The Theory of Everything | A Hypothesis

Arnab Sinha[a]

Abstract - Theoretical physicists have not been able to formulate a widely accepted & consistent theory that would combine together the fundamental forces. The mass-energy equivalence has been the greatest deterrent in the process. Though the mass-energy equivalence tends to connect mass and energy through a constant which is the square of the velocity of light, it fails to bring about an element that underlies both mass and energy. A theory of everything lies in the definition of this underlying element. This paper is a hypothesis wherein I have called this underlying element, matter. I have defined matter from the perspective of an observer observing from outside the system, making mass and energy, the constituents of matter, an observed phenomenon. In this hypothesis it has been assumed that matter can only be dilated or compressed, energy in nature is used only for the dilation or compression of matter and there is only one fundamental force, therefore the question of unification does not arise. The hypothesis reveals that the observer itself is an anomaly as the universe is massless except for the mass of the observer itself. The hypothesis also reveals that it is the same energy that shows up in the form of electromagnetic radiation in a certain length of dilation or compression of matter and in another, it is stored in the form of potential and experienced as gravity.

Keywords: Matter, Mass, Energy, Unified Theory, Fundamental Forces, Quantum Mechanics, electromagnetic radiation, gravity, observer, mass-energy equivalence, Theory of Everything

a. Founder & Chief Scientist at Novonanmek Material Sciences Private Limited, India.
Email: arnab.sinha@novonanmek.com

1. Introduction

In the past, researchers and philosophers of science have continuously and extensively deliberated to inherently relate mass and energy. Newton's Query in the year 1704 [1]: "*Are not gross bodies and light convertible into one another, and may not bodies receive much of their activity from the particles of light which enter their composition?*" was probably the first modern suggestion of an inherent relationship between mass and "Activity" (Energy). Genevan physicist Georges-Louis Le Sage (1724–1803) attempted to provide a mechanical explanation of gravity [2]. He assumed that *ultramondane corpuscles* of minute mass and high speed existed that struck bodies from all sides. From this premise he deduced that an attractive force between two macroscopic bodies would block some of the impinging particles that would result in the attraction of the two bodies. He theorized that attraction between gross objects is an illusion and gravity is the result of the pushing of bodies by the *ultramondane corpuscles*. Le Sage claimed that this impulsive force would vary inversely as the square of the distance between the bodies, in accordance with the Newtonian law. English philosopher and theologian Samuel Tolver Preston in 1875 expressed the idea that aether is "rarefied mass" and mass "concentrated aether" [3]. According to Leibniz's 1686 fundamental concept of an inherent vis motrix equal to mv^2 for a body of mass m moving at the velocity v, Samuel Preston found, for v=c, an energy equal to mc^2. In his 1900 Festschrift article [4], dedicated to the 25th anniversary of Lorentz' dissertation, Henri Poincaré derived an equation expressing conservation of momentum in electromagnetic systems. After spelling out very clearly the limitations in electromagnetism of Newton's third law in its strict form as a law of action/reaction between pairs of material objects, Poincaré in his Festschrift article goes on to consider a particular example. It leads him to attribute to electromagnetic radiation a mass equal to E/c^2 where E is the total energy of the radiation. It is thus in this paper where for the first time a derivation of $E = mc^2$ may rightfully be considered to have been given. This most famous formula of physics is described by Poincaré, not in

equation form, but rather in words by considering "*a light pulse emitted from a Hertzian oscillator and causing the emitter to suffer a recoil*" for which he gives numerical calculations in which $E = mc^2$ is implicit. In 1904, the year before Einstein's seminal papers on special relativity, Austrian physicist Fritz Hasenohrl examined the properties of blackbody radiation in a moving cavity [5]. He calculated the work necessary to keep the cavity moving at a constant velocity as it fills with radiation and concluded that the radiation energy has associated with it an apparent mass such that E = (⅜)mc^2. Also in 1904, Hasenohrl achieved the same result by computing the force necessary to accelerate a cavity already filled with radiation [6]. In early 1905, he corrected [7] the latter result to E = (¾)mc^2. In his papers in the year 1905 & 1906 [8,9], Albert Einstein has mentioned that *if a body emits radiation L, its mass reduces by an amount L/c^2*, where 'c' is the velocity of light in vacuum. Going by what has been said by Einstein in his paper[1], let us say at the beginning there is a body having mass M, known as the *initial mass.* The mass M emits radiation L and thus its mass gets reduced by mass L/c^2. Let us say the mass remaining after the emission of radiation having energy *L* is M_R. Let us call M_R the *remaining mass*.

Mathematically representing what Albert Einstein has said in his 1905 paper [8],

$$M - \frac{L}{c^2} = M_R$$

$$Mc^2 - M_R c^2 = L$$

$$(M - M_R)c^2 = L \qquad [1]$$

In other words, *at the end of the process of emission* having energy $L = (M - M_R)c^2$, the mass of the body is reduced from M, its initial to M_R, the residual mass where $M_R < M$.

This brings the following questions to my mind:

a. Is the giving-off of energy L a one time event? Is the event of giving-off energy and corresponding reduction in mass an event discrete in time?

b. Is the energy L given off in an one time event as it has been reported by researchers in the past or remains associated with remaining mass M_R?

c. If energy L is given-off or emitted in the process as claimed by the researchers above, and energy associated with the remaining mass M_R $(= M_R c^2)$ is only in the form of its mass and not in any energy form, how do we explain phenomena like the wave particle duality [10]? If the energy associated with M_R is only available in the form of mass, how does it show up in the form of waves?

d. If energy is given off simultaneously with reduction in mass, and does not remain associated with remaining mass M_R and exists only in the form of mass and not any form of energy, how can the existence of gravitational fields [11] that are associated with masses be explained?

e. Assuming energy, in the form of L or in any other form, remains associated with the remaining mass, is the existence of gravitational fields and wave particle duality the same phenomenon at different scales?

f. If we assume that the energy L remains associated with remaining mass M_R, is M the original mass that has not lost any energy, the source of all the masses in the universe?

g. M the original mass that has not lost any energy, the source of all the masses in the universe, then is every mass we come across is M_R?

h. Is M_R a visual representation of M ? If yes, then $M = M_R$. The equation [1] does not stand.

i. If we assume that energy is not lost but remains associated with the remaining mass M_R and any mass that we come across is M_R, then how do we find what the original or initial mass M was, that had not lost any energy, in order to find the energy associated with M_R?

j. Does the mass M existed at all?

k. If M didn't exist, then from where does M_R, of which mass M is the source, come from?

These questions bring the question "Whether mass is a real physical quantity?"

The applicability of equation [1] can be determined only if we are able to answer the above questions.

Lev Okun in a paper [12] has written that in the modern language of relativity theory there is only one mass, the Newtonian mass m, which does not vary with velocity; hence the famous formula $E = mc^2$ has to be taken with a large grain of salt. Lev Okun in another paper [13] has said, "There is no doubt that the problem of mass is one of the key problems of modern physics, though there is no common opinion even among the experts what is the essence of this problem (p.1-2)".

The Hypothesis

Questions about the existence of mass arise because the inevitable observer apparently brings in an irregularity. Let the observer be called obs-1. Other than his or her own mass, obs-1 experiences the rest of the universe as massless, as there appears to be a separation between obs-1 and the rest of the universe. Let us consider obs-1 and the rest of the universe as one system. Obs-1 has no access to the rest of the universe. Thus for objects beyond obs-1's reach, obs-1's experience is limited only to *observation*. But at the same time, obs-1's experience of his own mass is more and not limited only to observation. This makes obs-1 experience itself separate from the rest of the universe as the rest of the universe is away, at a distance, separate from itself. This is an aberration because obs-1 and the universe cannot be separate. To do away with this irregularity, we assume that obs-1 places itself outside the system. Now to obs-1, the universe appears as *one continuum* as obs1's was the only mass and that only mass is no more a part of the system. I call this continuum *matter*. *Matter is only an observed phenomenon* observed only by an observer observing from outside the system.

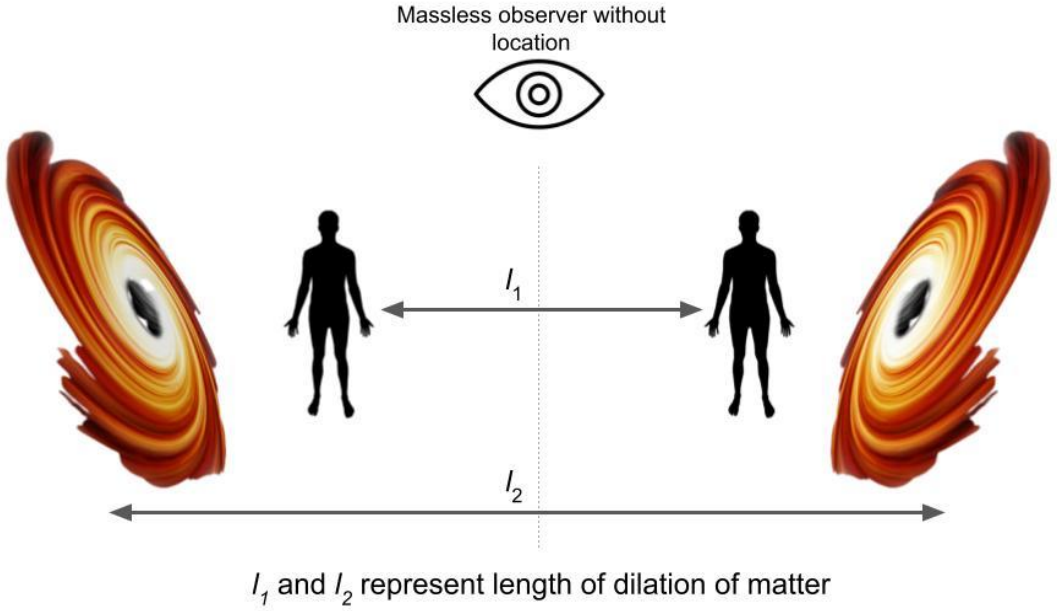

Figure 1: Shows formation of two identical halves of the same state of matter as a result of dilation of matter. The state of matter revealed is a function of the length of dilation of matter.

The hypothesis given in this paper is based on the following assumptions:

1. The observer is observing the system from outside the system itself, thus sees the system as one continuum, called matter.
2. Matter is the fundamental element underlying this universe and all its contents.
3. Matter can only be dilated or compressed.
4. States of matter, as observed, are a result of dilation of matter.
5. States of matter appear as combinations of mass and energy and both are independently functions of length of dilation or compression of matter.
6. Energy in nature is used only for the dilation or compression of matter.
7. Energy is neither given off leading to reduction in mass, nor remains associated with mass after the reduction in mass.
8. Energy and mass, as observed, are independent of each other and both are a function of dilation of matter.
9. The universe is just one of infinite states of matter.
10. The universe appears the way it is, is because of a particular length of dilation or compression of matter. At another length of dilation or compression of matter, a state of matter other than the universe would appear.
11. Matter when dilated manifests as two identical halves of the same state of matter as given in **Figure 1.**
12. The two identical halves of a given state of matter and the dilation of matter between them appear as two hemispheres of the same sphere separated by a distance which is the length of dilation of matter as illustrated in **Figure 2.**
13. The two identical halves of the state of matter and the length of dilation of matter between them is considered one *system*
14. There are innumerable such systems. Every system represents a state of matter. There are multiple systems of the same state of matter.
15. At various lengths of dilation of matter, various states of matter emerge, one of them is the universe.
16. Every system is connected to each other and all the systems together are called a *super-system*.
17. Energy applied to dilate or compress matter is stored in the systems.
18. The super-system is dynamic. Energy in the super system is transferred from one system to another leading to an increase in energy in one and decrease in the other.

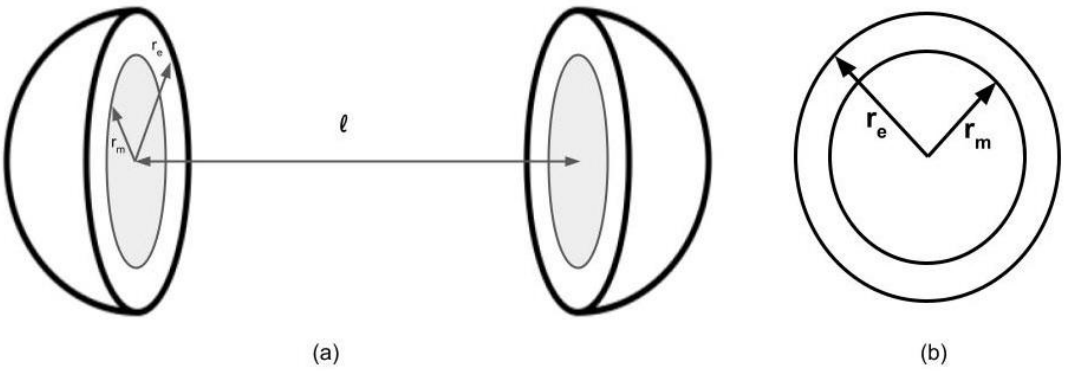

Figure 2: (a) Hypothesised model of matter, as observed by an observer from outside the realm of matter, where two identical halves of the same state of matter are generated as a result of length l dilation of matter (b) The mass and energy of the state of matter are observed as two concentric circles having radii radius of mass (r_m) and radius of energy (r_e).

19. The force acting on each element of matter is given by

$$F = -\text{म}(l_e - l) \qquad [2]$$

The hindi alphabet 'म' (*Ma)* is called the *constant of matter*, l_e is the equilibrium length of separation and l is the length of dilation of matter in between the two hemispheres.

20. The energy of a system is given by

$$E = \frac{1}{2}\text{म}(l_e - l)^2 \qquad [3]$$

21. Mass and energy of a system is observed by the observer outside the realm of matter in the form of concentric circles on the flat surfaces of both the hemispheres as the circle of mass having radius r_m and circle of energy having radius r_e as illustrated in **Figure 2.** r_m and r_e are given by the following equations. The curves that represent r_m and r_e are given in **Figure 3.**

$$r_m = r\sin\theta \qquad [4]$$

$$r_e = r\cos\theta \qquad [5]$$

$$\frac{r_m}{r_e} = \tan\theta \qquad [6]$$

22. r_m and r_e are independent of each other; both independently are functions of θ.
23. r is called the radius of the *circle of matter.*
24. The two radii, radius of the circle of mass and the radius of the circle of energy, are in no circumstances more than r
25. Circle of mass and circle of energy together form states of matter at a given value of θ
26. As increments in θ tending to zero the number of states of matter tends to infinity.
27. tan θ gives the ratio of radius of mass and radius of energy in a given state of matter.
28. tan θ is significant as it is a ratio and thus has no unit. It thus, along with the ratio of observed radius of the circle of mass and circle of energy, also indicates the actual ratio of mass and energy in a given state of matter.

$$\frac{r_m}{r_e} = \frac{m}{e} = \tan\theta \qquad [7]$$

Where m and e are the actual mass and energy of a state of matter characterized by θ

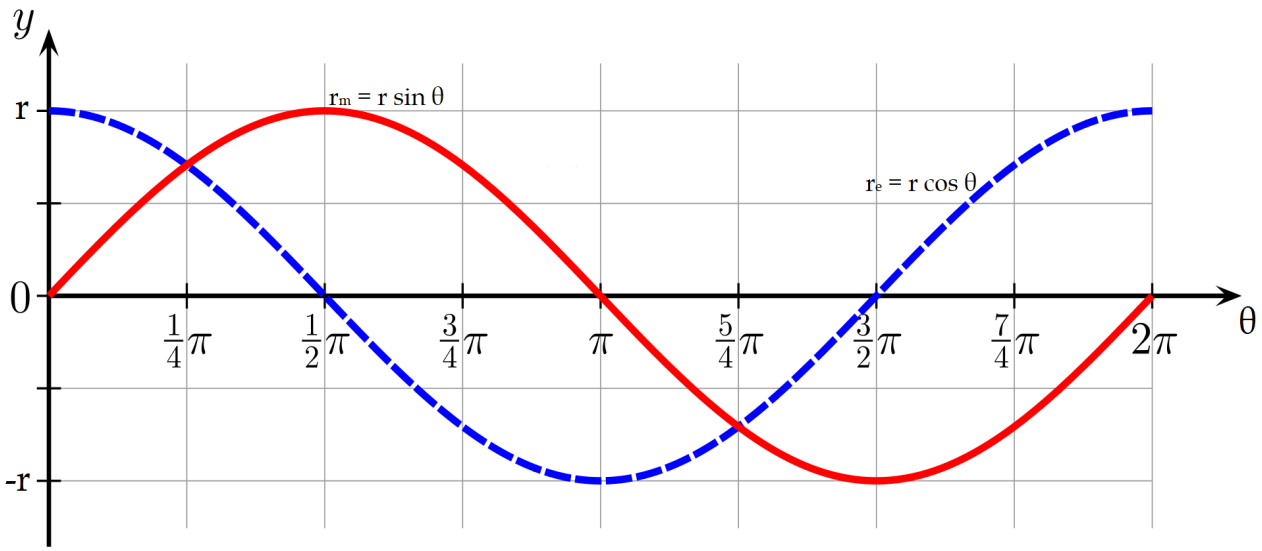

Figure 3: Curves of equations representing variation of radius of mass (r_m) and radius of energy (r_e) with variation in dilation of matter. The relation connecting theta with length of dilation is given in equation [4 & 5].

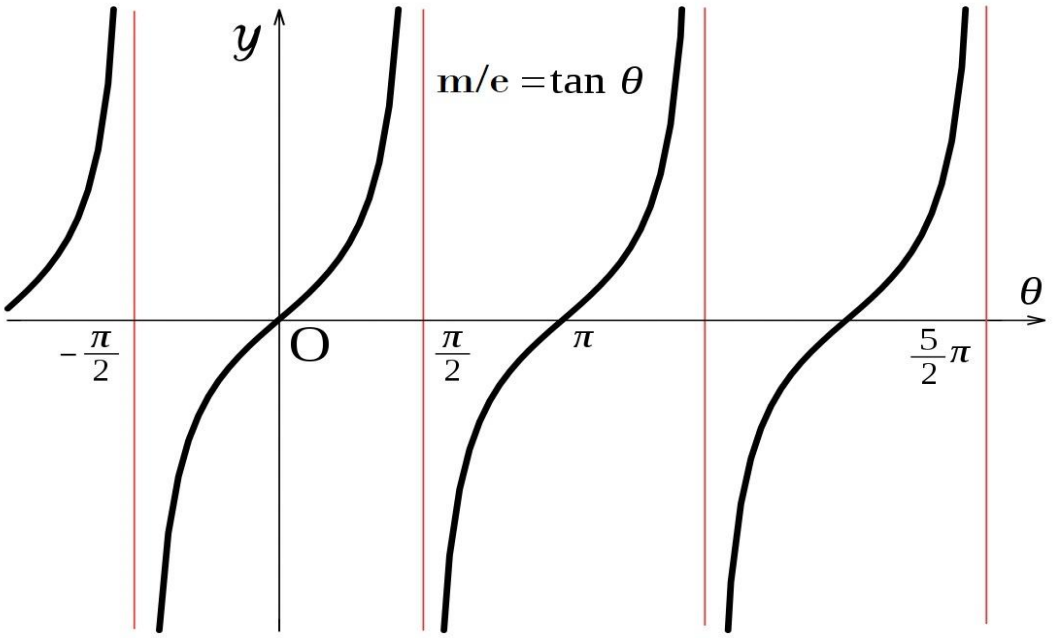

Figure 4: tan x curves in this figure represent the ratio of radius of mass (r_m) and radius of energy (r_e). Since tan x is a ratio, it has no unit, so the curves also represents the ratio of actual mass to energy (m/e) of permissible states of matter.

29. The maximum length to which the two hemisphere as illustrated in **Figure 2** can be separated is l_{max}

$$l_{max} = 2\pi r \quad [8]$$

30. The equilibrium separation between the hemispheres is l_e
31. The length of separation between the two hemispheres is denoted by l.

$$l = r\,\theta;\ \theta\ is\ in\ radians \quad [9]$$

32. The probability of appearance of a state is given by half of the the product of probability of appearance of circle of mass and the probability of appearance of a circle of energy in a given value of θ.

Probability of appearance of the circle of mass,

$$P(c_m) = \frac{Area\ of\ the\ circle\ of\ mass\ at\ a\ given\ by\ r\sin\theta}{Area\ of\ the\ circle\ of\ matter\ having\ radius\ r}$$

$$= \frac{\pi r^2 \sin^2\theta}{\pi r^2}$$

$$P(c_m) = \sin^2\theta \quad [10]$$

Probability of appearance of the circle of energy,

$$P(c_e) = \frac{Area\ of\ the\ circle\ of\ energy\ at\ a\ given\ by\ r\cos\theta}{Area\ of\ the\ circle\ of\ matter\ having\ radius\ r}$$

$$= \frac{\pi r^2 \cos^2\theta}{\pi r^2}$$

$$P(c_e) = \cos^2\theta \quad [11]$$

Probability of appearance of a state of matter,

$$P(\theta) = P(c_m) \cap P(c_e)$$

$$P(\theta) = \frac{\sin^2\theta \cos^2\theta}{2} \quad [12]$$

A factor of (½) has been included as every state of matter has been split into two identical halves and the probability of finding one of the two identical hemispheres for a given value of θ is (½).

3. Inferences

From the assumptions, the following inference are drawn:

1. There is only one fundamental force given by equation [2]. Force in nature is used only for the purpose of dilation or compression of matter. Thus the question of unifying the fundamental forces does not arise.

2. Within the realm of matter, an observer experiences its own mass carving out a boundary between the universe and itself, while from outside the system, the realm of matter is observed as a continuum, without any boundaries.

3. The observer itself is an anomaly because the universe is massless except its own mass. The mass is limited only to the observer.

4. It is impossible to come up with a unified theory or a theory of everything from within the system as there remains a boundary between the observer's mass and the rest of the universe and therefore the observer and the universe are not unified inside the system.

5. Mass is a result of dilation or contraction of matter and thus found within the realm of matter as separate from the rest of the realm and only observed from outside the realm of matter as a part of the continuum.

6. There is no mass, but states of matter that are observed as combinations of mass and energy, the proportions of which are a function of the length of dilation of matter.

7. Together the two curves rsinθ and rcosθ in the range $0 \leq \theta \leq 2\pi$ in **Figure 3** represent variation in the observed radius of the circle of mass and circle of energy with dilation or compression in matter. At a given value of θ, $rsin\,\theta$ and $rcos\,\theta$ are the radii of the circle of mass and the circle of energy respectively. The radii of the circle of mass and the circle of energy are *representations* of the actual mass and energy of the state of matter represented by θ.

8. Together the two curves $rsin\,\theta$ and $rcos\,\theta$ in the range $0 \leq \theta \leq 2\pi$ in **Figure 3** give a picture of the universe. Every permissible state of matter, in other words, every permissible combination of mass and energy in the universe, can be represented by the two curves. There are no states of matter beyond the region $0 \leq \theta \leq 2\pi$.

9. Values of tan θ as given in the curves in **Figure 4** provides the ratio of radius of the circle mass and radius of the circle energy observed in a given state of matter in the range $0 \leq \theta \leq 2\pi$.

10. tan θ, as given in the curves in **Figure 4,** being a ratio is an important parameter, as it also represents the actual ratio of mass to energy in a given state of matter.

11. Based on the values of tan θ, as given in the curves in **Figure 4,** it is impossible to have systems with zero energy as the value of tan θ at π/2 and 3π/2, the points of zero energy, is undefined. But states of zero mass are permissible as tan θ at 0 and π are not undefined but zero.

12. Based on the value of tan θ, as given in the curves in **Figure 4,** the universe is divided into three regions $0 < \theta < \pi/2$, $\pi/2 < \theta < 3\pi/2$ and $3\pi/2 < \theta < 2\pi$ keeping in mind that the value of tan θ at π/2 and 3π/2 is infinity indicating infinite mass. The regions have come into the picture as infinite mass acts as a barrier. It is thus impossible for systems lying in one region to jump to the other by dilating or contracting matter to an extent so as to move to the other regions, as they have to pass through a system of infinite mass, which is impossible. The systems are therefore confined to their own regions.

13. Based on the values of tan θ, as given in the curves in **Figure 4,** it can be concluded that we cannot have a system or a state of matter that extends across all the three regions making it impossible to formulate a unified theory that would faithfully represent the universe. *The universe as a whole can therefore be only*

observed with its states in their respective regions.

14. Keeping in mind the infinite mass barrier that lies at $\theta = \pi/2$ it is impossible for observers in the region $\pi/2 < \theta < 3\pi/2$ to attain states of matter in the range $0 < \theta < \pi/2$.

15. Also, keeping in mind the infinite mass barrier that lies at $\theta = 3\pi/2$ it is impossible for observers in the region $\pi/2 < \theta < 3\pi/2$ to attain states of matter in the range $3\pi/2 < \theta < 2\pi$.

16. Though the systems tend to reach equilibrium, the equilibrium state of a system, a state of matter with minimum energy, is not achievable in nature. The state of equilibrium is found at $\theta = \pi$. As per equation [12], the probability of occurrence of the state at $\theta = \pi$ is Zero. This keeps the realm of matter perpetually in a dynamic state as no system is ever able to achieve equilibrium.

17. In the curves given in **Figure 3**, a positive radius of the circle of mass indicates *presence of mass* while a negative radius indicates *absence of mass*.

18. In the curves given in **Figure 3**, the positive radius of the circle of energy represents electromagnetic radiation while the negative radius of the same is indicative of potential that is responsible for the force of gravity.

19. Energy can either be observed in the form of electromagnetic radiation or stored as potential that cannot be observed. Energy cannot exist simultaneously in the form of both potential and electromagnetic radiation in a given state of matter.

20. There is a probability of appearance for every state of matter. The probability of the appearance of a state of matter is given by equation [12].

21. Because every state of matter has a probability of appearance, considering single states of matter, their appearance is not continuous in time. For e.g. if a state of matter has a 20% probability of appearance as per equation [12], it appears for one second in 5 seconds. This leads to the *quantum nature of matter*. The quantum nature of matter is not only applicable to states of matter with lower dilations but to all states of matter.

22. At dilations where the probability of appearance of a state of matter is high, the quantum nature is not pronounced enough so it appears that the quantum nature does not exist while at dilations where the probability of appearance of a state of matter is low, the quantum nature of matter is pronounced.

23. An observer in the realm of matter has to be invariably in one of the states. In order to see another state while already being in one state, two states have to be observed simultaneously - the state the observer already is in and the state of matter the observer wants to observe while being in his own state. The probability of observing two states simultaneously is given by the below equations.

    Probability of simultaneous appearance of two states of matter

$$P(\theta_1 \cap \theta_2) = \frac{sin^2\theta_1 cos^2\theta_1}{2} \times \frac{sin^2\theta_2 cos^2\theta_2}{2}$$

$$P(\theta_1 \cap \theta_2) = \frac{sin^2\theta_1 cos^2\theta_1 sin^2\theta_2 cos^2\theta_2}{4} \quad [13]$$

24. As per equation [12] the probability of appearance of states of matter with $\theta = 0, \pi/2, \pi, 3\pi/2$ and 2π is zero. Though the states of matter for $\theta = 0, \pi$ & 2π are permissible as tan θ values for $\theta = 0, \pi$ & 2π are not undefined, they still cannot be experienced. Thus states of matter having only electromagnetic radiation or gravitational potential without negative or positive mass and states of matter having only positive or negative mass without energy, either negative or positive, are not observed in nature.

25. Electromagnetic radiation in the visible frequency range is called light. The state of matter that is called light lies in the range $0 < \theta < \pi/2$ in the curves given in **Figure 3,** is not pure electromagnetic radiation, but contains both energy and mass in a ratio given by tan θ.

26. As per the curves given in **Figure 3**, Pure electromagnetic radiation is mathematically found at $\theta = 0$. As per theory proposed in this paper, the probability of observing pure electromagnetic radiation is 0. Thus photons, which are considered as pure massless 'packets' of electromagnetic radiation, are not found in nature.

27. At a certain dilation of matter between the two hemispheres as given by the curves in **Figure 3**, the continuously applied energy to maintain the dilation or contraction, is given off as electromagnetic radiation.

28. In other dilations of matter, the same energy applied for the dilation or contraction of matter is stored as potential and experienced as a force of attraction or repulsion between the two hemispheres. This force of attraction is called *gravity*.

29. The curves in **Figure 3** explains the reason for an enormous amount of energy associated with subatomic particles. As the compression gets more, the energy of the state of matter increases as per the curves.

30. With increase or decrease in dilation of matter there is change of state. During a change of state, the radius of mass is observed to either increase or decrease. The rate of change in the radius of mass while a change of state is underway is called velocity.

31. If a state of matter undergoes change in state from length of dilation corresponding to $\theta = \theta_1$ to $\theta = \theta_2$ in time t, then velocity v is given by

$$v = \frac{r \sin \theta_2 - r \sin \theta_1}{t} \qquad [14]$$

32. The curves in **Figure 3** suggest that energy is continuously being given off in the form of electromagnetic radiation in the range $0 < \theta < \pi/2$ and $3\pi/2 < \theta < 2\pi$. Energy given off in the range $0 < \theta < \pi/2$ and $3\pi/2 < \theta < 2\pi$ represents the electromagnetic spectrum. At some range of θ, the energy is in the visible range.

33. In the range, $\pi/2 < \theta < 3\pi/2$, the energy being applied to dilate matter is stored as potential and experienced as gravity. This energy is used to pull the hemispheres together towards equilibrium.

34. Thus it is the same energy that under some dilation of matter is given off as electromagnetic radiation and on other dilations is stored as potential and experienced as gravity.

35. In the curves given in **Figure 3,** in the range $0 < \theta < \pi$, the radius of the circle of mass is positive suggesting presence of mass. In the range $\pi < \theta < 2\pi$, the radius of the circle of mass is negative suggesting absence of mass. Absence of mass indicates existence of space for mass, a space where mass is supposed to be but is missing, is elsewhere in the universe or beyond.

36. Absence of mass is not the same as zero mass. Zero mass indicates states of matter where mass never existed, does not exist, is not supposed to exist and will never exist in the future.

37. States of matter depicted in the range $0 < \theta < \pi/2$ in the curves given in **Figure 3,** both mass and electromagnetic energy are experienced simultaneously. In this range, *wave-particle duality* is observed.

38. Every state of matter is a combination of mass and energy and thus can be observed as mass, which can be either positive or negative, or energy, which can also be positive or negative or both. It is thus the duality of matter.

39. In the curves given in **Figure 3,** in the range $\pi < \theta < 2\pi$, mass is observed as negative. This observed negative mass signifies "absence of mass" as opposed to "presence of mass" in the range $0 < \theta < \pi$.

40. In the curves given in **Figure 3,** the range $\pi < \theta < 3\pi/2$ indicates absence of mass and presence of energy stored as potential, that is gravity

(not given out as electromagnetic radiation). This indicates that gravity can exist without mass as

41. gravity is not a function of mass, but that of dilation or contraction of matter.

42. In the curves given in **Figure 3**, The range $\theta = 3\pi/2$ to 2π indicates absence of mass with presence of electromagnetic radiation. A black hole will be found in this range as a black hole is the absence of mass with electromagnetic radiation. As energy can only exist in the form of electromagnetic radiation or potential and experience as gravity, both cannot be present simultaneously. If a black hole has energy in the form of electromagnetic radiation, there is no gravity associated with black holes the way it is currently assumed. Black holes are then just an absence of mass together with electromagnetic radiation.

43. Presence of energy in states of matter where mass is *absent* indicates that mass and energy exist independently in nature. It indicates that both mass and energy in nature are functions of length of dilation or compression of matter.

44. A state of matter is stable when the ratio of radius of mass and radius of energy fall on the $\tan\theta$ curves as given in **Figure 4**.

45. Any ratio of radius of mass and radius of energy that does not fall on the $\tan\theta$ curves as given in **Figure 4** are unstable states of matter. Unstable states stabilize themselves by either releasing or absorbing energy or mass to eventually have them placed on the $\tan\theta$ curve.

46. Wave particle duality and presence of gravitational fields along with mass are results of the same phenomenon at different dilations of matter.

4. Conclusion

This paper is a hypothesis wherein it has been assumed that matter is the fundamental element that underlies the universe and energy in nature is used only for the dilation or compression of matter. The hypothesis assumes that mass does not exist but only states of matter in which mass is just an observed phenomenon. The energy used to attain a given state of matter remains associated with the state of matter. The hypothesis assumes that there is one fundamental force that is used only for the dilation or compression of matter so the question of unification of fundamental forces does not arise. The hypothesis reveals that it is the same energy that shows up as electromagnetic waves at some dilations of matter and as gravity in other dilations.

5. References

1. Newton, I. Opticks, Query 30 (1704).
2. Kleinert, Andreas. (2002). Pushing Gravity: New Perspectives on Le Sage's Theory of Gravitation. Isis. 93. 698-699. 10.1086/376003.
3. Preston, S. T. The Physics of Aether (1875).
4. H. Poincaré (1900) "La théorie de Lorentz et le principe de réaction" , *Archives néerlandaises des Sciences exactes et naturelles*, Recueil de travaux offerts par les auteurs à H. A. Lorentz. Ser II, 5 Nijhoff, The Hague, Netherlands 252-278.
5. Zur Theorie der Strahlung bewegter Körper. (Sitzungsberichte der mathematisch-naturwissenschaftlichen Klasse der kaiserlichen Akademie der Wissenschaften, Wien. 113 IIa, 1039, 1904).
6. Zur Theorie der Strahlung in bewegten Körpern. (Annalen der Physik 15, 344-370, 1904).
7. Zur Theorie der Strahlung in bewegten Körpern. Berichtigung (Annalen der Physik 16, 589-592, 1905).
8. Albert Einstein (1905) Ist die Trägheit eines Körpers von seinem Energieinhalt abhängig? Annalen der Physik 18, 639–641.

9. Albert Einstein (1906), Annalen der Physik 20, 627–633.
10. L. de Broglie, Recherches sur la théorie des quanta (Researches on the quantum theory), Thesis (Paris), 1924; L. de Broglie, Ann. Phys. (Paris) 3, 22 (1925).
11. Newton, Isaac, Philosophiae Naturalis Principia Mathematica ("Mathematical Principles of Natural Philosophy"), London, 1687; Cambridge, 1713; London, 1726.
12. L. B. Okun, "The concept of Mass," Physics Today 42 (6), 31–36 (1989).
13. L.B. Okun, "The Concept of Mass in the Einstein Year," presented at the 12th Lomonosov Conference on Elementary Particle Physics, Moscow State University, August 25-31, 2007.