UNIVIEW GLOSSARY

Solar System		
Solar System	Originally, some of the planets were named after Greek gods/goddesses, but, since Rome conquered Greece, the Roman Catholic Church dictated that the planets were to have the Roman Latin names. In the18th century, Copernicus was first with the idea of a heliocentric Solar System. While Galileo provided evidence that not everything orbits the Earth. Copernicus propositioned that the Sun was the center of a System of planets, which orbited about it. He eventually was proved right.	**The Open University: An Introduction to the Solar System, edited by Neil McBride & Iain Gilmour.** http://nineplanets.org.html
Sun: (Greek:Helios) Discovered by the Ancients. Approximately 93 Million miles from Earth (1 AU or Astronomical Unit)	The Sun is made of 92,1 %hydrogen and 7,8% Helium, The Sun is a fusion machine, delivering heat and light to all the planets. It is a G-4 Star, and it takes about 8 minutes for it's energy to reach Earth. Its estimated life is 9 billion years, and it is approximately 4.6 billion years old. The circumference:2.715 million miles. A day on the Sun is 25.4 earth days, and it orbits the Milky Way every 230 million years (and the Solar System goes with it!). Its core temperature is about 27 million degrees F; surface about 10,000 degrees F., and the Corona get up to 3.5 million degrees F.	http://nineplanets.org/sol.html
The Planets: Started with a huge, tenuous cloud of dust and gasses that accreted into the planets. The word `"planet" means "wanderer". There are a total of 8 planets- 4 inner planets, which are sometimes called "rocky planets" or "terrestrial planets" and 4 outer planets, called "the gas giants."	The cloud that contained the matter that was to become our Solar system contracted due to mutual gravitation, and began to rotate, contracting further. Due to the contraction, the cloud flattened out to a disk, and the dust particles began to stick together, as well as the gas particles. The inner 4 planets, "terrestrial planets" or "rocky planets", attracted more solids, and the 4 outer planets became gaseous. This disk was known as the "accretion" disk. All 8 of the planets orbit within a 11.5 degrees wide area. The Planets known to the ancients (and which can be seen with naked eye) are Mercury, Venus, Mars, Jupiter and Saturn. The planets discovered after the invention of the telescope are Uranus (1781), Neptune (1846) and Pluto (1930). However, Pluto became a "Dwarf Planet" per the International Astronomy Union (IAU) in 2005. (See definition of "Dwarf Planet" below)	http://nineplanets.org.html

Mercury: Named after the Roman god of travel, commerce and thievery, Mercury is the fastest and smallest planet. Although Mercury is the closest planet to the Sun, it is not as hot as the 2nd planet, Venus, which is hotter at 900 degrees Fahrenheit.	Mercury, the first planet from the Sun (only 35.5 million miles away), orbits around Sun in 88 days. It is our smallest planet at 3,031 mile in diameter Mercury has very little atmosphere, which is the major reason that is not as hot as Venus, which has an atmosphere (751 degrees versus 900 degrees Fahrenheit). Mercury has an iron core and a small amount of gravity, but no moon. The rotational period , or Earth day, is58.1 days Mercury has been visited by 2 US satellites: Mariner10 and Messenger, and only about 47% mapped. It is intended that Messenger, will map the entire planet (in color) before its mission ends, possibly late 2013. On 3/29/2011, we started receiving the latest images from Messenger, the only satellite to orbit Mercury.	http://nineplanets.org/mercury.html
Venus: (Greek-Aphrodite) Venus has some unusual facts: It rotates backwards and very slowly. Its day (rotation), is 244 Earth days. even longer than its year, 223 Earth days.	Named after the Roman Goddess of love and beauty, Venus is the 2nd planet from the Sun (about 67.7 million miles). The planet's temperature is 900 degrees F, due to its very thick cloud cover (a greenhouse effect). This condition makes it the hottest planet, even though it is not as close to the Sun as Mercury. The clouds are composed of mostly carbon dioxide (97%), sulphuric acid droplets (2%), with trace elements of other very corrosive compounds. Venus is a rocky, metallic world, mostly desert-like and arid, and is the 6th largest planet (almost the size of Earth), with very little magnetism. Venus has no moon. The atmospheric pressure is about 100 times that of Earth.	http://nineplanets.org/venus.html
Earth: Gaia, Old English or German; also Endymion; also. Latin: Terra	Sometimes known as "the third Rock from the Sun", Earth has a molten core, a diameter of 7,926 miles, rotates in 23.9 hours and orbits the Sun in 365.2 days. The distance from the Earth to the Sun is 93 million miles, known as an AU or astronomical unit. Earth has 1 moon, which is a natural satellite. The mean Earth temperature is 59 degrees F. There is a strong magnetic field around Earth, often affected by solar winds, which creates north and south Auroras, visible as a form of light as the atoms of the solar wind reacts with the upper atmosphere; the magnetic field lines merely channel the solar wind particles. (This magnetic field is called the Magnetosphere-see further information on Magnetosphere, below). The Earth's circumference is about 24.900 miles around, with a diameter of 7.926 miles. Its axis tilts about 23.5 degrees from the vertical. The Earth is moving through its orbit at about 66,600 mph. When we launch rockets, they must travel at nearly 25,000 mph to escape the Earth's gravitational pull.	http://nineplanets.org/earth.html

Moon: (Roman - Luna), (Greek - Selene or Artemis)	Our moon is a natural satellite of the Earth. Its gravitational effect is seen on Earth as the oceanic tides. It is the only celestial body visited by Man, and only 12 men have walked the surface. The moon's temperature varies between 253 degrees F in daytime to minus 387 degrees F at night. The Moon's rotation is measured in two ways. A sidereal month, measured with respect to the stars, and is about 27.32 days. A synodic month, measured from one phase to the same phase as seen from Earth, averages 29.53 days. It is tidally locked with Earth, i.e. the same side of the Moon faces Earth at all times. There is no atmosphere on the Moon. Water ice is thought to have been detected in polar craters, but this is not "oceans".	http://nineplanets.org/luna.html
Magnetosphere: The region around a planet or star in which the magnetic field of the body dominates relative to the ambient medium, or, in our case, the Solar Wind	In spite of its low density, the solar wind, and its accompanying magnetic field, is strong enough to interact with the planets and their magnetic fields to shape magnetospheres. A magnetosphere is the region surrounding a planet where the planet's magnetic field dominates. Because the ions in the solar plasma are charged, they interact with these magnetic fields, and solar wind particles are swept around planetary magnetospheres. Life on Earth has developed under the protection of this magnetosphere. At times of increased solar activity, particles in the solar wind reach inward along the magnetic field lines toward each pole, interacting with the upper atmosphere, to create a colorful glow. These are known as the Aurorae: Aurora Borealis around the North Pole, and Aurora Australis around the South Pole. A supersonic shock wave is created sun-ward of Earth somewhat like a sonic boom. This shock wave is called the Bow Shock. The elongation of the Magnetosphere, known as the Magnetotail, is caused when there is increased solar wind from a coronal mass ejection reaching the Earth. It sometimes extends about as far as the orbit of the Moon.	helios.gsfc.nasa.gov/magnet.html

Bow Shock: An arc-shaped shock wave curved around one face of a body, and away from a second body which is a source of rapidly travelling particles. The shock wave is the junction at which the speed of those particles abruptly slows, from super-sonic speeds to sonic waves, due to resistant forces of the first body.	In the case of the Earth's magnetic Bow Shock, the Sun emits a fast solar wind, which consists of rapidly-moving charged particles, both protons and electrons. These are 99% hydrogen and helium, but also include every other element. They abruptly slow on colliding with the Earth's magnetic field.	http://helios.gsfc.nasa.gov/magnet.html
Mars: (Greek - Ares) Mars is the fifth planet from the Sun (42 million miles) and was named after the Roman god War. It is being actively explored by Earth-controlled robotic means.	Mars appears angry or red faced, due to iron oxide on its surface. About one-half the size of Earth, it rotates in a day of 24.5 hours, and obits the sun in 687 Earth days (about 1.9 or 2 years). The daytime temperature starts at minus 21 degrees F. and rises to about 32 degrees F. Nights can get to minus 191 degrees F. The Valles Marineris Canyon, or Mars' Grand Canyon, stretches about 3000 miles, or about the distance from New York City to San Francisco, and is fully 1/5 the distance around Mars. Its depth varies from 6 to 10 miles. The highest known mountain in our solar system is on Mars: Mt. Olympus is 78,000 ft. high. (Earth's highest mountain, Everest, is about 29,000 feet.) Mars was first visited by 2 orbiters: Mariner 4 and Mars 2, in 1965. The first landing on Mars was in 1976, Viking 1 & 2. As of 2012, there are two rovers on Mars, Spirit and Opportunity. These rovers were only supposed to last 3 months, but one, Opportunity, is still going after 8 years, as of 2012, and Spirit is dormant. The next exploration of Mars will come in late in 2012, with the landing in August of the bus-sized rover, Curiosity. The Curiosity mission will focus on whether at one time Mars has had conditions conducive to life. Mars has 2 moons, Phobos and Deimos, both discovered in 1877, but neither has ever been visited by our spacecraft.	nineplanets.org/mars.html

Jupiter: (Greek-Zeus) The largest of the 8 planets, so big, that all of the other planets will fit inside its volume.	Jupiter is the 5th planet from the Sun, with an orbit of 11.9 years, and a day of only 9.9 hours. Named for the most powerful of the Roman gods, Jupiter is known for it "Great Red Spot" in the southern hemisphere (a storm lasting over 400 years with winds estimated to exceed 300 mph), and has travelled several times around the planet, relative to any possible fixed rotational marker below it. The "Red Spot" can fit about 2 to 3 Earths-sized planets in it. Jupiter, like all the gas giant planets, has a ring around it. However, the particles making up the ring are so far apart, that it can only be seen by the largest telescopes or by Hubble. Jupiter also has a very strong magnetic field, which probably attracts objects headed for Earth, thereby protecting us. At last count, Jupiter had 63 moons or natural satellites. The four largest moons of Jupiter are known as the Galilean moons and are named Callisto, Ganymede, Europa, and Io. Their names were derived from the Greek god Zeus' lovers. Galileo them in 1610, and used this discovery to disprove the prevailing idea that all planets revolved around the Earth. Jupiter is the first of the four "gas Giants" and the first of the "Outer" planets. It is composed of highly dense gaseous hydrogen and helium, with a metal hydrogen mantle, but a very small inner core, hence the phrase "Gas Giant." The average distance from the Sun is 4.9 AU.	http://nineplanets.org/jupiter.html
Saturn: (Greek-Cronus); also the father of Jupiter in mythology) The day, Saturday, is named after the planet	Saturn was named for the Roman god of agriculture and lies 885 million miles from the Sun, (9.6 AU). Saturn takes 29.5 years to orbit, but only 10.7 hours to rotate (day). Its diameter is 75,000 miles, making it the second largest planet. Its mass is 95 times that of Earth. It is the second of the four "Gas Giants". However, Saturn is less dense than Earth; it would float in a bathtub of water, if such a thing could be built in space. The mean surface temperature is -220 degrees F. Saturn's Rings are the most visible ones among the 4 gas giant planets, which all have rings. The Rings are composed of ice and rocks, and some ice-covered dust, but all the particles are so close together, they appear to be Rings. There are 62 moons (or satellites) orbiting Saturn.	http://nineplanets.org/saturn.html

Uranus: (Originally "the Supreme god of heaven" before Jupiter) was so named. It is unusual in that it rotates tilted at about 98 degrees from the ecliptic	Uranus is the 7th planet from the sun, and a "gas giant," The planet has 9 very dark rings, which were discovered indirectly from Earth, but have only been observed directly by Voyager 2. It has 29 moons, whose names are from the writings of Shakespeare & Pope, rather than classical mythology. It is colder than Saturn, minus 357 degrees F. It is the 3rd largest planet, 31,763 miles in diameter at its equator. It rotates every 17.2 hours. It takes Uranus 84 years to make 1 orbit of the sun. Uranus' atmosphere is 83% hydrogen, 15% helium & 2% methane.	http://nineplanest.org/uranus.html
Neptune: (Greek-Poseidon, god of the sea) Neptune is the last full-fledged planet.	Neptune is the 4th "gas giant," and the coldest, at minus 330 degrees. Its atmosphere is 74% hydrogen, 25% helium and 1% methane, Sometimes call the "Blue Giant", it appears that color possibly due to the absorption of light by the methane in its atmosphere. Neptune has a series of dark spots, believed to represent holes in its methane cloud. The first of these was discovered in 1989, by Voyager 2, and named the Great Dark Spot, similar to the Great Red Spot of Jupiter. Hubble views in 1994 showed that this spot had disappeared, but other dark spots appear about half the time, currently in the North hemisphere. Neptune obits in 165 years, but its "day" or rotation is only 16.1 hours. There are 13 moons orbiting Neptune, and 4 faint rings, seen only through a large telescope. It is approximately 30,775 miles in diameter at its equator, and about 2 billion miles from the Sun (30.1 AU)	http://nineplanets.org/neptune.html

Dwarf Planets: Only 5 celestial objects have received the designation of "Dwarf Planet": Pluto, Eris, Make Make ,and Haumea orbit in the Trans-Neptunian area. Ceres, in the asteroid belt, is also considered a "dwarf planet."	When the International Astronomical Union met in 2006, they defined what a planet was, and what the other orbiting bodies were to be called. This definition was not a "law", per se, but a convention that could be applied to our Solar System. Thus, came the conditions for which an orbital body is called a planet: a) It orbits the Sun b) It is massive enough to be spherical as a result of its own gravity c) It has cleared its own neighborhood of celestial bodies (asteroids, comets, etc.) d) It is not a satellite And those for a "dwarf planet:" a) It orbits the Sun b) It is massive enough to be spherical as a result of its own gravity c) It has NOT cleared its own neighborhood d) It is not a satellite	http://nineplanets.org/dwarf.html
Pluto: (Greek - god of the Underworld) Considered the 9th of the planets until reclassified in 2008 as a Dwarf Planet.	Pluto was discovered in 1930. Its orbit is 248 Earth years. Charon, discovered in 1978, was thought to be Pluto's moon, but upon further observation, it was discovered that Charon and Pluto rotate about a common point, and it is thus a binary dwarf system. Further, 2 new satellites, Nix and Hydra, orbit this binary system. And recently, a new object, presently named "P4"also orbits the binary system. More should be found out in 2015, when New Horizons will fly by the system.	http://nineplanets.org/pluto.html
Eris: (Greek for discord & strife) Originally its nickname was Planet "X" or "Xena," the warrior princess (TV serial).	Eris was discovered in 2005, from images taken by ground telescopes in 2003. Its orbit is 557 Earth years. It is about 96.6 AU from our Sun, and is slightly larger than Pluto. It is currently the largest Kuiper Belt object known.	http://nineplanets.org/eris.html
Ceres: - (Greek goddess of the harvest) Discovered in 1801 and called a planet. This was later changed (1847) to asteroid, which translates to "star-like" (somewhat of a misnomer). Since 2006, it is also classified as a Dwarf Planet.	Ceres lies in the main asteroid belt and orbits in 5.1 years, in a somewhat elliptical path. Its mass is approximately 25% of the total mass of the belt. Ceres is classified as both the largest asteroid in the Asteroid Belt, and also meets the present definition of Dwarf Planet, as it does not clear objects in its path. Its orbit is tilted 10.9 degrees from the plane of the Solar System.	ehttp://nineplanets.org/ceres.html

Makemake:-(Easter islands fertility god or god of creation); also nicknamed the"Easter-bunny"	Makemake is 52 AU from the Sun, has a 310 year orbit and no moons. Once some final measurements are made, this dwarf has the potential to be the largest Kuiper belt object yet known.	http://nineplanets.org/dwarf.html
Haumea: - (Polynesian goddess of fertility), formerly known by the nickname "Santa Claus", with moons nicknamed "Rudolph & "Blitzen"	This dwarf planet orbits in 238 (?) years. The name also has been translated to the cannibal woman who swallowed her own children. It has 2 moons: Hi'iaka and Namaka.	http://nineplanets.org/dwarf.html
Sedna:(Inuit or Eskimo - goddess of the north sea hunt)	Our farthest known dwarf orbits in 12,000 years and has no moons. Very little is known about Sedna.	http://nineplanets.org/sedna.html
Other trans-Neptunium objects: Orcus (1 moon), Quaoar (1 moon), and Varuna (no moons) are a few.)	Objects in this area are known as Kuiper Belt objects, so named after Gerald Kuiper, who did some work on this suspected belt in the 1950's. (Pluto is the first of the Kuiper Belt objects, Eris is the second.)	
Asteroids: minor planets	Asteroids are intermediate sized celestial objects, between meteoroids and planets. In our solar system, most of them reside in a belt, orbiting between Mars and Jupiter. Ceres, the largest object in the belt (about 25% of the total mass and named after the Sicilian goddess of grain), was originally identified as a Planet upon discovery in 1801, but renamed an "Asteroid" in 1847. The name, Asteroid, translates as "star-like," an apparent misnomer, but accepted worldwide. They can be less than 1 mile wide and up to 600 miles wide. The total mass of all the asteroids is less than the mass of the Moon. Near-Earth Asteroids orbit in elliptical paths: their perihelion, or point nearest the Sun, is less than 1.3 AU from the Sun. They are further divided into Asteroids which orbit exterior to, crossing, or interior to the Earth's orbit.	http://nineplanets.org/asteroids.html http://neo.jpl.nasa.gov/neo/groups.html

	Potentially Hazardous Asteroids are Near-Earth Asteroids that 1) can get close to the Earth; defined as a Minimum Orbital Intersection Distance (MOID) at or less than .05 AU from the Earth. 2) have absolute magnitude 22 or greater, which correlates to about 500 ft. diameter.	
Near-Earth Asteroids: Asteroids that orbit with a perihelion less than 1.3 AU from the Sun.	They orbit in elliptical paths. Their perihelion is the point nearest the Sun. They are further divided into asteroids which orbit exterior to, crossing, and interior to the Earth's orbit.	http://neo.jpl.nasa.gov/neo/groups.html
Potentially Hazardous Asteroids: Near-Earth asteroids that are at risk for collision with Earth, meeting criteria of distance from Earth and size.	These are a subset of Near-Earth asteroids that meet these criteria: 1) They could get close to the Earth at some time in the future because of the proximity of their orbits. This is measured by Minimum Orbital Intersection Distance (MOID), at or less than .05 AU from the Earth. 2) They have absolute magnitude of 22 or greater, correlating roughly with 500 ft. in diameter.	http://neo.jpl.nasa.gov/neo/groups.html, http://www2.lowell.edu/users/elgb/moid.html
Satellites: 100 Brightest Other orbiting telescopes:	Satellites are both natural (moons) & Man made (various space bearing telescopes and sensors/camera, labs.) Earth Satellites: GPS; COMM; Telescopes (Hubble, Spritzer, Chandra, Compton, etc.,International Space Station). Others: Kepler; Voyager 1 & 2; Pioneer 10 & 11; Cassini;	

Milky Way		
Milky Way: The galaxy in which our Sun is a member. A galaxy is a gravitationally-bound cluster of stars, typically hundreds of million to billions, and dust and gas.	The Milky Way is a giant galaxy, containing at least 400 billion stars. Its mass is around one trillion solar masses, and its diameter around 100,000 light-years. It belongs to the Local Group, a cluster of over 50 galaxies, in which it is the second largest, the largest one being Andromeda, or M31. It is expected that Andromeda and the Milky Way will eventually merge due to their gravitational attraction. There are a few dwarf galaxies already merging with the Milky Way; the best-known being the Large and Small Magellanic Clouds. The Milky Way is described as having a barred-spiral shape, in that it is a disc, whose central bulge is somewhat elongated, and it has several distinct spiral arms. The spiral arms contain thousands of star clusters and nebulae, interstellar regions of gas and dust which give rise to stars. The central bulge consists of older stars, and the halo around it the oldest ones. The galaxy rotates around a supermassive black hole in the center. Our Solar System is located in the outer third, within a small collection of younger stars, known as the Orion Spur. It is located around 28,000 light-years from the Galactic Center, and about 20 light-years to the North of the Galactic symmetry plane. The name "Milky Way" arises from its milky appearance in the night sky as we visualize our galaxy directly through its equatorial plane.	http://seds.org/messier/more/mw.html
Oort Cloud: A vast, distant, spherical shell of icy bodies surrounding the Solar System. It is believed these are the home of the comets.	It is estimated to start around 2,000 AU, and extend from 100,000 to 200,000 AU from the Sun. (One astronomical unit, or AU, is the mean distance of Earth from the Sun: about 150 million kilometers or 93 million miles.) The outer extent of the Oort Cloud is considered to be the outer boundary of our solar system. This is estimated to lie a little over 3 light-years from the Sun, where the Sun's gravitational influence exceeds that of the nearest star. The Oort Cloud probably contains 0.1 to 2 trillion icy bodies in solar orbit. Occasionally, giant molecular clouds, stars passing nearby, or tidal interactions with the Milky Way's disc disturb the orbit of one of these bodies in the outer region of the Oort Cloud, causing the object to streak into the inner solar system as a so-called long-period comet. These comets have very large, eccentric orbits and are observed in the inner solar system only once. The doughnut-shaped inner cloud, or Hills cloud, supplies the short-period comets. It lies around 2,000 to 20,000 AU (0.03 to 0.32 light-years) from the Sun. The cloud	http://solarsystem.nasa.gov/planets/profile.cfm?Object=KB

	gradually becomes spherical as distance increases from the Sun. This spherical outer Oort cloud begins around 20,000 AU (0.32 light-years) from the Sun. The comets are most numerous around 50,000 AU (0.79 light-years). Comets that have been analyzed consist of various ices such as water, methane, ethane, carbon monoxide, and hydrogen cyanide. However, the discovery of the object 1996 PW, an asteroid in an orbit more typical of a long-period comet, suggests that the cloud may also be home to rocky objects. It is named for the Dutch astronomer Jan Hendrik Oort, who proposed its existence in 1950.	
Particle System: A theoretical graphic of particles to illustrate the individual comets in the Oort Cloud.	It is most dense around 50,000 AU from the Sun, and demonstrates the concentration along the central disc plane in a "doughnut" pattern.	The Digital Universe Guide, Hayden Planetarium, American Museum of Natural History, New York, NY USA, 2007
Wireframe Model: A theoretical spherical grid, set to a radius of 50,000 AU, to illustrate the extent of the heaviest concentration of comets in the Oort Cloud.		The Digital Universe Guide, Hayden Planetarium, American Museum of Natural History, New York, NY USA, 2007
Star Catalogue: A catalogue of over 100,000 of the nearby stars in the Milky Way, 228 of which are labelled.	This graphic display of stars is compiled from several sources. Most of them come from the Hipparcos project, a mission of the European Space Agency. It used a satellite in high Earth orbit, and operated between 1989 and 1993. This project used two methods to determine distances to stars. One kind, geometric parallax, determines the distance the far object appears to travel as the point of observation on Earth changes due to the Earth's orbit around the Sun. Using geometry, the length of the third line of a triangle can be determined this way. It is most accurate for closer distances, and includes data for over 100,000 stars. The other kind, misnamed photometric parallax, uses photometric data to determine the luminosity of a star and compares it to its stellar type. The Hipparcos catalogue includes photometric data for over 1 million stars. The Tycho-2 catalogue added to and improved the accuracy of these measurements, for over 2.5 million of the brightest stars.	The Digital Universe Guide, Hayden Planetarium, American Museum of Natural History, New York, NY USA, 2007, p. 65, http://www.rssd.esa.int/index.php?project=HIPPARCOS

	The Gliese catalogue is a compilation of 2,800 nearby stars measured by parallax from ground-based telescopes. It was done by Wilhelm Gliese, in Heidelberg, Germany, who updated the last edition in 1991. As these stars were already mapped, they were not included in the Hipparcos project. A joint project of NASA and the Smithsonian Astrophysical Observatory provided a catalogue of over 38,000 stars, using mean radial velocity. This method uses the Doppler principle, or degree of redshift of a star's spectral emission pattern, as the star moves toward or away from the point of observation, to determine the distance to a star.	
Alpheratz: Alpheratz or Alpha Andromedae, is a star in the constellation of Andromeda.	Alpheratz is located 97 light-years from Earth. Although it appears to be a single star to the naked eye it is really a binary system made of two stars in close orbit.	For more information, see: http://en.wikipedia.org/wiki/Alpha_Andromedae
Ankaa: Ankaa, or Alpha Phoenicis, is a star located in the constellation Phoenix.	Ankaa is the brightest star in that constellation. Ankaa is from the Arabic word, al-anqa' meaning "the phoenix." It is an orange giant about 85 light years away form Earth. Ankaa also has a not much known about stellar companion.	For more information, see: http://en.wikipedia.org/wiki/Alpha_Phoenicis
Bellatrix: Bellatrix is a star in the constellation Orion.	Bellatrix is also called Gamma Orionis and is the third brightest star in the constellation Orion. It is also the twenty-seventh brightest star in the night sky. It is a white-bluish giant with a surface temperature of 40,000 degrees F. Its mass is ten times that of our sun.	More information can be found at : http://en.wikipedia.org/wiki/Gamma_Orionis
Caph: Caph is a star in the Cassiopeia constellation.	Caph is also called Beta Cassiopeia and the popular name Caph comes from an Arabic word meaning palm. The etymology of the word as explained in Wikipedia is as follow. Originally, the pre-Islamic Arabic term al-Kaff al-Khadib "the stained hand" referred to the five stars comprising the 'W' of the constellation Cassiopeia, and depicted a hand stained with henna. The term was abbreviated and somehow came to signify β Cassiopeia alone.	For more information see: http://en.wikipedia.org/wiki/Beta_Cassiopeiae

Electra: Electra is a star about 370 light years from the sun inside the constellation Taurus.	Electra is a bright star. It is a fast rotator (181 km/sec). The rapid rotation extends its life span by increasing the core density and reducing the radiation output, especially near its equator.	For more information, please see: http://en.wikipedia.org/wiki/Electra_(star)
Mira: Mira is a red giant star discovered in 1596 by one of Tycho Brahe's disciples.	This star is named after the Latin word for "Wonderful." Billions of years ago, Mira was like our own sun. Over time it began to swell. For a red giant, it moves exceptionally fast. One of Nasa's space telescopes has recently discovered an amazing comet-like tail streaking behind it offering a unique opportunity to study how stars die.	Check out http://science.nasa.gov/science-news/science-at-nasa/2007/15aug_mira/ for more information.
Rana: Rana is an active yellow star.	Rana's mass is 20% more than the Sun's. It has lithium content. It is relatively close to the sun.	For more information, see: http://en.wikipedia.org/wiki/Delta_Eridani
Constellations: Constellations are star clusters. They are being charted from very early times for navigation and other purposes. Historically, they were named after mythological figures. There are 88 constellations.	Constellations are groups of stars (or other celestial objects) occupying a certain part of the celestial sphere. Records about some of the popular constellations go as far back as the time great Egyptian astronomer Ptolemy. Ancient civilizations starting the Babylonians identified clusters of stars that appeared to form a known pattern in the sky for various purposes the most important being navigation. For example, the stars in the popular constellation Orion are visualized as a hunter with a belt and a sword. Many of the constellations were thus identified by the astronomers in the ancient period who would name them after extant mythological figures usually consistent with the shape the stars formed. In various parts of the world, most constellations still bear the names from the mythology that is prevalent in that part. In the modern times, astronomers led by the International Astronomical Union, have come up with a more formal scheme of identifying and naming constellations. International Astronomical Union (IAU) astronomers used grids to divide the sky into 88 constellations of which 37 belong to Northern hemisphere and 51 to the Southern. In its 1922 congress, IAU adopted Latin names for the 88 constellations and also decided to use the first three letters as the abbreviation (e.g., AND for Andromeda). These names are mostly from the Greco-Roman mythology.	For an authentic list of all 88 constellations, with a table containing the names, pronunciation and constellation charts please visit the IAU constellation page at http://www.iau.org/public/constellations/ Other comprehensive constellation guides can be found at: http://www.astro.wisc.edu/~dolan/constellations/ and http://chandra.harvard.edu/photo/constellations/constellations_intro.html

Andromeda: Andromeda is an Autumn constellation in the Northern hemisphere. It is named after Andromeda, daughter of queen Cassiopeia. Alpheratz is its brightest star. It also contains a spiral galaxy with the same name.	In the northern hemisphere, Andromeda constellation is visible in the autumn. In the Southern hemisphere it is visible in Spring. The word "Andromeda" means "the Chained Maiden." The name of the constellation comes from Greek mythology. Andromeda, daughter of Queen Cassiopeia and King Cepheus, was chained to a rock because her mother bragged her beauty was greater than even water nymphs, who were renowned for their beauty. As a punishment, Poseidon sent Cetus, a horrible beast, to terrorize King Cepheus' country. The only thing that would stop Cetus was to sacrifice Andromeda to Cetus. Perseus saved her. The brightest star in Andromeda is Alpheratz. Other stars include Mirach and Almach. This constellation shelters our nearest spiral galaxy, Andromeda. There is also a planetary nebula in it.	For a constellation chart of Andromeda, visit: http://www.iau.org/static/public/constellations/gif/AND.gif, for the visibility time period, many pictures, and other useful information, visit: http://www.cfa.harvard.edu/afoe/And.html, for the location and other information, visit: http://chandra.harvard.edu/photo/constellations/andromeda.html, and for the myth, read: The New Patters in the Sky by Julius D. W. Staal
Virgo: Virgo is one of the Zodiac constellations. It symbolizes fertility and harvest. It is the second largest constellation after Hydra consisting of Spica and 17 other stars. It is a Spring constellation in the Northern hemisphere best viewed in May. It has the highest number of exoplanets.	Virgo is one of the twelve constellations used as zodiac symbols and lies in the sky between two other zodiac constellations, Libra to its east and Leo to its west. The very word "Virgo" is a Latin word meaning virgin and the constellation used to symbolize both fertility and harvest in the ancient times when it used to rise in mid-August. It is the second largest constellation after the substantially fainter Hydra. Virgo itself is also faint and can be best viewed in the month of May by spotting its brightest star Spica. Spica along with the western stars of Virgo form a Y that can be imagined as the arms of the virgin after whom Virgo is named. To find Spica, one can start at Big Dipper, the most prominent object in the north-eastern sky in the Spring evenings. By following the arc made by the handle of the Big Dipper away from it (further south) the first prominent star one can find is Arcturus, the bright read giant from the constellation Bootes. Extending the arc further south and little west will take the stargazer to the next bright star, none other than Virgo's Spica star, lying close to horizon. Virgo has the highest number of confirmed exo-planets (extra-solar system planets) among the constellations. It includes 18 stars with 24 known exoplanets, of which 8 were discovered in 2009.	http://chandra.harvard.edu/photo/constellations/virgo.html
Orion: Orion is a prominent constellation. It is easily identifiable on the celestial equator in the shape of a hunter.	The constellation of Orion is located in celestial equator, and can be seen in the winter. Orion was a legendary Greek hunter associated with several myths. He is said to be related to water. In one myth, Artemis fell in love with him. After Apollo tricked Artemis into killing Orion, Artemis placed the hunter in the heavens. Another myth says Orion boasted about how many animals he would kill and was banished to the heavens for that foolish act. The major stars in Orion include Bellatrix, Rigel, Saiph, and Betelgeuse. An interesting feature within the legendary hunter is a bright nebula, the Orion Nebula.	For a detailed constellation chart of Orion, see: http://www.iau.org/static/public/constellations/gif/ORI.gif, For a web-page containing the location and other interesting information, visit: http://chandra.harvard.edu/photo/constellations/orion.html

Pisces: Pisces is the first constellation of the Zodiac. The name comes from the Latin word for fish.	Pisces, the Fishes, is a constellation that can be seen in the autumn, right below Pegasus and Andromeda. It is the first constellation of the Zodiac. In Pisces, there are two irregularly shaped diamonds which are fish. In many myths, the fish are wealthy, secretive, and powerful animals. In a Roman myth, Venus and Cupid, her son, were disturbed by the powerful, fire creature, Typhon. Typhon couldn't go in the water but Venus could, so she turned herself and Cupid into fishes and escaped. In order not to lose Cupid, Venus tied herself and Cupid together with a long rope. This Roman image is shown in the Pisces constellation. Some major stars in this constellation are α, γ, and η. None of these stars have specific names. Besides stars, there aren't any distinguishing features besides a couple of asteroids and a galaxy just on the outskirts of the constellation.	For a good resource telling of the location, visibility time, and story behind the name, see The New Patterns in the Sky by Julius D. W. Staal. For a detailed constellation chart, see http://www.iau.org/static/public/constellations/gif/PSC.gif
Cancer: Cancer is a Zodiac constellation with dim stars.	Cancer, the Crab, is a constellation with mostly dim stars. If it can be seen at all, it would be in the season of spring, in between Leo and Gemini and below Lynx. Cancer is one of the original Zodiac constellations. One myth explaining Cancer was: Cancer, the Crab, was a crab Hera sent to stop Hercules from killing Hydra. The Crab was said to have hurt Hercules' foot, but then was stepped on by Hercules. Hera felt pity for the dead crab, since it was her fault, so she gave the crab a spot to rest upon in the great heavens. This myth is Greek. Some major and conspicuous stars in Cancer are γ-, δ-, and φ-Cancri. The stars in Cancer are very dim. Even though there aren't bright stars in Cancer, there are some cool features. For example, within Cancer, there is an important star cluster named "Beehive."	For a good resource on visibility, visibility time, and location, see The New Patterns in the Sky by Julius D. W. Staal, for a detailed constellation chart, see http://www.iau.org/static/public/constellations/gif/CNC.gif , and for a informative page on the myth and the star cluster, see http://chandra.harvard.edu/photo/constellations/cancer.html
Hercules: It is a major constellation visible in summer in the Northern hemisphere. The name of the constellation comes from the great Greek mythological hero Hercules, son of Zeus and a mortal woman.	Hercules is a major constellation which can be seen in the summer near Ophiuchus, Draco, Corona Borealis, and Aquila. Hercules was the son of Zeus and a mortal woman. Of course, Hera grew jealous since she, after all, was supposed to be married to Zeus and tried to make Hercules' life miserable. When Hercules was a mere baby, Hera put snakes in his crib, but Hercules strangles the snakes with only his hands. Later on, when Hercules married, Hera inflicted a blazing madness upon him and made him kill his family. As a result, Hercules, in one version, went to Apollo for help. Apollo said Hercules had to do the Twelve Labors for peace of mind and cleaning is soul, and he did. Hercules' next wife unknowingly killed him. The wife gave Hercules a handmade cloak smeared with a magical balm that she thought would make Hercules love her. As it turns out, the person who gave her the balm was lying and once Hercules put it on, he was tortured with a severe burning. Just when Hercules thought he would die, Zeus sent Athena to bring him to the Heavens. Some major stars in the constellation Hercules are Ras Algethi, β-, and δ-Herculis. Within Hercules, there are two globular star clusters.	For a good resource on visibility, visibility time, and location, see The New Patterns in the Sky by Julius D. W. Staal. For a detailed constellation chart, see http://www.iau.org/static/public/constellations/gif/CNC.gif For a informative page on the myth and the star cluster, see http://chandra.harvard.edu/photo/constellations/hercules.html

Hydra: Hydra is a large constellation that can be viewed in the spring (in the Northern Hemisphere). The name comes from the multi-headed mythological snake that Hercules had to combat.	Hydra, the female water snake, is a large constellation that can be viewed in the spring. It is under Leo and Virgo and above Antilla and Centaurus. Hydra as supposedly the monster Hercules had to kill for the second labor. In a couple of versions, Hydra had nine heads, and in others, it had more. It was hard to kill it because each time a head was cut off, two grew in its place. At last, Hercules decided to cut a head off and then burn the stump so none grew back. It is said that Hydra's breath could kill and its blood was poisonous. Major stars in Hydra are Al phard, β-Hydrae, and γ-Hydrae. In the constellation Hydra, there is a star cluster and a planetary nebula.	For a good book on the visibility time, location of the constellation, and the myth, see The New Patterns in the Sky by Julius D. W. Staal; McDonald and Woodward, Virginia, 1988. (pp 160-67). For a detailed constellation chart, see http://www.iau.org/public/constellations/gif/HYA.gif
Columba: Columba, the Dove, is a constellation that can be seen in the winter in between Canis Major and Caelum and under Lepus.	Columba, the Dove, can be seen in the winter in between Canis Major and Caelum and under Lepus. When Argo, a ship, approached clashing rocks, Jason, who was warned about this, sent a dove to see whether it would live or die because of these rocks. The dove was successful, and Jason thought that was a good omen, so, he went on. The ship made it through the rocks, and those rocks stopped clashing from then on. Athena put the dove in the sky for its good and daring deed. Major stars in Columba include Wazn and Phaet. In Columba is also a globular star cluster.	For a good resource on location, visibility time, myth, and major stars, see The New Patterns in the Sky by Julius D. W. Staal, and for a detailed star chart, see http://www.iau.org/static/public/constellations/gif/COL.gif
Cetus: Cetus is an autumn constellation named after the mythological sea monster.	Constellation Cetus is named after Cetus, the sea monster in Greek mythology. It resides in the "Watery" part of the sky with other watery constellations like Aquarius and Pisces. Most notable among the Cetus' stars is Mira, which was the very first variable star detected. In the Northern hemisphere, Cetus can be found in the sky in September and October crawling low over the southern horizon.	
Libra: Libra is a zodiac constellation visible in summer.	Libra is a zodiac constellation visible in summer (in the Northern hemisphere). In the ancient times Libra was identified as an extension of Scorpius. The story behind the name Libra is interesting and somewhat confusing at the same time. Astronomer's calculations show that the major star of this constellation would have coincided with the Autumnal Equinox back in 1190 BC. That might be the source of the name Libra, or the Scales weighing the lengths of day and night at the Equinox. Another story is that the stars in this constellation form the scales in the hand of nearby Virgo, the constellation personified as the Goddess of justice.	

Cygnus: Cygnus the Swan, also called the Northern Cross, is a constellation which lies in the middle of the constellations Vulpeca, Lyra, Draco, Lacreta, and Pegasus.	Cygnus is in the Northern hemisphere and can be viewed in the summer. This constellation can be based on a number of Greek myths. Two of the most common ones involve Zeus or Poseidon. One is about Zeus changing himself into a swan to lure Leda, Queen of Sparta, to him, and as a result had Helen of Troy. Another is that Cygnus, a godly son, was the forgotten and abused son of Poseidon, thrown onto the seashore, awaiting death. But, a sympathetic swan came and cared for him like a mother. Later on, Cygnus became a king, but was somewhat tyrannical. He sent his children floating on the ocean and killed his own wife. He did have his reasons though. He helped Troy when Achilles came to kill. In the end, Achilles strangled him. Out of pity and love for his son, Poseidon turned Cygnus into a swan. Interestingly, the Greeks called this group of stars "Bird," and the Romans renamed it as "Swan." This constellation only has one major star, and that is Deneb, which is often associated with Arabic myths. Surrounding Cygnus are many distinguishing features, such as star clusters, and bright and planetary nebulae.	For a detailed star chart describing location and distinguishing features see http://www.iau.org/static/public/constellations/gif/CYG.gif, for a good myth about Cygnus, see http://www.dibonsmith.com/cyg_con.htm and http://chandra.harvard.edu/photo/constellations/cygnus.html
Lupus: Lupus, the Wolf, is an old constellation that has relatively dim stars and is therefore rather inconspicuous.	Lupus is above Norma and Ara, below Libra, and near Hydra and Crux. Lupus is a constellation of the Spring. Greeks' and Romans' view of Lupus was a wild animal in the stars. When this wild animal is pictured, it looks like a recognisable animal. Arabs saw Lupus as a leopard or lion. Western Europeans saw Lupus as a wolf. There are no really major, bright, or named stars. The brightest star is at an apparent magnitude of 2.3. The only distinguishing feature in Lupus is an open star cluster in the outskirts of the constellation.	For a good resource on location, visibility time, myth, and major stars, see The New Patterns in the Sky by Julius D. W. Staal, and for a detailed star chart, see http://www.iau.org/static/public/constellations/gif/LUP.gif
Aquila: The constellation Aquila is the great Eagle.	Aquila can be seen in the summer, and is south of Cygnus and on the eastern bank of our galaxy. It's between the Dolphin and Hercules. Aquila was Zeus' bird. The Eagle carried out many of Zeus' difficult tasks, like killing Ophiuchus. Also, when the hostess at the table of the gods twisted her ankle, Aquila swept down to Earth to find a handsome youth to be the cup bearer and wine pourer instead. Aquila found Ganymede and Ganymede was promoted to the celestial waiter of the gods. Aquila had to be the one who carried out Prometheus' punishment for stealing fire and giving it to the humans. The Eagle ate Prometheus' liver, but it grew back each day, so Aquila would come again the next day to eat his liver. Hercules finally ended this cruel punishment by killing Aquila with a poisoned arrow. Zeus placed his loyal Eagle into the sky to commemorate him. In Indian mythology, Vishnu was preserver of the universe, and the three bright stars of Greek Aquila was, to the Hindus, the footsteps of Vishnu. The brightest star of Aquila is Altair ("the Rising One"). The stars Deneb (in Cygnus, the Swan), Altair (in Aquila, the Eagle), and Vega (in Lyra, the Lyre) form a distinct triangle named the Summer Triangle. This triangle can be seen until the end of November, when it disappears below the horizon.	For a good resource on location, visibility time, myth, distinguishing features, and major stars, see The New Patterns in the Sky by Julius D. W. Staal, and for a detailed star chart, see http://www.iau.org/static/public/constellations/gif/AQL.gif

Delphinus: Delphinus, the Dolphin, is a constellation that lies in the middle of Pegasus and Aquila.	Delphinus can be seen in the summer. The story behind Delphinus most likely involves Poseidon, the god of the seas. Poseidon was looking for a suitable immortal bride. His eye was first on Thetis, a sea nymph, but a prophecy stated any son of Thetis' would overcome his father. Naturally, Poseidon didn't want this. Instead, Poseidon set his eye on another sea nymph, Amphitrite. But Amphitrite was repulsed at the idea of marrying Poseidon and ran away. Poseidon sent a lot of messengers to get her to come back and marry him. The one who succeeded was Delphinus the Dolphin. Amphitrite came back, married Poseidon, and gave him many children. Delphinus has no major stars, but has a globular star cluster in the area.	For a good resource on location, and visibility time see The New Patterns in the Sky by Julius D. W. Staal, for a detailed star chart, and distinguishing features see http://www.iau.org/static/public/constellations/gif/DEL.gif, and for a good myth about Delphinus, see http://www.dibonsmith.com/del_con.htm
Cassiopeia: Cassiopeia is a popular constellation depicting foolish, showy African queen, Cassiopeia, who bragged to everybody about her and her daughter's beauty.	Cassiopeia sits in the northern sky with Andromeda on its south side, Perseus on its southeast and Cepheus to the north of it. The constellation is also opposite to the Big Dipper and can be best seen in November. The Greek mythology behind this constellation is quite interesting. Cassiopeia, queen of Ethiopia, bragged that she and her daughter, Princess Andromeda, were even prettier than the Nereids, the sea nymphs. Thetis, a Nereid, and also a goddess of the sea was greatly angered by this, and begged Poseidon, god of the sea, to punish the queen. Poseidon in return sent a flood on its way to the kingdom, and along with it, a sea monster, Cetus. The king of the land, King Cepheus, talked to an oracle about how to save his kingdom, and he learned that he had to sacrifice his daughter, Andromeda, to Cetus. They reluctantly chained Andromeda to be eaten by Cetus, but Perseus saved her and killed Cetus as well. Perseus, doing this deed for Andromeda's hand in marriage, then proceeded to marry her. Cassiopeia and Cepheus were placed in the night sky, but as a punishment from the gods, her constellation was in the shape of a "W" or "M," depicting her chained to her throne. A major star in Cassiopeia is Caph. In the general area of Cassiopeia, there are a couple of open star clusters.	For a useful information about its location, and time best viewed, see: http://en.wikipedia.org/wiki/Cassiopeia_(constellation), for an entertaining myth, see http://chandra.harvard.edu/photo/constellations/cassiopeia.html, and for a detailed star chart, see: http://www.iau.org/static/public/constellations/gif/CAS.gif

Pegasus: Pegasus, the Winged Horse, is a constellation that sits in the northern sky, beneath Lacerta and atop of Aquarius.	Pegasus can be seen mainly in the autumn. Pegasus was said to be the child of Poseidon and Medusa. Pegasus was kept out of the world until Medusa was slaughtered. Then, he sprung out of Medusa and lived with the Muses on the mountains. Later on, Bellerophon had to catch and tame Pegasus, and wen he did, Bellerophon used Pegasus to defeat Chimera. After Bellerophon became wealthy, famous, and happy, he let fame get to his head, and thought he could fly Pegasus to Olympus. This very thought infuriated Zeus. Zeus sent a horsefly on it's way to bite Pegasus, and when it did, Bellerophon fell from the rearing Pegasus, and landed in thorns, becoming blind, and lame, and greatly shamed. Pegasus, on the other hand, was actually accepted into Olympus and carried Zeus' thunderbolts for him. The constellation of Pegasus has eight named stars. Its three brightest stars along with Alpheratz, from Andromeda, make the Great Square of Pegasus. There is a galaxy in the area of the constellation, along with a globular star cluster.	For a good resource on the location and stars, see: http://en.wikipedia.org/wiki/Pegasus_(constellation), for an interesting myth, see: http://chandra.harvard.edu/photo/constellations/pegasus.html, and for a detailed star chart, see: http://www.iau.org/static/public/constellations/gif/PEG.gif
Ursa Major: Ursa Major, the Great Bear, is a constellation that lies in the northern hemisphere, next to Bootes and Leo.	The most commonly accepted myth behind Ursa Major is that Callisto was a woman Zeus fell in love with. Out of jealously, Hera turned her into a bear. Her son, Arcus, was out hunting when Callisto, in bear form, saw him. She ran to greet him, but he, not knowing this was Callisto, got prepared to kill her. To save Callisto, Zeus turned Arcus into a smaller bear and threw the both of them into the night sky. Some bright and major stars in Ursa Major are Mizar, Alcor, Alkaid, and Phecda. There are two galaxies in the area of the constellation. Also, some of the brighter stars of the constellation make up the constellation known as the Big Dipper.	For information about the location and myth, see: http://chandra.harvard.edu/photo/constellations/ursamajor.html, for a detailed star chart, see: http://www.iau.org/static/public/constellations/gif/UMA.gif
Capricorn: Capricorn is one of the zodiac constellations named after the Latin word for horned male goat (Capricornus).	Capricorn is one of the zodiac constellations named after the Latin word for horned male goat (Capricornus). It was listed by Ptolemy in the second century. However, the cataloging of this constellation and the myth associated with this goes as far back as the Babylonian times. The Sun's most southerly position attained (in the Northern hemisphere) at the winter solstice is called the Tropic of Capricorn, as this solstice used to occur when the sun was in this constellation (that has changed due to the gradual shift in earth's rotational axis over time). This is located in the part of the sky called the Sea with other water-related constellations like Aquarius and Pisces. In Hindu mythology, Capricorn is called Makara which means a half animal half fish creature which is the ride of Ganga, the goddess of river.	Resources on the web: http://en.wikipedia.org/wiki/Capricornus; http://www.ianridpath.com/startales/capricornus.htm; http://en.wikipedia.org/wiki/Makara_(Hindu_mythology)

Leo: Leo is a comparatively brighter Zodiac constellation located between Cancer and Virgo.	Leo is a comparatively brighter Zodiac constellation located between Cancer and Virgo. It was detected as early as in the time of the Mesopotamians. The origin of the name, meaning lion, comes from the shape of a lion obtained by joining major stars in the constellation. According to Greek mythology, Leo is the Nemean Lion which was killed by Hercules on one of his great quests.	Resources on the web: http://www.astro.wisc.edu/~dolan/constellations/constellations/Leo.html; http://www.windows2universe.org/the_universe/Constellations/spring/leo.html
Pulsars and Neutron Stars: A neutron star is the highly dense, energetic core left after a star explodes into a supernova. A pulsar is a spinning neutron star.	A neutron star is formed as enormous gravitational forces suddenly collapse, along with the supernova explosion of a highly massive star, into its core. The mass required for this to happen is estimated to be between 1.44 and 3 to 9 Solar masses. Less mass than 1.44 Solar masses results in a white dwarf, more mass than 9 Solar masses results in a black hole. While the massive star has an iron core, the high gravitational forces from the high mass exceed the electromagnetic repulsive forces which keep electrons outside the nucleus of their atoms. Thus, these forces pull an electron into the nucleus of the atom, where it combines with a proton to become a single, slightly more massive, neutron. In the process, neutrinos are released rapidly, along with radio signals. Neutron stars have enormous magnetic fields, around 10^{12} times that of the Earth. Pulsars are neutron stars that spin, due to this enormously dense matter. They are perceived in our view as “beacons” of radio signals. They emit electromagnetic energy in our direction only once each cycle, thus their name, as they appear to pulsate. Over 1,000 pulsars have been discovered. Their size is estimated at less than 10,000 m. diameter. Their periods last between 1.4 milliseconds and over 5 seconds, with gradual increased periods, or slowing down, over time, as they lose energy. They last around 1 million years, much longer than the supernova remnants which arise from the same star. Thus they are apparent, along with other older bodies, in the sphere of the galactic halo. The first radio pulsar was detected in 1967 by Jocelyn Bell, a graduate student, and her advisor, Anthony Hewish. For this, Hewish shared the Nobel Prize in physics. An example of a pulsar is from the Crab Nebula, (PSR B0531+21), whose supernova was discovered in 1054 by Chinese, Arabic, and North American astronomers. The pulsar was discovered in 1968, the first time this phenomenon was connected to a supernova remnant.	http://www.astro.umd.edu/~miller/nstar.html, http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html

Extrasolar Planets: Planets found orbiting stars other than our Sun, called for short "exoplanets."	The first evidence for these was in 1995, and most of the planets were first identified by the radial velocity method, also defined as the "wobble method." This method tracks the movement over time of the parent star. This method uses the Doppler phenomenon, i.e. shift in light frequency, to identify movement by the parent star as it is influenced by the mass of an orbiting object. Both the star and its planet orbit their common center of gravity. In systems with multiple planets, the "wobble" is increasingly complex. Another indirect way to identify exoplanets is the "transit" method, used by the current Kepler Mission. This method involves measuring over time the light emitted by the star, and identifying dips in that light associated with eclipse or "transit" of a body in front of the star. Measuring these dips over a duration that identifies repeat transits allows a determination of the duration of the orbit, and from this the distance between the planet and its star can be derived. The degree of the dip is used to determine size of the object. As of June 11, 2012, there are 779 confirmed exoplanets, and many more candidates. The data arriving from the Kepler Mission is huge, so the public is being used to help screen it via the Internet. Most of these observations are of stars within 350 light-years of our Sun. Another indirect method is gravitational lensing for distant systems.	The Digital Universe Guide, Hayden Planetarium, American Museum of Natural History, New York, NY USA, 2007, pp. 77,78 http://exoplanet.eu/catalog.php
Star Clusters: A grouping of several stars that appear to be physically in the same location in the interstellar space of their galaxy, and moving together. This excludes stars grouped as a galaxy.	These groups of stars are likely to be gravitationally-bound, temporarily or permanently, as they move together within the galaxy. They are presumed to originate from the same molecular cloud, which provides gas and dust that collapses and forms proto-stars. They may be in the process of dispersing, as they encounter gravitational disturbances in the galaxy. Various catalogues include distinct star clusters. The MESSIER Catalog shows 59 star clusters, among 107 nonstellar objects. The NEW GENERAL CATALOG (NGC), lists 487 clusters. The update to the NGC, the IC, adds another 30 clusters. An example of a star cluster is the Pleiades, with 7 to 10 easily visible stars, and over 600 stars visible by telescope. Star clusters are divided into globular and open clusters, associations, and moving groups.	http://www.astro.caltech.edu/~george/ay20/eaa-starclus.pdf

Open Clusters: Star clusters in which each star is visibly distinct from the others throughout, including at the center.	Open clusters are younger and less massive than globular clusters. They are found in the disk of the galaxy, close to the galactic plane, and represent Population I stars. Those at the outer edge of the disk have higher metallicity, defined by the ratio of the amount of the metal element to the amount of hydrogen. They arise from the same common gas nebulae, and some are seen inside of their nebula, showing evolution of star formation in process. Since stars within open clusters are of the same age and chemical composition, studies of them provide information important to the understanding of stellar evolution, and other aspects of cosmology. There are over 1,100 known open clusters in our galaxy, while it is estimated there are about 100,000 total.	http://messier.seds.org/open.html
OB Associations: Groupings of stars in the Milky Way that contain numerous O and B stars.	These associations are about 100 parsec in diameter, and many have a very young open cluster in the center. They are stars that arose from the same molecular cloud. In the Harvard spectral classification, stars are listed according to surface temperature. The OB stars are the two hottest classes in this sequence, which is O, B, A, F, G, K, M. The O stars are at or over 33,000 Kelvin, and appear blue, very bright, as they are the most luminous. They are also the most massive, at or greater than 16 times the mass of the Sun. The B stars are next hottest, at 10,000 to 33,000 Kelvin. They appear blue-white, also bright, with masses 2.1 to 16 times the mass of the Sun. There are about 70 known such associations. Since they are the most massive, they are very short-lived, and help trace regions of high star-formation, such as along the spiral arms of our Milky Way. The Orion OB1 Association is a large example. They emit high UV radiation, which then impacts hydrogen in further regions that form stars. These ionized hydrogen regions, often associated with clouds of molecular gas, are denoted as “HII Regions.” Here, the Roman numeral “II” denotes protons separated from their electrons, distinguishing this form of hydrogen from H_2, which stands for a bonded pair of hydrogen atoms.	An Introduction to Galaxies and Cosmology, Mark H. Jones, and Robert J.A. Lambourne, Eds., 2004

Globular Clusters: Star clusters in which stars are not visibly distinct from each other in the center. The center is so dense with stars, it appears as a "glob."	Globular clusters are older and more massive than open clusters, containing the oldest stars in the Galaxy. Stars we can see are classified by age into Populations I and II stars, through measurements of their metallicity. "Metal" in this sense refers to elements heavier than hydrogen and helium. High metallicity stars are created through nuclear fusion in subsequent generations of stars, known as Population I stars. Low metallicity stars are formed from gas containing fewer metals, i.e., less "polluted" by these heavy elements. These are known as Population II stars. The stars In globular clusters show very low metallicity, consistent with their older, primordial. age as Population II stars. There are 147 known globular clusters in the Galaxy, though it is estimated there are about 200 in the Milky Way. We don't detect the rest, since the ones nearest the galactic center and the other side of the galaxy are obscured. The smallest globular clusters contain 10,000 solar masses of stars and a few, such as M22 and Omega Centauri, exceed one million solar masses. The globular clusters travel in widely elliptical orbits, forming the outlines of the spherical halo of the Milky Way. The observation that they are not evenly distributed around the sun gave rise to the conclusion that the sun is not at the center of our galaxy. In the 1920's, Harlow Shapley was able to use measurements of the globular clusters to determine the direction and distance to the galactic center.	http://messier.seds.org/glob.html http://www.astro.caltech.edu/~george/ay20/eaa-starclus.pdf
Orion: An area seen in the belt and sword area of the constellation Orion, which includes a diffuse nebula, an OB Association, and an open cluster.	Located at the lower part of the sword in the Orion constellation, the Orion nebula, (M42, or NGC 1976), is 1500 light-years away. It is part of the Orion Complex, which includes the "Horsehead Nebula," seen closer to the belt of the constellation. The Nebula includes over 3,000 stars. Since the Orion nebula is so close to our Solar System, along the same spiral arm, the Advanced Camera System (ACS) of the Hubble Telescope has beautifully captured details in it. Because the bubble of gas and dust has opened to the side facing Earth, we can see several features, which show us about stellar evolution. The inner Trapezium represents a central highly energetic area with 4 massive stars which eject intense UV light and stellar winds. These emissions impact surrounding smaller stars, molecular gas, and dust. Described as "pillars," elongated features represent clouds of denser molecular gas which remain behind, while the surrounding less dense gas and dust is blown away by the UV radiation and winds. The pillars always point toward the stars which have thus eroded their surroundings. Arcs, bubbles, and bow shock patterns also display the direction of stellar wind	http://hubblesite.org/newscenter/archive/releases/2006/01/full/

	blowing against the clouds of gas and dust. A full range of stars are seen, from the massive ones in the Trapezium, through several brown dwarfs, known as “failed stars” from lack of adequate fuel to burn and cause radiation. Region M43 is a smaller nebula, called a “miniature Orion,” as it is attached to the larger one, and displays similar features.	
Nebulae: (from Latin: "cloud", pl. nebulae or nebulæ, or nebulas) Interstellar clouds of dust, hydrogen gas, helium gas and other ionized gases.	The term “Nebula” was originally used for all Deep Sky Objects, before telescopes had the resolution to determine that many of these objects were actually star clusters, galaxies, etc. Nebulae are classified as either pre-stellar or post-stellar. The pre-stellar ones are diffuse clouds, usually with star-forming regions of up to about 1,000 stars. These are HII regions, named after the symbol for ionized Hydrogen, which predominates. They are observable for a few 100,000 to a million years, becoming brighter as they are energized by the O stars formed within them. Reflection nebulas are also pre-stellar; they are clouds of dust which are visible only because they reflect light from nearby stars. They do not have enough energy to become ionized by those stars, or to form stars of their own. They usually appear blue, due to the reflection of the light. The post-stellar ones are brighter, forming a strikingly round pattern as either planetary nebulae or supernova remnants. They form around a single star at its death, when its nucleus releases a rapidly expanding bubble. They live briefly, a few thousand years, then disperse into the interstellar medium. All nebulae, especially bright nebulae, undergo rapid changes and have only comparatively short lifetimes, so those we observe are all rather young objects.	http://seds.org/messier/nebula.html

Star Forming Regions: Regions within a molecular cloud, in which new stars are formed. Also known as "stellar nurseries."	Star-forming regions have been identified within our galaxy, along several of the spiral arms. The process of molecular clouds evolving into the formation of stars is not yet fully understood, partly because it is difficult to discern the early stars, known as proto-stars. These do not emit enough radiation in visible wavelengths to be seen through the obscuration of the surrounding dust and gas. They are found from infrared surveys by NASA's Spitzer Space Telescope and from radio surveys by the Very Large Array (VLA) telescope, part of the National Radio Astronomy Observatory. The clouds begin as cool molecular gas, but at sufficient density, their self-gravity causes them to collapse into denser cores, which become proto-stars. Once there is enough mass in the core, the proto-star heats up under increasing pressure, and begin to burn its mass as fuel. The resultant nuclear fusion, turning hydrogen into helium, emits the radiation which gives the star its brightness. As stars cycle through this formation, end of life, and return to clouds of gas and dust, the ratio of other metals compared to hydrogen continues to rise, as further fusion leads to forming the heavier elements. This process is known as "metallicity." The metallicity is highest for youngest stars.	http://www.nrao.edu/pr/2010/gbthiiregions/
Planetary Nebulae: Emission nebulae, rapidly expanding, short-lived, glowing shells of ionized gas, ejected during the late life of stars like our sun. The name "planetary" is a misnomer, deriving from early observations of their spherical shape .	After a star uses up its central nuclear fuel, it ejects a large part of its mass into a shell of gas. This fades, dispersing its matter into the interstellar medium. The shell is visible in the light emitted by the excitation from the extremely hot central star. The outer layers of the star are expelled by pulsations and strong stellar winds. Then, the core emits UV radiation that ionizes the ejected outer layers. The shell radiates, showing various shapes of the short-lived planetary nebula.	http://seds.org/messier/nebula.html
Supernova Remnants: Nebulous clouds of gas and dust that follow the supernova explosion and death of a star.	The most massive stars have short life spans and explode in an enormous energy burst called a supernova. The outer layer forms these remnants, while the core forms a neutron star, or, from the most massive stars, a black hole. The remnant lasts briefly, glowing for about 50,000 years, terminated by the dispersing of the cooling gas into the ambient interstellar medium. The gas can become fuel for subsequent star formation. An example is the Crab Nebula (M1), a remnant from the supernova of 1054.	The Digital Universe Guide, Hayden Planetarium, American Museum of Natural History, New York, NY, USA, 2007. p. 56

Milky Way Image: The closest representation of our Galaxy, a 2-D picture of NGC1232, a similar barred-spiral, well-differentiated, giant galaxy.	Since the early 20th century when Harlow Shapley described the size of the Milky Way, there have been increasingly precise measurements of it. Edwin Hubble was the first to conclude that Andromeda was a separate galaxy, not, as once thought, a nebula inside the Milky Way. He determined this by measuring the distance to the Cepheid variable stars within the Andromeda Galaxy. Measurements since then have largely focused on determining the distance from the Sun to the galactic center. Currently, this is estimated at 8.1 ± .6 kilo parsecs, or 25,000 - 28.000 light-years. It is difficult to determine this more accurately for many reasons, including the obscuration caused by the dust line between the Sun and the galactic center.	The Digital Universe Guide, Hayden Planetarium, American Museum of Natural History, New York, NY USA, 2007, p. 124
Milky Way Model: A graphic designed to show the components of the Milky Way, in 3 Dimensions.		The Digital Universe Guide, Hayden Planetarium, American Museum of Natural History, New York, NY USA, 2007, p. 124
Milky Way Halo: A roughly spherical area around the center of our Galaxy. It contains older, cooler stars, with about 150 globular clusters of stars.	The halo is shown on the display at a radius of 134, 000 light-years. It is possibly much larger, from 300,000 to 800,000 light-years radius. Distinct from the dust disk which contains gas and dust and in which stars and planets form, the halo is devoid of gas and dust, but consists of many old stars as well as globular clusters.	The Digital Universe Guide, Hayden Planetarium, American Museum of Natural History, New York, NY USA, 2007, p. 129
Galactic Bulge: The bright mass at the center of the Milky Way that provides most of its mass and luminosity.	The Galactic Bulge is elliptical, approximately 20,000 light-years wide and 13,000 light-years depth, extending both directions away from the galactic plane. It contains many older, dimmer stars mixed with new, brighter stars.	The Digital Universe Guide, Hayden Planetarium, American Museum of Natural History, New York, NY USA, 2007, p. 128

Extragalactic		
Tully Galaxies: Galaxies included in The Nearby Galaxies Atlas, (the "NBG"), and the accompanying catalogue, published by Brent Tully of the University of Hawaii. A galaxy is a system of stars, stellar remnants, gas, dust, and dark matter that is bound together by gravity. The term is from Greek, "galaktos", meaning "milk," describing our Milky Way.	The Catalogue lists 2,367 galaxies within a cube spanning 300 million light years, centered from the Milky Way. Tully measured and recorded several parameters of these galaxies. He color-coded the galaxies according to groups. All galaxies belonging to dense clusters are red, while the galaxies in the Local Group and other nearby groups are green. Galaxies belonging to the Ursa Major Filament are light blue.	The Digital Universe Guide, Hayden Planetarium, American Museum of Natural History, New York, NY USA, 2007 The Nearby Galaxies Catalogue, R. Brent Tully, 1988.
Density Contours: Graphic displays representing relative densities of galaxies in space. There are Low, Medium, and High density contours	These outline areas in which there is low, medium or high density of galaxies. The non-Gaussian, i.e., non-random, nature of distribution of galaxies in the Universe is being investigated this way. These describe the bubbles, filaments, voids, and tunnels characterizing the topography of the Universe.	http://adsabs.harvard.edu/full/1989ApJ...340..647R
2MASS: The Two Micron All-Sky Survey, that catalogued numerous galaxies, stars and other objects in near-infrared wavelengths, from 1.25 to 2.17 microns.	The survey includes over 1 million galaxies and ~300 million star and other objects, and was published in 2003. Because the near-infrared signal is able to travel through the less opaque dust along the Galactic plane, this provided some new data, beyond that from visible wavelengths used in prior surveys. It also used greater sensitivity, so detected brown dwarfs and low-mass stars, the most common kind. The data was collected between 1997 and 2001, using two telescopes: In the Northern Hemisphere, Whipple Observatory in Mt. Hopkins, Arizona, and in the South hemisphere, Cerro Tololo, CTIO, in Chile. The project was sponsored by a collaboration of University of Massachusetts, (thus the "MASS" name), Infrared Processing and Analysis Center (IPAC, run by JPL and Caltech), NASA, and the NSF.	http://www.ipac.caltech.edu/2mass/

Abell Cluster: Galaxy clusters included in A Catalogue of Rich Clusters of Galaxies, published by George Abell. Each galaxy cluster represents many galaxies, and the clusters are of various shapes.	This data set has an arbitrary rectangular shape, and consists of 2,246 nearby galaxy clusters. Survey data for this catalogue was collected from the Palomar Observatory owned by California Institute of Technology (Caltech), in San Diego County, California. The Northern Hemisphere survey was published in 1958, and the Southern one was published posthumously in 1989. The Shapley concentration (named after the American astronomer Harlow Shapley, 1885–1972) is one of the closest rich superclusters to us. Six hundred million light-years away, the supercluster is composed of about 25 rich galaxy clusters, amounting to 10,000 Milky Ways.	The Digital Universe Guide, Hayden Planetarium, American Museum of Natural History, New York, NY USA, 2007 www.astro.caltech.edu/palomar/research.html
2dF Galaxies: The Two-degree Field (2dF) Survey is a project designed to map extragalactic portions of the Universe, using a telescope that has a two-degree field of view of the sky.	This survey project includes 229,293 galaxies. The data are in a “butterfly” or “bow-tie” shape due to the obscuration of data by the dense galactic dust in the disc of our Milky Way. It used the Anglo-Australian Telescope near Sydney, Australia. The data were collected between 1997 and 2002. The spectral range is the visible spectrum.	The Digital Universe Guide, Hayden Planetarium, American Museum of Natural History, New York, NY USA, 2007, http://www.2dFquasar.org/
Sloan Galaxies: The Sloan Digital Sky Survey (SDSS) is an ambitious project to map and catalog one-quarter of the sky.	This survey project mapped over 100 million objects, including galaxies, galaxy clusters, as well as filaments and void areas. It also measures redshift for 1 million galaxies and quasars. The Sloan galaxies appear to extend beyond the 2dF survey to distances that exceed 5 billion light-years, although only the brighter data appear beyond 2 billion light-years. The telescope is located at Apache Point Observatory in south-central New Mexico (USA). The data were collected between 2003 and 2007. The spectral range for the SDSS is 380–920 nm, stretching from the blue end of the visible spectrum to the red and barely into the infrared.	The Digital Universe Guide, Hayden Planetarium, American Museum of Natural History, New York, NY USA, 2007, http://www.sdss.org/

2dF Quasars: The 2dF survey contains many thousands of objects identified as quasars. The data come from the telescope that was used to compile the 2dF Galaxy catalogue. The word “quasar” derives from “quasi-stellar” objects, since they were first thought to be like distant stars. Quasars are violent, poorly formed, extremely luminous galaxies, whose supermassive black holes spew out huge jets of energy.	Quasars are the farthest objects we see. The nearest quasar is 1 billion light-years away, but most are more than 10 billion light-years away. Reflecting a greater abundance at an earlier time in the Universe, quasars show one way the Universe is changing over time. Quasars have been observed to emit light in several regions of the electromagnetic spectrum. Originally, astronomers, seeing their intense radio signals, thought they were highly luminous, radio-emitting stars. But they identified these as objects much larger than a star, and much farther away. This survey carefully analyzed their spectral patterns, which showed they were travelling away very rapidly from our point of observation. Astronomers believe that quasars are “baby snapshots” from the formation stage of galaxies, enormous and highly luminous compared to most of the galaxies we see. As a galaxy evolves, its black hole consumes material left over from the galaxy’s formation and that rate of consumption slows over time. This is the active, or radio, galaxy phase. Once there is a lack of material for the black hole to feed on, the galaxy becomes less active and enters its normal stage, like our Milky Way. The Milky Way still has a massive black hole at its center, but its rate of consumption has slowed to the point where the energy emitted is much less than that of an active galaxy. Quasars in the deep field sky map, measuring Two-degree fields at one time, appear like a natural extension to the galaxies. They are denser as we look longer ago, toward 11 billion years. Past around 11 billion years, we see fewer of them, but this may also reflect the limits of our telescopes to detect objects so far away.	The Digital Universe Guide, Hayden Planetarium, American Museum of Natural History, New York, NY USA, 2007, pp. 142, 181 http://www.2dFquasar.org/
Sloan Quasars: The Sloan Quasar Survey contains over 90,509 quasars. The data is from the same observations that were used to compile the Sloan Digital Sky Survey (SDSS) galaxy catalog.	The data is similar to that of the 2dF Quasars, though SDSS quasars are listed in terms of the year the data were released. Compared to the galaxies, these objects are dimmer from our perspective. Their average distance is 12.5 billion light-years away, compared with 1.8 billion light-years for the galaxies. The light we see from them has been traveling 8 billion years on average, while it is only 1.7 billion years for the galaxies. The SDSS quasars appear to have no obvious signs of large-scale structure. Around 16 billion light-years distance, the data begin to "fade out," or become sparse, as it represents quasars that are relatively rare against the wide background.	The Digital Universe Guide, Hayden Planetarium, American Museum of Natural History, New York, NY USA, 2007, http://www.sdss.org/news/releases/20000413.qso.html

Voids: Regions of few large galaxies. The overall density of these regions is low relative to that of the galaxy-rich filaments. However, there are likely small dwarf galaxies that we cannot detect in these regions.	The local Universe seems to resemble a bubble-like form, where filaments of galaxies reside on the bubble surface and vast voids exist between them. These filaments connect large clusters of galaxies and make larger superclusters. Rudnick's Void is seen past the constellation Eridanus. It is huge, around 1 billion light-years in diameter, and lies around 6 to 19 billion light-years from Earth. Lawrence Rudnick, of University of Minnesota, discovered it in 2007, from two different sets of data. A cold spot of cooler radiation from the Cosmic Microwave Background was found by the WMAP satellite, (the Wilkinson Microwave Asteroid Probe). At the same place, the ground-based Very Large Array (VLA) telescope found fewer radiowave-producing galaxies in this area.	http://www.nrao.edu/pr/2007/coldspot/
Cosmic Microwave Background Radiation (CMBR): A form of electromagnetic radiation filling the Universe. It is the faint background glow, similar in all directions, that is not associated with any star, galaxy, or other object. What we observe at present is radiation from the last scattering of photons off electrons, when the Universe was around 30,000 to 40,000 years old.	When the universe was very young, it was smaller, much hotter, and filled with a uniform, glowing, opaque, white-hot fog of hydrogen plasma. As it expanded, both the plasma and the radiation filling it grew cooler. When it cooled enough, stable atoms formed, which could no longer scatter the thermal radiation. Photons were emitted then, growing fainter and less energetic as they fill the expanding universe. This is the source for the term "relic radiation", another name for the CMBR. After about 10^{-6} seconds, the Universe was an expanding plasma of photons, electrons, and baryons. The projects that have provided our knowledge of the CMBR used NASA's Cosmic Background Explorer (COBE), and NASA's Wilkinson Microwave Anisotropy Probe, (WMAP). Both measured the spectrum of radiation. Scientists analyzed this spectral data, including the degree of "shift" of the spectral patterns to the less energetic side of the spectrum. This shifting is known as "redshift" as the pattern shifts toward the less energetic, i.e. from blue towards red, side of the spectrum. It is the cosmological, or gravitational, redshift, which becomes relevant for distant objects. This is distinct from the redshift caused by the Doppler effect of a body moving away from the receiver of its signal, which is useful for nearby objects where the expansion of space is less significant. Cosmological redshift is due to space-time of the Universe expanding: light-waves become stretched into longer wavelengths along with this expansion. The CMBR's discovery in 1964 by American radio astronomers Arno Penzias and Robert Wilson was the culmination of work initiated in the 1940s, and earned them the 1978 Nobel Prize.	http://wmap.gsfc.nasa.gov/

Grids		
Celestial Coordinates (R=70ly): A spherical system of coordinates, in which Earth is at the center, and the axis of rotation is a line between the North and South Poles of the Earth. The plane, called the Equatorial plane, is aligned with the Earth's Equator.	The Radio Sphere shows the boundary of Earth's radio signals beginning in the late 1930s and into the early 1940s, when radar, television carrier waves, and atomic testing started sending strong radio signals into space. Strong enough to pass through Earth's ionosphere, these signals travel into interstellar space at the speed of light. The radio sphere is the farthest extent of mankind's presence in our Galaxy and the Universe. As of 2012, its radius extends over 70 light-years from Earth.	An Introduction to Galaxies and Cosmology, Mark A. Jones and Robert J. A. Lambourne, Eds., 2004
Ecliptic Coordinates (R=100ly): A spherical system of coordinates, in which Earth is at the center, and the plane is aligned with the Solar System's planets orbiting around the Sun.	The Ecliptic plane matches the plane the planets obit around the Sun. It is close (7.25 degrees) to the Sun's rotational plane, consistent with the planets' forming within the accretion disc of the young Sun. Because of the tilt of the Earth's axis, the plane of this sphere is oriented 23 degrees and 7 minutes (23.45 degrees) away from the plane of the Celestial coordinates. "The Ecliptic" refers to the path the Sun and the other planets travel when seen from a point on the Earth. The Equatorial plane and the Ecliptic plane intersect twice yearly, at the Vernal and Autumnal Equinoxes.	An Introduction to Galaxies and Cosmology, Mark A. Jones and Robert J. A. Lambourne, Eds., 2004
Galactic Coordinates (R=1000ly): A spherical system of coordinates, in which the Sun is the center, and the plane is aligned with the rotation of the Milky Way galaxy around its apparent center.	The zero degree latitude line is the plane of our galaxy. Because of the disc shape of the galaxy, stars are densest at latitudes close to zero degrees, and less dense in the galactic North and South at higher latitudes. The galactic longitude is measured in the plane of the galaxy, using an axis pointing from the Sun to the Galactic Center, as zero degrees longitude.	An Introduction to Galaxies and Cosmology, Mark A. Jones and Robert J. A. Lambourne, Eds., 2004

Solar System Aligned (Dynamic): A 2-dimensional system of coordinates, aligned along the ecliptic plane. The starting point at the center is the point set on Uniview as the current target.	Radial grids show concentric circles. Cartesian grids show a checkerboard pattern of equal squares. The coordinates are marked in units of either light years (ly) or Astronomical Units (AU).	
Milky Way Aligned (Dynamic): A 2-dimensional system of coordinates, aligned along the galactic plane. The starting point at the center is the point set on Uniview as the current target.	Radial grids show concentric circles. Cartesian grids show a checkerboard pattern of equal squares. The coordinates are marked in units of either light years (ly) or Astronomical Units (AU).	