not in any other state. References to such concepts were previously offered by the ancient Indian texts like Vedanta, Samkhya, which was further explained by Swami Vivekananda, suggesting in a clear scientific way to link LPE and CoP [2-8].

Deeper research on this subject is needed to explore various postulates of LPE, ALPE and CoP to better understand their relationship in quantum applications and classical fields of studies. It is to be particularly noted here that the LPE equation [1] is a relativistic equation (Dirac equation for Fermions and Klein Gordon equation for Bosons) since the momentum and the energy are applied interchangeably in case of LPE

Finally the vacuum catastrophe, a very long-standing anomaly, is demystified in this paper by the very intrinsic property of LPE state. This LPE state as postulated in the earlier publication [1], is capable of containing an enormous energy oscillating with very high frequency vibrations, but with very low magnitude, owing to the gradually decreasing displacement. This energy state is unbounded and infinite when vibration approaches 'zero', and we utilize the LPE state's energy characteristics to bridge the gap in theoretical understanding of Vacuum Catastrophe.

2. MODIFIED EFE IN SPACE-TIME-VIBRATION

According to EFE in General Relativity, any mass or energy warps the space-time, and the curvature due to the warping is the measure of the gravitational field. If there is no mass or energy in the space-time, there will be no curvature created. But, these field equations do not provide any explanation as to why the enormous energy in the space (the vacuum energy) does not cause any gravitational effect.

Considering a Gaussian Normal coordinate in a very small localized area we get a definite, non-fluctuating energy and momentum at that coordinate. We propose here to include vibration as the 5th dimension to be an expansion of Einstein's 4-vector "space-time" continuum [9] to create a 5-vector triad, (defined as the "Space-Time-Vibration triad" (STV)).

The rationale of proposing the STV - a 5 dimensional continuum triad is a subject of separate study; in which it can be shown that vibration forms the fifth continuum to form STV. Due to the addition of LPE, the Energy-momentum Tensor Components *S*, will have a 5 dimensional object forming STV continuum. Vibration becomes the 5th set of components in the matrix elements as the dimension goes from 0 to 4 (i.e., $x^0, x^1, x^2, x^3, x^4 \rightarrow$). We write the 5-vector matrix (addition of LPE) as follows:

$$\begin{bmatrix} S_{00} & S_{01} & S_{02} & S_{03} & S_{04} \\ S_{10} & S_{11} & S_{12} & S_{13} & S_{14} \\ S_{20} & S_{21} & S_{22} & S_{23} & S_{24} \\ S_{30} & S_{31} & S_{32} & S_{33} & S_{34} \\ S_{40} & S_{41} & S_{42} & S_{43} & S_{44} \end{bmatrix} = S_{\mu\beta} e^{\mu} \otimes e^{\beta}$$

$$= S_{00}e^0 \otimes e^0 + S_{01}e^0 \otimes e^1 + S_{02}e^0 \otimes e^2 + S_{03}e^0 \otimes e^3 + S_{04}e^0 \otimes e^4$$
$$+ S_{10}e^1 \otimes e^0 + S_{11}e^1 \otimes e^1 + S_{12}e^1 \otimes e^2 + S_{13}e^1 \otimes e^3 + S_{14}e^1 \otimes e^4$$
$$+ S_{20}e^2 \otimes e^0 + S_{21}e^2 \otimes e^1 + S_{22}e^2 \otimes e^2 + S_{23}e^2 \otimes e^3 + S_{24}e^2 \otimes e^4$$
$$+ S_{30}e^3 \otimes e^0 + S_{31}e^3 \otimes e^1 + S_{32}e^3 \otimes e^2 + S_{33}e^3 \otimes e^3 + S_{34}e^3 \otimes e^4$$
$$+ S_{40}e^4 \otimes e^0 + S_{41}e^4 \otimes e^1 + S_{42}e^4 \otimes e^2 + S_{43}e^4 \otimes e^3 + S_{44}e^4 \otimes e^4 \quad (1)$$

where, e is the basis vector, and ⊗ is the notation for tensor product of two matrices.

The LPE energy-momentum components of the tensor $S_{\mu\beta}\, e^{\mu} \otimes e^{\beta}$ can be constructed out of energy PX and momentum Pt derived from normalizing the LPE quantum state equation [1] as shown in eqn. (21) and eqn. (22) respectively in this paper. Consider a vector with its β component Vβ and a small closed loop with dx^{μ} and dx^{ν} as its 2 sides, in STV 5 dimensional intrinsically curved space (Fig.1a&1b). Now take the vector V_{β} and make parallel transport of this vector around the loop starting at the point O in the dx^{ν} direction first and then in the dx^{μ} direction to come back to the point O (Fig.1a).

Let us repeat this parallel transporting of the vector V_{β} around the same loop starting from the point O; but this time starting in the dx^{μ} direction first and then going along dx^{ν} direction to come back to the same point O (Fig.1b).

FIG 1a Parallel transport starting from *dxv* direction **Fig 1b** Parallel transport starting from dx^{μ}direction In an intrinsically curved space, the result of the 1st parallel transport will not be the same as the result of the 2nd parallel transport. The vector *Vβ* will be deflected by some angle at the same point O. Let us call this deviation dv_{λ}. The 1st parallel transport of the vector *Vβ* starting 1st in the dx^{ν} direction, ending at the point O is represented by

$$\nabla_{\mu}\nabla_{\nu}V_{\beta} = \nabla_{\mu}\left[\nabla_{\nu}V_{\beta}\right] \quad (2)$$

where, ∇ is the covariant derivative operator of covariant tensor with $\nabla = \frac{\partial}{\partial x} - \Gamma$ where Γ the Cristoffel symbol of 2nd kind which has 1 upper index and 2 lower indices. When the operator Γ_{μ} acts on V_{β} it gives $\Gamma^{t}{}_{\mu\beta}V_t$ Again, the 2nd parallel transport of the vector V_{β} starting first in the dx^{μ} direction and ending at the point O, is represented by

$$\nabla_{\nu}\nabla_{\mu}V_{\beta} = \nabla_{\nu}\left[\nabla_{\mu}V_{\beta}\right] \quad (3)$$

dv_{λ} the deviation of the vector *Vβ* is given by the following

$$dv_{\lambda} = dx^{\mu}dx^{\nu}\left[\nabla_{\mu},\nabla_{\nu}\right]V_{\beta} \quad (4)$$

where, $\left[\nabla_{\mu},\nabla_{\nu}\right]$ is the commutator of two covariant derivatives acting on *Vβ* This commutator known as the Riemann tensor $R_{\mu\nu}{}^{\lambda}{}_{\beta}$ is anti-symmetric with respect to μ and ν Hence $g^{\mu\nu}R_{\mu\nu}{}^{\lambda}{}_{\beta} = 0$, where $g^{\mu\nu}$ is symmetric metric tensor.

Contracting the indices λavd ν , we get the Ricci Tensor $R_{\mu\beta}$ Now

$$\left[\nabla_{\mu},\nabla_{\nu}\right] = \nabla_{\mu}\nabla_{\nu} - \nabla_{\nu}\nabla_{\mu}$$

If the space is flat, these two covariant derivatives will commute with each other, in which case

$$\nabla_{\mu}\nabla_{\nu} - \nabla_{\nu}\nabla_{\mu} = 0 \quad (5)$$

Let us now compute all the components of these covariant derivatives acting on V_{β} in terms of metric tensors and equate it with 0 (eqn.5), since we know that the energy-momentum tensor obtained from the LPE doesn't create any curvature in spite of having huge energy. Thus all the components of the Riemann tensor will vanish due to the presence of LPE state.

Now:

$$\nabla_{\mu}\nabla_{\nu}V_{\beta} = \nabla_{\mu}\left[\frac{\partial V_{\beta}}{\partial x^{\nu}} - \Gamma^{t}{}_{\nu\beta}V_t\right] = \left[\frac{\partial}{\partial x^{\mu}} - \Gamma_{\mu}\right]\left[\frac{\partial V_{\beta}}{\partial x^{\nu}} - \Gamma^{t}{}_{\nu\beta}V_t\right] \quad (6)$$

and

$$\nabla_{\nu}\nabla_{\mu}V_{\beta} = \nabla_{\nu}\left[\frac{\partial V_{\beta}}{\partial x^{\mu}} - \Gamma^{t}{}_{\mu\beta}V_t\right] = \left[\frac{\partial}{\partial x^{\nu}} - \Gamma_{\nu}\right]\left[\frac{\partial V_{\beta}}{\partial x^{\mu}} - \Gamma^{t}{}_{\mu\beta}V_t\right] \quad (7)$$

We get the commutator by subtracting eqn. (7) from eqn. (6)

$$\left[\nabla_{\mu},\nabla_{\nu}\right]V_{\beta} = \left(\nabla_{\mu}\nabla_{\nu} - \nabla_{\nu}\nabla_{\mu}\right)V_{\beta} = \nabla_{\mu}\nabla_{\nu}V_{\beta} - \nabla_{\nu}\nabla_{\mu}V_{\beta}$$

$$= \left[\frac{\partial}{\partial x^{\mu}} - \Gamma_{\mu}\right]\left[\frac{\partial V_{\beta}}{\partial x^{\nu}} - \Gamma^{t}{}_{\nu\beta}V_t\right] - \left[\frac{\partial}{\partial x^{\nu}} - \Gamma_{\nu}\right]\left[\frac{\partial V_{\beta}}{\partial x^{\mu}} - \Gamma^{t}{}_{\mu\beta}V_t\right]$$

$$= \left(\frac{\partial}{\partial x^{\nu}}\Gamma^{t}{}_{\mu\beta} - \frac{\partial}{\partial x^{\mu}}\Gamma^{t}{}_{\nu\beta} + \Gamma^{\alpha}{}_{\mu\beta}\Gamma^{t}{}_{\alpha\nu} - \Gamma^{\alpha}{}_{\nu\beta}\Gamma^{t}{}_{\alpha\mu}\right)V_t \quad (8)$$

Writing all the Cristoffel symbols in terms of metric tensors, we get

$$\Gamma^{t}{}_{\mu\beta} = \frac{1}{2}g^{st}\left[\frac{\partial g_{s\beta}}{\partial x^{\mu}} + \frac{\partial g_{s\mu}}{\partial x^{\beta}} - \frac{\partial g_{\mu\beta}}{\partial x^{s}}\right] \quad (9)$$

$$\Gamma^{t}{}_{\nu\beta} = \frac{1}{2}g^{pt}\left[\frac{\partial g_{p\beta}}{\partial x^{\nu}} + \frac{\partial g_{p\nu}}{\partial x^{\beta}} - \frac{\partial g_{\nu\beta}}{\partial x^{p}}\right] \quad (10)$$

$$\Gamma^{\alpha}{}_{\mu\beta} = \frac{1}{2}g^{q\alpha}\left[\frac{\partial g_{q\beta}}{\partial x^{\mu}} + \frac{\partial g_{q\mu}}{\partial x^{\beta}} - \frac{\partial g_{\mu\beta}}{\partial x^{q}}\right] \quad (11)$$

$$\Gamma^{t}{}_{\alpha\nu} = \frac{1}{2}g^{rt}\left[\frac{\partial g_{r\nu}}{\partial x^{\alpha}} + \frac{\partial g_{r\alpha}}{\partial x^{\nu}} - \frac{\partial g_{\alpha\nu}}{\partial x^{r}}\right] \quad (12)$$

$$\Gamma^{\alpha}{}_{\nu\beta} = \frac{1}{2}g^{m\alpha}\left[\frac{\partial g_{m\beta}}{\partial x^{\nu}} + \frac{\partial g_{m\nu}}{\partial x^{\beta}} - \frac{\partial g_{\nu\beta}}{\partial x^{m}}\right] \quad (13)$$

$$\Gamma^{t}{}_{\alpha\mu} = \frac{1}{2}g^{nt}\left[\frac{\partial g_{n\mu}}{\partial x^{\alpha}} + \frac{\partial g_{n\alpha}}{\partial x^{\mu}} - \frac{\partial g_{\alpha\mu}}{\partial x^{n}}\right] \quad (14)$$

Replacing the Cristoffel symbols taken from the eqn. (7) to eqn. (14), in the eqn. (8) we get

$$\Rightarrow \left(\frac{\partial}{\partial x^{\nu}}\left[\frac{1}{2}g^{st}\left[\frac{\partial g_{s\beta}}{\partial x^{\mu}} + \frac{\partial g_{s\mu}}{\partial x^{\beta}} - \frac{\partial g_{\mu\beta}}{\partial x^{s}}\right]\right] - \frac{\partial}{\partial x^{\mu}}\left[\frac{1}{2}g^{pt}\left[\frac{\partial g_{p\beta}}{\partial x^{\nu}} + \frac{\partial g_{p\nu}}{\partial x^{\beta}} - \frac{\partial g_{\nu\beta}}{\partial x^{p}}\right]\right]\right.$$

$$+\left[\frac{1}{2}g^{q\alpha}\left[\frac{\partial g_{q\beta}}{\partial x^{\mu}} + \frac{\partial g_{q\mu}}{\partial x^{\beta}} - \frac{\partial g_{\mu\beta}}{\partial x^{q}}\right]\right]\left[\frac{1}{2}g^{rt}\left[\frac{\partial g_{r\nu}}{\partial x^{\alpha}} + \frac{\partial g_{r\alpha}}{\partial x^{\nu}} - \frac{\partial g_{\alpha\nu}}{\partial x^{r}}\right]\right]$$

$$\left.-\left[\frac{1}{2}g^{m\alpha}\left[\frac{\partial g_{m\beta}}{\partial x^{\nu}} + \frac{\partial g_{m\nu}}{\partial x^{\beta}} - \frac{\partial g_{\nu\beta}}{\partial x^{m}}\right]\right]\left[\frac{1}{2}g^{nt}\left[\frac{\partial g_{n\mu}}{\partial x^{\alpha}} + \frac{\partial g_{n\alpha}}{\partial x^{\mu}} - \frac{\partial g_{\alpha\mu}}{\partial x^{n}}\right]\right]\right)V_t = 0 \quad (15)$$

Eqn. (15) is the equation of flat space under LPE.

Einstein's field equation for the curved space-time in the presence of energy or matter [10,11] is given by

$$R_{\mu\beta} - \frac{1}{2}g_{\mu\beta}R = \frac{8\pi G}{c^4}T_{\mu\beta} \quad (16)$$

where $R_{\mu\beta}$ is the Ricci tensor, $g_{\mu\beta}$ is metric tensor, R is the scalar curvature and $T_{\mu\beta}$ is the energy-momentum tensor due to the presence of any energy body. Now, from the eqn.(1) we understand that the 5-vector energy-momentum tensor due to LPE, denoted by $S_{\mu\beta}$ is present in the STV continuum. But the energy-momentum does not create any curvature (as it is well-known in case of vacuum energy). In other words, this LPE creates no gravitational effect. Each component of energy and the momentum of LPE comes from the eqn. (21) and eqn. (22) respectively, in this paper.

Now, to make a complete Einstein's field equation taking LPE tensor into account we add $S_{\mu\beta}$ on the right hand side as '1' extra term. And on the left hand side we add one extra term $\sigma g_{\mu\beta}$ to denote the metric tensor due to the no-curvature created by the energy momentum $S_{\mu\beta}$ Thus the eqn.(16) takes the form as follows

$$\boxed{R_{\mu\beta} - \frac{1}{2}g_{\mu\beta}R + \sigma g_{\mu\beta} = \frac{8\pi G}{c^4}T_{\mu\beta} + S_{\mu\beta}} \quad (17)$$

where σ is an arbitrary constant due to LPE tensor.

The eqn. (17) is the modified Einstein's 5-vector continuum field equation of General Relativity. It is evident from the eqn. (1) that, in all, there are 25 equations squeezed into the eqn. (17). This equation may be called as the V Tensor equation. To rewrite eqn. (17) in terms of V Tensor, we have

$$V_{\mu\beta} = \frac{8\pi G}{c^4} T_{\mu\beta} + S_{\mu\beta} \quad (17a)$$

The 5 dimensions of the 5-vector continuum consist of 1 time dimension, 3 space dimensions, and 1 vibration dimension. Or, we can think of it as a 3-vector continuum of the STV triad.

It is clear from the above equation (eqn. 17) that when there is the presence of energy body (other than LPE) in in the STV triad, the energy-momentum tensor $T_{\mu\beta}$ will create curvature.

When there is no such energy body present in STV triad, which means $T_{\mu\beta} = 0$ there will be no curvature, which means the scalar curvature $R = 0$ and all the components of the Ricci tensor $R_{\mu\beta} = 0$.

But on the right hand side there will be still the energy-momentum term $S_{\mu\beta}$ created due to LPE, but this $S_{\mu\beta}$ will not have any gravitational effect though having humongous energy in it. Thus we get from equation (17) at $R_{\mu\beta} = 0$ $T_{\mu\beta} = 0$ and $R = 0$

$$S_{\mu\beta} = \sigma g_{\mu\beta} \quad (18)$$

Eqn. (18) gives the geometry of LPE state when there is no other energy body present in the field than LPE.

Based on eqn. (17), it can be postulated that vast energy exists in the vacuum field, despite a lack of gravitational effect.

3. THE CoP AND THE RATIONALE OF UNIFICATION THEORY

Studies on the genesis of multifold manifestations of our universe have not yet incorporated the unification principle in a consistent theory.

Energy is the basic substratum of all manifestations, and in the physical universe (per the classical theories) this energy is taken to be in indiscrete/continuous state. However, per the quantum theories this energy state is known to exist in the discrete (or non-continuous) state. To expand further, the LPE theory proposes the quantum energy (initially discrete) will again transform to the indiscrete state when approaching infinity energy with zero vibration. The following explanation will justify this observation.

3.1 Discrete and continuous energy-momentum Eigen state

The wave function of the LPE state (eqn. 19 here) as derived in the paper [1] is

$$\frac{\partial \psi}{\partial t} = \frac{\psi}{i\hbar}\left(x\rho - i\hbar\omega\right) \quad (19)$$

After normalization, we have

$$\psi_1 = \frac{1}{\sqrt{2\pi}} e^{\frac{\rho t x}{i\hbar}} \quad (20)$$

Applying the energy operator, $i\hbar\frac{\partial}{\partial t}$ to ψ_1 in eqn. (20), we have

$$i\hbar\frac{\partial \psi_1}{\partial t} = \rho x \psi_1 \quad (21)$$

where the term ρx is the Energy Eigen value, which gives a 'definite energy' of the state ψ_1 at a given P and X.

Likewise applying the momentum operator,

$-i\hbar\frac{\partial}{\partial x}$ to ψ_1 in eqn.(20), we have

$$-i\hbar\frac{\partial \psi_1}{\partial x} = -\rho t \psi_1 \quad (22)$$

where the term ρt is the momentum Eigen value which gives a 'definite momentum' at a given P and t

It is well-known that though the uncertainty of position-momentum is maintained, we get a definite momentum and energy Eigen value in a quantum state, provided the definite position is not measured simultaneously. Here, in the case of LPE state (eqn. 19), the same principle is also applicable in eqn. 21 and eqn. 22.

The energy and momentum can be discrete or continuous, depending upon the condition under which the state is present. For example, a free particle can be in the continuous energy state if existing in a highly ionized state, where the free electrons arbitrarily can get as far away as possible. We then get a continuous, high vibrational energy state. Likewise, in the LPE, which is also a very high energy state, the continuous energy state does arise, but exists with minimal vibration.

Let us illustrate the above proposition with the help of an infinite square well where L is the length of the well. When energy has no nodes (Fig.2), we get discrete energy with corresponding probability distribution (Fig.3). When the number of nodes is increased from 0 to 1 (Fig.4), the discreteness of the probability distribution gets slightly denser (Fig.5). But when the number of nodes tends to infinity (Fig.6), the energy and momentum can take any possible indiscrete value (Fig.7). This continuous (indiscrete) energy state can be considered to be existing in the proposed STV 5-vector continuum.

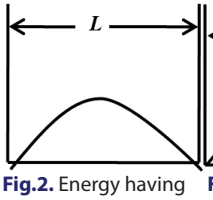

Fig.2. Energy having no node

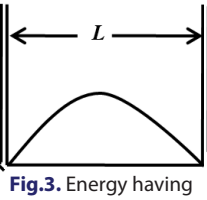

Fig.3. Energy having no node

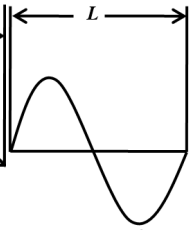

Fig.4. Energy with one node

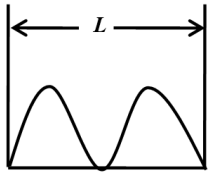

Fig.5. Probability distribution of energy with one node

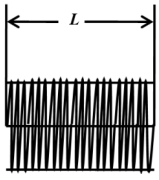

Fig.6. Energy having many densely nodes

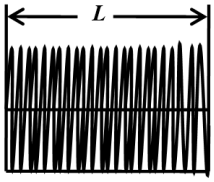

Fig.7. Probability distribution of high energy having many densely nodes

Fig.7. illustrates how the LPE (eqn.19), when it reaches infinity, behaves in a perfect indiscrete manner, referred to as ALPE state, with LPE limit tending to infinity.

In this state (termed as ALPE) the energy particle does not vibrate (limit tending to 0). Hence there is no change in state. Therefore, with the limit 0, even the time and space practically vanish here. Further, it is known that any relative change in any field or state gives an indication of time. But, when there is no change in state, in other words, when 'nothing moves' – time ceases to exist, as found in the following statements: (i) "Since the Hamiltonian generates time translations in any canonical theory, we arrive at the conclusion that 'nothing moves' in GR…"; and (ii) "…. since there is no time also the usual interpretation of quantum mechanical experiments at given moments of time breaks down" [12].

Since, as per the Theory of Relativity space-time is one single continuum, 'space' also ceases to exist with the cessation of time. There is yet another state, beyond even the ALPE state where the STV is an exact 0 (distinct from 'limiting to 0'). This state, beyond the relativity and all limitations of STV triad, is termed here as the CoP, a perfectly unchanged and homogeneous state in the true sense of the terms.

It can be thus logically extrapolated that this CoP state is beyond the cause and effect relation, which defines the law of precedence and succession, a necessary condition of our existence in the proposed STV triad. In other words, interdependence or relative existence of STV solely forms the law of our universe. But beyond the STV (which is the CoP state), no law can possibly operate. In the CoP state there is neither time, nor space nor vibration - It is all ONE – that which exists by itself alone without having any cause. Furthermore, the CoP has to be an infinite state, since the definition of 'finite' presupposes the STV as the limiting adjunct.

As there cannot be two selfsame coexisting infinite states, it is a state that is the One-without-a-second and that is ubiquitous. Since it is one single state (N = 1), the entropy of the CoP must be 0 (S = logN). When the CoP state is observed through the STV, or in other words becomes limited by the proposed STV triad, it remains no more as pure CoP - it has become finite, as it were - manifesting as the whole universe with all its multiplicities. Thus everything that is limited by the STV becomes finite or relative, and the CoP appears to be enveloped by space, time and vibration, and manifests as this finite and existential cosmos.

The one important attribute of the proposed STV triad is that the space, time and vibration cannot exist separate from one another. For instance, we do not have any concrete idea of time, and therefore need some changeful phenomena (known as event), to understand this concept.

Thus time depends on change in space. We cannot have any idea of time if there is no change of space around us. Likewise, space has to be related to two separate points in the fields, which again depends on time, as the field changes every moment. The idea of vibration, the quintessential of the proposed STV triad, is also inseparable from both space and time. The STV always remains together as a single factor, working to project the whole gross and subtle cosmos by apparently enveloping the real nature of the CoP (by time, space and vibration in some combination).

Most importantly, the inter-dependent STV triad has no real existence because of dependency and ever-changing nature of each component of STV On the contrary, the CoP state (which is absolutely independent of the STV triad), is an ever-existing state with infinite energy but zero vibration. Here, the relativistic behaviors of creation cease to exist in the CoP. This state appears to be relative only when it is observed through the STV.

Being beyond the STV triad makes a convincing argument that the CoP state existed even before the creation of this universe, namely before the Big Bang.

The foremost postulation in this paper is that creation is manifested in this universe in and through the CoP, and is seemingly existential within the STV triad. Thus the whole universe is but the appearance of one infinite energy continuum, which is clearly expressed through the modified Einstein's field equation (eqn.17). This equation, at infinite energy and zero vibration, postulates the CoP, which is purely a unified state, and that can be termed as the Unified State Theory (UST). Thus the eqn. 17 with 5-vector continuum, at and the vibrational displacement $E=\infty$ and the vibrational displacement $dx=0$,gives the clear notion of the UST. This UST is always present within the frame of the CoP, the substratum on which the ever-changing STV is superimposed by the individual observers.

3.2 Quintessence of the Unified State Theory (UST): Consciousness is non-physical

Since the CoP is an unchangeable and an ever present state, it 'alone' is fit to be called 'absolute existence'. Any state of relative existence, which encompasses every creation in the universe defined by the proposed STV triad, has only the 'appearance' of existence. It is "appearance" because every single state, out of which every energy-matter system is made of, is composed of STV, and thus the state itself changes into another state in every single moment. This is the reason why no STV state can be said to have existence in the real sense. It is like a cat gets suddenly changed into a dog in a moment, and next moment the dog changes into a rabbit, and so on. And these changes happen in every moment. How hard it is to define a cat, or a dog or a rabbit in this situation of constant change! Exactly in the same way the whole creation is undergoing such changes in every fraction of a second. So it becomes quite impossible to define a particular state. Thus we can only say that each state under STV has only an "appearance" of existence. We have seen that being beyond the changeful STV, the CoP is a single state (existing changelessly), and there is no other state than CoP that has real existence in true sense of the term. Also, as CoP state is absolutely motionless, it stands to be beyond all energy-matter system. Hence the CoP state must be totally a different state from any of the available states in the whole creation we can think of. It then becomes a natural supposition that the CoP should have special attributes that can be in no way similar to and compared with the attributes of energy and matter system in our entire creation. In other words, we can think that the CoP will have all non-physical attributes as its nature So it is need to bring in some concepts that are beyond energy-matter (or physical) system, since the CoP itself is beyond the energy and matter. The state being only and only one, the observer and the observed merge into one, there remains neither the subject nor there is any object to objectify. This sort of non-physical CoP is defined as the real Consciousness, as the very term CoP indicates. Apart from being Consciousness itself, the CoP has various other non-physical attributes that need deeper and wider study. Science must and should be bold enough to include such non-physical study into its fold in order to have comprehensive understanding of the totality and the real unifying factor.

The very moment when the vibration begins, the inter-dependent space-time also gets a start off, resulting in all different arrays of energy-matter manifestations. Thus begins the inviolable cause and effect relation of our cosmos.

It now becomes evident that from the indiscrete CoP state, the discrete quantum relative state apparently emerges.

From eqn. (19), taking the proposed STV 5-vector continuum, we understand that when $E=\infty$, we have only one principle present everywhere, and this principle is the CoP. Everything that we observe around us is produced out of the STV triad manifesting out of the CoP.

In other words, the wave function $|\psi\rangle$ obtained from eqn. (19) converts itself into CoP at $E=\infty$ In other words, when the STV triad acts on the state CoP, it gives rise to the primordial force field F.

This discrete force field, as it is produced, is quantized in different energy quanta. F can be thought of as Eigen value of the finite Eigen vector.

$$STVtriad\left|\psi_{E=\infty}\right\rangle = F\left|\psi_{E=finite}\right\rangle \quad (23)$$

The state vector ψ here comes from the eqn. (19) viz.

$$\frac{\partial\psi}{\partial t} = \frac{\psi}{i\hbar}\left(x\rho - i\hbar\omega\right)$$

Before the STV triad acts on the CoP (as in eqn.23), the CoP is in a perfect 'Unified State'. After the action of STV triad, the unified CoP appears to be limited by STV.

From the CoP state everything emerges while acted upon by STV. The modern science today is deeply leaning towards the idea of CoP, the **Self-Existent,** that which pervades the entire cosmos. The concept like panpsychism and others similar concepts clearly echo the idea of modern scientists leaning towards CoP [13-15].

4. EXPLAINING THE ANOMALY OF VACUUM CATASTROPHE

The Casimir effect is a pxhysical force arising from a quantized field, demonstrated by measuring the resultant force between two uncharged conductive plates in vacuum. This force [16,17] per unit area **A** is given by

$$\frac{F(a)}{A} = \frac{\pi^2}{240}\frac{\hbar c}{a^4} \quad (24)$$

According to Quantum Field Theory (QFT), we find that each particle in vacuum field acts like an infinite number of Quantum Harmonic Oscillators (QHO), each having an infinite zero-point energy. This energy in the vacuum field (many QHOs put together) should have caused an intense gravitational effect. But observations confirm that the vacuum energy does not create any gravitational effect. This is the apparent contradiction in our present understanding.

Most quantum field theories predict the magnitude of the vacuum energy density, as in Dark Energy (DE), which is derived from the quantum vacuum, to be more than 100 orders [18]. Also, the quantum electrodynamics (QED), and the stochastic electrodynamics (SED), in consistency with these two well established theories, the principle of Lorentz covariance, and the magnitude of the Planck constant necessitate the vacuum state to have an energy of joules per cubic meter [19].

In spite of this huge energy, there is no observed gravitational effect or any other manifested effect. This discrepancy is Vacuum Catastrophe.

Let us now consider the LPE state of a QHO as discussed in [1]. A quantum phase space state has been proposed there to reach up to infinite amount of energy; while the vibrations in QHO would decrease proportionately to a minimal state so as not to manifest the QHO energy as a dynamic force.

This fact is evident from the following graph (Fig.8) obtained from the equation,

$$\frac{\partial \psi}{\partial t} = \frac{\psi}{i\hbar}\left(x\rho - i\hbar\omega\right)$$

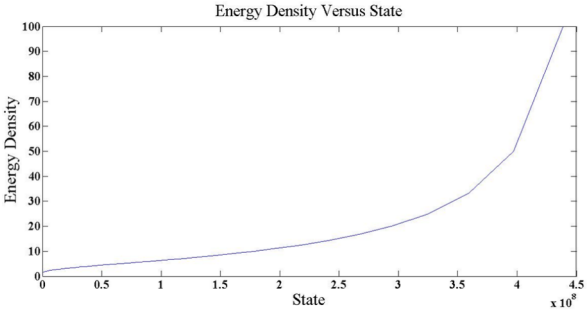

Fig.8. Energy increases in LPE state with diminishing state of vibration [1]

The LPE state theory predicts that subtler (or more potential) the state is, the greater will be the amount of energy it will have intrinsically.

Now if we consider the vacuum state to be in the LPE state, it becomes evident that though the vacuum contains large energy, the vibrations of the vacuum will be in a very dormant state. And at this state (vacuum energy) the LPE won't produce any sort of gravitational or any other manifested effect.

Hence it is a natural pre-requisite for vacuum to be in LPE state in order to resolve the discrepancy called vacuum catastrophe.

5. RESULTS

We have derived in this paper the three significant results arising from the LPE theory [1] as follows:

(i) The LPE exists with huge energy and does not create any curvature or gravitational effect (as observed with vacuum energy). This requires us to slightly modify Einstein's field equation of General Relativity to accommodate LPE tensor into it - and accurately postulate the observed natural phenomena

(ii) The LPE with infinite energy and zero vibration (termed as the CoP state) is known to be the unchanging state of existence, described as One-without-a-second state. Since the CoP state, unlike all energy and matter, is a single self-existing state beyond the STV, we postulated that this CoP state theory, obtained from the modified Einstein's Field Equation (eqn.17) is the actual 'Unified State Theory (UST)' of the entire cosmological phenomena.

(iii) A plausible explanation for the anomaly called 'Vacuum catastrophe' is provided with the help of LPE and corresponding graph (Fig. 8) to give a complete understanding of the nature of this state.

6. DISCUSSION

6.1 The CoP is a purely uncompounded, undifferentiated state to be the state of unification.

It is a well-accepted fact that as long as there are two, unity cannot be reached, because the unity means the existence of only one, not more. As we look into any matter or energy, it is observed they are compounded, i.e. composed of more than one substance. Matter is composed of subatomic particles like leptons and quarks. The Large Hadron Collider (LHC) identified these tiny subatomic particles that are made up of energy packets and spin etc., proving any type of matter to be essentially compounded energy packets. Even if we consider a single photon with one energy packet in a particular state (say the ground state), we observe that there are quantities like space, time and vibration present within that packet. In other words, each energy packet is actually composed of Space-Time-Vibration (STV triad). So, the energy particle, as long as it vibrates, must and should be composed of this STV, which dovetails the fact that nothing in the physical world can possibly be composed of a single entity. Therefore, the real unity/unification cannot be obtained in the physical world. We should have something non-physical to get to the unification. Moreover, as the STV keeps changing at every moment, these energy packets also must and should undergo changes every moment from one state to another (as happens in every quantum state), which means the physical world (made out of bundles of STV), has no real existence in the true sense.

Any compounded object can be thought of as combination of its constituents, and each of these can be considered a combination of some other less compounded objects. If we proceed this way, we will reach a state where any type of matter or energy packets can be thought of as made with the purely uncompounded entity. And this entity is the CoP, which is infinity due to its pure uncompounded nature - infinite in the sense that the CoP is unbounded by the STV triad and its manifestations.

The same CoP appears to be finite, only when we look at it through the medium of STV, just as the combination of Hydrogen and Oxygen in a particular way gives us a feel of the existence of water. Therefore, by properly analyzing any type of matter or energy, we can realize the substratum CoP to be the foundation.

Thus the STV confirms the presence of many states, instead of one, and each of them obscures recognition of the elusive single state. It is only the state beyond the STV that can be thought of as real unified state. This unified state, as proposed here to be the CoP, is

the state where the STV triad vanishes yet at the same time contains all the source materials to project the universe.

6.2 The Big Bang Theory versus CoP

According to the Big Bang theory, universe has been created out of a dimension-less, infinitesimal point. All the source materials to create this huge energy-matter system in the whole universe were compressed into that point. Then there was a resulting Bang, and soon afterward, that point started to expand and gave shape to today's still expanding universe.

However, several key unanswered questions remain, such as what actually banged, why it banged, and where.

Moreover, this Big Bang theory postulates that before this bang, i.e. 13.7 billion years ago, it was an absolute void, the actual "nothing" that prevailed; even the space-time was not existing there. Out of this "Nothing" the whole universe, as we know now, has sprung.

The CoP theory, on the other hand, postulates that "Something can never come out of Nothing" [5]. The CoP, which is the state beyond STV, is the ever-existing substratum out of which the finite universe limited by STV appears to arise. Any "thing" that we can think of - must be within the STV triad. So, the CoP state may be called as the state of "No-thing", but it is not "Nothing" in true sense. This "No-thing" can be equated with the concept of *Shunya* of the Vedas [4].

6.3 Universe: cycle of creation from CoP and dissolution in CoP

As per the postulation in this paper, CoP is the ultimate substratum of the whole finite systems of energy-matter in universe, both gross and subtle. Our universe can be thought of just as a numerical zero, both in the scale of space and time, as compared with the CoP, which is infinity in the scale of both space and time. Thus there can be many or possibly almost infinite number of finite universes in the whole cosmos taken together.

To better understand the cycle of creation it is to be noted that the whole universe, due to the influence of STV, is projected out of CoP, and again gets dissolved into CoP. An observer can perceive this phenomenon when the observer transcends the effects of STV upon realizing that the STV has no real existence. In contrast with the STV, the CoP remains as the ever-existent entity. This way the eternal cycle goes on – the projection and then the dissolution of the universe in a cyclic manner.

Since the dawn of science we are in search of the building block of matter and energy. But this seems to be a never-ending process, and the modern research tends to obtain inconclusive results. It seems to be an impossible task to define this basic substratum as long as we remain within the STV triad- CoP remains outside its limitations.

6.4 Matter and CoP: in mathematical analogy

The CoP proposed here may be taken as the subtlest form of matter. But yet it is not matter, since matter undergoes changes in the STV (unlike CoP). Using the trail of energy-matter, we can reach this one substratum, viz. the CoP.

Now to take a mathematical analogy, if we have a polynomial of degree 5, we have exactly 5 zeros counting multiplicities. If we have a polynomial of degree infinity, we see everything ranging from number 0 to infinity of counting multiplicities.

Here the polynomial with finite degree can be compared with all the (finite) matter and energy principles under the STV triad; and the polynomial with degree infinity (the term "polynomial with degree infinity" or, equivalently, "polynomial of degree infinity" is usually not to be seen in a textbook or a monograph - instead, the term "exponential function/ transcendental function" is used) which can be thought of as the CoP in this analogy.

Although an analogy may be either misinterpreted or inappropriate, the analogy here only focuses on the term "infinity" against "non-infinity". If we have a polynomial of degree 10 trillion, then we will have exactly 10 trillion zeros counting multiplicities.

It would be easy to follow that the exponential functions (polynomials of degree infinity) $x\text{-}e^x$ has no zero, $x\text{-}e^{-x}$ has exactly '1' zero, $\sin x - \cos x$ has infinity of zeros [20].

One more analogy can be cited here, i.e. the state at zero Kelvin. None has so far reached the absolute or, equivalently, exact 0 Kelvin (K), but we know the volume of an ideal gas is numerical 0 at 0 K. We know the existence of exact 0 K only by extrapolation since we can never reach the exact 0 K [21]. So also extrapolating the entire energy-matter system to its most basic and fundamental substratum, we can arrive at the existence of the CoP.

If we observe any kind of gross matter, we will find that the basic components of every material substance are the subatomic particles like fermions and bosons, as in the Standard Model. And each such subatomic particle is nothing but each Quantum Harmonic Oscillator (QHO). In further analysis we find that these tiny QHOs are composed of vibrating energy states that are continuously fluctuating from one state to another. Again, if we try to reach further deeper, we will come across the vacuum energy which is proposed here to exist in the LPE state. It is the same identical LPE state that is present both within a matter system as well as within the outer space in the universe. Thus it is understood that the actual ingredient of the entire cosmos can be thought of as the LPE state, which is again made out of STV. And as we have seen before - by extrapolation - the LPE state can be further reduced to ALPE state, and then finally the ALPE state to the CoP state that runs in and through the whole cosmos and beyond.

In other words, it is understood that the same object can be seen in different ways. Taking water as an example, one typically thinks of it as the liquid substance with all its properties. The same water can be viewed as the combination of hydrogen and oxygen under certain conditions. Similarly, it can be thought of as the bundle of innumerable QHOs with all quantum fluctuations.

And ultimately, the very same water can be understood as composed of the CoP alone and nothing else. All these differences depend upon the understanding of the observer (and not the substance). If we can extrapolate the same idea to all matter and break it down to the essential principles of existence, we begin to see the similarities at the deepest levels. When the understanding of the observer goes to the CoP level, there is total elimination of the difference between one object and another. As such, all matter (at the stage of final analysis), is made up of the CoP, thus unifying all existence into one

.

Each time we perceive water, we should be prompted to think of the vibration and CoP state. In the same way, underlying all matter - is one energy at its core and origin. The CoP offers this possibility of infinite energy and a homogenous state of existence for all matter. Basically, it is all one!

6. CONCLUSIONS

The proposed theory on the reality of universe has been logically explained with significant results that have been derived, primarily revolving on the central theories, well ascribed in the ancient Indian scriptures [4-6]. As explained, in reality we live in the world of Consciousness Principle (CoP), the all-pervading principle, which is indiscrete and homogeneous. It is with the influence of space-time-vibration (the STV triad which changes every moment, thus having no real existence) that the indiscrete CoP state appears to being existential in the discrete quantum world.

As postulated, the LPE state is capable of explaining the fundamental and core principle of the cosmos. And the CoP forms the actual underlying principle of the origin and evolution of the universe. It is very important to note that the CoP never undergoes any change.

It is the STV triad that makes the CoP appear, as though it is undergoing changes, and as a result the entire creation along with its complete energy-matter system including Dark Energy (DE) and Dark Matter arises.

The LPE theory potentially aids our understanding of this DE, its characteristics, its subtle interactions and its modifying effects on the universe that till today remains almost irreconcilable.

Of particular interest is to establish the vibration as the fundamental causation for different elements constituting the energy-matter array, both within and outside the Standard Model. As our understanding of the vibration in the micro (quantum) level increases, we have to incorporate this concept in the macro (cosmos) level as well.

Also, we can postulate that the universe we live in can be conceived as a tiny (numerical zero) quantum particle as compared to the infinite CoP. Just as the small quantum energy particle (implying QHO) oscillates back and forth, so also this apparently vast universe oscillates back and forth.

This is the cause of the expansion of the universe today. This expansion is the stretching phase of the oscillator - considered as the universe itself. After a certain time (the time scale is hyper-astronomical), when the oscillation of the universe reaches its last point, it will start to contract, and then, after reaching the zero vibration, again it will expand in the next cycle of expansion. Recently, some have proposed a similar theory, in support of the Big Bounce model of the universe [22].

We can, therefore, assume that the entire universe may appear as a QHO, when compared to the scale of the infinite CoP, and this QHO in the scale of the universe will have usual oscillation as we have observed before in case of a QHO.

For example, the average life span of a human being can be thought of just even much less than a zeptosecond (10^{-21}second) compared to the age of the universe. And therefore, this human life span can be thought of as a very short lasting quantum fluctuation with usual uncertainty, when measured compared to the timescale of the universe. Conversely, what appears to humans as the quantum state may appear as purely classical state for a very small creature, as the standard of space-time measurement is always relative. For example, a common housefly can measure time 4 times faster than we humans do, since the "time perception is directly related to size" [23,24]. Thus we propose that the microcosm (quantum world) and the macrocosm (classical world) are actually built upon the same principles of CoP and STV triad. Only the scales of space, time and vibration differ according to how we observe them.

Further, the most prevalent theories on particle physics suggest that the existing particles of the universe should all be cancelled out by pair particles called *supersymmetric particles* to produce absolute void at the end of creation. Or, in other words, due to supersymmetric particles, it was all void before the creation of this present universe. The latest data from the LHC has ruled out the possibilities of the existence of such supersymmetric particles, leaving only a tiny sliver of hope for fetching any plausible explanations [25,26]. The proposed LPE state in this paper, on the other hand, is a logically justifiable explanation of the fundamental phenomena of the universe.

The cycle comprising the birth, the growth, and the cessation of the universe has been described in Vedanta, and ancient Indian texts The time period for 1 cycle is hyper-astronomical and hence physical demonstration is beyond any mundane experiment. The spiritual scientists of the world, on the other hand, have experienced this through focusing their mind on the issue (cycle and the reality) and reaching the ultimate state of mind called *"Nirvikalpa state"* described in Vedanta. The mind is the laboratory and also the instrument at the same time for the experiment. [27]

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