# Stars and Universe

**Introduction**

Looking at the night sky on a new Moon night, one sees innumerable number of luminous objects, called the stars, grouped together in constellations (group of Stars that seem to form the shape of an animal). Then, there are the planets orbiting round the Stars, the Moons circling round the planets and so on. The Stars that we see are some of those that make up what is called a galaxy and our Earth belongs to one nicknamed the Milky Way. There are several other galaxies separated from our galaxy by large distances. It is estimated that there are something like hundred thousand million ($10^{11}$) galaxies in the Universe and each galaxy contains multiples of that number of Stars. There is also an occasional visitor called the comet with its long shining tail. All this fascinated man and led him to ask as to how all this came about. In the early days, man associated these heavenly bodies with abodes of gods who presided over the destiny of individuals and governed the Universe. From this belief, arose the field of astrology, which had at its basis a belief that life of men on this planet Earth is governed by other planets in the solar system and other heavenly bodies. This gave rise to the concept of horoscopes, used to foretell events in the life of an individual. In some cultures, there was also a belief that life exists on these heavenly bodies.

It is only after the development of systematic scientific methods that man has been able to know how distant these bodies are. What their composition is, whether they are stationary or moving and if they are moving, then with what speed etc. While seeking answers to these questions it has been possible to trace the life history of these bodies, and that of the Universe as a whole, and to even project their ultimate destiny.

**Astronomy**, study of the universe and the celestial bodies, gas, and dust within it. Astronomy includes observations and theories about the solar system, the stars, the galaxies, and the general structure of space. Astronomy also includes cosmology, the study of the universe and its past and future. People who study astronomy are called astronomers, and they use a wide variety of methods to perform their research. These methods usually involve ideas of physics, so most astronomers are also astrophysicists, and the terms astronomer and astrophysicist are basically identical. Some areas of astronomy also use techniques of chemistry, geology, and biology.

The ultimate goal of astronomers is to understand the structure, behavior, and evolution of all of the matter and energy that exists. Astronomers call the set of all matter and energy the universe. The universe is infinite in space, but astronomers believe it does have a finite age. Astronomers accept the theory that about 14 billion years ago the universe began as an explosive event resulting in a hot, dense, expanding sea of matter and energy. This event is known as the big bang (see Big Bang Theory). Astronomers cannot observe that far back in time. Many astronomers believe, however, that within the first fraction of a second after the big bang, the universe went through a tremendous inflation, expanding many times in size, before it resumed a slower expansion (*see* Inflationary Theory).

**Solar system**

Definition: Sun and bodies orbiting it: the Sun and all the planets, satellites, asteroids, meteors, and comets that are subject to its gravitational pull

The solar system consists of the Sun, its orbiting planets, and their moons as well as dwarf planets, asteroids, comets, and meteoroids. The planets are, in order from the Sun: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. Pluto has been counted as a planet, but is now officially classified as a dwarf planet. The solar system probably formed from a cloud of gas and dust that broke away from a larger cloud about 4.6 billion years ago. Gravitational forces caused the cloud to spin and contract. The center, becoming densely packed and extremely hot, formed the Sun. The outer material formed a disk, which clumped into bodies that collided and cooled to form the planets.

**Sun**

The Sun is a medium-sized self-luminous gaseous mass that contains 99.9% of all the matter in the solar system. It is of average brightness for a star. All the planets, including the Earth, revolve around the Sun. Although less than half a billionth of the Sun's energy strikes the Earth each second, it is enough to support life. Sunspots, which appear as dark spots on the Sun's surface, are cooler regions on the Sun. Solar flares (eruptions of gas and particles associated with sunspot activity) can disrupt communications and electrical power systems on the Earth. The solar wind, a stream of charged particles that blasts the entire solar system, causes magnificent auroral displays.

**Mercury**

Mercury is the planet nearest the Sun. From Mercury's hot, dry surface, the Sun appears twice as large as it does from Earth. Mercury's surface temperatures, which have the widest range in the solar system, can reach $427^0$C (800F) at midday, falling to $-184^0$C (-300F) in the middle of the night. Mercury's surface is covered with craters from the bombardment of meteors and comets. Mountain ridges have resulted from shock waves and the slow cooling of the planet. Mercury seems to be made mostly of iron, and much of its outer rocky material is believed to have been blasted away by an asteroid. Its gravitational field is too weak to hold more than a thin atmosphere of sodium vapor and helium.

**Venus**

The planet Venus is second in order from the Sun. Although it is twice the distance from the Sun as Mercury, it is the hottest planet in the solar system. A thick, cloudy atmosphere of carbon dioxide traps the Sun's heat and bathes the planet's surface in a drizzle of sulfuric acid caused by volcanic eruptions. The surface of Venus consists of low-lying plains and highland regions shaped by volcanoes and lava flows. It is believed that volcanoes continue to erupt on Venus, as sulfur dioxide levels vary and unusually hot regions have been recorded. Except for three features, all of Venus's landmarks are named after women. A map of Venus shows a crater named Cleopatra, a canyon called Diana, and a plain named Guinevere.

**Earth**

The planet Earth is third in order from the Sun. Because of its distance from the Sun, the presence of a protective atmosphere, and a correct mixture of organic chemicals, Earth is the only planet in our solar system that can sustain life. It is also the only planet on which the same substance (such as water) can exist in gaseous, liquid, and solid forms. Earth is an extremely dynamic, active planet whose crust is constantly recycling itself by the constant motion of its plates.

**Mars**

The planet Mars is fourth in order from the Sun. It is half the size of Earth, its day is almost exactly the same length as Earth's, and, like Earth, it tilts on an axis, which results in seasons. They are the familiar winter, spring, summer and fall,. But there are also two additional seasons, aphelion and perihelion, which occur because of Mars' highly elliptical orbit These changing seasons probably give the planet its 161 km/h (100 mph) winds, which cause its raging dust storms. Mars has two moons, which are possibly captured asteroids. The planet's southern hemisphere is an old, stable surface with many craters. Its northern hemisphere, however, holds vast lava flows and gigantic volcanoes that are the largest in the solar system. A huge rift valley called the Valles Mariners is large enough to swallow up the Rocky Mountains. Thousands of branching channels snake across plains that are concentrated near the equator. These channels resemble river systems found on Earth and may have been formed when conditions on Mars were much different from what they are today.

**Jupiter**

The fifth planet in order from the Sun, Jupiter is the solar system's largest planet. It is more than twice the size of all the other planets combined. Surrounded by its 63 moons, Jupiter resembles a miniature solar system. Like a star, it is made mostly of gases and generates its own heat. Scientists theorize that if Jupiter had about 70 to 100 times more matter, it would be a star. Jupiter's atmosphere is made up of bands of moving gases. The dominant Great Red Spot, three times the diameter of the Earth, is a huge storm that has existed at least as long as telescopes have been viewing Jupiter. A speedy rotation (once every ten hours) gives Jupiter the shortest day of any planet and helps support its powerful magnetic field, which is thousands of times the strength of the Earth's. Nighttime on Jupiter is far from dark; the sky is lit up by its many moons, a shimmering aurora caused by its magnetic field, and flashes from gigantic lightning bolts.

**Saturn**

The planet Saturn is sixth in order from the Sun. It is surrounded by thousands of rings made up of small particles of ice and rock. These may be debris from a former moon that was shattered in a collision with another celestial body. Saturn has at least 60 moons, and some of them show evidence of such collisions. Saturn's density is so low that this gigantic planet could float on water, a clue that it consists mostly of hydrogen and helium gases. Saturn generates its own heat, probably because gases are separating in its interior, similar to the action between oil and vinegar. This separation enables gases to change some of their movement or kinetic energy into heat energy. Saturn has a strong magnetic field whose poles match its geographical poles.

**Uranus**

The planet Uranus is seventh in order from the Sun. Its most characteristic feature is that it spins on its side, with one pole facing the Sun. One theory suggests that Uranus was struck by a large object and knocked onto its side. The intruder was pulverized, and its debris formed clouds of water vapor and rocky debris around Uranus. This debris later settled to form the many moons and thin, dark rings that surround the planet. Another theory holds that the rings may have formed from debris created when some of Uranus's moons were smashed by small meteors. Like Neptune, most of Uranus is a dirty ocean of water laced with ammonia and methane and underlain by a rocky core. A hydrogen and helium atmosphere holds a trace of methane that gives the planet its blue-green color.

**Neptune**

The planet Neptune is eighth in order from the Sun. With huge storms that blow at up to ten times the force of a hurricane, almost enough to break the sound barrier, Neptune is the solar system's windiest planet. One of its great mysteries is what drives these ferocious winds. Four times the size of Earth and slightly smaller than Uranus, Neptune probably has no definite boundaries between its layers. It has a small core of molten rock surrounded by an ocean mixed with rocky material and mud. The top of the ocean gradually grades into an atmosphere composed of hydrogen and helium. A little methane gives Neptune its blue-green color.

**Pluto**

The dwarf planet Pluto lies in part of the Kuiper Belt, a disk of icy bodies beyond Neptune. Once counted as the ninth planet in order from the Sun, Pluto has an elliptical orbit that at times can bring it closer than Neptune to the Sun. Because Pluto has not yet been visited by a spacecraft, less is known about it. Pluto seems more like an asteroid made of a mixture of rock and frozen water, ammonia, and methane than a true planet. Pluto and its one moon actually function like a double dwarf planet. Charon, the moon, is about half of Pluto’s size and would appear in Pluto’s sky to be about six times the size of the Earth’s moon. The two bodies revolve around a balance point that lies between them.

**Historical Accounts**

Around 340BC, the famous Greek philosopher Aristotle gave two good arguments for believing that the Earth was a sphere rather than a flat plate. Eclipses of the Moon were caused by the Earth's shadows on the Moon of the light from the Sun. these were always round. Therefore the Earth must be spherical except if the collapses’ always occurred when the Sun was directly under the flat disk (Earth). If the Earth were a disk, the shadows would be usually elliptical (eclipse means an elongated circle). Greek travelers knew that the North Pole Star was lower in the sky. The more southern their positions of observation. From the difference in apparent position. Aristotle was able to deduce the apparent distance around the Earth (circumference to be about 400,000 stadium or about 2 times the currently accepted value if we take stadium to be equal to 200 yards). The Greeks had a third argument that the Earth must be round one first sees the sails of a distant ship coming from the horizon and only later does one see the hull.

Aristotle thought that earth was stationary and that the sun, moon, planets, and Stars moved in circular orbits about the Earth (he felt for mystical reasons that the Earth was at the center of the Universe and that circular motion was the most perfect). Around 200AD, Ptolemy elaborated the Earth-centered idea into a complete cosmological model in which the Earth is at the center surrounded by 8 spheres that carried the Moon, the Sun, the Stars and the 5 known planets (Mercury. Venus, Mars, Jupiter, and Saturn). The planets moved on circles attached to their sphere (this accounted for their rather complicated observed paths in the sky). The outermost sphere carried fixed Stars-which notate together (while maintaining the same relative positions to each other) across the sky. What lay beyond the last sphere was never made clear, but not part of mankind's observable Universe.

In 1514AD Nicholas Copernicus a Polish priest anonymously circulated a simpler model-in which the Sun was stationary at the center and the Earth and Galileo Galilei (Italian) almost a century later publicly supported the Copernican theory even though the orbits it predicted didn't quite match the ones observed. In 1609AD, Galileo observed the Moon’s of Jupiter with a telescope thereby demonstrating that everything did not have to orbit directly around the Earth. This was deathblow to the Aristotelian/Ptolemaic theory. At about the same time Johannes Kepler modified Copernicus’s theory suggesting that the planets moved not in circles but in eclipses. His predictions now finally matched with observations.

**General Overview of Solar system**

There are two kinds of planets in our solar system. One kind is called a **Terrestrial planet** because it is very much like Earth. The other is called **a Jovian planet** because it is more like Jupiter. When the solar system formed, the planets took shape out of clouds of dust and gas. Those planets that formed near the Sun, like Earth formed mainly out of heavy dust containing elements such as iron and carbon, while the lighter gases were burned away by heat of the Sun. So the **terrestrial planets-Earth, Mars, Mercury, and Venus**- are small and solid. But Jovian planets formed far from the Sun, where the Sun’s heat was not strong enough to burn away the gases. So the **Jovian planets -Jupiter, Saturn, Neptune and Uranus-** are much larger and lighter, made up of liquids or gases, with a small center of solid matter.

Almost everything in the Universe travels in a circular path. The Moon goes around the Earth, the Earth and other planets go around the Sun and even the Sun revolves around the centre of our galaxy. This is because of two basic laws of science. First, and object moving in space, where there is no air to slow it down, will continue to move forever once it begins in motion. The Moon has been moving through space ever since it was formed billions of years ago. But the gravity of the Earth pulls the Moon toward us. This gravity is not strong enough to pull the Moon into the Earth, but it holds the Moon at a certain distance from the Earth, where the gravity of the Earth, the Sun, and the planets balanced. So the Moon keeps moving around the Earth at that distance, traveling in a circular path called an orbit. The Earth goes around the Sun for the same reason.

**Law of Universal Gravitation**

Kepler however didn't like his elliptical orbits, as they didn't agree with his idea that planets moved round the Sun under the influence of magnetic forces. An explanation was provided much later by sir Isaac Newton when he Published in 1687AD, his Philosophiae Naturalis Phinapia Mathemtica (commonly called the 'principia'), in which he postulated a law of Universal Gravitation according to which each body in the Universe was attracted toward every other body by a force that was stronger the more massive the bodies and the closer they were to each other. He also developed the complicated mathematics needed to analyze these motions. This is the same force that causes objects to fall to the ground. Gravity causes the Moon to move in an elliptical orbit around the Earth, and causes the Earth and planets to follow elliptical paths around the Sun.

## STARS AND GALAXIES

Stars, unlike planets, are luminous bodies. They radiate because of their high temperatures. The interior of a Star is at a very high temperature of the order of hundred million degrees, $10^8$K. As one moves from the interior of the Star to its surface, the temperature falls down with the result the surface temperature of a Star is much less. The temperature of the inner core of our Sun is around $10^{8}$'K whereas its surface temperature is only 6000K. For all practical purposes, for an observer on Earth, the Sun appears to be white in colour. The surface temperature determines the appearance of any Star. If one takes a piece of iron and heats it to about 900K, it appears reddish; violet is hotter than bluish which in turn is hotter than a reddish flame and so on. Therefore, different Stars radiate different colours.

**0rder of magnitudes of Stars and Galaxies**

Our solar system is a tiny island that occupies a minute volume of the Universe. The Sun is a fairly ordinary Star among thousands of others, and microscopic (tiny) on a cosmological scale. Several thousands of millions of Stars cluster together to form what are called galaxies, thus if one considers our Sun as a small tennis ball, Then the Earth would appear to be a grain of sand orbiting round the ball at a distance of ten meters. On this scale, a galaxy would consist of hundred billion ($10^{11}$) tennis ball, each separated from the other by average distance of about 1600 kilometers.

The speed of light is about 300,000,000 ($3\times10^8$) meter per seconds. That means that light travels a distance of $9x10^{15}$metres in a year. Since this is typical of distance encountered in astronomy and cosmology (the study of the Universe), it is given the special name light year. The distance of our Moon from the Earth is 1.2 light second ($3.6\times10^8$m). The nearest Star other than the Sun is some four light years away. The size of our galaxy is hundred thousand light years i.e. about $9\times10^{20}$m, light-year is equal to six trillion miles. The nearest galaxy that we can see namely the Andromeda is two million light years (about $1.8\times10^{22}$ m) away and so on. The Sun is eight light minutes away or is at a distance of $14.4x10^{10}$m, it also means that if for some reason the Sun were to disappear now, we will know the disappearance of the Sun eight minutes later. Similarly, light Starting from a Star 43 light years away would take 43 years to reach us on the Earth.in other words, in 2001, we see the light that emanated from this star in 1958. It also means that we do not and cannot even in principle see the Star as it is at any given instant of time. Thus when we look at distant Stars, we see them as they were at different times in the past enabling us to piece together the evolutionary history. Another quantity used by astronomers is called parsec, which is equal to 3.26 light years. The sec refers to a second of arc, which is a measure of an angle. It is found that a star at a distance of 1 parsec from the Earth will shift in position across a background of much more distant stars by about 1 second of arc when viewed from the Earth on opposite sides of its orbit around the Sun. Our galaxy is about 30,000 parsec from end to end, or about 99,000 light year across.

**Life Cycle of a Star**

A Star is formed when a large mass of gas (mostly hydrogen) starts to collapse in on itself due to gravitational attraction. The gas heats up and this contraction leads to increased collision of the gas atoms with greater and greater speeds and so the gas heats up. The gas becomes so hot that the colliding atoms no longer bounce off but coalesce to form helium atoms releasing heat equivalent to that of a controlled hydrogen bomb. This is what makes the Sun and Stars shine! The additional heat increases the pressure of the gas until it is sufficient to balance the gravitational contraction and the gas stops contracting. Stars remain like this for a long time. Stars spend over 90% of their life in more or less at the same position and conditions of the main sequence in the equilibrium stage maintaining its temperature and luminosity. The equilibrium of the Star is determined by the thermonuclear reactions taking place in the core of the Star.

In the process of formation of helium nuclei consisting of two protons and two neutrons from collision of four hydrogen nuclei (protons), the number of nuclear particles per cubic centimeter, decreases at the core as helium formation proceeds. When about 10% of hydrogen in the Star is converted into helium the Star changes its appearance dramatically. With the formation of helium, pressure decreases and gravitation becomes more dominant. Then the nuclear fuel ends. The end of the Star is when the fuel finishes. Paradoxically, the more fuel the Star starts with, the sooner it runs out! This is because the more massive the Star is the hotter it needs to be to balance its gravitational attraction. And the hotter it is the faster it will use up its fuel! When a Star runs out of fuel, it starts to cool and the internal heat pressure can no longer balance the gravitational contraction.

**White Dwarfs and Neutron Stars**

When all its fuel has run out the inner dense core of the Star settles as a white dwarf (with radius of a few thousand miles and density of hundreds of tons per cubic inch). In 1928, Indian postgraduate student Subrahmanyan Chandrasekhar on his way to Cambridge University in England worked out what happens to a Star as it starts to cool off and contract under its own gravity. How big could a Star be and still support itself against its own gravity after it has used up all its fuel? He realized that as the central core of a white dwarf contracts. It gets into the limits of uncertainty principle, which prevents a white dwarf from collapsing to infinite density. In the collapsing Star under gravitational forces, there are a large number of electrons confined in a small volume, giving rise to quantum repulsion between them due to Pauli Exclusion Principle. This principle states that no two electrons can occupy a given state or can exist at one place at the same time. On exhaustion of the nuclear fuel namely hydrogen and helium Stars with mass less than the Chandrasekhar limit namely 1.4 solar mass, settle down as white dwarfs. White dwarfs come to the dull end, slowly cooling, coming less and less luminous and finally slip below the limit of detection. A large number of white dwarfs have been observed. One of the first discovered is a Star orbiting Sirius-the brightest Star in the night sky. Above the Chandrasekhar Limit some massive Stars may explode. For the Star, the disaster takes the form of supernova explosion. Some may manage to throw off enough matter to reduce its mass below the Chandrasekhar Limit and so avoid the catastrophic gravitational collapse.

A Star with a mass about the Chandrasekhar limit builds up carbon and oxygen through thermonuclear reactions. Such Stars proceed further to synthesize nuclei of heavier elements. The synthesis of nuclei during thermonuclear reaction is referred to as nucleosynthesis. Interestingly, about the same time as Chandrasekhar' the Russian Physicist Davidovitch Landau, also theorized the existence of neutron Stars (and pulsars). The neutron Stars are supported by the Pauli Exclusion Principle between neutron and protons (rather than between electrons). There radius is only 10miles or so and a density of hundreds of millions of tons per cubic inch. The core, Because of various nuclear reactions collapses inwards. This collapse takes-place very fast to reach the density of nuclear matter in the range of $10^{12}$ -$10^{14}$g/cc. this conclusion need not cause any surprise since Stars having such high mean densities have been observed. This collapsed inner core become a neutron star or a black hole depending upon the mass of the Star.

## THE UNIVERSE

Like space, the Universe stretches in time over an equally vast range. The longest time interval is of course the age of the Universe, which is around 20billion years. Our Sun has been burning as brightly as today over the last five billion years and it is hoped that it will sustain life on planet for another five billion years or so. Our planet acquired its separate identity about 4.6 billion years ago. Scientists believe that it is a rare privilege of our planet to have evolved the first living cell some 3.7 billion years ago. Man, as we know of him today, is said to have evolved some millions of years ago, although, an individual human being lives at best for hundred years.

### Boundary of the Universe

It used to be generally believed that either the Universe had existed forever in an unchanging state, or that it had been created at a finite time in the past more or less as we see it today. Newton realized that according to his theory of gravity, the Stars would attract, each other and would fall together at some point. He then reasoned that this would only happen if there were only a finite point. He then reasoned that this would only happen if there were only a finite number of stars distributed over a space. It would not happen if there were an infinite number of stars distributed more or less uniformly over infinite space because there would be no central point for them to fall to. This gave rise to the concept of infinite static Universe.

However, if this happened the intervening matter would eventually heat up until it glowed as brightly as the Stars. The only way to avoiding the conclusion that the whole of the night sky should be as bright as the surface of the sun would be to assume that the Stars had not been shining forever but had turned on at some finite time in the past. In that case, the absorbing matter might not have heated up yet or the light from distant Stars might not yet have reached us. Which brings us to the question of what could have caused the Stars to have turned on in the first place. No then one suggested that the Universe was expanding or contracting

**Expanding Universe**

Radiation from Stars and galaxies convey to us the relevant information concerning the distance of the Star or the galaxy, its temperature, the chemical composition of its atmosphere, its velocity away or towards us, etc. In 1929, Edwin Hubble made the landmark observation that wherever you look, distance galaxies are moving rapidly away from us! In other words, the Universe is expanding. It seems that about 10 or 20 thousand million years ago (10 or 20 x $10^9$ years) all objects were at exactly the same place and the density of the Universe would have been infinite. It was determined from these observations that every galaxy was moving from our own with a velocity proportional to their distance from our galaxy. This implied that farther the galaxy, the faster it was receding away from our galaxy. Hubble's relation states that 'the velocity of separation V of any two galaxies separated by a distance R is V = HR where H is a constant, called the Hubble constant is presently estimated at 15km per second per million light years. Hubble's relation is extremely significant and provides crucial information on the nature of our Universe. The discovery that the Universe is expanding has been one of the greatest intellectual achievements of the human mind.

Curiously the general theory of relativity proposed by Einstein in 1915, predicted the expanding Universe. However, because of the firm faith and belief in static Universe, Einstein included empirically another force called antigravity, he felt that space-time has an inherent property to expand and this would balance gravitational attraction. It may, however, be mentioned that a Russian theoretician Friedman realized in 1922 itself the implication of the general theory of relativity and predicted the expanding Universe, which Edwin Hubble confirmed in 1929.

Moving away of any two galaxies with a velocity proportional to the distance separating them not only indicated that the Universe must be continuously expanding but that any instant of time, the Universe should look the same to the observer on all galaxies and in whatever direction they may look There is thus no unique location in the Universe. This is not only true for equidistant galaxies but for all galaxies in the Universe. Thus the Universe appears the same in terms of the distribution of galaxies and their speeds from whatever direction and from whatever places you may choose to observe. The Universe is thus isotropic, the fact that the Universe is isotropic and homogeneous is referred to as the cosmological principle

**Beginning and End of the Universe**

The underlying premise of mainstream cosmology is the big bang theory-currently accepted explanation of the beginning of the universe. The theory rests on three pillars of evidence. First, there is the discovery by the astronomer Edwin P. Hubble some 70years ago that light from galaxies is shifted toward the lower-frequency, or red, end of the spectrum in proportion to their distance from us. Just as the lowered pitch of a convoy siren indicates that it is moving away from, so does the redshift of the galaxies indicated that they are receding, and the fact that the recessional velocity is proportional to distance confirms that the Universe is expanding. By extrapolating backward from the current rate of expansion, astronomers have concluded that the big bang occurred about 13, billion years ago. Second evidence is the cosmic background, which was discovered in 1965 by Arno A. Penzias and Robert W. Wilson of Bell Telephone Laboratories, USA. It is believed that the radiation they observed was emitted when the Universe was only about 100,000 years old, and had been traveling freely since then in all directions, waiting to interact with their radio antenna. The third is the observed abundances of hydrogen, which form about three quarter of the total mass in the Universe and helium forming one quarter, with other heavier elements occurring in traces. Physicists have calculated that a big bang would forge elements in just such proportions through nuclear fusion, also known as nucleosynthesis.

Many scientists believe that the Universe began with a tremendous explosion that sent all matter flying out into space from some central point. The idea that the Universe began with a big explosion is called the big bang theory. Scientists have tried to figure out how long the universe will exist, but they haven't been able to agree with one another yet. Some scientists believe the Universe will go on forever, even after all the Stars are burnt out. The Universe will then be completely dark and cold for the rest of time. But others believe that gravity pull will eventually halt the expansion of Universe and causes it to collapse in a big crunch and start all over again. Right now, the Universe is getting bigger, and all the Stars are getting farther apart from one another.

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