The Big Bang Theory

Scientists have gathered a lot of evidence and information about the Universe. They have used their observations to develop a theory called the Big Bang. The theory states that about 13.7 billion years ago all the matter in the Universe was concentrated into a single incredibly tiny point. This began to enlarge rapidly in a hot explosion, and it is still expanding today.
Evidence for the Big Bang includes:

- all the galaxies are moving away from us
- the further away a galaxy is, the faster it is moving away.

These two features are found in explosions - the fastest moving objects end up furthest away from the explosion.

Scientists have also detected a cosmic microwave background radiation or CMBR. This is received from all parts of the Universe and is thought to be the heat left over from the original explosion.

Birth of Stars

Stars form from massive clouds of dust and gas in space. Gravity pulls the dust and gas together.

As the gas falls together, it gets hot. A star forms when it is hot enough for nuclear reactions to start. This releases energy, and keeps the star hot. The outward pressure from the expanding hot gases is balanced by the force of the star's gravity. Our sun is at this stable phase in its life. Gravity pulls smaller amounts of dust and gas together, which form planets in orbit around the star.

Interpreting the evidence
Summary of some of the evidence of the Big Bang and its interpretation

Evidence	Interpretation
light from other galaxies is red-shifted (change in color frequency)	other galaxies are moving away from us
The further away the galaxy, the more its light is red-shifted	The most likely explanation is that the whole Universe is expanding and this supports the theory that the start of the Universe could have began with a single explosion

(http://www.bbc.co.uk/schools/gcsebitesize/science/ocr_gateway/energy_resources/big_bangrev2.shtml)

Expanding Universe Theory

Hubble showed that, in our expanding universe, every galaxy is rushing away from us with a speed which is in direct proportion to its distance, known as Hubble's Law, so that a galaxy that is twice as far away as another is receding twice as fast, one ten times as far away if receding ten times as fast, etc. The law is usually stated as v = H0D, where v is the velocity of recession, D is the distance of the galaxy from the observer and H0 is the Hubble constant which links them. The exact value of the Hubble constant itself has long been the subject of much controversy: Hubble's initial estimates were of the order of approximately 500 kilometres per second per megaparsec (equivalent to about 160 km/sec/million light years); the most recent best estimates, with the benefit of the Hubble Telescope and the WMAP probe, is around 72 kilometres per second per megaparsec. (It should perhaps be pointed out that the Hubble constant is technically a parameter, not a constant, because it will actually change over long periods of time.)

This expansion, usually referred to as the "metric expansion" of space, is a "broad-brush effect" in that individual galaxies themselves are not expanding, but the clusters of galaxies into which the matter of the universe has become divided are becoming more widely separated and more thinly spread throughout space. Thus, the universe is not expanding "outwards" into pre-existing space; space itself is expanding, defined by the relative separation of parts of the universe. Returning to the image of the expanding universe as a balloon inflating, if tiny dots are painted on the ballon to represent galaxies, then as the balloon expands so the distance between the dots increases, and the further apart the dots the faster they move apart. Another analogy often used (and maybe even clearer) is that of a raisin cake expanding as it bakes, so that the raisins (galaxies) gradually all move away from each other.

In such an expansion, then, the universe continues to look more or less the same from every galaxy, so the fact that we see all the galaxies receding from us does not necessarily mean that we are at the very centre of the universe: observers in all other galaxies would also see all the other galaxies flying away according to the same law, and the pattern of galactic dispersal would appear very much the same from anywhere in the cosmos.

(http://www.physicsoftheuniverse.com/topics_bigbang_expanding.html)

Nebula Theory

The nebular theory is an explanation for the formation of solar systems. The word “nebula” is Latin for “cloud,” and according to the explanation, stars are born from clouds of interstellar gas and dust. The transition from an undifferentiated cloud to a star system complete with planets and moons takes about 100 million years. According to this theory, our own solar system formed about 4.6 billion years ago, and others are forming today in distant nebulae.

What the Theory Explains

As it relates to our own solar system, the nebular theory explains three observable facts. The first is that the planets all rotate in the same direction. The second is that they all orbit within 6 degrees of a common plane. The third is that all the terrestrial planets, which are those within the orbit of the Asteroid Belt, are rocky, while those outside it are gaseous. The theory also explains the existence of the Kuiper Belt -- a region on the fringes of the solar system with a high concentration of comets.

A Star Is Born

According to the nebular theory, a solar system begins when an interstellar cloud, containing approximately 75 percent hydrogen, 25 percent helium and traces of other elements, begins to form areas of higher concentration, or clumps. As the clumps grow, gravitational forces increase and get converted to the kinetic energy of the increasingly fast-moving particles, which collide with one another and generate heat. Eventually one clump dominates, and when its temperature reaches 10 million degrees Kelvin (18 million degrees Fahrenheit), nuclear fission begins. The outward pressure created by the fission reactions prevents further collapse, and the clump of burning hydrogen gas stabilizes and becomes a star.

(http://education.seattlepi.com/nebular-theory-4444.html)