

**Student Notes: Unit 2- The Earth in Space**  
**Part 1- Discovering the Universe**

**What is the Universe?**

- The universe is comprised of all that physically exists
- The universe is much larger than what we know it to be as we are not able to see the entire thing.
  - We are currently only able to see 14 billion light years away from Earth
  - This is what is referred to as the observable universe.

**Measuring the Universe:**

- A light year is a unit that measures the distance that a ray of light is able to travel in one year.
  - light is able to travel about 300,000 km/sec
  - one light year is equal to about 9.5 trillion Km
- Light years allow scientists to use more manageable numbers and determine the age of an object.

**Formation of the Universe:**

- There have been many ideas and theories on how the Universe was formed.
- Today the most widely believed theory is the big bang theory.
  - believed to have occurred 13.7 billion years ago (bya)
  - see concept map on the origin of the universe for more details!

**Major Parts of the Universe**

1. Super galaxies
2. Galaxy clusters
3. Galaxies → can be classified as spiral galaxy, bar spiral galaxy, elliptical galaxy or irregular galaxy
4. Solar Systems → consist of stars, planets, dwarf planets and planetesimals

**Formation of Galaxies:**

- Believed to have begun at the same time as the big bang and are largely due to the formation of gravity at this time.
- After the big bang, the particles of dust immediately began to cool and create clumps of dark matter.
- The gas within the dark matter began to condense making larger and denser particles of matter.
- The condensing caused changes in gravity which attracted gas and more dark matter creating denser areas which were the seeds for galaxies.

- Within the seeds the gases of hydrogen and helium began to condense making the first stars and in turn the first galaxies.

### **Milky Way Galaxy:**

- Our own galaxy that was created early on as a spiral shaped galaxy
- One of the larger galaxies due to the fact that it has collected and coalesced with other galaxies in the universe causing it to grow.
  - Size: 10,000 light years thick by 100,000 light years in diameter
  - Earth is positioned on one of the inside spiral arms.
- Due to the position of earth in the galaxy it is hard for us to see our own so we are able to learn about our galaxy through studying our similar neighbor galaxy, the Andromeda Galaxy which at some point in the future will collide with us and we will become on extremely large galaxy.