3200 East Cheyenne Avenue
North Las Vegas, NV 89030

Now Playing

The Planetarium

Black Holes
Tales of the Maya Skies
The Little Star that Could

Show Times:
Black Holes: 8 pm Friday & Saturday
Mayan Skies: 7 pm Friday & Saturday
Little Star: 6 pm Friday, 3:30 & 6 pm Saturday
General admission price: $6.00
Students, children & seniors: $4.00
Gift Shop: Fri.: 5 - 9 pm, Sat.: 3 - 9 pm

Seasonal Stargazing
with all shows
The Student Observatory
Free observing sessions after 8:00 pm
planetarium shows, weather permitting.

Saturn: Jewel of the Heavens in SciDome™
Call for other titles

Show Times:
Hourly from opening. Call for times and titles for additional programs.
General Admission: $7.00
Children and Seniors: $5.00
Open Monday-Thursday 12 noon - 5 pm
Friday & Saturday 10 am - 9 pm
Sunday 10 am - 5 pm
775-784-4811 Show Info.

Seasonal Stargazing
with some shows
Telescope Viewing
Free observing sessions on the first Friday of each month at MacClean Observatory (Redfield Campus) starting 30 minutes after sunset. Weather permitting.
775-784-4812 Office
Word from the Editor

Radio Galaxy Hercules A

(NASA/STScI) Spectacular jets powered by the gravitational energy of a supermassive black hole in the core of the elliptical galaxy Hercules A illustrate the combined imaging power of two of astronomy’s cutting-edge tools, the Hubble Space Telescope's Wide Field Camera 3, and the recently upgraded Karl G. Jansky Very Large Array (VLA) radio telescope in New Mexico.

Some two billion light-years away, the yellowish elliptical galaxy in the center of the image appears quite ordinary as seen by Hubble in visible wavelengths of light. The elliptical galaxy is roughly 1,000 times more massive than the bulge of our Milky Way and harbors a 2.5-billion-solar-mass central black hole that is 1,000 times more massive than the black hole in the Milky Way. But the innocuous-looking galaxy, also known as 3C 348, has long been known as the brightest radio-emitting object in the constellation Hercules. Emitting nearly a billion times more power in radio wavelengths than our Sun, the galaxy is one of the brightest extragalactic radio sources in the entire sky.

The VLA radio data reveal enormous, optically invisible jets that, at one-and-a-half million light-years wide, dwarf the visible galaxy from which they emerge. The jets are very-high-energy plasma beams, subatomic particles and magnetic fields shot at nearly the speed of light from the vicinity of the black hole. The outer portions of both jets show unusual ring-like structures suggesting a history of multiple outbursts from the supermassive black hole at the center of the galaxy.

The innermost parts of the jets are not visible because of the extreme velocity of the material; relativistic effects confine all of the light to a narrow cone aligned with the jets, and so that light is not seen by us. Far from the galaxy, the jets become unstable and break up into the rings and wisps.

The entire radio source is surrounded by a very hot, X-ray-emitting cloud of gas, not seen in this optical-radio composite.

Hubble’s view of the field also shows a companion elliptical galaxy very close to the center of the optical-radio source, which may be merging with the central galaxy. Several other elliptical and spiral galaxies that are visible in the Hubble data may be members of a cluster of galaxies. Hercules A is by far the brightest and most massive galaxy in the cluster.

© 2013, Board of Regents, Nevada System of Higher Education. onOrbit is published monthly by the Planetariums of the Nevada System of Higher Education. It may be copied in whole or part as long as credit is given. While every effort is made to insure the accuracy of the information presented, the Planetariums are not responsible for any errors or the consequences of those errors. All the news that fits is print.

Editor: Dr. Dale Etheridge, CSN Planetarium Director • Graphic Design: Denise MacRae
Circulation Manager: Pam Maher
Hubble Sees A Galaxy Hit A Bullseye

(ESA/STScI) Bright pink nebulae almost completely encircle a spiral galaxy in this NASA/ESA Hubble Space Telescope image of NGC 922. The ring structure and the galaxy’s distorted spiral shape result from a smaller galaxy scoring a cosmic bullseye, hitting the centre of NGC 922 some 330 million years ago.

In Hubble’s image, NGC 922 clearly reveals itself not to be a normal spiral galaxy. The spiral arms are disrupted, a stream of stars extends out towards the top of the image, and a bright ring of nebulae encircles the core. Observing with NASA’s Chandra X-ray Observatory reveals more chaos in the form of ultraluminous X-ray sources dotted around the galaxy.

NGC 922’s current unusual form is a result of a cosmic bullseye millions of years ago. A smaller galaxy, catalogued as 2MASXI J0224301-244443, plunged right through the heart of NGC 922 and shot out the other side. In wide-field views of the NGC 922, the small interloper can be still be seen shooting away from the scene of the crash.

As the small galaxy passed through the middle of NGC 922, it set up ripples that disrupted the clouds of gas, and triggered the formation of new stars whose radiation then lit up the remaining gas. The bright pink colour of the resulting nebulae is a characteristic sign of this process, and it is caused by excited hydrogen gas (the dominant element in interstellar gas clouds). This process of excitation and emission of light by gases is similar to that in neon signs.

In theory, if two galaxies are aligned just right, with the small one passing through the centre of the larger one, the ring of nebulae should form a perfect circle, but more often the two galaxies are slightly off kilter, leading to a circle that, like this one, is noticeably brighter on one side than the other.

These objects, called collisional ring galaxies, are relatively rare in our cosmic neighbourhood. Although galaxy collisions and mergers are commonplace, the precise alignment and ratio of sizes necessary to form a ring like this is not, and the ring-like phenomenon is also thought to be relatively short-lived.

The chances of seeing one of these galaxies nearby is therefore quite low. Despite the immense number of galaxies in the Universe, this is one of only a handful known in our cosmic neighbourhood (the Cartwheel Galaxy being the most famous example). Observations of the more distant Universe (where we see further into the past) show that these rings were more common in the past, however.
Hubble's image of NGC 922 consists of a series of exposures taken in visible light with Hubble's Wide Field Camera 3, and in visible and near-infrared light with the Wide Field and Planetary Camera 2.

'Dark Core' May Not Be So Dark After All

(NASA/STScI) These composite images, taken by two different teams using the Hubble Space Telescope, show different results concerning the amount of dark matter in the core of the merging galaxy cluster Abell 520.

Dark matter is an invisible form of matter that astronomers deduce is the underlying gravitational "glue" that holds galaxies together.

Top Image: Observations of the cluster, taken by D. Clowe with the Advanced Camera for Surveys, map the amount of dark matter in Abell 520. The map reveals an amount of dark matter astronomers expect based on the number of galaxies in the core. The dark-matter densities are marked in blue, and the dotted circle marks the dark-matter core. The map is superimposed onto visible-light images of the cluster.

Bottom Image: A second team, led by James Jee of the University of California, Davis, used the Wide Field Planetary Camera 2 and found an unusual overabundance of dark matter in the cluster’s core, denoted by the bright blue color at image center. The observation was surprising because astronomers expect that dark matter and galaxies should be anchored together, even during a collision between galaxy clusters.

This discrepancy between the two results requires further observation and analysis, say researchers.

The two dark-matter maps were made by detecting how light from distant objects is distorted by the galaxy clusters, an effect called gravitational lensing.

Abell 520 is located 2.4 billion light-years away.

X-rays from a Reborn Planetary Nebula

(NASA/CXC) These images (next page) of the planetary nebula Abell 30, (a.k.a. A30), show one of the clearest views ever obtained of a special phase of evolution for these objects. The inset image on the right is a close-up view of A30 showing X-ray data from NASA’s Chandra X-ray Observatory in purple and Hubble Space Telescope (HST) data showing optical emission from oxygen ions in orange. On the left is a larger view showing optical and X-ray data from the Kitt Peak National Observatory and ESA’s XMM-Newton, respectively. In this image the optical data show emission from oxygen (orange) and hydrogen (green and blue), and X-ray emission is colored purple.

A planetary nebula, so called because it looks like a planet when viewed with a small telescope, is formed in the late stage of the
evolution of a sun-like star.

After having steadily produced energy for several billion years through the nuclear fusion of hydrogen into helium in its central region, or core, the star undergoes a series of energy crises related to the depletion of hydrogen and subsequent contraction of the core. These crises culminate in the star expanding a hundred-fold to become a red giant.

Eventually the outer envelope of the red giant is ejected and moves away from the star at a relatively sedate speed of less than 100,000 miles per hour. The star meanwhile is transformed from a cool giant into a hot, compact star that produces intense ultraviolet (UV) radiation and a fast wind of particles moving at about 6 million miles per hour. The interaction of the UV radiation and the fast wind with the ejected red giant envelope creates the planetary nebula, shown by the large spherical shell in the bigger image.

In rare cases, nuclear fusion reactions in the region surrounding the star’s core heat the outer envelope of the star so much that it temporarily becomes a red giant again. The sequence of events, envelope ejection followed by a fast stellar wind, is repeated on a much faster scale than before, and a small-scale planetary nebula is created inside the original one. In a sense, the planetary nebula is reborn.

The large nebula seen in the larger image has an observed age of about 12,500 years and was formed by the initial interaction of the fast and slow winds. The cloverleaf pattern of knots seen in both images, correspond to the recently ejected material. These knots were produced much more recently, as they have an observed age of about 850 years, based on observations of their expansion using HST.

The diffuse X-ray emission seen in the larger image and in the region around the central source in the inset is caused by interactions between wind from the star and the knots of the ejected material. The knots are heated and eroded by this interaction, producing X-ray emission. The cause of the point-like X-ray emission from the central star is unknown.

Studies of A30 and other planetary nebulae help improve our understanding of the evolution of sun-like stars as they near the end of their lifetime. The X-ray emission reveals how the material lost by the stars at different evolutionary stages interact with each another. These observations of A30, located about 5,500 light years away, provide a picture of the harsh environment that the solar system will evolve towards in several billion years, when the sun’s strong stellar wind and energetic radiation will blast those planets that survived the previous, red giant phase of stellar evolution.

The structures seen in A30 originally inspired the idea of reborn planetary nebulae, and only three other examples of this phenomenon are known. A new study of A30, using the observatories mentioned above, has been reported by an international team of astronomers in the August 20th, 2012 issue of *The Astrophysical Journal*. ☛
Record-Setting X-ray Jet Discovered

(NASA/CXC) This composite image shows the most distant X-ray jet ever observed. X-ray data from NASA’s Chandra X-ray Observatory are shown in blue, radio data from the NSF’s Very Large Array are shown in purple and optical data from NASA’s Hubble Space Telescope are shown in yellow. The jet was produced by a quasar named GB 1428+4217, or GB 1428 for short, and is located 12.4 billion light years from Earth. The shape of the jet is very similar in the X-ray and radio data.

Giant black holes at the centers of galaxies can pull in matter at a rapid rate producing the quasar phenomenon. The energy released as particles fall toward the black hole generates intense radiation and powerful beams of high-energy particles that blast away from the black hole at nearly the speed of light. These particle beams can interact with magnetic fields or ambient photons to produce jets of radiation.

As the electrons in the jet fly away from the quasar, they move through a sea of background photons left behind after the Big Bang. When a fast-moving electron collides with one of these so-called cosmic microwave background photons, it can boost the photon’s energy into the X-ray band. Because the quasar is seen when the universe is at an age of about 1.3 billion years, less than 10% of its current value, the cosmic background radiation is a thousand times more intense than it is now. This makes the jet much brighter, and compensates in part for the dimming due to distance.

While there is another possible source of X-rays for the jet, radiation from electrons spiraling around magnetic field lines in the jet, the authors favor the idea that the cosmic background radiation is being boosted because the jet is so bright.

The researchers think the length of the jet in GB 1428 is at least 230,000 light years, or about twice the diameter of the entire Milky Way galaxy. This jet is only seen on one side of the quasar in the Chandra and VLA data. When combined with previously obtained evidence, this suggests the jet is pointed almost directly toward us. This configuration would boost the X-ray and radio signals for the observed jet and diminish those for a jet presumably pointed in the opposite direction.


The Las Vegas Astronomical Society

The Astronomical Society of Nevada
The ASN normally meets on the 2nd Tuesday of each month at 6:30 pm at the Fleischmann Planetarium. Call 775-324-4814 for information. http://www.astronomynv.org/
NASA Rover's First Soil Studies Help Fingerprint Martian Minerals

(NASA/JPL) NASA's Mars rover *Curiosity* has completed initial experiments showing the mineralogy of Martian soil is similar to weathered basaltic soils of volcanic origin in Hawaii.

The minerals were identified in the first sample of Martian soil ingested recently by the rover. *Curiosity* used its Chemistry and Mineralogy instrument (CheMin) to obtain the results, which are filling gaps and adding confidence to earlier estimates of the mineralogical makeup of the dust and fine soil widespread on the Red Planet.

"We had many previous inferences and discussions about the mineralogy of Martian soil," said David Blake of NASA Ames Research Center in Moffett Field, Calif., who is the principal investigator for CheMin. "Our quantitative results provide refined and in some cases new identifications of the minerals in this first X-ray diffraction analysis on Mars."

The identification of minerals in rocks and soil is crucial for the mission's goal to assess past environmental conditions. Each mineral records the conditions under which it formed. The chemical composition of a rock provides only ambiguous mineralogical information, as in the textbook example of the minerals diamond and graphite, which have the same chemical composition, but strikingly different structures and properties.

CheMin uses X-ray diffraction, the standard practice for geologists on Earth using much larger laboratory instruments. This method provides more accurate identifications of minerals than any method previously used on Mars. X-ray diffraction reads minerals' internal structure by recording how their crystals distinctively interact with X-rays. Innovations from Ames led to an X-ray diffraction instrument compact enough to fit inside the rover.

These NASA technological advances have resulted in other applications on Earth, including compact and portable X-ray diffraction equipment for oil and gas exploration, analysis of archaeological objects and screening of counterfeit pharmaceuticals, among other uses.

"Our team is elated with these first results from our instrument," said Blake. "They heighten our anticipation for future CheMin analyses in the months and miles ahead for *Curiosity*."

The specific sample for CheMin's first analysis was soil *Curiosity* scooped up at a patch of dust and sand that the team named Rocknest. The sample was processed through a sieve to exclude particles larger than 0.006 inch (150 micrometers), roughly the width of a human hair. The sample has at least two components: dust distributed globally in dust storms and fine sand originating more locally. Unlike conglomerate rocks *Curiosity* investigated earlier, which are several billion
Bish said, "So far, the materials Curiosity has analyzed are consistent with our initial ideas of the deposits in Gale Crater recording a transition through time from a wet to dry environment. The ancient rocks, such as the conglomerates, suggest flowing water, while the minerals in the younger soil are consistent with limited interaction with water."

"Much of Mars is covered with dust, and we had an incomplete understanding of its mineralogy," said David Bish, CheMin co-investigator with Indiana University in Bloomington. "We now know it is mineralogically similar to basaltic material, with significant amounts of feldspar, pyroxene and olivine, which was not unexpected. Roughly half the soil is non-crystalline material, such as volcanic glass or products from weathering of the glass."

The Martian soil examined by the Chemistry and Mineralogy (CheMin) instrument on NASA's Curiosity rover shows the diffraction signature, or "fingerprint," of the mineral olivine, shown here on Earth in the form of tumbled crystals about a quarter-inch (several millimeters) in size.

Bish said, "So far, the materials Curiosity has analyzed are consistent with our initial ideas of the deposits in Gale Crater recording a transition through time from a wet to dry environment. The ancient rocks, such as the conglomerates, suggest flowing water, while the minerals in the younger soil are consistent with limited interaction with water."

During the two-year prime mission of the Mars Science Laboratory Project, researchers are using Curiosity's 10 instruments to investigate whether areas in Gale Crater ever offered environmental conditions favorable for microbial life.

NASA's Jet Propulsion Laboratory, a division of Caltech in Pasadena, manages the project for NASA's Science Mission Directorate, Washington, and built Curiosity and CheMin.
NASA Mars Rover Fully Analyzes First Martian Soil Samples

(NASA/JPL) NASA's Mars Curiosity rover has used its full array of instruments to analyze Martian soil for the first time, and found a complex chemistry within the Martian soil. Water and sulfur and chlorine-containing substances, among other ingredients, showed up in samples Curiosity's arm delivered to an analytical laboratory inside the rover.

SAM used three methods to analyze gases given off from the dusty sand when it was heated in a tiny oven. One class of substances SAM checks for is organic compounds, carbon-containing chemicals that can be ingredients for life.

"We have no definitive detection of Martian organics at this point, but we will keep looking in the diverse environments of Gale Crater," said SAM Principal Investigator Paul Mahaffy of NASA's Goddard Space Flight Center in Greenbelt, Md.

Curiosity's APXS instrument and the Mars Hand Lens Imager (MAHLI) on the rover's arm confirmed Rocknest has chemical-element composition and textural appearance similar to sites visited by earlier NASA Mars rovers Pathfinder, Spirit and Opportunity.

Curiosity's team selected Rocknest as the first scooping site because it has fine sand particles suited for scrubbing interior surfaces of the arm's sample-handling chambers. Sand was vibrated inside the chambers to remove residue from Earth. MAHLI close-up images of Rocknest show a dust-coated crust one or two sand grains thick, covering dark, finer sand.

"Active drifts on Mars look darker on the surface," said MAHLI Principal Investigator Ken Edgett, of Malin Space Science Systems in San Diego. "This is an older drift that has had time to be inactive, letting the crust form and dust accumulate on it."

CheMin's examination of Rocknest samples found the composition is about half common volcanic minerals and half non-crystalline materials such as glass. SAM added information about ingredients present in much lower concentrations and about ratios of isotopes. Isotopes are different forms of the same element.
This map shows where NASA's Mars rover *Curiosity* has driven since landing at a site subsequently named "Bradbury Landing," and traveling to an overlook position near beside "Point Lake," in drives totaling 1,703 feet (519 meters).

and can provide clues about environmental changes. The water seen by SAM does not mean the drift was wet. Water molecules bound to grains of sand or dust are not unusual, but the quantity seen was higher than anticipated.

SAM tentatively identified the oxygen and chlorine compound perchlorate. This is a reactive chemical previously found in arctic Martian soil by NASA's *Phoenix Lander*. Reactions with other chemicals heated in SAM formed chlorinated methane compounds -- one-carbon organics that were detected by the instrument. The chlorine is of Martian origin, but it is possible the carbon may be of Earth origin, carried by *Curiosity* and detected by SAM's high sensitivity design.

"We used almost every part of our science payload examining this drift," said *Curiosity* Project Scientist John Grotzinger of the California Institute of Technology in Pasadena. "The synergies of the instruments and richness of the data sets give us great promise for using them at the mission's main science destination..."
onOrbit February

The Mars Hand Lens Imager (MAHLI) on NASA's Mars rover Curiosity acquired close-up views of sands in the "Rocknest" wind drift to document the nature of the material that the rover scooped, sieved and delivered to the Chemistry and Mineralogy Experiment (CheMin) and the Sample Analysis on Mount Sharp."

NASA's Mars Science Laboratory Project is using Curiosity to assess whether areas inside Gale Crater ever offered a habitable environment for microbes. NASA's Jet Propulsion Laboratory in Pasadena, a division of Caltech, manages the project for NASA's Science Mission Directorate in Washington, and built Curiosity.

**Spirit Mars Rover in 'McMurdo' Panorama**

(NASA/JPL) This 360° view, called the "McMurdo" panorama, comes from the panoramic camera (Pancam) on NASA's Mars Exploration Rover Spirit. From April through October 2006, Spirit stayed on a small hill known as "Low Ridge." There, the rover’s solar panels were tilted toward the sun to maintain enough solar power for Spirit to keep making scientific observations throughout the winter on southern Mars. This view of the surroundings from Spirit’s "Winter Haven" is presented in approximately true color.

Many dark, porous-textured volcanic rocks can be seen around the rover, including many on Low Ridge. Two rocks to the right of center, brighter and smoother-looking in this image and more reflective in infrared observations by Spirit's miniature thermal emission spectrometer, are thought to be meteorites. On the right, "Husband Hill" on the horizon, the rippled "El Dorado" sand dune field near the base of that hill, and lighter-toned "Home Plate" below the dunes provide context for Spirit’s travels from mid-2005 to early 2006.

Left of center, tracks and a trench dug by Spirit’s right-front wheel, which could no longer rotate, exposed bright underlying material. This bright material is evidence of sulfur-rich salty minerals in the subsurface, providing clues about the watery past of this part of Gusev Crater.

Some image mosaic seams and brightness variations in the sky as well as several other small areas of color mis-alignments or other mismatch problems have been smoothed over in image processing in order to simulate the view that a human would see if he or she were standing here and looking around. This "natural color" view is the rover team's best estimate of what the scene would look like if we were there and able to see it with our own eyes. It is presented as a cylindrical projection.

Spirit completed its three-month prime mission on Mars in April 2004, then continued operating in bonus extended missions into March 2010, when it ceased communicating. This newly processed image was just released.
Month in History

February

1: The Space Shuttle Columbia broke up during re-entry due to wing damage in 2003. The vehicle and its crew were lost.

2: Christopher Clavius, responsible for the calendar reform implemented by Pope Gregory XIII, died on this date in 1612. The Gregorian calendar is still in use today.

3: Luna 9, launched by the Soviet Union, made the first soft landing on the moon and returned pictures from another world for the first time on this date in 1966.

4: Clyde Tombaugh, the discoverer of Pluto, was born on this date in 1916. See Feb. 18.

5: The US spacecraft, Mariner 10, returned the first close images of our sister planet as it passed Venus on this date in 1974 headed towards Mercury.

5: Apollo 14, the 3rd mission to the moon’s surface landed near Fra Mauro close to the lunar equator on this date in 1971. Alan Sheppard and Ed Mitchell visited the surface and Stuart Roosa remained in orbit aboard the command module.

7: American astronauts Bruce McCandless and Robert Steward accomplished the first untethered space walks with Manned Maneuvering Units (MMU) during the STS-41B shuttle mission in 1984.

11: Japan became the fourth nation to launch an artificial satellite in 1970 with the launch of the 50 pound Ohsumi satellite. They used a newly developed solid fuel, multi-staged rocket similar to the US Scout rocket. The satellite’s battery failed the next day.

12: The NEAR-Shoemaker spacecraft became the first to land on an asteroid in 2001 when it touched down on the surface of Eros. It had orbited Eros since February 2000.

14: The US launched Syncom 1, the first geosynchronous satellite, in 1963.

15: Pioneer 10 became the first spacecraft to successfully pass through the asteroid belt between Mars and Jupiter in 1973.

15: Galileo Galilei was born in 1564 in Pisa, Italy. In December, 1609, he was the first person to use a telescope to look at the heavens and report what he saw.

18: Clyde Tombaugh, an observing assistant at the Lowell Observatory, announced the discovery of the planet Pluto in 1930 from photos taken over the previous two months.

19: Nicolaus Copernicus was born in 1473. He was the first modern proponent for a model of the solar system with the sun at the center.

19: The Soviet Union launched the Mir space station into orbit in 1986. This space station was deorbited and burned up in the atmosphere in March 2001.

20: John Glenn became the first American astronaut to orbit the earth in 1962 aboard the Friendship 7 Mercury craft. His mission lasted for three orbits which ended in less than five hours.

22: The USSR launched Cosmos 110 in 1966. It carried the dogs Veterok and Ugolyok into orbit. They were returned safely to earth 22 days later. This was the last of many high altitude and space flights by dogs dating back to 1951.

24: The discovery of the first pulsar was announced by Jocelyn Bell in 1968 at Cambridge in the United Kingdom.

28: The US launched the first spacecraft into a polar orbit on this date in 1959.

Take a Field Trip to a Planetarium

Shows available for all grade levels are offered Monday thru Friday at both the Fleischmann Planetarium and the CSN Planetarium.

For information, call 702-651-4505 in Las Vegas or 775-784-4812 in Reno.
All times are Pacific Standard time. Rise and set times are for the astronomical horizon at Las Vegas or Reno as noted.

### The Planets

**Mercury.** Mercury is in the evening sky setting shortly after the sun. Greatest eastern elongation (18° east of the sun) occurs on February 16.

**Venus.** Venus is too close in direction to the sun to be seen and it will return to the evening sky in June. Superior conjunction on the far side of the sun occurs on March 28.

**Mars.** Mars, in Aquarius this month, is too close in direction to the sun to be visible. It will reach conjunction on the far side of the sun on April 17 and return to the morning sky in late June.

**Jupiter.** Jupiter, in Taurus between the Hyades star cluster and the Pleiades star cluster, is high in the south in the early evening. Look for the first quarter moon just below Jupiter on the evening February 17.

**Saturn.** Saturn, in Libra, is high in the south sky before sunrise. It rises at about 11 pm at mid-month.

**Uranus.** Uranus, in Pisces, is low in the southwest in the early evening. The waxing crescent moon passes about 7° below Uranus on the evening of February 12 and sets about 20 minutes before Uranus.

**Neptune.** Neptune, in Aquarius, is too close in direction to the sun to be seen. Conjunction, when it passes on the far side of the sun, occurs on February 20.

### The Moon

Each day the moon rises about one hour later than the day before. The New Moon (not visible) is in the direction of the sun and rises and sets with the sun. The first quarter moon rises at about noon and sets near midnight. The full moon is opposite the sun in the sky and rises at sunset and sets at sunrise. The last quarter moon rises near midnight and sets near noon. Perigee is when the moon is closest to the earth and apogee is when it is farthest. The distance varies by ±6% from the average.

<table>
<thead>
<tr>
<th>Dwarf Planets. (At mid-month - 15th)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Planet</strong></td>
</tr>
<tr>
<td>Pluto</td>
</tr>
<tr>
<td>Ceres</td>
</tr>
<tr>
<td>Eris</td>
</tr>
<tr>
<td>MakeMake</td>
</tr>
<tr>
<td>Haumea</td>
</tr>
</tbody>
</table>

All Dwarf Planets require a telescope. Ceres is visible through most amateur telescopes. Pluto usually requires a telescope of at least 12" diameter. Dwarf planets beyond the orbit of Neptune can also be referred to as Plutoids. Eris ("EE-ris"), MakeMake (mah-keh-mah-keh) and Haumea, like most Plutoids, require a professional sized telescope. Transit times and altitudes (from Las Vegas) are when the object is at its highest in the southern sky. Each will appear slightly lower in the sky from Reno.

| Full Moon | Jan. 26 | 8:38 pm pst |
| Last quarter | Feb. 3 | 5:56 am |
| New Moon | Feb. 9 | 11:20 pm |
| First quarter | Feb. 17 | 12:31 pm |
| Full Moon | Feb. 25 | 12:26 pm |
| Apogee | Jan. 22 | 2:53 am pst |
| Perigee | Feb. 7 | 5:10 am |
| Apogee | Feb. 18 | 10:31 pm |
The Mid-Winter Sky

High in the south at about 8:00 pm during February is the bright constellation of Orion. Orion has more bright stars in it than most other constellations. Orion is the hourglass figure in the middle of the diagram.

The left shoulder of Orion is marked by the bright red star Betelgeuse. The right foot of Orion is the bright blue star Rigel. These are the two brightest stars of Orion.

The three stars at the waist of the hourglass form the “belt” of Orion. They are called Mintaka, Alnilam and Alnitak. Extending the line formed by the belt stars upward, takes you to the bright red star Aldebaran, the brightest star in Taurus, the Bull. Continuing the line takes you through the “V”-shaped pattern of the Hyades star cluster and eventually to the small “dipper-shaped” pattern of the Pleiades star cluster. The Pleiades are seven sisters kidnapped by Zeus in the form of Taurus.

Extending that same line downward takes you to Sirius, the brightest star in Canis Major, the Big Dog. Sirius is also the brightest appearing star in the sky.

Below the Belt of Orion, in the lower part of the hourglass, are three faint stars in a row. The middle star does not look quite sharp to the eye. This fuzziness is caused by the fact that the middle star is not actually a star, but a nebula. It is the famous Great Nebula of Orion, also known as M42. This cloud of glowing gas can be easily seen with a pair of binoculars. It is a star forming region that is 400 light years across and nearly 1500 light years away. Telescopes have shown evidence of hundreds of new stars being born there.

Above and to the left of Orion is the constellation of Gemini, the Twins. The two brightest stars, along the left side of the diagram, are Castor and Pollux. These stars are very similar in appearance which led to them being called “The Twins”. 🌟
**Now Playing**

### In Las Vegas

- **Black Holes**
- **Tales of the Maya Skies**
- **The Little Star that Could**
- **Seasonal Stargazing**
  - *all in Digistar 5™*

### In Reno

- **Saturn: Jewel of the Heavens**
  - *in SciDome™*
- **Call for other titles**
- **Seasonal Stargazing**

---

*The CSN Planetarium* and *The Fleischmann Planetarium* are units of the Nevada System of Higher Education.

- **CSN President:** Dr. Michael Richards
- **UNR President:** Dr. Marc Johnson
- **NSHE Chancellor:** Daniel Klaich
- **NSHE Board of Regents:** Dr. Jason Geddes - Chair, Kevin Page - Vice Chair, Dr. Andrea Anderson, Robert Blakely, Cedric Crear, Dr. Mark Doubrava, Ronald Knecht, James Dean Leavitt, Kevin Melcher, Dr. Jack Lund Schofield, Allison Stephens, Rick Trachok, Michael Wixom.

---

**Contact us at:**

- **The Planetarium** - S1A
  - College of Southern Nevada
  - 3200 E. Cheyenne Avenue
  - North Las Vegas, NV  89030-4228
  - [http://www.csn.edu/planetarium/](http://www.csn.edu/planetarium/)
  - Address corrections:
    - pam.maher@csn.edu

- **Fleischmann Planetarium**
  - University of Nevada
  - 1664 N. Virginia Street
  - Reno, NV  89557-0010
  - [http://planetarium.unr.edu/](http://planetarium.unr.edu/)
  - Address corrections:
    - joanne@unr.edu