GCSE Astronomy

Topic 2 Revision

Planets

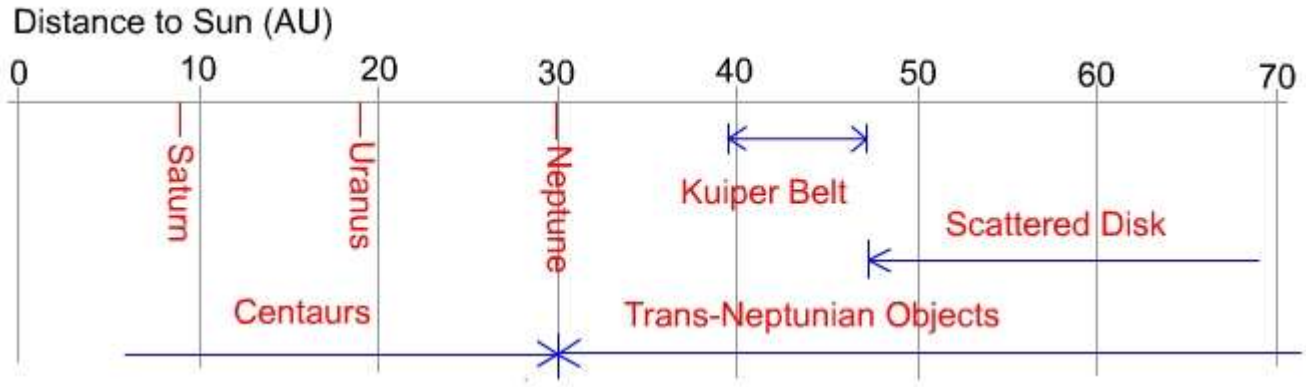
Mercury
Venus
Earth
Mars
Jupiter
Saturn
Uranus
Neptune

Dwarf Planets

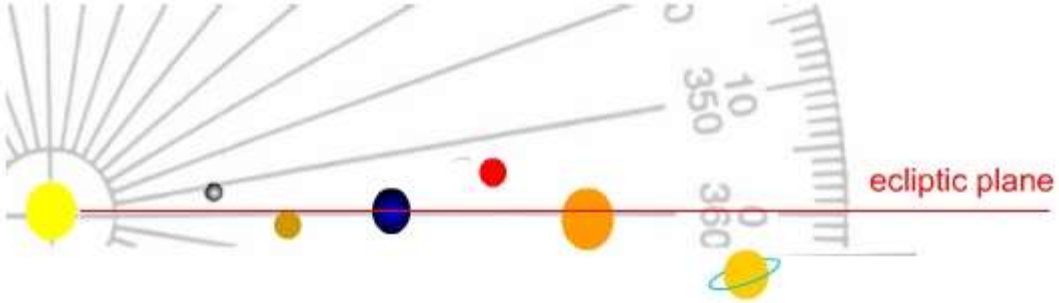
Ceres	(asteroid belt)
Pluto	(Kuiper belt)
Huamea	(Kuiper belt)
MakeMake	(Kuiper belt)
Eris	(scattered disc)

Centaurs

Hidalgo
Chiron

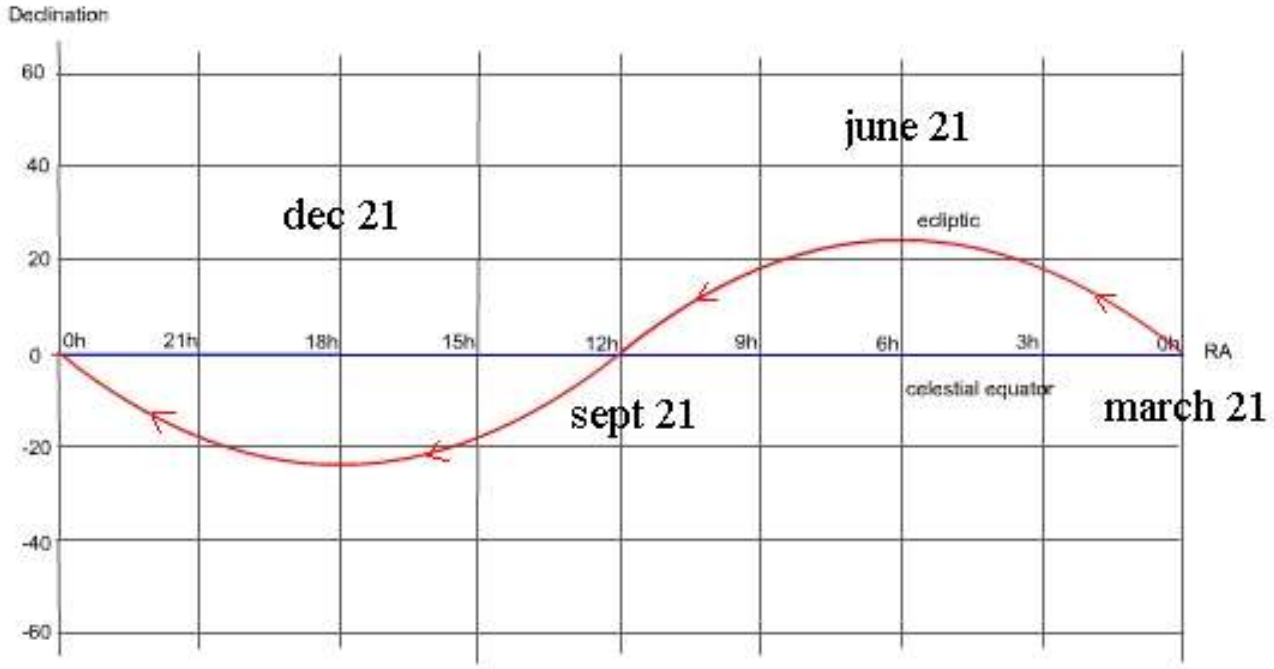


Inclination to the ecliptical plane



The path of the sun in the sky

The **ecliptic**



The Zodiac	A band containing 12 constellations the ecliptic passes through
Retrograde motion	When a planet, e.g. Mars, appears to move backwards
Perihelion	When a planet is closest to the Sun
Aphelion	When a planet is furthest from the Sun
Greatest elongation	When an inferior planet appears furthest from the Sun
Conjunction	When two objects are close in the sky
Opposition	When a superior planet is opposite the Sun to us
Transit	When a small body passes in front of a larger one
Occultation	When a small body is hidden by a larger one

Mercury
No atmosphere, surface like our moon, rotates very slowly

Venus
Slightly smaller than Earth, dense CO_2 atmosphere makes it very hot

Mars
Thin atmosphere mostly CO_2, surface features, evidence of erosion

Jupiter
Biggest, mostly hydrogen, giant red spot, 4 Galilean moons

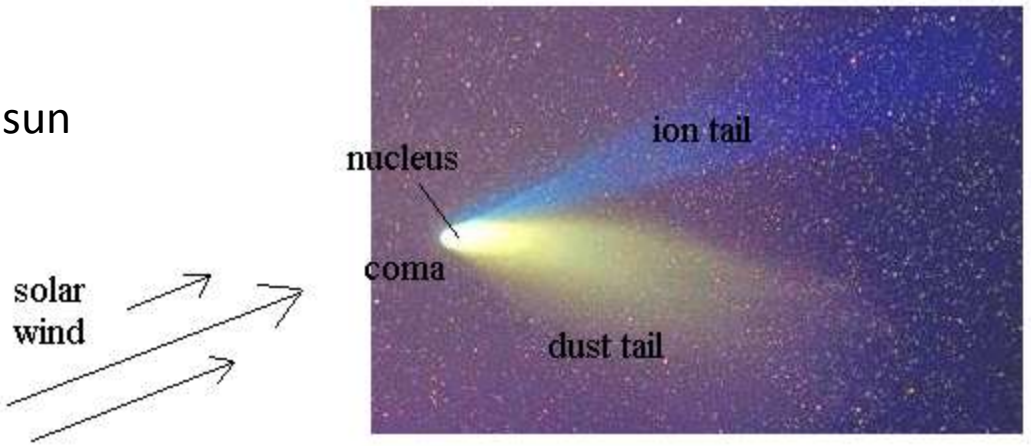
Saturn
Mostly hydrogen, ring system

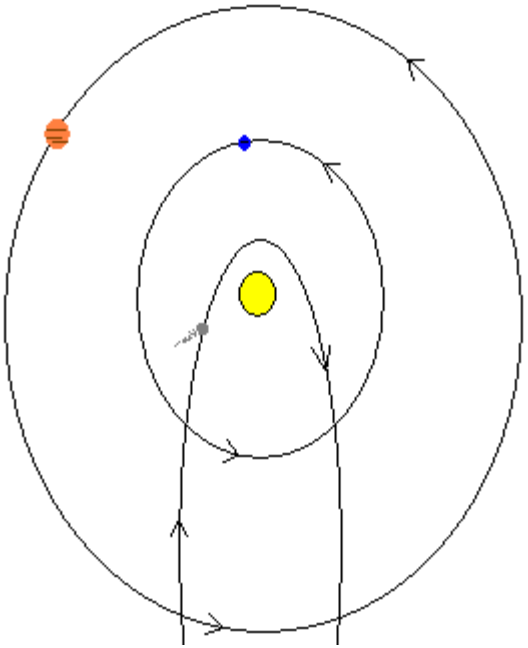
Uranus
Mostly hydrogen, some methane makes it blue, discovered with a telescope, spins on a tilted axis

Neptune
Similar to Uranus, existence was predicted before discovery

Dust tail made of bits broken off

Curved as the bits further from the sun have a longer orbit time





Orbits of comets are very eccentric, inclined and often retrograde

They originate from the Kuiper belt or possibly the Oort cloud

Meteoroid - a ball of rock flying through space. Smaller than an asteroid.

Meteor - a meteoroid that has entered the Earth's atmosphere and is burning up due to friction.

Meteorite - a meteor that lands on Earth.

Micrometeorites These are microscopic meteorites, tons of which fall on the Earth each day

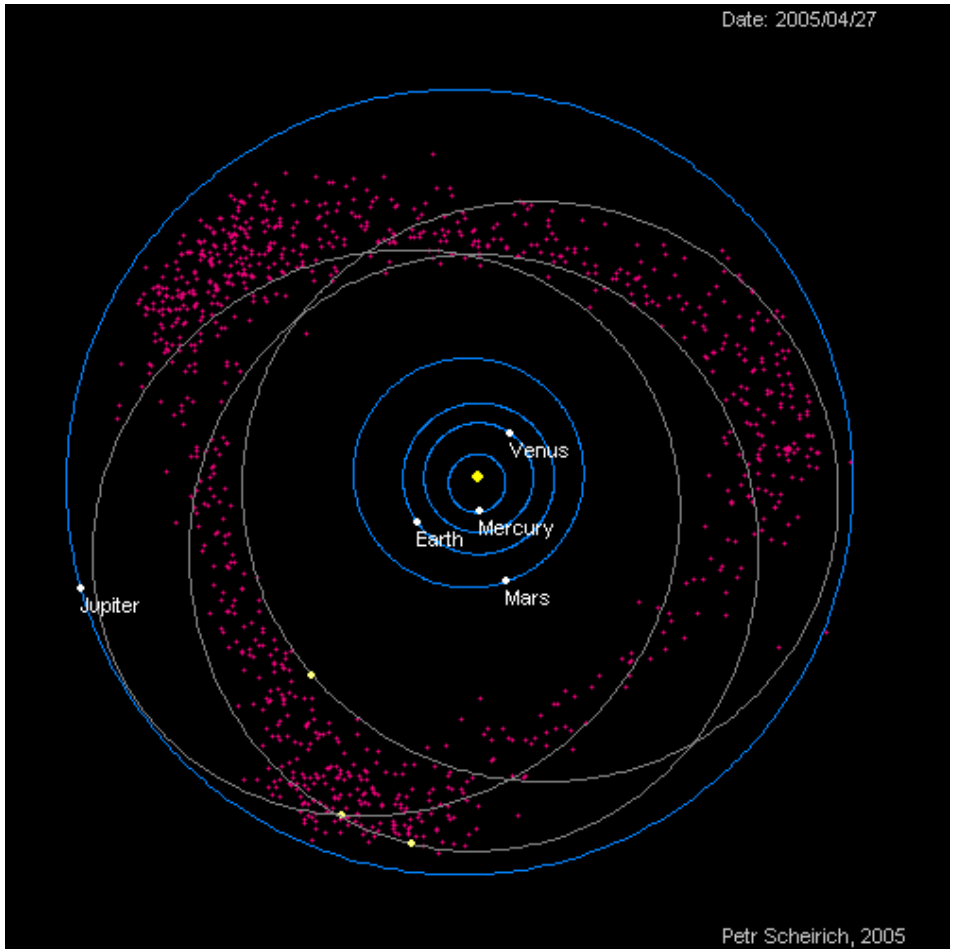
Fireball This is a very bright meteor.

Meteor showers occur annually when the Earth passes through the debris left by a comet

e.g. The Perseids

The point they come from is called the **radiant**

PHOs are potentially hazardous objects monitored closely by NASA

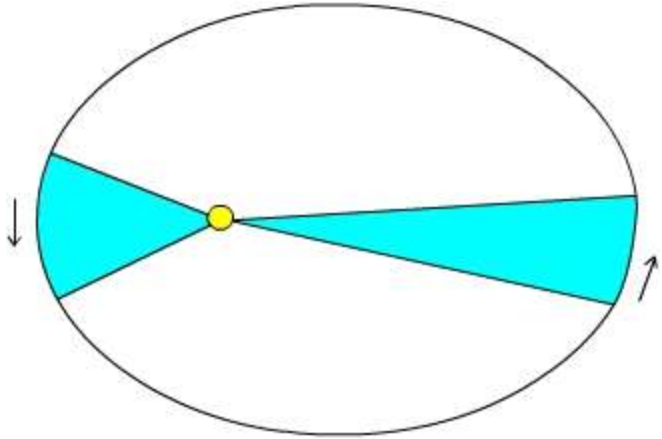


Copernicus first suggested a heliocentric model of the solar system

Tycho made many accurate observations

These were used by Kepler to develop his laws

Kepler's 2nd law
A line joining a planet to the Sun sweeps out equal areas in equal time intervals



The two areas swept out are equal

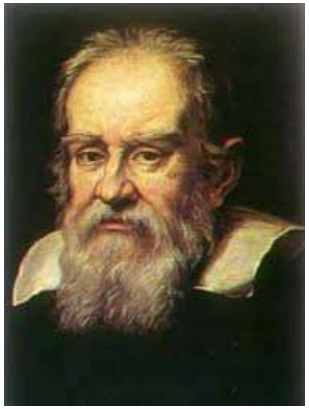
Kepler's 3rd law
The squares of the periods of the planets are proportional to the cubes of their mean distance from the Sun

In our solar system if T is in years and R is in AU then $\frac{T^2}{R^3} = 1$

The main astronomical discoveries of Galileo related to the Solar System:

•phases and apparent size of Venus (is it orbiting the Sun?)

•relief features of the Moon



•principal satellites of Jupiter (Callisto, Europa, Ganymede, Io)

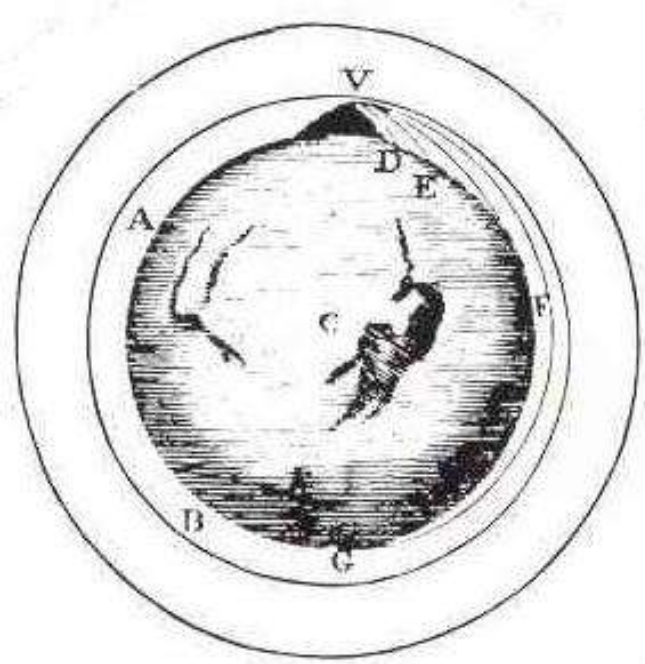
Ceres
The first asteroid ever discovered. A Sicilian monk, Giuseppe Piazzi first saw it in January 1801.

Uranus
It was first recognised as a planet by William Herschel in 1781 with the aid of his telescope.

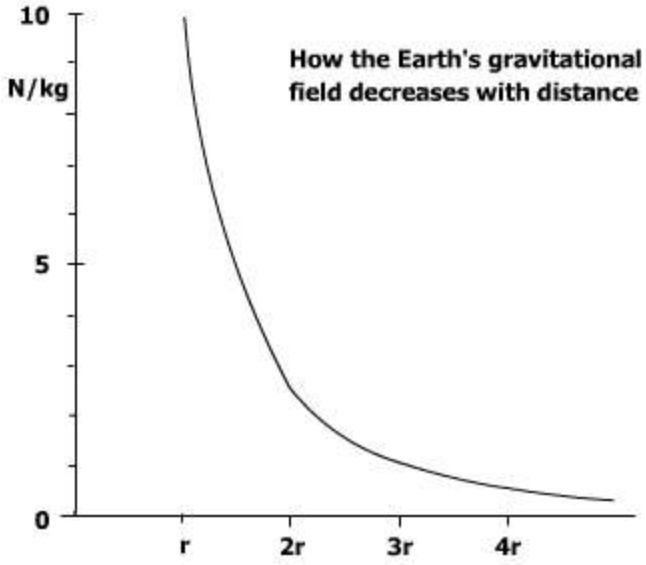
Neptune
The existence of Neptune was predicted before its discovery because of irregularities in the orbit of Uranus by Heinrich D'arrest in a position predicted by mathematician Urbain Le Verrier.

Pluto
The presence of Pluto was mistakenly predicted from irregularities in the orbit of Uranus in 1906 by American Percival Lowell. Despite an extensive search no planet was found until in 1930 Clyde Tombaugh, after a year of searching, found the elusive object.

He used a device called a blink comparator.



Gravity provides the attractive force that keeps smaller bodies in orbit around larger ones



Gravity gets weaker with distance

It follows an “inverse square” law. This means that if the distance increases by x then the gravity is x^2 times weaker

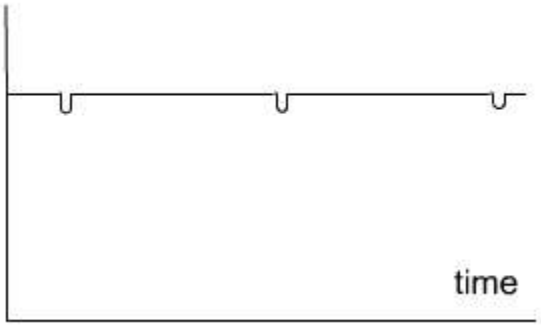
Exoplanets orbit other suns

All stars are so far that they are just points of light. Many have planets in orbit. How do we know they exist?

Astometry – very accurate measurements of the wobble of stars

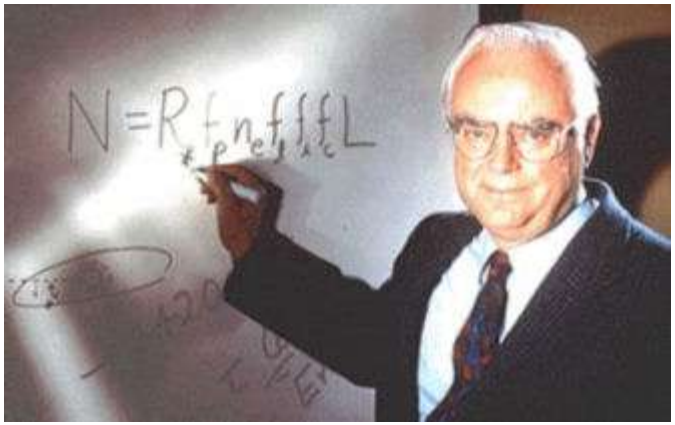
Light curves as they transit their star

Doppler shifts due to wobble



Water is probably essential for life. Water on earth may have been brought here by comets.

Giotto probing a comet



According to Frank Drake's equation the chances of us making contact depend on ...

R* = stars formed per year in our galaxy

f_p = what fraction of these stars have planets

n_e = how many of these planets could support life

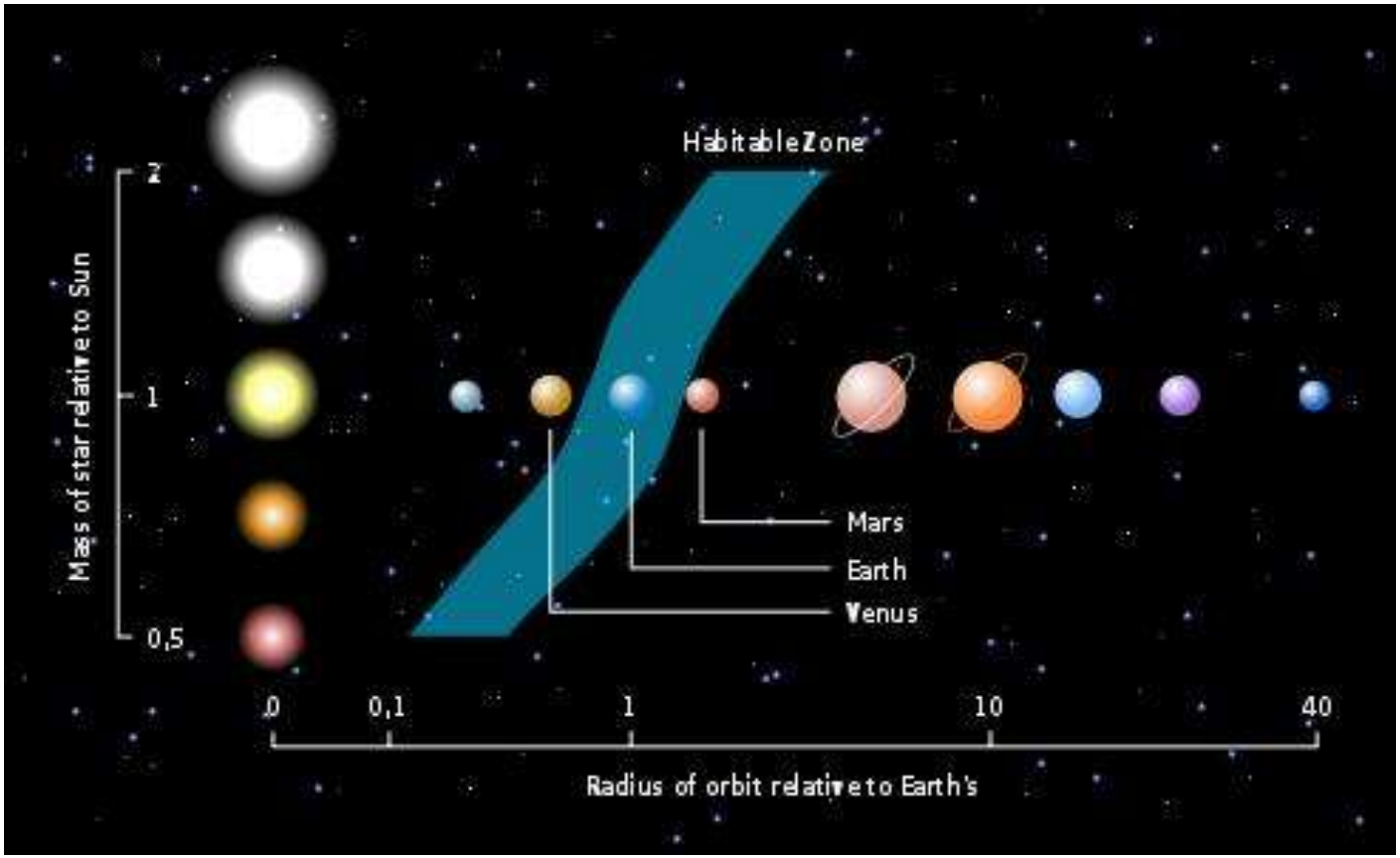
f_l = what fraction of these go on to develop life

f_i = what fraction of this life is intelligent

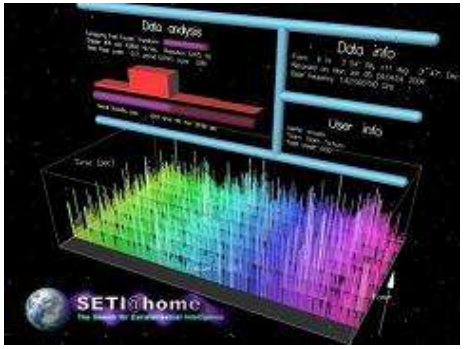
f_c = what fraction of these develop technology that make them detectable to other civilisations in space

L = for how long they release such signals

Life could only exist on planets within **habitable zones**



Looking for life



If we discover it ...?

Sharing technology knowledge
Increasing our knowledge of the Universe

Are they friendly?
Might we infect each other?