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# "THEORY OF EVERYTHING (TOE) IN MODERN SCIENCE & VEDIC SCIENCE"

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## ABSTRACT

The formation and functioning of universe both at microscopic level and macroscopic level is a topic of research not only in recent times but also in hoary past. It is a matter of interest to people of all cross sections, starting from nuclear physicists, philosophers, medical professionals, psychologists, and cosmologists.. While the studies at microscopic level constantly involve attempts for the discovery of particles and their relations at subnuclear and much lower levels, the studies at macroscopic level include the discovery of objects and their behavioural pattern at galaxy and much higher levels. Simultaneously the philosophical pursuits have reached the horizons of various levels of cognition and identified the common thread that governs the universe.

Sir Isac Newton proposed that four items, viz., Mass, Energy, Space and Time constitute the fundamentals of the universe, that these four are absolute in nature and also that they are not inter-changeable.

While Einstein also agreed with the above four aspects, he argued that these four are not fundamental, but are derivatives of two fundamentals entities, viz., 'mass-energy' entity and 'space-time' entity. The mass-energy entity, can give rise to mass and energy separately with interconvertibility. Similarly the space-time entity, can be used to view space and time separately under given conditions. He explained his propositions with the help of his Theory of Relativity.

In 1980's, Stephen Hawking, an Oxford University Professor, supported a further revolutionary theory. According to him, there is a much subtler 'something' which is the fundamental item and also the cause for everything. While this 'something' can be taken as the first order item, the Einstein's two entities can be taken as the second order items derived from the first one and the Newton's four items as the third order items derived from the second.

As that 'something' is the source and origin for everything, Stephen Hawking named his theory as 'Theory of Everything', or, in brief, "TOE". This is also called 'Unified Theory' (A brief History of Time, p163-179).

A similar concept, but with broader dimensions is found in our Vedic literature:

(Chandogya Upanishad 3.4.1)

'All this is Brahman'

Here 'all this' is nothing but 'everything' that is perceived in awakened state, dreamy state, deep sleep state and beyond that.

The word 'Everything' used by Stephen Hawking refers to the physical world, that is, awakened state only. It did not cover items of other states, i.e., dreamy state, deep slumber state, and beyond that. It is a subset of the broader Vedic concept covered under the word Thus the 'Theory Of Every-





thing' existing in Vedic science can be explored further to broaden the scope of modern science.

### INTRODUCTION

To have a good understanding of the guiding principles of universe it is essential to know about the fundamental systems operating at both the micro level and macro level, viz., sub-nuclear level and the universe level. Accordingly an attempt is made for a brief coverage of the elementary particles and forces, their properties, quantum mechanics, attempts for a unified theory and relevance of Vedic insight for a superunified theory.

### ELEMENTARY PARTICLES

The subject of elementary particles in the nature is explored by several scientists for several millennia to understand their nature and properties, related to both living and non-living objects. While sages like Kanāda attempted with philosophical outlook, scientists like Rutherford and Bohr attempted with physical outlook. This is the case in both India and abroad, in ancient times as well as in recent times.

### FINDINGS OF MODERN SCIENCE

In the evolutionary process, the matter was explained in terms of molecules which are formed by different combinations of atoms of different elements. For long time, it was thought that the atom is the most elementary particle and also that it is indivisible. But the experiments have led the scientists to call the electron, proton and neutron as the elementary particles for quite some time.

The subsequent experiments have established the divisibility of proton and neutron and the existence of several subtler subnuclear particles like positrons, neutrinos, 'sigma' particles etc.. Later it was established that these subnuclear particles are obtained by combinations of much smaller particles, named as quarks (A Brief History of Time, p77).

As on date these quarks are taken as the most elementary particles, and the building blocks from which every thing is made. We do not know whether this science will reveal still smaller particles, in future.

### PROPERTIES OF ELEMENTARY PARTICLES

However, during the process, a fundamental question has arisen w.r.to the nature of these so called elementary particles-whether they are 'discrete' particles, or 'continuous' waves, or having dual nature. This question in turn has led to some more queries like - what are their masses and charges, what are their energies and shapes of formations, what are the forces to be considered, etc. If more than one force is noticed, whether it will be possible to propose a unified theory to explain the universal phenomenon. For answering the above, a detailed research is being conducted throughout the globe.

### SPIN OF ELEMENTARY PARTICLES

Using the wave/particle duality, everything in the universe, including light and gravity, can be described in terms of particles. These particles have a property called spin which throws light on various aspects of the particle behaviour. The spin of a particle really indicates its appearance, when looked from different directions. For example, a particle of spin 0 is like a dot. It looks the same from every direction. On the other hand, a particle of spin 1 is like an arrow; it looks different from different directions (A Brief History of Time, p71)

All the known particles in the universe can be divided into two groups: particles of spin, with fractional values (like  $\frac{1}{2}$ ,  $\frac{3}{2}$  etc.) which make up the matter in the universe, and particles of spin, with integral values (like 0, 1, and 2), which give rise to forces between the matter particles. The fields with half-integer values-spin  $\frac{1}{2}$ ,  $\frac{3}{2}$  etc. are called Fermions. The fields with integer-values-spin 0, 1, 2, etc., are called Bosons (Modern Science and Vedic Science, p43).

### FUNDAMENTAL FORCES RECOGNISED IN MODERN SCIENCE

Detailed studies of these items in the last century have resulted in identification of several forces in the universe which could be categorized broadly under four fundamental varieties. They are gravitational force, electromagnetic force, weak nuclear force and strong nuclear force.

The gravitational force occurs due to interaction among particles having some mass. It is the weakest of all the forces. The electromagnetic force occurs due to interaction among charged particles like electrons, quarks etc.. It is much stronger than gravitational force. The weak nuclear force is responsible for the radioactivity in the radioactive elements. The strong nuclear force is responsible for keeping the protons and neutrons together in the nucleus. It also helps the quarks to stay together within the protons and neutrons (A Brief History of Time, p76).

### QUANTUM MECHANICS FOR ELEMENTARY PARTICLES

Initially these elementary items were treated as discrete particles only, and attempts were made to establish relations among them through a mathematical system called classical mechanics. This is a system with which we are all familiar generally. However, it could not explain all the nuclear and subnuclear phenomenon.

In that context, a revised mathematical system called quantum mechanics was adopted which allows dual nature for the particles. That is, they are discrete and also continuous simultaneously. Regarding continuity, it is proposed that all particles are waves fundamentally, and that the higher the energy of a particle, the smaller the wave length. Regarding discreteness, each particle is represented by a field associated with discrete energy levels. Further this theory proposes a 'quantum field' as the fundamental one, which behaves as a 'particle' and also as a 'force'. In other words, the 'particle' and 'force' simply correspond to different modes of activity of an underlying quantum field.

Though the subject dealing with the elementary particles has become huge in size, varied in approach and complex in interrelationships, the Quantum mechanics could explain the phenomena related to the particles and forces at nuclear and subnuclear levels in a unified way to some extent.

### ATTEMPTS FOR UNIFIED THEORY

Einstein was having a deep conviction that the laws of nature had a simple and unified foundation. Accordingly he attempted for evolving a unified theory, covering all the elementary particles and forces in general and the gravity and electromagnetic forces in particular. Unfortunately, the theoretical tools and understanding needed to achieve such a unification were not available and his quest for unified field theory remained largely unfulfilled.

However, in the recent past, there have been a number of significant breakthroughs for the progress towards a grand





unified theory. The three theories that advanced the subject in that direction are the principle of spontaneously broken symmetry, the principle of super symmetry and the principle of super string.

### PRINCIPLE OF SPONTANEOUSLY BROKEN SYMMETRY

The principle of spontaneously broken symmetry is based upon the deeply hidden symmetries of nature at fundamental space-time scales.

It is believed that the electro-weak symmetry existed in the very early stages of cosmic evolution. For the first one-billionth of the first second in the evolution of the universe, when the cosmic temperatures were above  $10^{15}$  K degrees (i.e., ten crore crore centigrade degrees), the universe was in a unified phase, in which all the fundamental particles are in the same state without separate identity. That is, the weak bosons were massless and the electron and the neutrino were indistinguishable particles. Thus this theory proposes that unified state exists among all particles and forces at very high temperatures (Modern Science and Vedic Science, p44).

Then as the universe expanded and cooled, the universe entered a broken phase in which the bosons acquired a mass and the electron and neutrino etc. assumed very different physical characteristics. In this process the fundamental matter fields and force fields were identified having some sort of symmetry.

The matter fields, which have spin-1/2, include the electron 'e' and its associated neutrino  $\nu_e$ , the muon  $\mu$ , and its associated neutrino  $\nu_\mu$ , the tau  $\tau$ , and its associated neutrino  $\nu_\tau$ , and six quark flavors: up u, down d, charm c, strange s, top t and bottom b. Each quark flavor comes in three identical replications or 'colors': red r, green g, and blue b.

The force fields, which have spin-1, include the photon  $\gamma$  responsible for the electromagnetic force, three weak bosons  $W^+$ ,  $W^-$ ,  $Z^0$  responsible for the weak force, and 8 gluons g responsible for the strong force. The spin-2 graviton G is responsible for the force of gravity (Modern Science and Vedic Science, p37).

### PRINCIPLE OF SUPERSYMMETRY

It may be noted that among the four fundamental forces, the gravitation is the only one which is always attractive in nature. In gravitation, there is no repulsion at all. However the other three have both attraction and repulsion. Hence it was a difficult job to propose a unified theory, reconciling the gravitation and other three forces. However it was attempted using the symmetry of values of 'spin' which defines the particles and forces uniquely. This is called principle of supersymmetry. The details are presented in simple terms as follows:

It was stated earlier that every force will have some fundamental particles involved. For example, the electrical force is due to the fundamental particle 'electron'. It was also stated in quantum theory that a Quantum field represents both the fundamental particles and forces. Each quantum field is described by a parameter called spin. The value of spin can be both positive and negative, indicating attraction and repulsion. With this methodology, the fundamental particles, electron and neutrino, were allotted a spin value of -1/2 each.

Earlier some unified theories were developed involving a symmetry principle capable of uniting fields belonging to the

same spin class, e.g., spin -1/2 electrons with spin -1/2 neutrinos. However they were not able to establish unity among particles and forces with different spin. The problem was further confounded when the gravitational force could not be represented by any fundamental particle as against other forces.

The present supersymmetry principle is carried out broadly in two phases:

- i) representation of gravitational force by a quantum field, with a unique spin value that stands only for attraction, and
- ii) unification of both particles and forces with different spin.

### QUANTUM GRAVITY

In 1686, Newton published his theory of gravitation. Since then his formula of inverse square law of gravity continued to provide adequate computational framework for nearly all terrestrial and celestial applications. But in the beginning of 20<sup>th</sup> century, his theory has to be modified significantly in order to be compatible with Einstein's theory of relativity. During the past few decades, there have been many attempts to reformulate Einstein's general relativity as a quantum theory. One positive outcome has been the realization that the force of gravity must be described by "graviton" field which should be massless and with spin-2. This spin is sufficient to guarantee that the gravitational force will attract all objects proportionally to their mass-energy. It is this universally attractive nature of the gravitational field which lends itself to a geometrical interpretation, that is, theory of relativity. In this respect, gravity is different from the other fundamental forces, which have spin-1 and therefore possess both attractive and repulsive aspects. (Modern Science and Vedic Science, p48).

However, with this approach, problems were encountered while computing the quantum-mechanical contributions to gravitational processes. Hence the supergravity theory was proposed.

### SUPERGRAVITY

In 1976, the theory of supergravity was suggested. The application of supersymmetry to quantum gravity is called supergravity. The idea was to combine the spin-2 particle called the graviton, which carries the gravitational force, with certain other new particles of spin 3/2, 1, 1/2 and 0. In a sense, all these particles could then be regarded as different aspects of the same 'superparticle', thus unifying the matter particles with spin 1/2 and 3/2 with the force carrying particles of spin 0, 1, and 2.

### SUPERSTRING THEORY INTEGRATING ALL THE THEORIES RELATED TO ELEMENTARY PARTICLES OF MATTER

As the supersymmetry theory proved to be more complex to explain the fundamental phenomenon, superstring theories were proposed for unification in 1984. Here all the elementary particles and forces are treated, not as quantum fields, but as different vibrational modes of a single fundamental entity called string. In simple words, the basic object is not a particle which occupies a single point of space, but one point of space at each instant of time. It has length but no other dimension, like an infinitely thin piece of string. So its history can be represented by a line in space-time. Two pieces of string can join together to form a single string; in the case





of open strings they simply join at the ends.

In string theories, what were previously thought of as particles are now pictured as waves traveling down the string. The emission or absorption of one particle by another corresponds to the dividing or joining together of strings. It is observed with interest that

a profound simplicity supplants the surface complexity of nature. The distinctions between the gravitational force and electromagnetic force, matter and energy, electric charge and field, space and time, all fade in the light of their revealed relationships and resolve into configurations of the four dimensional continuum which is universe (The Universe and Dr. Einstein, p120).

Thus the unified field theory now culminates and climaxes this coalescing process. The entire universe is revealed as one elemental field in which each star, each atom, each wandering comet and slow wheeling galaxy and flying electron is seen to be but a ripple in the underlying space-time unity.

### A PARALLEL IN BHAGAWADGITA

In this context we get prompted to refer to the classical statement by the Lord Krishna, in the *Bhagawad Gita* : (Gita-7.7)

'There is nothing in the universe that is different from me; everything is embedded in me just like a set of gems in a string'.

### LIFE MECHANISM

So far the discussion was with respect to the unified theory of objects as analysed from physics point of view. As the Universe has living objects also, the laws of life mechanism should also be covered under unified theory.

### UNIFIED THEORY FOR LIFE MECHANISM

The great sages and seers of India recognized that the science of life of all the beings was known through *Āyurveda*, which deals with the structure of manifest existence (Caraka Samhita, p9). They further identified that *vāta*, *pitta* and *kapha* are the three pathogenic factors common in the bodies of all the living beings. These factors pertain to the structure of natural law at fundamental level and prepare the ground for the unified theory (Vedic Health Care System, p1).

### THE SUPER UNIFIED THEORY OF VEDAS INTEGRATING ALL ASPECTS

The Vedas unequivocally declared that Pure consciousness (also called as *Para Brahma*, *Paramātma*, *Nirgunābrahma* etc.) is the basis for the manifestation, sustenance and dissolution of the universe.

(Pure consciousness is *Brahman*) (Aitareya Upanishad 3.1.4) (Thus *Brahman* is everything)) (Chandogya Upanishad 3.4.1) These great Vedic statements establish the super unified theory, i.e. 'the theory of everything' through consciousness, which is not constrained by time or temperature, or state, or any other parameter which we may conceive to refer to. The details are provided in the following sections.

### MANIFESTATION OF UNIVERSE & CAUSAL ELEMENT

The pure consciousness, or *Brahman*, allows the association of its own dynamic form in a distinct way, called the 'Nature', which is the actual force behind the creation. The Nature is also said to be the combination of three properties, or *gunas*, viz., *sattva*, *rajas* and *tamas*.

(Vedanta Paribhasha, p1)

### SUBTLE ELEMENTS

At the first level, it created five subtle elements, called *Tanmātras*.

(Vedanta Paribhasha, p310)

The first *Tanmātra* is *Ākāśa*, or 'space' *tanmātrā* (literally, elementary space). The second one is *Vāyu* or 'air' *tanmātrā*. The third one is the *Agni* or 'fire' *tanmātrā*. The fourth one is *jala* or 'water' *tanmātrā*. The fifth and also the last one is *prithivi* or 'earth' *tanmātrā*. These five elements, which are totally pure and without any kind of mix, are also called *apañcīkr̥ta pañca mahāBhūtas*. These are also called subtle matter, rudimentary elements and uncompounded elements.

### GROSS ELEMENTS

In the next stage, these *tanmātrās* combine with each other in an orderly way and form five compounds, called gross elements; or *MahāBhūtas*, named as *Ākāśa*, *Vāyu*, *Agni*, *Jala*, and *prithivi*. It may be observed that the *tanmātrās* (elements) and the *MahāBhūtas* (compounds) are given the same names. But it must be clearly noted that they differ in their contents. The structure of each *MahāBhūta* is such that it has 50% filled with the same *tanmātrā*, and the balance 50% combinedly contributed by the remaining four *tanmātrās*, with a share of 12.5% each. For illustration, the *PrithviMahāBhūta* contains *Prithvi tanmātrā* to the extent of 50%, *Ākāśa tanmātrā*: 12.5%; *Vāyu tanmātrā*: 12.5%; *Agni tanmātrā*: 12.5%; and *Jala tanmātrā*: 12.5%.

The five *MahāBhūtas* have their properties like sound, touch, form, taste and smell.

The permutations and combinations of the three *gunas*, *tanmātrās*, and the gross elements, result in the living and non-living objects of the Universe.

(Vedanta Sara, 117)

From the compounded elements have evolved the 14 planes (*lokas*), the living beings, with four kinds of gross bodies, along with the food and drink appropriate to them. The four kinds of gross bodies are those that are born of the womb, the egg, moisture and the soil.

The gross bodies, also, may be regarded as collective or individual according to the way of looking at them. All the gross bodies may be looked upon as one whole, like a forest, or they may be looked upon as separate entities like the trees in a forest. (Vedanta Sara, p62).

Consciousness associated with this aggregate of gross bodies is called *Vaisvānara* or *Virat*, on account of its identification with all bodies, and from its manifestation in diverse ways respectively.

The sum total of the gross, subtle and causal worlds makes a vast universe as the sum total of smaller forests makes a vast forest, of a collection of smaller lakes makes a vast expanse of water.

(Vedanta Sara, 118)

Thus the gross phenomenal universe has evolved from the five gross compounded elements.

Consciousness associated with this, from *Vaisvānara* to *Ishvara*, is also one and the same, as the space enclosed by a number of smaller forests is the same as that enclosed by the big forest of which they form part, or as the sky reflected in different smaller lakes is the same as that reflected in the vast expanse of water which they form.

(Vedanta Sara, 119)





Consciousness, unassociated with any adjuncts (*Upâdhis*) whatsoever, when not discriminated-like the red-hot iron-ball-from the vast universe and the consciousness associated with it, becomes the direct import of the great Vedic dictum, "All this is verily *Brahman*" (Chandogya. Upanishad. 3.14.1) and when discriminated from them it becomes the implied meaning of the text.  
(Vedanta Sara, 110)

### DISSOLUTION OF UNIVERSE

The Vedic science predicts that this universe, which comes into existence as described above, undergoes the reverse process up to the beginning. In the process, the four kinds of physical bodies which are the seats of enjoyment; the different kinds of food and drink etc., which are the objects of enjoyment; the fourteen planes such as *Bhur* etc. which contain them and the universe (*Brahmanda*) which contains these planes- all these are reduced to their cause, the five gross elements.

These five gross elements, together with the five objects such as sound etc., and the subtle bodies- all these are reduced to their cause- the un compounded elements.

(Vedanta Sara, 140)

The five un compounded elements, together with the tendencies of *Sattva*, *Rajasa*, and *Tamas*, are reduced to their cause, namely Consciousness associated with ignorance.

(Vedanta Sara, 141)

This ignorance and the Consciousness associated with it, such as *Iswara*, etc., are resolved into the transcendent *Brahman* unassociated with ignorance, which is the substratum of them all.

(Vedanta Sara, 142)

Ultimately the total process of manifestation and dissolution of the universe is declared by the Vedas as apparent only, with the *Brahman* being the eternal truth.

### SIMILARITIES IN THE THEORIES OF MODERN SCIENCE AND VEDIC SCIENCE

The five *MahâBhûtas* are identified with classical space-time, and the four states of bulk matter, i.e. gaseous, plasma, liquid and solid, respectively (Modern Science and Vedic Science, p75).

A very similar structure is observed within the framework of quantum field theory, where there are also five fundamental categories of quantum field or 'spin types' which are responsible for the entire material universe. These are the spin-2 graviton (responsible for space-time curvature and the force of gravity), the spin-3/2 gravitino (appearing only in the context of supersymmetric field theory), spin-1 force fields, spin-1/2 matter fields, and the spin-0 Higgs fields responsible for symmetry breaking.

The correspondence between the five *tanmâtrâs* and spin types is very striking, the space *tanmâtrâ* is similar to the gravitational field; the air *tanmâtrâ*, which stands as a link between space and other elements, is similar to the gravitino field; the fire *tanmâtrâ*, responsible for chemical transformations, corresponds to the spin-1 forces; water and earth *tanmâtrâs* are similar to spin-1/2 and spin-0 matter fields.

The correspondence is even more striking in the context of a supersymmetric theory, where there is a natural pairing of the five quantum-mechanical spins into three types of

superfields. The spin-2 graviton and the spin-3/2 gravitino become unified in the context of the gravity superfield; the spin-1 force fields and spin-1/2 'gauginos' combine to form gauge superfields, and the spin-1/2 matter fields and their spin-0 supersymmetric partners give rise to matter superfields. The Vedic science also has similar fundamental pairings. The *Âkâûa* and *Vâyu* appear unified in the structure of *vâta prakriti*, *agni* and *jala* become united in the structure of *pitta prakriti*, and *jala* and *prithivi* are united in the structure of *kapha prakriti*.

Like the N=1 superfields, the *prakritis* pertain to the structure of natural law at fundamental scales-at or near the scale of super unification.

Ultimately the pure consciousness is identified with the unified field (Modern Science and Vedic Science, p75).

It may be pertinent to note the opinion of Swâmi Ranganâthânanda in this context (The Message of the Upanishads, p113):

"In countless ways every department of science today is extending the bounds of man's knowledge of cosmic unity. The *Upanishads* discovered this basic unity through the study of mind, and through inward meditation.

Modern scientists started with the exploration of the mysteries of external nature; but at the farthest end of this exploration, it finds itself face with mystery of man and his mind, the deepest mystery of all.

The Vedantic study of the mystery of man has all the qualities of a scientific study, including the most important one of verifiability. It is also systematic and thorough, leading the enquirer through the various outer shells or sheaths of *kosas*, of personality, to the abiding innermost being of man, the *Âtman*, which is also the innermost being of the universe, *Brahma*."

### SUMMARY

Thus the Vedas establish the theory of consciousness as the theory of every thing and explain the apparent manifestation and dissolution of the Universe systematically, which is being explored in modern science.

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