The forming of the solar system

Throughout the Milky Way, and other galaxies like it, are Massive swirling clouds of dust and gas known as nebula. It is within nebula that stars are born. Our star, the sun as we all Know, was created in a nebula.

It is thought that supernova explosions (the event of a dying star) causes masses of dust particles to be drawn together to make a gigantic spherical cloud. As more and more dust is accumulated in the centre of the cloud, the greater the gravitational pull becomes, this causes more dust to pile into the cloud eventually leading to it collapsing in on itself! As this is happening, the speed that the cloud spins increases dramatically which stops more dust being sucked into the centre. This effect is very much like spinning a pizza which as we all know, forces the dough mixture outwards making a larger, flatter surface area. This is how a solar system is created inside a nebula.

The Birth of a star As more dust gathers at the centre of the more disc like cloud, the temperature increases by a massive amount. Over time, enough energy (mainly thermal energy) is produced which forms nuclear reactions to take place. Hydrogen atoms then fuse to form helium, releasing enormous amounts of energy in vigorous bursts. This marked the birth of the sun, although it would take between one and 10 million more years for it to settle into the main sequence star recognizable today.

The forming of the planets

The planets, and other extraterrestrial objects such as asteroids, formed in the flat plane of the spinning disc of dust. Electrostatic forces or sticky carbon coatings made dust particles stick together to form clusters, which in turn stuck together to form rocks. Mutual gravity caused these rocks to come together, eventually to form planets. This 'coming together' of material is a process known as accretion.

Supernovas:

Supernovae are a sudden burst of radiation that can often outshine entire galaxies, after its initial explosion the bright light can fade from view for weeks or months. During its disappearance it can be expected to emit as much radiation as our sun will in its entire lifespan.

The super massive explosion expels most of a stars matter and a velocity of up to 30,000 km/s (around 10% of the speed of light). This drives a shock wave into the rest of the interstellar medium. This shock wave sweeps up an expanding shell of gas and dust called a supernova remnant.

Supernovae only occur about once every 50 years in the Milky Way, therefore I huge amount of study is required of many galaxies to find these rare and spectacular events.

Classification of Supernovae:

Supernovae Taxonoy

Type 1	**Classifications**
Ia	Lacks Hydrogen and presents a singly ionized silicon (Si II) line at 615 nm, near peak light
Ib	Non-ionized helium (He I) line at 587.6 nm and no strong silicon absorption feature near 615 nm
IC	Weak or no helium lines and no strong silicon absorption feature near 615 nm.
Type 2	
IIP	Reaches a "plateau" in its light curve.
IIL	Displays a "linear" decrease in its light curve (linear in magnitude versus time).

Supernovae are a key source of elements heavier than oxygen. These elements are produced by nuclear fusion (for iron-56 and lighter elements), and by nucleosynthesis during the supernova explosion for elements heavier than iron.

Supernovae are the most likely, although not undisputed, candidate sites for the r-process, which is a rapid form of nucleosynthesis that occurs under conditions of high temperature and high density of neutrons. The reactions produce highly unstable nuclei that are rich in neutrons. These forms are unstable and rapidly beta decay into more stable forms.

The r-process reaction, which is likely to occur in type II supernovae, produces about half of all the element abundance beyond iron, including plutonium, uranium and californium. The only other major competing process for producing elements heavier than iron is the s-process in large, old red giant stars, which produces these elements much more slowly, and which cannot produce elements heavier than lead. The nearest supernova candidate is IK Pegasi (HR 8210), at a distance of 150 light-years.

The forming of the moon:

Pre Apollo theories:

- The moon was formed alongside the earth
- The moon formed elsewhere in the solar system then captured
- The moon spun off from the early earth.

Evidence:

1) Basalt rock means that part of the moon was very hot as basalt only forms in high temperatures.
2) Isotopes found in the rocks were the same in the Earth's.
3) The moon must have been complete liquid at the start of its creation.

Current Theory:

A proto Earth was struck by a small planet which was on the same orbit. Materials blown off which collected together to form the moon.

Age of the Moon's Surface:

The early solar system had lots of stray rocks in space and therefore many meteorites and craters being formed. As the moon has very little atmosphere the early craters can still be seen. It has no magnetic field or not enough gravitational force to hold its atmosphere.

The maria are due to molten rock coming out of the ground and covering the surface. The lack of craters tells us this surface is younger.

Finding Exo-Planets

NASA scientists have found more than 1000 planets from distant solar systems and 500 new worlds using a particular technique. The way they have found all these new planets, by continuingly watching a star and watching for slight dips of light, this means there is a chance that there is a planet orbiting that star.

This technique is like trying to find a flea flying across a cars headlight.

How far away are the planets in our solar system from the sun?

- **Mercury: 58 million km**
- **Venus: 108 million km**
- **Earth: 150 million km**
- **Mars: 228 million km**
- **Jupiter: 778 million km**
- **Saturn: 1430 million km**
- **Uranus: 2880 million km**
- **Neptune: 4500 million km**