

# SUBATOMIC WORLD & BEYOND (A review and a study)

Yogesh .C. Pathak, Lavish Jain, Swapnil Selokar, Ekta Sakharkar, Rachna Jain,  
Akanksha Allewar

**ABSTRACT-** The quest for the nature of dark matter has reached a historical point in time, with several different and complementary experiments on the verge of conclusively exploring large portions of the parameter space of the most theoretically compelling particle dark matter models. This focus issue on dark matter and particle physics brings together a broad selection of invited articles from the leading experimental and theoretical groups in the field. The *leitmotif* of the collection is the need for a multi-faceted search strategy that includes complementary experimental and theoretical techniques with the common goal of a sound understanding of the fundamental particle physical nature of dark matter. These include theoretical modeling, high-energy colliders and direct and indirect searches. We are confident that the works collected here present the state of the art of this rapidly changing field and will be of interest to both experts in the topic of dark matter as well as to those new to this exciting field.

## INTRODUCTION

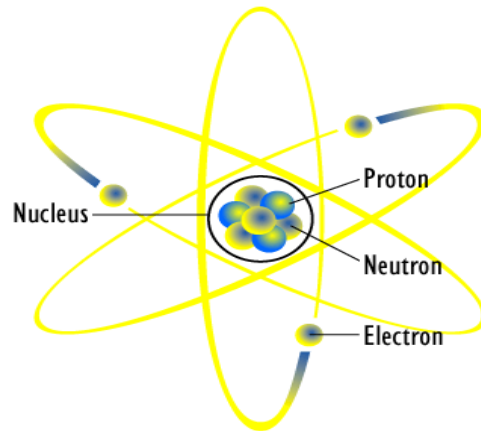
What is atomic World?

We have learned that every matter is composed of atoms, once presumed to be matter elementary Particles, Atom meaning indivisible in Greek.

But we have learned also about electron, Proton had been observed, along with the photon the particles of electromagnetic radiation.

But there is something again smallest beyond this as embodies in particle physics.

- 1) Matter Particles forces and carrier particles.
- 2) Dark matter what is dark matter? What is dark, energy?
- 3) How the universe began?
- 4) What happened to the antimatter after big bang?
- 5) Conclusion



Again scientist have came to the conclusion that there is some other type of matter we have never observed, it is different from the matter which had made the start, planet & other observation creations We will see here the detail about this we will discuss here about, the popular law of super symmetry, what the law says that there is symmetry in the universe & must be i.e. double the number of elementary particles by hypothesizing that each known particles associates with a shadow particles which posses exactly opposite properties of that matter called ANTIMATTER we will go through the points.

## Matter Particles, Forces and Carrier Particles

Every particle is made up of atom. Again atom is made up electron revolving around nucleus, nucleus again contains protons & neutrons. But how is the proton, neutron are made up of? The basic elementary particles which are discovery till today are

### ❖ Fermions

### ❖ Bosons

Fermions- Quarks, Leptons

Bosons- Gauge bosons, Scalar Bosons

**Quarks:** quarks are the basic building block for proton and the neutrons.

There are six types of quarks as shown in fig 1:

Everyone has its own properties Proton is made up of 3- Quarks, 2. are up Quarks and 1. Is down quarks.

Fig. 1

Adding their charges gives the charge of proton  $\rightarrow 2/3 + 2/3 - 1/3 = 1$

Neutron is made up of 2-down quarks and 1-up quarks. Adding their

Charge  $\rightarrow 2/3 - 1/3 - 1/3 = 0$

### Leptons:-

One type of lepton that you have probably heard of is the electron, Electrons are important building blocks for atom,. Other types of leptons include the **muon**, the **tau**, and three **neutrinos**.

There are **SIX Flavors** in lepton forming three generations.

1) **Electronic – Electron & Electron Neutrino.**

2) **Muonic – Muon & Muon Neutrino.**

3) **Tauonic- Tau & Tau Neutrino.**

## Particles Antiparticles

Fig. 2

Electron

Positron

Proton

Antiproton

Quarks

Anti quarks

Matter composed of this **antiparticles** will give the **antimatter**. For Ex. **Hydrogen – antihydrogen atom.**

According to law super symmetry there must be symmetry in the universe

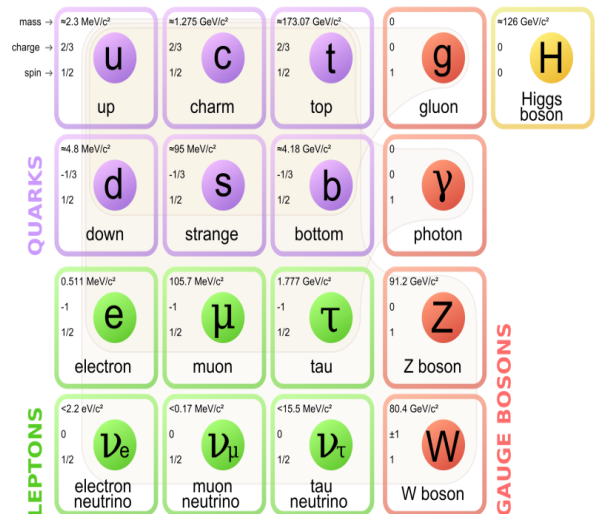
Winter

---

summer

Fig. 3

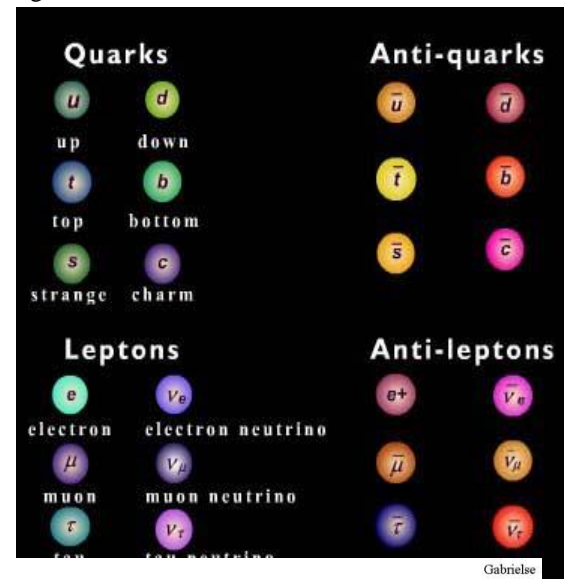
Pressure – vacuum



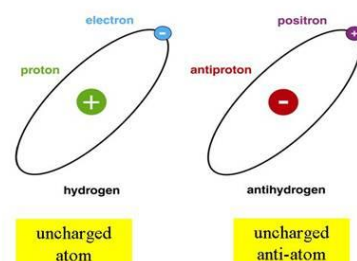
Positive - Negative

Charge - discharge

Light - Dark



## Matter and Antimatter Atoms



Particle and antiparticle charges are opposite

Both atoms are uncharged  $\rightarrow$  same charge

## Four Gauge Boson includes

Y-Photon  $\rightarrow$  Photon is the electromagnetic force carrier particles

g – Gluon → Hold antinuclear particles in the nucleus  
responsible for all strongest forces

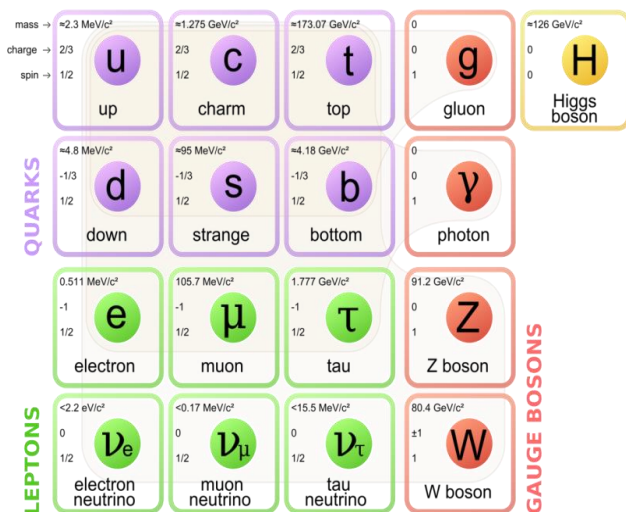
Z- Boson

W-Boson ->The W and Z bosons together know as the weak bosons or, less specialty, the intermediate vector bosons are the elementary particles bosons are the elementary particles that mediate the weak interaction.

**Higgs boson** :- it is the particles which is responsible for higgs field. What is the higgs field first suspected to exist every where, now believed to be confirmed. Higgs boson is massive particles with no charge & no spin. Higgs boson is nothing but the concept of **god's particles**

Which is believed to be the most fundamental particles of matter which made whole universe. Higher boson have no color charge also it is also very unstable decomposes into other particles almost immediately.

## Dark Matter & Dark Energy



We have seen what are matter particles but it is supposed to have some other type of matter in the universe which is very different from normal matter.

First of all the matter is not observable i.e. it do not response to any type of radiation and light.

It does not absorb, emit or reflect light hence it can't be seen by the telescope but accounts for most of the matter in the universe.

Since it is not observable it is called the **Dark, the Dark matter.**

**Dark Energy –74%**

**Dark Matter –22%**

**Normal Matter - 4% only**



## Artistical view of Dark matter

Normal matter: that we can observe which makes the stars, planet and other observable creation.

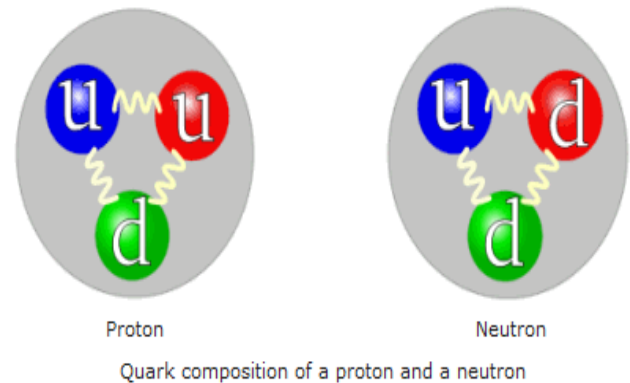
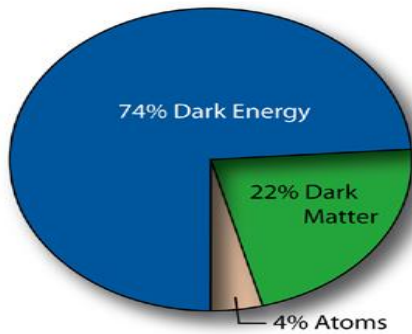


Fig 4

**Dark energy** is the hypothetical concept Dark energy dominates the mass of



universe by nearly 3:1

Dark energy would need to have a strong negative pressure acting repulsively in order to explain the observed acceleration of the expansion of the universe.

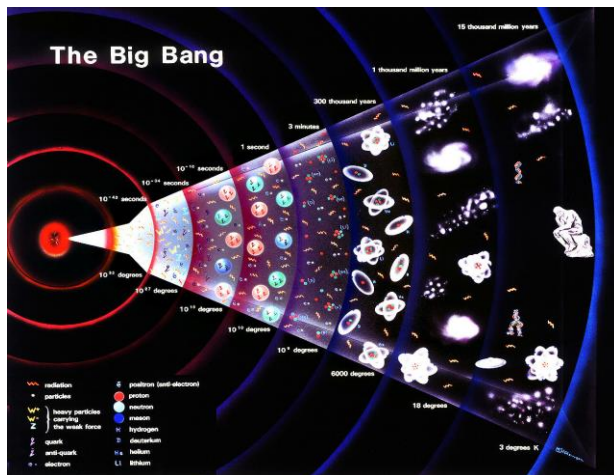
### Difference b/w dark matter and energy:-

While dark energy repels dark matter attract. And dark matter influence shows up even individual galaxies ,while dark energy acts on the scale of entire universe.

## How the universe began?

The most interesting, **Big Bang theory.**

According to Big Bang theory, All matter in the universe was formed in one explosive event 13.7 billion year ago the Big Bang in 1929 the American astronomer Edwing Hubble discovered that they are proportional to their **redshifts**.



**Redshift** is an evidence for that the distant galaxies were moving away from us, then at the sometime in the past, they must have been clustered close

together. The observation gives rise to the Concept of Big Bang Accordingly.

In the first movement after the Big Bang, the universe was extremely hot and dense. As the universe cooled, the conditions became just right to give rise to the building blocks of matter: the quarks and leptons of which all is made.

A few millionth of second latter quarks aggregated to produce proton and neutrons. Within minutes , these protons and neutrons combined into nuclear. As the universe continued to expand and cool, things began to happen more slowly. It took 380,000 Year for electron to be trapped in orbit around nucleus, forming the first atom. These were mainly **helium and hydrogen** 1.6 million year after, gravity began to form stars & galaxies from clouds of gas.

Heavier atom such as carbon Oxygen and iron, have since been continuously product in the hearts of stars and catapulted throughout the universe in spectacular staler explosions called supernovae

This is how the universe began! **What happened to the antimatter after big bang?**

According to law of symmetry, the big bang should have created equal amount of matter and antimatter in the early universe.

But today, everything we see from the smallest life forms on earth to the largest stellar object is made almost entirely of matter. Comparatively. There is not much antimatter to be found something must have happened to tip the balance.

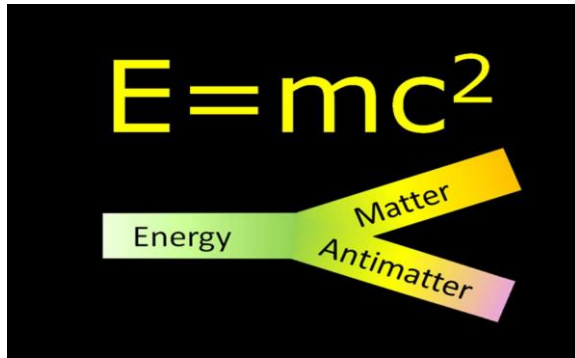
### Why we see matter/ antimatter asymmetry.

Antimatter particles share the same mass as their matter counterparts, but qualities such as electric charge are opposite. The positively charged positron for example, is the antiparticles to the negatively charged electron. Matter and antimatter particles are always produced as a pair if they come in contact, annihilate one another, leaving behind pure energy.

There must be something different should have happened that destroyed all the antimatter nearly.

This antimatter should have converted into something other we can say energy or different type of matter.





#### **Future scope:-**

*The dark matter plays a vital role for the future scope. The theory never ends till the end of the century. dark matter technology is used in space .there may have a change in the galaxy where the stars twinkle* we have studied the theory and potential of quantum computing for years, and more recently they have been experimenting with the concepts, said Bill Gallagher, the senior manager of quantum computing . The scientific program foresees talks on “science and applications”, interleaved with talks on “future machines”, with the scope of presenting the future horizon of science, as envisaged by the international community, and the need for new scientific instrumentation.

#### **CONCLUSION**

Looking at these all point we have conclude that, There are again smallest particles than higgs boson. Also electron may not be a indivisible electron may also composed of some other particles. The elementary particles that we have discovered are not the last particles. There is antimatter something in the universe may be in some other dorm of energy or something else.

The universe that we see is most vacuum But it is not vacuum actually it may be some type of energy & different matter that we can say Dark energy & Dark matter. We can say Dark energy is opposite kind of energy For example, Pressure is energy, vacuum is all energy

Potential energy due to light is also due to depth Negative charge alone can't give energy there must be a positive charge or positive potential then only electron will move & give electricity.

We have seen the darkness hence we believe on light. If there were no darkness, we can't get photoelectric effect also.

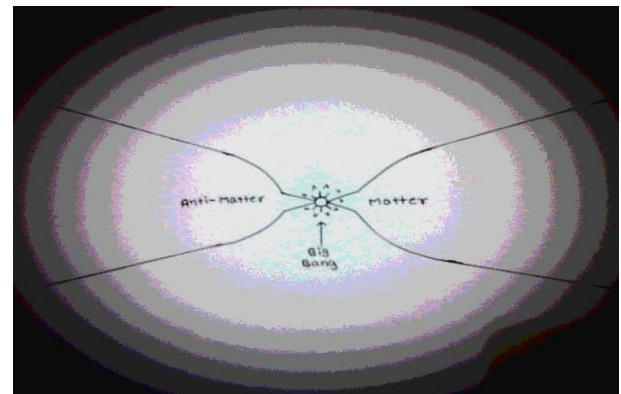
So there must be opposite thing of everything to balance the universe. Energy is not observable we can observe only the effect of energy.

At the time of big-bang

If we thing about antimatter There may be a formation of other universe than our which is made of all antimatter just like one of matter.

There may be expansion of other universe in opposite of our.

So that we can believe that there is huge beyond the what know.



#### **REFERENCES**

1. CERN EUROPEAN COUNCIL FOR NUCLEAR RESEARCH
2. [https://www.google.co.in/search?q=DARK+MATTER&ie=utf-8&oe=utf-8&aq=t&rls=org.mozilla:en-US:official&client=firefox-a&channel=sb&gfe\\_rd=cr&ei=2\\_jVeOzF67G8AcZyKjIBQ](https://www.google.co.in/search?q=DARK+MATTER&ie=utf-8&oe=utf-8&aq=t&rls=org.mozilla:en-US:official&client=firefox-a&channel=sb&gfe_rd=cr&ei=2_jVeOzF67G8AcZyKjIBQ).

YOGESH .C. PATHAK (1),LAVISH JAIN(2),SWAPNIL SELOKAR(3),EKTA SAKHARKAR(4),RACHNA JAIN(5),AKANKSHA ALLEWAR(6)

(1)(Guide) ASST PROF. COMPUTER TECHNOLOGY  
DEPARTMENT, PRIYADARSHINI COLLEGE OF  
ENGINEERING, NAGPUR.

(2, 3, 4, 5)Students, Computer Technology Department,  
PRIYADARSHINI COLLEGE OF ENGINEERING, NAGPUR