

## COSMOS: At the middle of manifestation

Evolution! Sounds as a forwardly timed cosmic consequence that had put us to think as our own ancestors were actually the apes. Many theories hypothetically put forward that would explain the evolution of mankind. Charles Darwin's *Theory of Evolution* on the basis of natural selection, for example, holds dominance among many. Likewise, to explain the evolution of the universe we have been already put behind with many theories those explain about the birth of Universe. Big Bang theory is to be accepted as most prominent.

The year, 2015, celebrated centenary year of the Albert Einstein's most profound **General Theory of Relativity** (now onwards, **GTR**), on which the birth of the universe can be explained. Astrophysicist Edwin Hubble really did conclude that the universe had been started with the infinite space curvature (well, GTR comprises the *Gravitational constant* which however states that the universe is static but not expanding!). Experimental evidence provided by Edwin Hubble showed the universe was really expanding. Edwin Hubble did also observe that the planets, perhaps the galaxies were speeding apart from the earth itself. Where according to the results obtained, galaxies were not only accelerating away from us (earth), along with he concluded mysterious that the farther the distance of galaxy the faster they were accelerated from one another. The whole observations were concluded by keeping Einstein's GTR and Doppler shift as foundations. Hubble concluded, from his all observations and calculations that the universe is expanding, in other sense the universe is been accelerated. That means to say the space itself is expanding.

The universe is expanding, so that mean there's a centre from which everything is stretching? We mean its looks like the centre is earth, where we live, that is because earth is not subjected to move when we scaled it. But when we scale the earth from standing on the other part of galaxy and they could just each look like centre. In fact there is no real centre to the scaling. There may be point that stay in the same place because of our frame of reference, which is centre of the expansion of the universe but to someone in the Andromeda galaxy it would appear that they were the centre of the expansion. This evidence, combined with the mathematics of GTR allowed calculating that *the farther back in time we go, the smaller the universe had to be*. The natural conclusion is that everything we can currently see in the universe was at one point in time more or less at one point in space. And today we call it as the *Big Bang theory*.

## **Micro and Macro Universe**

Let us consider two models namely the **Macro universe**, an attempt to explain gigantic nature the universe. **Micro universe**, an attempt to describe the universe which scales at subatomic level.

### The Macro Universe:

As in our ancient times we are just amazed what would have been our own solar system and in mean time what it was up to. And in more recent years we are capable of predicting the existence of the parallel universes, multiverse and to mention, the higher dimension among the space as well, which are not reachable to our own scientific comprehensions, which are beyond the chaos among the space. In a word it may be called the coherent dimensions of space.

Space a dominant aspect among the macro universe perhaps comes next, the hypothetical models that could explain the gigantic nature of the universe like its expansion initial and boundary conditions. As the voyage by the ever since man made satellite, the voyager (series 1 and 2) which is crossed our own solar system and still marching into Interstellar. Yet, we are not certain about the *initial and boundary conditions*, but, however we do have some mathematical conjectures those could explain the Initial and boundary conditions of cosmos.

Most of the physicists nowadays quote the universe as a balloon or a soap bubble and we live on the extreme curvature of it. Obviously when the soap bubble/balloon (on considering it similar to the space curvature of the universe) is blown, it is much similar as if the space is expanding i.e. the two marked points on balloon start expanding when it is blown, and moving away from each other. Now here there's no issues, everything is perfect, the expanding balloon resembles the expanding universe and the two relatively dotted marks on balloon which are apart resembles the planets and galaxies moving faraway from one another.

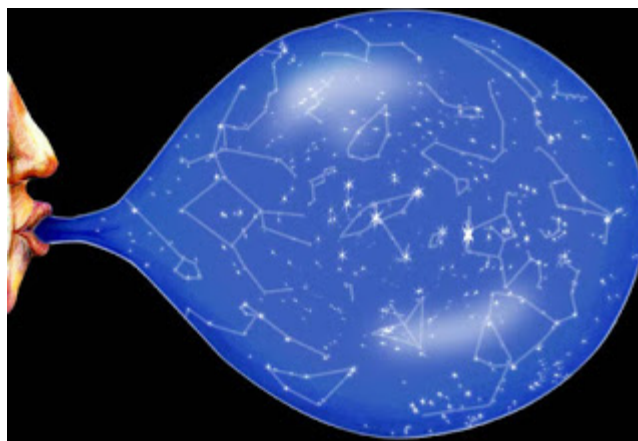


Image demonstrating the expansion of universe  
(Image source: <http://4.bp.blogspot.com>)

From above all paradigms we may in some sort conclude from a thought experiment as explained bellow:

Now, consider an empty box (mostly vacuum) of size 1\*1 foot. Place an empty balloon in it that is to be blown. When it is blown it expands until it reaches the volume of the box, in other sense the balloon after blown will expand till it

reaches the vicinity of the box. No further expansion of balloon is observed indeed. This is to be the boundary condition of the universe. As we don't have even an idea about the halt of universe, how one must can states its boundary conditions. In fact, if universe is expanding till now, then does the space have reached its boundary yet? Or actually universe does not possess any boundary conditions nor does it keep on moving regardless of the *Time*.

The Hubble telescope and the very most recently launched space telescope which is named after the Johannes Kepler, the "*Kepler*" telescopes is working with full on effort in search of the planets or solar system resembling our own. To write it in a precise sentence, we are in search of the human life beyond our habitable planet earth. Well from common expedition we are coming up with acknowledgement from so mentioned giant telescope is that we are finding more and more chaos within the observable universe. Indeed, they may have too far than they are measured distance and light has to travel too long to reach us, in consequence the changes in the physical conditions of the subject has happened are so certain. Astrophysicists are coming up with the more and more findings of planets, stars and even the galaxies and their natural satellites which are being in *Goldie Zone* (the distant area from a star within which a planet can be in habitable zone) "KOI (Kepler Object of Interest) 701" (Also known as Kepler-62e-exoplanet and kepler-62f-exoplanet) is found very recently by the Kepler. (More info and sourcelink:

[http://www.nasa.gov/mission\\_pages/kepler/news/kepler-62-kepler-69.html#.Vilpo12t-o8](http://www.nasa.gov/mission_pages/kepler/news/kepler-62-kepler-69.html#.Vilpo12t-o8)

From all the scientific expeditions, we usually think that our universe is vast nearly containing endless collection of the stars and galaxies. What if our universe is just one of many could we live in multiverse or one with parallel universe? Containing other galaxies and possibly other earths? It isn't a just a question of science fiction. Many theories are taking this question pretty seriously mainly to mention the *string theory* which was a unsung theory when it was published in 1960's and got eye catch of almost all the theoretical physicists from very recent years. String Theory is an theory attempting to accomplish the goal of unification, i.e. The Unified theory, that combines the two theories in the world those governs the universe, The General Theory of Relativity and Quantum Mechanical theory. And physicists do believe that the string theory could explain the physical nature of the universe indeed and hence forth the emergence of the parallel universe and multiverse.

From the string theory and most theoretically believed multiverse models are as follows:

1. The Inflationary Multiverse
2. The Quilted Multiverse
3. The Quantum Multiverse and
4. The Brane (short of Mem**brane**) Multiverse

Among above all, The Inflationary Multiverse and Quilted Multiverse are proven experimentally and the theoretical physicists are yet to figure out the proof for other two models, The Quantum Multiverse and The Brane (short of Mem**brane**) Multiverse. And yet we are onto compensating the proven multiverse. As we probe our expeditions deeper we are encountering the null conclusions about the macro universe, mean to say; **we are not precise about our macro universe after ages of expeditions and theories.**

### **Micro Universe:**

For every physicist at some time, for sure they come up with the question what would be the very basic fundamental building block of matter. Indeed in the early 20th century everyone was set their interest on subatomic level when J .J Thomson found the 'electron', a sub atomic particle charged negatively. Perhaps by its mysterious nature the electron itself dragged attention of all most all the experimental physicists and theoretical physicists as well.

Yes, indeed the atom, perhaps the nucleus is sub divided into many and many subatomic particles when we travel in on to the deeper level of micro universe. In fact the quantum mechanics predicts that we are bound by the quantum wave functions that guide the entire micro universe. The wave function predicted by the quantum realm applied to electronics makes us to take the physics into the philosophical underneath to conclude whether the building block for modern computing era, the electron is in fact a *wave* or *particle*. If electron is particle then particle of what? If it's a wave, then wave of what function? In a single instance it seems that we have entered into scientific relevant philosophical standpoint, which has never been given a particular definition. Instead, we have set our own sail to understand the fundamental building block responsible for all the matter underneath the manifestation.

Quantum mechanics indeed is the great development of early twentieth century. In fact the mechanics from its owed theoretical conjectures and experimental conclusions from all over the world describes the tiniest building block of the manifestation. In fact the particle which has been dominant over all the remaining aspect, and which every part of our day to day life is wrap up with, like from LCD, LED and NEON signboards to the MAGNETICALLY LEVITATED TRAINS (maglev trains), MRI SCANNING MACHINE, THE LASER and many are governed by the Electron. The electron in the world is nothing but the hybrid of the ball and the wave, the **wavicle**(WAVEpartICLE) properties, in olden days electrons are intended to implement in analog circuitry, revolutionized with the analog technology by the help of wave nature of electron, and that once the electron is taken into consideration as a particle and now there is a revolution of the digital revolution in technology. Perhaps we, as a perspective welcome electron as a hybrid of wave and particle as well.

Indeed from Heisenberg's uncertainty principle, a consequence of quantum mechanics, we cannot conclude the position and velocity of an electron simultaneously. That means to say, we cannot predict the existence of electron at

an instance, either the velocity at a time. There is always and will be uncertainty in the measurement. A further development in Quantum mechanics tells us that the electron can exist at any position at a time with probability. Suppose you have a particle and you have been insisted to measure the position 'x' and to measure its momentum 'p' too, the Heisenberg's uncertainty principle concludes that the more we are intended about the position of the particle the less precise we can be about the particles momentum and indeed vice versa. Now, say, if you measure the momentum to a good degree of accuracy your uncertainty about position increases. It's not that particle is somewhere definite but you just don't know where, rather the particle is, in some sense, in many locations at once. 'Δx' for the uncertainty in position and 'ΔP' for the uncertainty in momentum, the principle is encapsulated by the inequality.

$$\Delta x \times \Delta P \geq \hbar / (4 \cdot \pi)$$

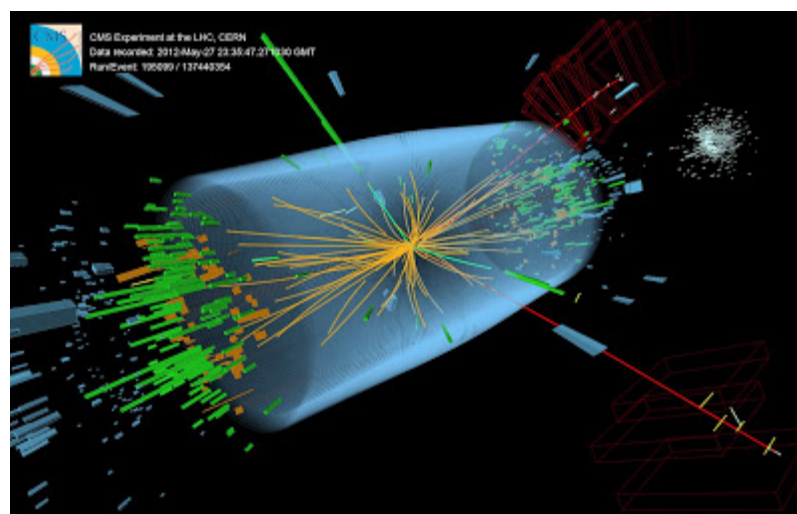
Here  $\hbar$  is planks constant.  $\hbar = 6.62606957 \times 10^{-34} \text{ m}^2 \text{ kg/s}$ .

But the inequality shows that  $\Delta x$  and  $\Delta P$  cannot simultaneously become arbitrarily small.

So what electron comprises of? On the way to resolve the very own mystery of the atom and its particles scientists found more and more sub-atomic particles those make up the atomic particles. The particles are divided into three categories literally called as **Standard Model (SM)** of the elementary particle that makes up the universe and they are as follows:

- The Leptons
- The Quarks and
- The Gauge Bosons.

According to the bases of a model all the elementary particles should be mass less. And the model explains how these particles attain the mass, and the model is called as **Higgs Mechanism**. So, finally we come with the very recently discovered Higgs Bosons.



*Image showing the particles collision to obtain more sub atomic particles  
(Image courtesy: CMS, CERN)*

Considering the Higgs boson as fundamental particle the empty space between the electron orbit and the nucleus of the atom still remains mysterious as considering from Bohr atomic model. In other words, after all finding more and more sub atomic particles, the gap between (must say empty) the electron orbit and nucleus remains unreasoned. However we are still lagging to understand why, the atom is almost empty. Eventually the whole universe is empty.

## The Smallest Length

Something curious happens when you try to combine quantum mechanics with relativity. To explore a region of space you need to send in a probing particle (typically a *photon*, a particle of light) and observe how that scatters off whatever objects are inside the region. Now if the region '*R*' is tiny, with a very small diameter  $\Delta x$ , then as a consequence of Heisenberg's uncertainty principle your probing particle's momentum is "spread" over a large range  $\Delta P$  which includes very large momentum. But a large momentum means a lot of energy and energy is related to mass by Einstein's famous equation:

$$E=mc^2$$

Where *E* is energy, *m* is mass and *c* is the speed of light.

So localizing a particle in very small regions means concentrating a lot of mass over there. If the region '*R*' is sufficiently small – if  $\Delta x$  is below a certain critical value – then the mass of the probing particle is so great that a black hole forms and swallows both '*R*' and whatever is inside it. The crucial size is given by something called the *Planck length*: its  $10^{-35}$  meters. This is unimaginably small, but nevertheless it's not zero. So anything sufficiently small is forever hidden from view. This concludes us that at bellow Planck scale it makes no sense to talk about distances and length. But does it mean that we just can't see anything smaller than the Planck length, or that something smaller does not exist? As a consequences space itself can be thought of as made of individual units of planks-length and we cannot simply go zooming into any closer. "I think we have a good reason to believe that space-time is made of atoms. If you hold your fingers, those 10cm apart, there is a large number of physical points between them, but not infinity of them, says, Francesca Vidotto, a theoretical physicist from Cape Town, to spark magazine.

From above all the discussion we come up again at the level of micro universe that we have not been able to trace down the fundamental existence of nature perhaps the matter or the manifestation nor we have not been able to confine the heavenly cosmic boundaries. We aren't concluding our own existence at a strong stake as because of the uncertainty resulting from physical experiments that shows again and again the emptiness covered the entire Universe. From all the measures and acceptance, the macro and micro universe are almost all are being beyond our reach, theoretically and experimentally. We are still wandering about our own existence as we are, however, described physically and biologically splendid of

the physically manifestations. And as always it seems tug of war between the ***Macro Universe and Micro Universe***. We always stay imbibe at god's creation, god itself hides most of dimensions from our reach to understand the very fundamental nature of the universe and hence we always stand amazed ***"AT THE MIDDLE OF MANIFESTATION"***.

\_\_\_\_End of article\_\_\_\_