Astronomy Topic 4

Revision Booster

How the Milky Way would appear from somewhere else in space

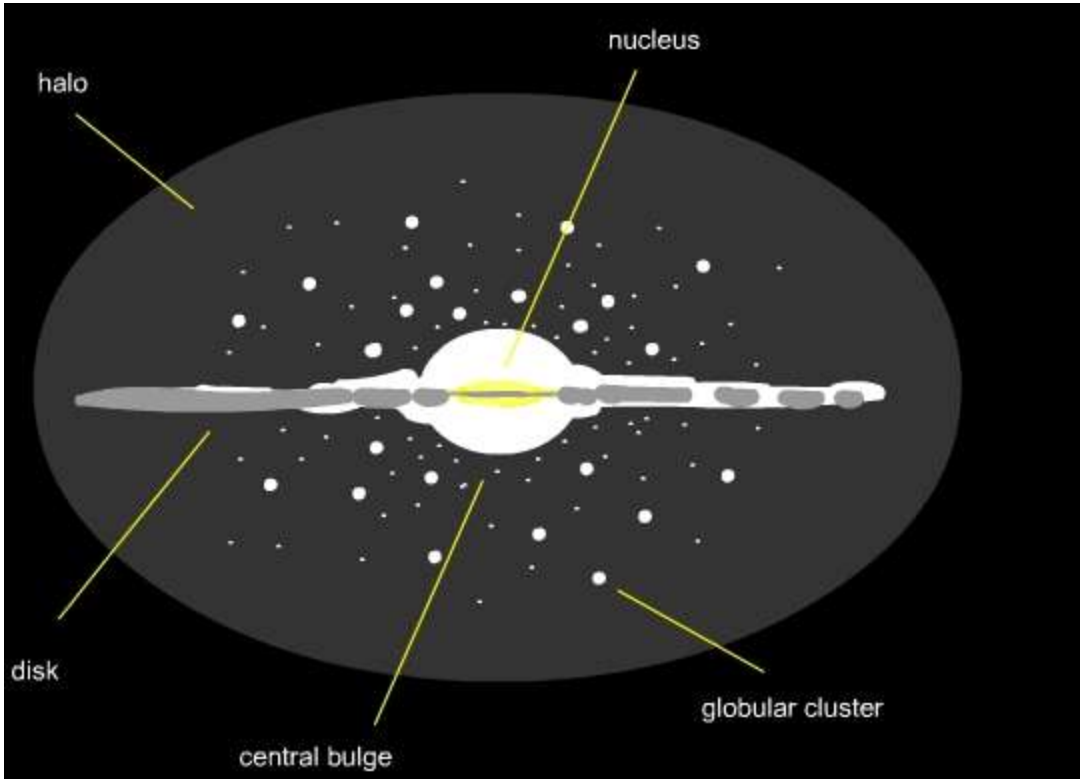
100,000 light years

Milky way facts

200 billion stars

250 million years to orbit

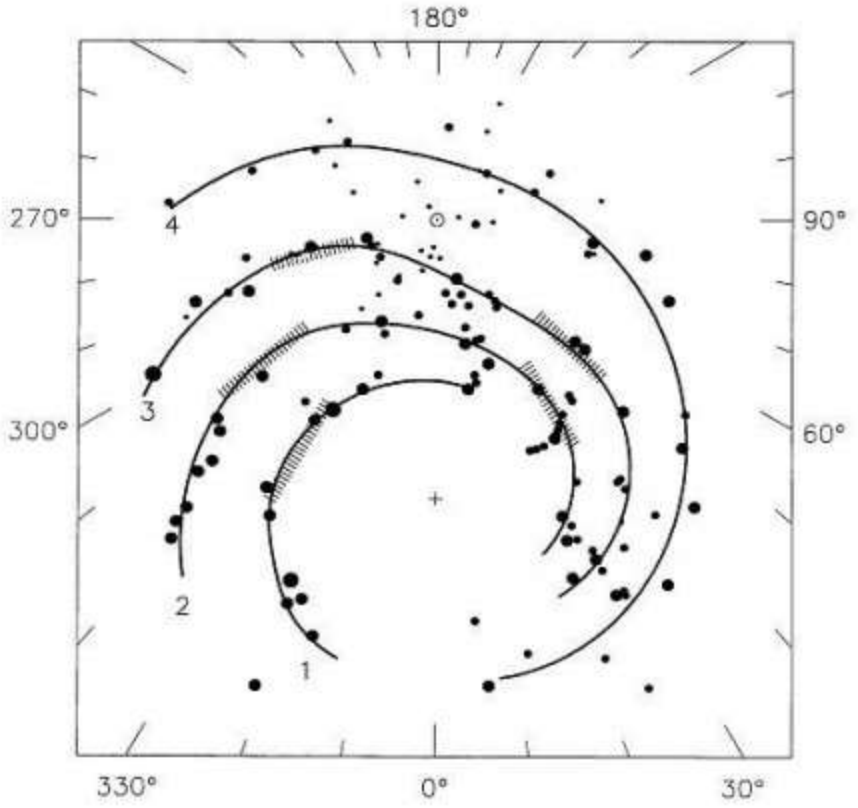
One of a group of about 30 galaxies (The local group)



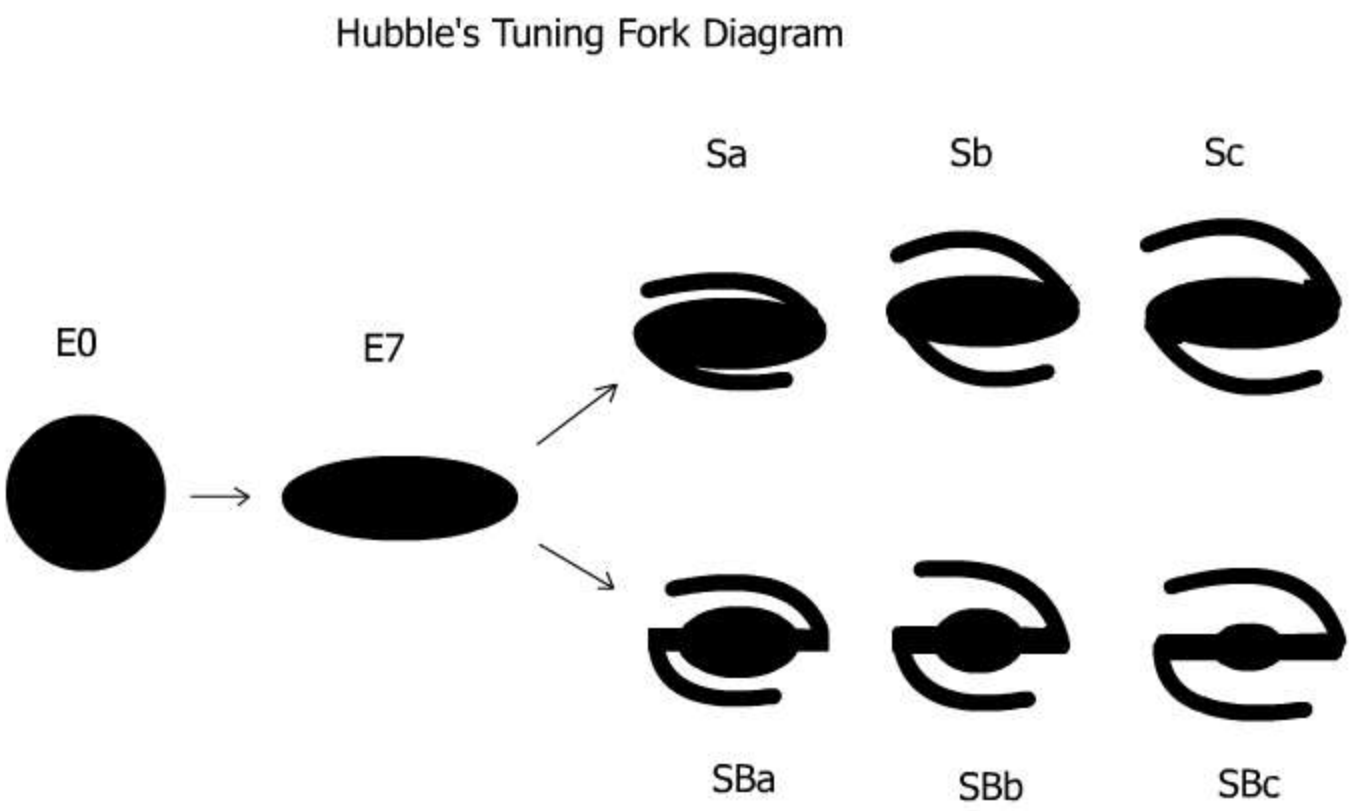
Open clusters – where stars are born, in the disc

Globular clusters – groups of very old stars, in the halo

Mapped using 21cm radio waves. These can get through the huge amounts of dust

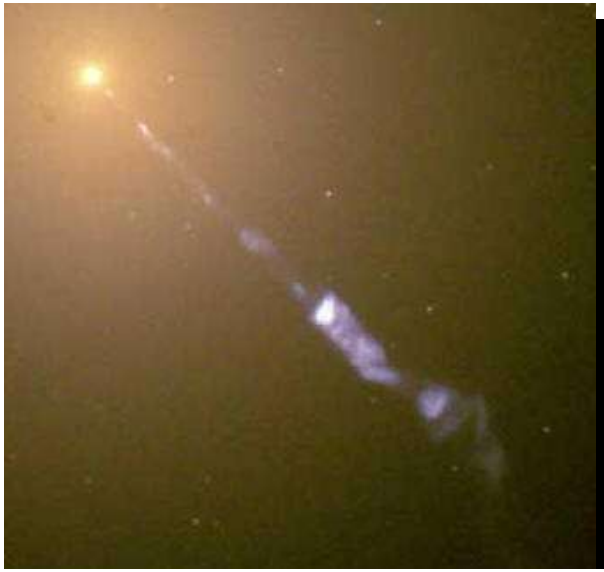


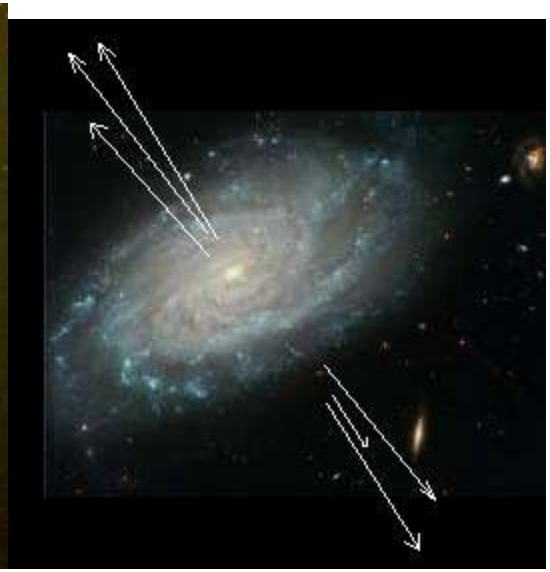
The Milky Way is an SBc type galaxy



There are also irregular galaxies

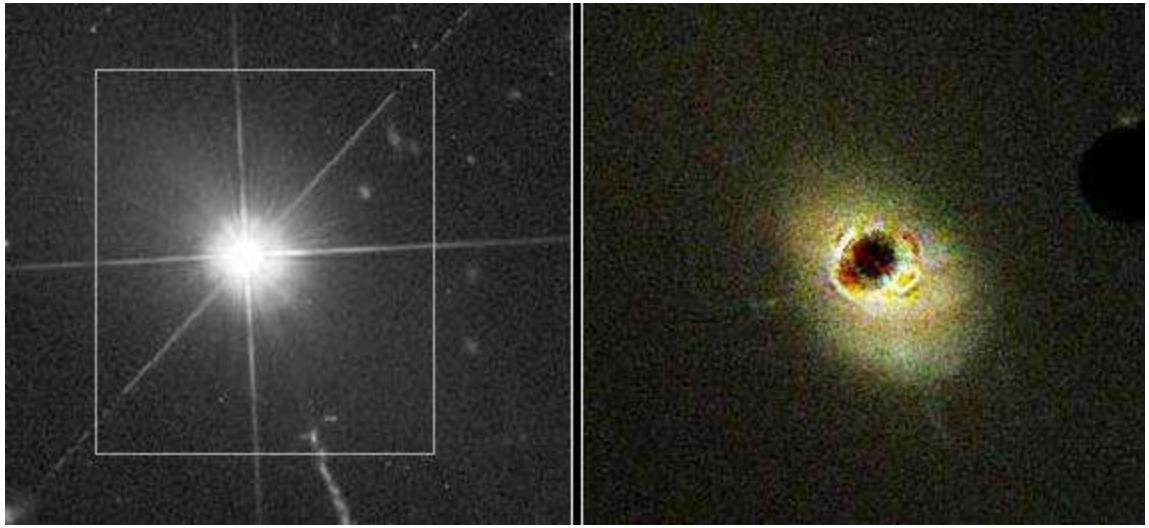
Galaxies emit all kinds of radiation, not just visible





Active galactic Nuclei
Stuff spirals (the accretion disc) around a supermassive black hole in the centre
This emits X rays

Some stuff bounces off due to shock waves causing jets of matter



Quasar galaxies
very big, very old, very bright, very far away, massive red shifts, very active

Seyfert Galaxies
These emit light from excited gas surrounding the nucleus

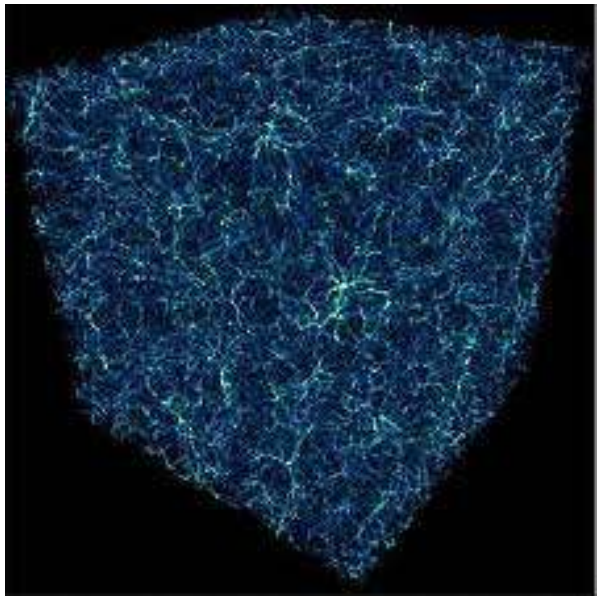
Blazers
The amount of radiation we detect varies. They are on their side relative to us so there is a lighthouse effect" as they rotate

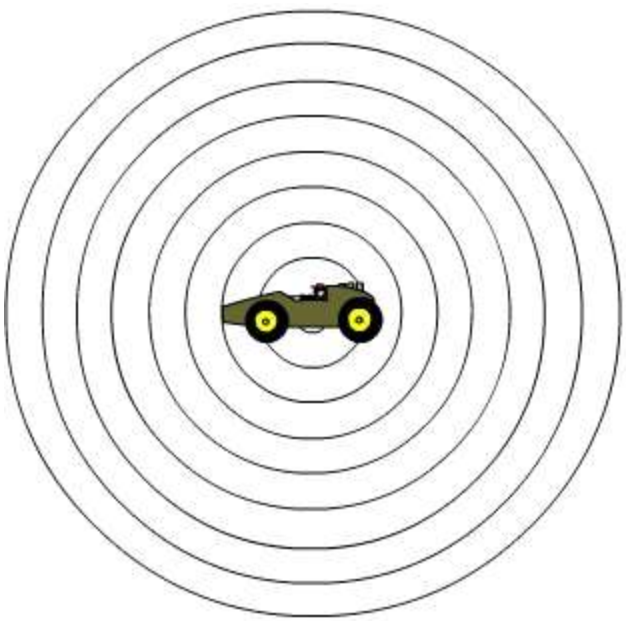
The structure of the Universe

Galaxy --> Group --> Cluster --> Super Cluster --> Universe

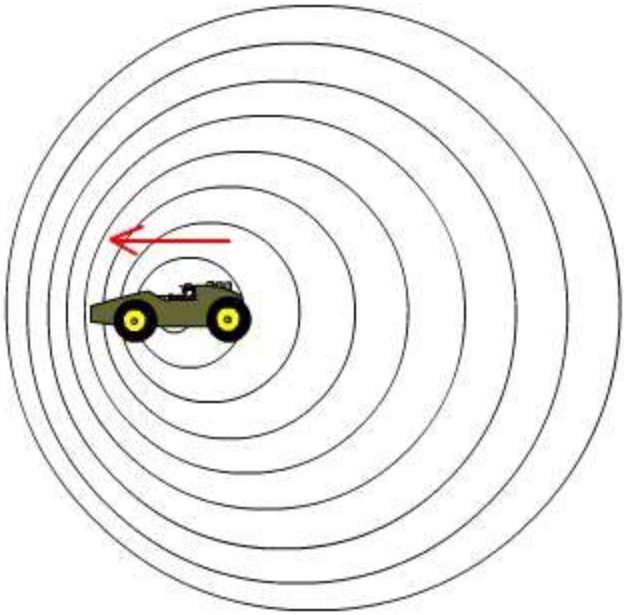
Ours includes Andromeda, Triangulum and the large and small Magellanic clouds

Ours is the Virgo super cluster, there are millions of others





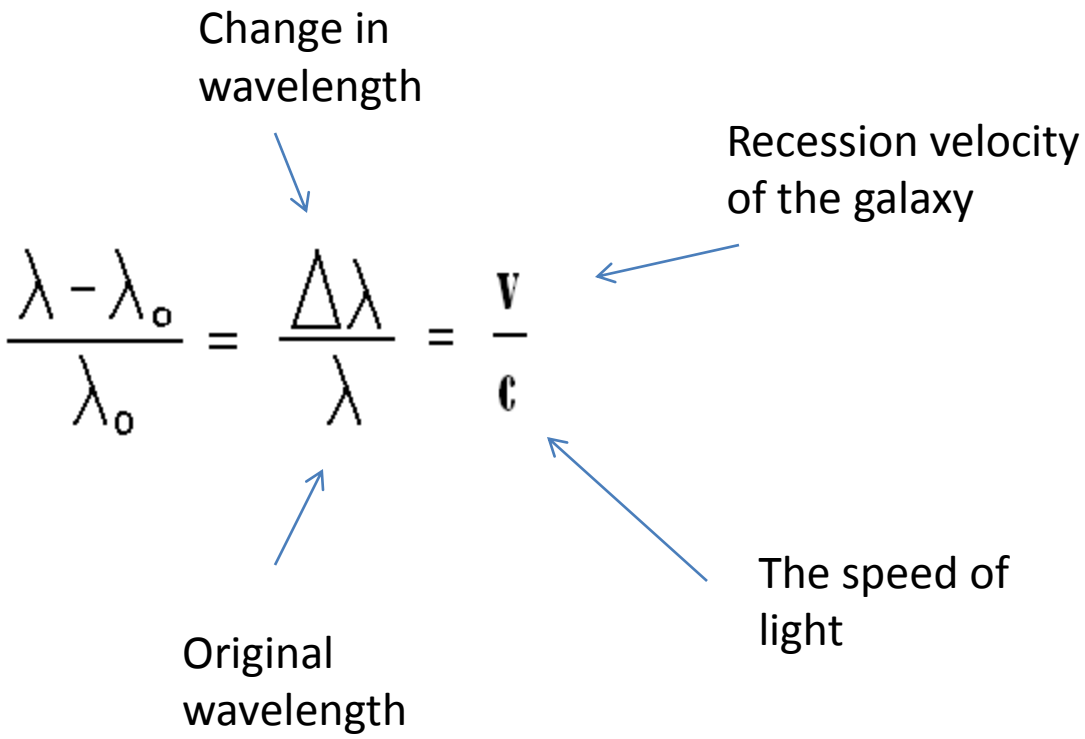
Stationary car
No change in wavelength



Moving car
Waves are squashed and Stretched

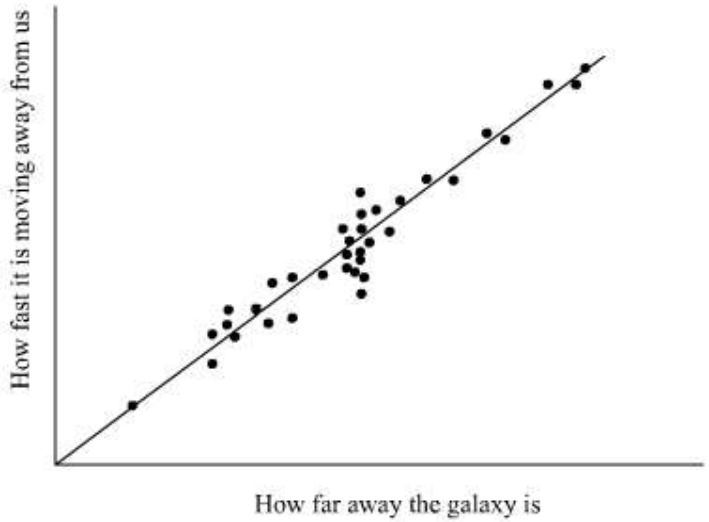
Light from distant galaxies is red-shifted

The light waves are stretched so that their wavelength is bigger



We can use the red shift to calculate the recession velocity

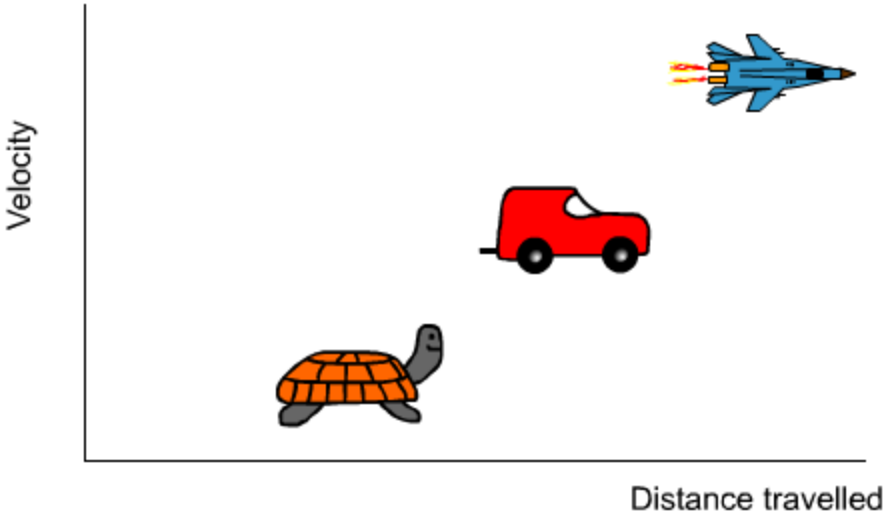
Andromeda shows a blue shift. Why?



Hubble's Law

Recession velocity = H x distance (R = H d)

H is the gradient known as Hubble's Constant

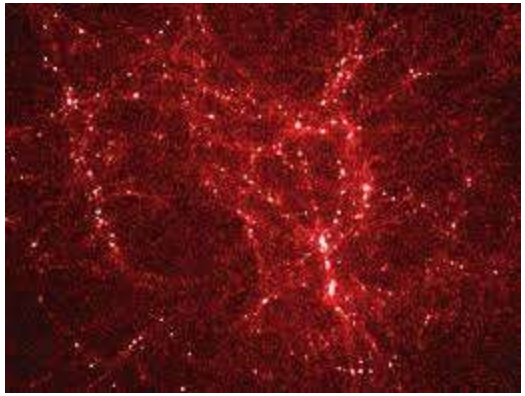


From the gradient of the graph we can calculate the age of the Universe

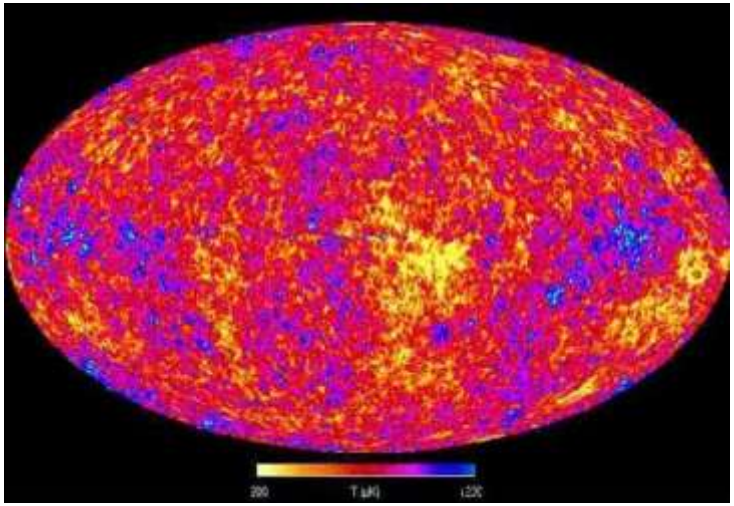
Age = 1 / H

About 13.6 billion years

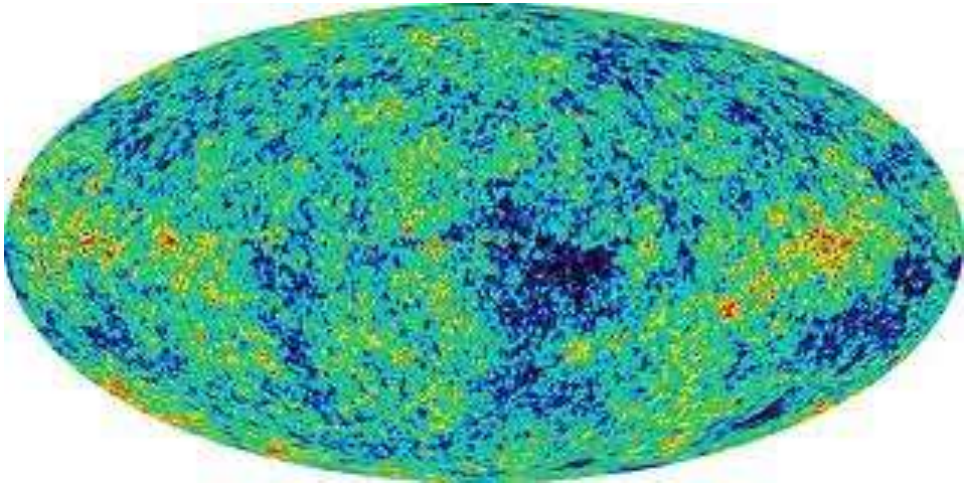
When the Universe was much younger (about 300,000 years old) and much hotter atoms first formed and lots of U.V. radiation was produced

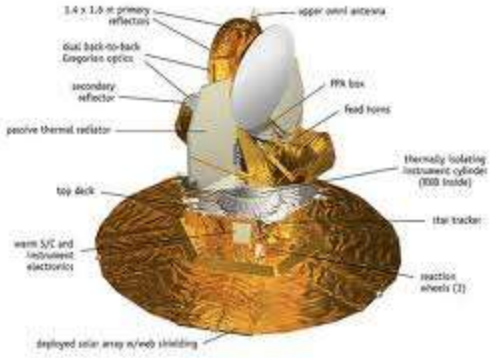


This radiation is still detectable. It is much weaker and it has been red shifted so it is now microwave. We call it **Cosmic Microwave Background Radiation**.



CMBR was discovered by accident by two telephone engineers



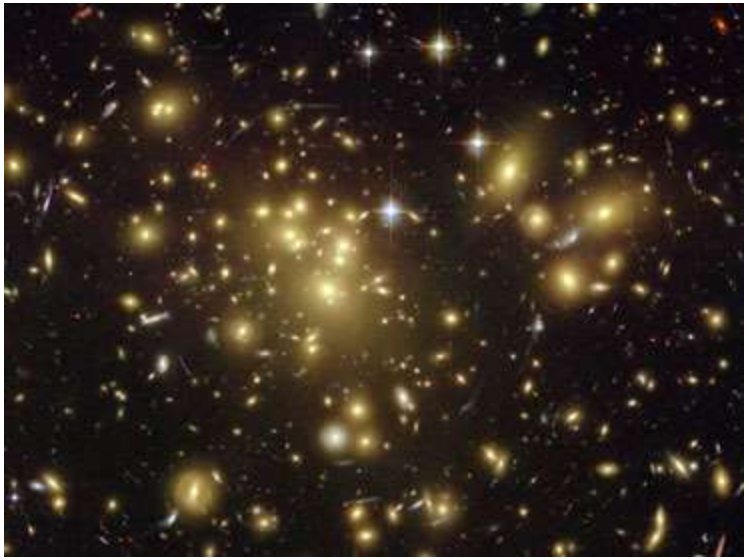


The probe WMAP has mapped this radiation accurately.

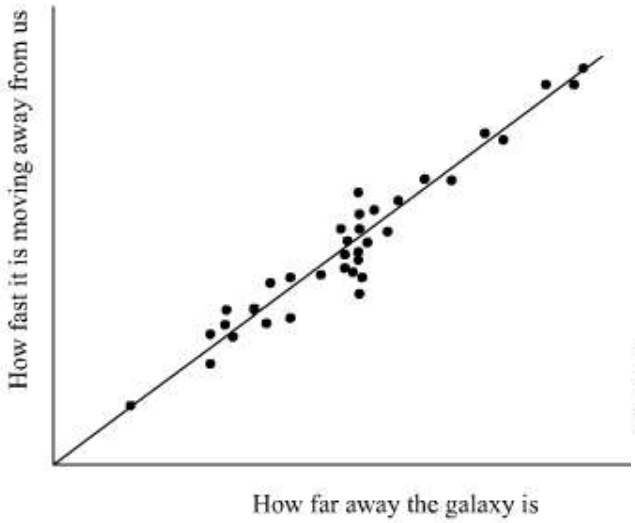
Variations in its strength tell us much about the early universe

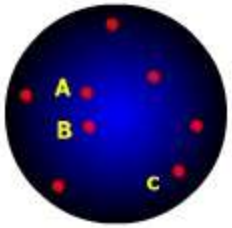
There is much more out there than we can't see

What we can't see is called Dark Matter (23%) and Dark Energy (72%)

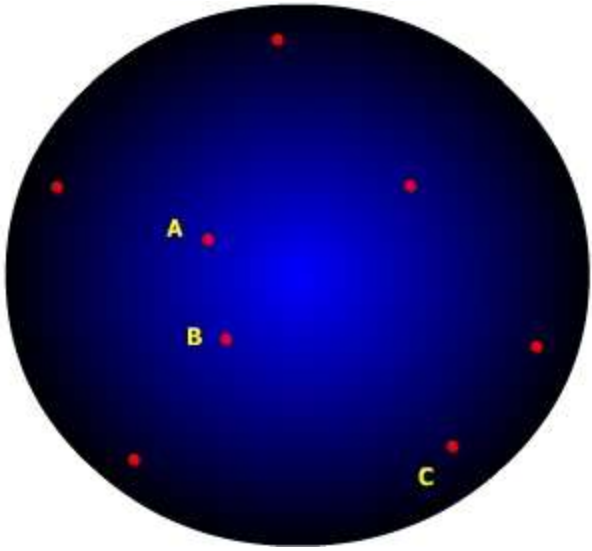


We know very little about it





The bigger the distance between galaxies the more this distance increases when the Universe expands.



The Universe is expanding

Just like a firework galaxies further away are moving away from us faster

Many scientists believe the Universe started with a **Big Bang**

They believe it will keep expanding for ever

Because of outward pressure due to dark energy they believe the rate of expansion is actually increasing