The Planetarium
College of Southern Nevada - Las Vegas

Fleischmann Planetarium
University of Nevada - Reno

Carina Nebula
Now Playing

**Extreme Planets**
**Black Holes**
**The Little Star That Could**

Show Times:
- **Extreme Planets**: 7:30 pm Friday & Saturday
- **Black Holes**: 6:00 pm Friday & Saturday
- **Little Star**: 3:30 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 7:30 pm
during planetarium shows, weather permitting.

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**Mystery of the Nile in Skydome 8/70™**
**Saturn: Jewel of the Heavens in SciDome™**

Show Times:
- **Nile**: 1 pm, 3 pm.
- **Saturn**: 12 noon, 2 pm, 4 pm.
Call for times and titles for additional programs.

General Admission: $6.00
Children and Seniors: $4.00
Open Friday - Tuesday at 11:30 am

**Seasonal Stargazing**
with some shows

**Telescope Viewing**
Free observing sessions on the first Friday of each month at Rancho San Rafael starting 30 minutes after sunset. Weather permitting.

775-784-4811 Show Info.
775-784-4812 Office

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3200 East Cheyenne Avenue
North Las Vegas, NV 89030
Show Info. 702-651-4SKY
Office 651-4505 or 651-4138

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No Peep from Phoenix in Third Odyssey Listening Stint

(NASA/JPL) NASA’s Mars Odyssey orbiter heard no signal from the Phoenix Mars Lander when it listened from orbit while passing over Phoenix 60 times recently. Odyssey had also listened for a signal from Phoenix during periods in January and February. During the third campaign, April 5 through April 9, the sun stayed above the horizon continuously at the arctic site where Phoenix completed its mission in 2008.

The solar-powered lander examined ice, soil and atmosphere at the site for two months longer than its planned three-month mission before succumbing to seasonal decline in sunlight. It was not designed to withstand winter conditions. However, in case it did, NASA has used Odyssey to listen for the signals that Phoenix would have transmitted if abundant spring sunshine revived the lander.

"In the unlikely event that Phoenix had survived the harsh Martian arctic winter and been able to achieve a power-positive state with the return of continuous sunshine, there is a very high likelihood that one or more of these 60 overflights would have overlapped with a transmission attempt by the lander," said Chad Edwards, chief telecommunications engineer for the Mars Exploration Program at NASA’s Jet Propulsion Laboratory, Pasadena, Calif.

"This was the last of our three planned Phoenix search campaigns. The Mars program will evaluate the results in hand to assess whether further action is warranted," Edwards said. "All the news that fits is print."
Starry-Eyed Hubble Celebrates 20 Years of Awe and Discovery

(NASA/STScI) NASA’s best-recognized, longest-lived, and most prolific space observatory zoomed past a threshold of 20 years of operation recently. On April 24, 1990, the space shuttle and crew of STS-31 were launched to deploy the Hubble Space Telescope into a low Earth orbit. What followed was one of the most remarkable sagas of the space age. Hubble’s unprecedented capabilities made it one of the most powerful science instruments ever conceived by humans, and certainly the one most embraced by the public. Hubble discoveries revolutionized nearly all areas of current astronomical research, from planetary science to cosmology. And, its pictures were unmistakably out of this world.

At times Hubble’s starry odyssey played out like a space soap opera, with broken equipment, a bleary-eyed primary mirror, and even a space shuttle rescue/repair mission cancellation. But the ingenuity and dedication of Hubble scientists, engineers, and NASA astronauts have allowed the observatory to rebound time and time again. Its crisp vision continues to challenge scientists with exciting new surprises and to enthral the public with ever more evocative color images.

NASA, the European Space Agency (ESA), and the Space Telescope Science Institute (STScI) are celebrating Hubble’s journey of exploration with a stunning new picture, online educational activities, an opportunity for people to explore galaxies as armchair scientists, and an opportunity for astronomy enthusiasts to send in their own personal greetings to Hubble for posterity.

NASA is releasing today a brand new Hubble photo of a small portion of one of the largest seen star-birth regions in the galaxy, the Carina Nebula. Towers of cool hydrogen laced with dust rise from the wall of the nebula. The scene is reminiscent of Hubble’s classic "Pillars of Creation" photo from 1995, but is even more striking in appearance. The image captures the top of a three-light-year-tall pillar of gas and dust that is being eaten away by the brilliant light from nearby bright stars. The pillar is also being pushed apart from within, as infant stars buried inside it fire off jets of gas that
can be seen streaming from towering peaks like arrows sailing through the air.

*Hubble* fans worldwide are being invited to share the ways the telescope has affected them. They can send an e-mail, post a Facebook message, use the Twitter hashtag #hst20, or send a cell phone text message. Or, they can visit the "Messages to Hubble" page on http://hubblesite.org, type in their entry, and read selections from other messages that have been received. Fan messages will be stored in the *Hubble* data archive along with the telescope’s many terabytes of science data. Someday, future researchers will be able to read these messages and understand how *Hubble* had such an impact on the world.

The public will also have an opportunity to be-at-home scientists by helping astronomers sort out the thousands of galaxies seen in a deep *Hubble* observation. STScI is partnering with the Galaxy Zoo consortium of scientists to launch an Internet-based astronomy project (http://hubble.galaxyzoo.org) where amateur astronomers can peruse and sort galaxies from *Hubble’s* deepest view of the universe into their classic shapes: spiral, elliptical, and irregular. Dividing the galaxies into categories will allow astronomers to study how they relate to one another and provide clues that might help scientists understand how they formed.

For students, STScI is opening an education portal called *Celebrating Hubble’s 20th Anniversary* (http://amazing-space.stsci.edu/hubble_20/). It offers links to "fun facts" and trivia about *Hubble*, a news story that chronicles the Earth-orbiting observatory’s life and discoveries, and the IMAX™ *Hubble 3D* educator guide. An anniversary poster containing *Hubble’s* "hall-of-fame" images, including the Eagle Nebula and Saturn, is also being offered with downloadable classroom activity information.

To date, *Hubble* has looked at over 30,000 celestial objects and amassed over one-half million pictures in its archive. The last heroic astronaut servicing mission to *Hubble* in May 2009 made it 100 times more powerful than when it was launched. In addition to its irreplaceable scientific importance, *Hubble* brings cosmic wonders into millions of homes and schools every day. For the past 20 years the public has become co-explorers with this wondrous observatory.
This Planet Tastes Funny

(NASA/SSC) NASA’s Spitzer Space Telescope has discovered something odd about a distant planet, it lacks methane, an ingredient common to many of the planets in our solar system.

"It's a big puzzle," said Kevin Stevenson, a planetary sciences graduate student at the University of Central Florida in Orlando, lead author of a study that appeared on April 22 in the journal *Nature*. "Models tell us that the carbon in this planet should be in the form of methane. Theorists are going to be quite busy trying to figure this one out."

The discovery brings astronomers one step closer to probing the atmospheres of distant planets the size of Earth. The methane-free planet, called GJ 436b, is about the size of Neptune, making it the smallest distant planet that any telescope has successfully "tasted," or analyzed. Eventually, a larger space telescope could use the same kind of technique to search smaller, Earth-like worlds for methane and other chemical signs of life, such as water, oxygen and carbon dioxide.

"Ultimately, we want to find biosignatures on a small, rocky world. Oxygen, especially with even a little methane, would tell us that we humans might not be alone," said Stevenson.

"In this case, we expected to find methane not because of the presence of life, but because of the planet's chemistry. This type of planet should have cooked up methane. It's like dipping bread into beaten eggs, frying it, and getting oatmeal in the end," said Joseph Harrington of the University of Central Florida, the principal investigator of the research.

Methane is present on our life-bearing planet, manufactured primarily by microbes living in cows and soaking in waterlogged rice fields. All of the giant planets in our solar system have methane too, despite their lack of cows. Neptune is blue because of this chemical, which absorbs red light. Methane is a common ingredient of relatively cool bodies, including "failed" stars, which are called brown dwarfs.

In fact, any world with the common atmospheric mix of hydrogen, carbon and oxygen, and a temperature up to 1,000 Kelvin (1,340°Fahrenheit) is expected to have a large amount of methane and a small amount of carbon monoxide. The carbon should "prefer" to be in the form of methane at these temperatures.

At 800 Kelvin (or 980°F), GJ 436b is supposed to have abundant methane and little carbon monoxide. *Spitzer* observations have shown the opposite. The space telescope has captured
the planet's light in six infrared wavelengths, showing evidence for carbon monoxide but not methane.

"We're scratching our heads," said Harrington. "But what this does tell us is that there is room for improvement in our models. Now we have actual data on faraway planets that will teach us what's really going on in their atmospheres."

GJ 436b is located 33 light-years away in the constellation Leo, the Lion. It rides in a tight, 2.64-day orbit around its small star, an "M-dwarf" much cooler than our sun. The planet transits, or crosses in front of, its star as viewed from Earth.

_**Spitzer**_ was able to detect the faint glow of GJ 436b by watching it slip behind its star, an event called a secondary eclipse. As the planet disappears, the total light observed from the star system drops, this drop is then measured to find the brightness of the planet at various wavelengths. The technique, first pioneered by _**Spitzer**_ in 2005, has since been used to measure atmospheric components of several Jupiter-sized exoplanets, the so-called "hot Jupiters," and now the Neptune-sized GJ 436b.

"The _**Spitzer**_ technique is being pushed to smaller, cooler planets more like our Earth than the previously studied hot Jupiters," said Charles Beichman, director of NASA's Exoplanet Science Institute at NASA's Jet Propulsion Laboratory and the California Institute of Technology, both in Pasadena, Calif. "In coming years, we can expect that a space telescope could characterize the atmosphere of a rocky planet a few times the size of the Earth. Such a planet might show signposts of life."

This research was performed before _**Spitzer**_ ran out of its liquid coolant in May 2009, officially beginning its "warm" mission.

Other authors include: Sarah Nymeyer, William C. Bowman, Ryan A. Hardy and Nate B. Lust from the University of Central Florida; Nikku Madhusudhan and Sara Seager of the Massachusetts Institute of Technology, Cambridge; Drake Deming of NASA's Goddard Space Flight Center, Greenbelt, Md.; and Emily Rauscher of Columbia University, New York.

**Abell 3376: Einstein's Theory Fights off Challengers**

(NASA/CXC) Two new and independent studies have put Einstein's General Theory of Relativity to the test like never before. These results, made using NASA's _**Chandra X-ray Observatory**_, show Einstein's theory is still the best game in town.

Each team of scientists took advantage of extensive _**Chandra**_ observations of galaxy clusters, the largest objects in the Universe bound together by gravity. One result undercuts a rival gravity model to General Relativity, while the other shows that Einstein's theory works over a vast range of times and distances across the cosmos.

The first finding significantly weakens a competitor to General Relativity known as "f(R) gravity".

"If General Relativity were the heavyweight boxing champion, this other theory was hoping to be the upstart contender," said Fabian Schmidt of the California Institute of Technology in Pasadena, who led the study. "Our work shows that the chances of its upsetting the champ are very slim."
In recent years, physicists have turned their attention to competing theories to General Relativity as a possible explanation for the accelerated expansion of the universe. Currently, the most popular explanation for the acceleration is the so-called cosmological constant, which can be understood as energy that exists in empty space. This energy is referred to as dark energy to emphasize that it cannot be directly detected.

In the f(R) theory, the cosmic acceleration comes not from an exotic form of energy but from a modification of the gravitational force. The modified force also affects the rate at which small enhancements of matter can grow over the eons to become massive clusters of galaxies, opening up the possibility of a sensitive test of the theory.

Schmidt and colleagues used mass estimates of 49 galaxy clusters in the local universe from Chandra observations, and compared them with theoretical model predictions and studies of supernovas, the cosmic microwave background, and the large-scale distribution of galaxies.

They found no evidence that gravity is different from General Relativity on scales larger than 130 million light years. This limit corresponds to a hundred-fold improvement on the bounds of the modified gravitational force's range that can be set without using the cluster data.

"This is the strongest ever constraint set on an alternative to General Relativity on such large distance scales," said Schmidt. "Our results show that we can probe gravity stringently on cosmological scales by using observations of galaxy clusters."

The reason for this dramatic improvement in constraints can be traced to the greatly enhanced gravitational forces acting in clusters as opposed to the universal background expansion of the universe. The cluster-growth technique also promises to be a good probe of other modified gravity scenarios, such as models motivated by higher-dimensional theories and string theory.

A second, independent study also bolsters General Relativity by directly testing it across cosmological distances and times. Up until now, General Relativity had been verified only using experiments from laboratory to Solar System scales, leaving the door open to the possibility that General Relativity breaks down on much larger scales.

To probe this question, a group at Stanford University compared Chandra observations of how rapidly galaxy clusters have grown over time to the predictions of General Relativity. The result is nearly complete agreement between observation and theory.

"Einstein's theory succeeds again, this time in calculating how many massive clusters have formed under gravity's pull over the last five billion years," said David Rapetti of the Kavli Institute for Particle Astrophysics and Cosmology (KIPAC) at Stanford University and SLAC National Accelerator Laboratory, who led the new study. "Excitingly and reassuringly, our results are the most robust consistency test of General Relativity yet carried out on cosmological scales."

Rapetti and his colleagues based their results on a sample of 238 clusters detected across...
The Astronomy Store

The CSN Planetarium
open 5 pm to 9 pm Friday & 3 pm to 9 pm Saturday

The Astronomy Store features items for sale that are of interest to the patrons of The Planetarium. We carry a wide variety of novelties, toys and observing aids with a space or astronomical theme. When patrons obtain their tickets to planetarium shows, they can also purchase a variety of astronomically oriented items. Friends of The Planetarium receive a 10% discount.

NASA Mars Spacecraft Snaps Photos Chosen by Public

(NASA/JPL) The most powerful camera aboard a NASA spacecraft orbiting Mars has returned the first pictures of locations on the Red Planet suggested by the public.

The High Resolution Imaging Science Experiment, or HiRISE camera, aboard NASA’s Mars Reconnaissance Orbiter is nicknamed the people’s camera. Through a program called HiWish that began in January, scientists have received approximately 1,000 suggestions. The first eight images of areas the public selected are available online at: http://www.nasa.gov/mission_pages/MRO/multimedia/images20100331.html.

"NASA's Mars program is a prime example of what we call participatory exploration," NASA Administrator Charlie Bolden said. "To allow the public to aim a camera at a specific site on a distant world is an invaluable teaching..."
tool that can help educate and inspire our youth to pursue careers in science, technology, engineering and math."

Since 2006, HiRISE has obtained approximately 13,000 observations covering dozens of square miles, including areas from a student-suggestion program called NASA Quest. However, only about 1 percent of the Martian surface has been photographed.

NASA has provided other opportunities for the public to see and explore Mars. A camera on NASA’s Mars Global Surveyor imaged 1,086 targets suggested through a public-request program from 2003 until 2006. Launched on Nov. 7, 1996, the probe pioneered the use of aerobraking at Mars and mapped the surface. The original one-year mission was extended four times until November 2006.

"Some people get into model railroading or Civil War re-enactments. My thing is exploring Mars," said James Secosky, a retired teacher in Manchester, N.Y., who suggested an area for HiRISE imaging after he examined online images from other Mars-orbiting cameras.

Another camera aboard NASA’s Mars Odyssey orbiter has taken nearly 500 images after receiving approximately 1,400 suggestions through a public-request program initiated in 2009. Odyssey has been orbiting Mars since 2001. It serves as a communications relay for Mars rovers and makes its own observations and discoveries.

HiRISE is one of six instruments on the Mars Reconnaissance Orbiter. Launched in August 2005, the orbiter reached Mars the following year to begin a two-year primary science mission. The spacecraft has found that Mars has had diverse wet environments at many locations for differing durations in the planet’s history, and Martian climate-change cycles persist into the present era. The mission is in an extended science phase. The spacecraft will continue to take several thousand images a year. The mission has returned more data about Mars than all other spacecraft to the Red Planet combined.

"What we hope is that people become more interested in science and appreciate this opportunity to explore another world," said Alfred McEwen, principal investigator for the camera at the University of Arizona in Tucson. "We appreciate fresh thinking outside the box and look for things we may not have chosen otherwise. It’s good to have a lot of eyes on Mars."

The University of Arizona Lunar and Planetary Laboratory operates the HiRISE camera, which was built by Ball Aerospace & Technologies Corp., in Boulder, CO. NASA’s Jet Propulsion Laboratory in Pasadena, CA, manages MRO for NASA’s Science Mission Directorate. Lockheed Martin Space Systems in Denver built the spacecraft.

This image shows a portion of the floor in Palos Crater on equatorial Mars. The floor appears bumpy with high-standing layered knobs. Most of the terrain on the floor is weathering into meter-size (yard-size) polygonal blocks. The circular structures in the image, many of which are filled with darker wind-blown material, are eroded impact craters. Palos Crater is breached in the south by the 180-kilometer-long (112-mile-long) Tinto Vallis. Water transported along Tinto Vallis could have collected into Palos Crater to form a lake that later drained to the north. Sediments carried by Tinto Vallis would have also been deposited within Palos Crater, so the layered unit we see along the floor today could represent these fluvial sediments.
This image covers the northern edge of the largest volcano in the solar system, Olympus Mons on Mars. The margin of Olympus Mons is defined by a massive cliff many several miles tall. At this location, it is nearly 23,000 feet tall. The cliff exposes the guts of the volcano, revealing interbedded hard and soft layers. The hard layers are lava and the soft layers may be dust (from large dust storms) or volcanic ash.

The Martian north polar layered deposits are an ice sheet much like the Greenland ice sheet on the Earth. Just as with the ice sheet in Greenland this Martian ice sheet contains many layers that record variations in the Martian climate. Sometimes icy layers can be ablated away during warm climates. Later the ice sheet can be buried by new ice layers and grow in size again. It's likely that many of these cycles have occurred over the ice sheet's history. Fluctuations in the thickness of the ice sheet are most pronounced at the edges of the sheet. The ice sheet ends here in a gentle scarp that slopes about 8° downhill from bottom to top in this image.
Samara Valles is one of the longest ancient valley systems on Mars. This system traverses more than 620 miles toward the northwest across the heavily cratered southern highlands eroding into the gentle slopes of Terra Meridiani. The valley is several hundred yards wide at this location, and the surface is mantled with dust as evidenced by the system of dunes that line the valley floor. The surface is heavily cratered by ancient impacts whose ejecta blankets have long ago been eroded.

The terrain in this image lies in the Deuteronilus Mensae region along the highland-lowland dichotomy boundary in the northern hemisphere of Mars. This region contains many mesas surrounded by lobate debris aprons that are thought to be ice-rich. These aprons have been interpreted as a variety of possible features including rock glaciers, ice-rich mass movements, or debris-covered glacial flows. Recent radar data has shown them to be composed of nearly pure ice.

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Common to the northern plains of Mars are rock and boulder strewn landscapes otherwise devoid of major features except a few impact craters. This image in the Cydnus Rupes region of northern Utopia Planitia is an excellent example of this sort of terrain. Boulders up to several yards in size densely coat the landscape. The concentration of these boulders varies at several scales. In some areas only smaller rocks less than a yard across dominate the surface, while a couple hundred yards away may be a somewhat circular "blotch" of larger boulders. Often these blotches of boulders coincide with a faint circular ridge.
**Month in History**

**July**

6: The *Philosophiae Naturalis Principia Mathematica* (usually referred to as *The Principia*) was published by Sir Isaac Newton in 1687. This massive work described the laws of physics as developed by Newton.

7: Spanish explorer Francisco Vasquez de Coronado’s expedition reached the Zuni pueblo in New Mexico in 1540.

10: *Telstar I*, the first private communications satellite was launched this day in 1962.

11: *Skylab*, the United States’ first orbiting space station, was destroyed as it reentered the atmosphere over the Indian Ocean in 1979. *Skylab* was launched in 1973 and hosted three crews for a total mission time of six months.

14: *Mariner 4* was the first spacecraft to reach the planet Mars. It returned the first close-up photographs of the Red Planet in 1965 during its close flyby.

15: In the first joint US/USSR space project, an *Apollo* spacecraft and a *Soyuz* spacecraft were launched into low earth orbit in 1975 headed towards a rendezvous and docking (see the 17th). The American crew was Thomas Stafford, Vance Brand and Deke Slayton. The Soviet crew was Alexei Leonov and Valeriy Kubasov.

16: *Apollo 11*, the first mission to land men on the moon was launched in 1969 leading to the first lunar landing four days later.

17: The first rendezvous and docking of two spacecraft from different nations occurred in 1975 as part of the *Apollo-Soyuz Test Project*.

19: Edward Pickering, co-founder of the American Association of Variable Star Observers, was born in 1846.

20: Nils Adolf Eric Nordenskjöld completed the first Northwest Passage across North America in 1879.

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Give a Star

A popular service of The CSN Planetarium lets you dedicate a star to a loved one. For a donation of $35, we will provide an attractive certificate that proclaims your dedication of the star of your choice to any other person. The certificate will have a chart of the constellation containing the star and complete information about the star. A donation of $100 will give you an exclusive dedication. Call 651-4138 or 651-4505 for further information.
Sky Calendar

All times are Pacific Daylight Time. Rise and set times are for the astronomical horizon at Las Vegas or Reno as noted.

The Planets

Mercury. Mercury is low in the west shortly after sunset for the last part of the month. Greatest eastern elongation (27°) on August 6. Look for Mercury less than one degree to the left of Regulus in Leo on the evening of July 27.

Venus. Venus is appearing low in the western sky after sunset. It is setting about three hours after the sun. Look for the waxing crescent moon below and to the left of Venus on the evening of July 14.

Mars. Mars, passing from Leo into Virgo, is in the southwest at sunset. It is less than 2° from Saturn at the end of the month.

Jupiter. Jupiter, in Pisces, is rising in the east near midnight. The last quarter moon rises to the left of Jupiter and Uranus on the morning of July 4.

Saturn. Saturn, in Virgo, is in the west in the early evening. The waxing crescent moon will be 12° to the left Saturn on the evening of July 16.

Uranus. Uranus, in Pisces, is low in the eastern sky after midnight. It is rising shortly before Jupiter.

Neptune. Neptune, near the Aquarius-Capricornus border, is rising in the east at before midnight. The waning gibbous moon will rise to the left of Neptune at 10:45 pm on June 30 and shortly before 9:00 pm on the evening of July 27.

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>Planet</th>
<th>Constellation</th>
<th>Transit</th>
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<tbody>
<tr>
<td>Pluto</td>
<td>Sagittarius</td>
<td>11:19 pm (36°)</td>
</tr>
<tr>
<td>Ceres</td>
<td>Ophiuchus</td>
<td>10:31 pm (27°)</td>
</tr>
<tr>
<td>Eris</td>
<td>Cetus</td>
<td>6:49 am (50°)</td>
</tr>
<tr>
<td>MakeMake</td>
<td>Coma Berenices</td>
<td>5:37 pm (82°)</td>
</tr>
<tr>
<td>Haumea</td>
<td>Boötes</td>
<td>6:46 pm (73°)</td>
</tr>
</tbody>
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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.

Dwarf Planets. (At mid-month - 15th)

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</tbody>
</table>

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>Phase</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Moon</td>
<td>Jun. 26</td>
<td>4:30 am pdt</td>
</tr>
<tr>
<td>Last quarter</td>
<td>July 4</td>
<td>7:35 am</td>
</tr>
<tr>
<td>New Moon</td>
<td>July 11</td>
<td>12:40 pm</td>
</tr>
<tr>
<td>First quarter</td>
<td>July 18</td>
<td>3:11 am</td>
</tr>
<tr>
<td>Full Moon</td>
<td>July 26</td>
<td>6:37 pm</td>
</tr>
<tr>
<td>Apogee</td>
<td>July 1</td>
<td>3:13 am pdt</td>
</tr>
<tr>
<td>Perigee</td>
<td>July 13</td>
<td>4:22 am</td>
</tr>
<tr>
<td>Apogee</td>
<td>July 28</td>
<td>4:51 pm</td>
</tr>
</tbody>
</table>
Meteor Shower

The Delta Aquarid meteor shower reaches its peak on the night of July 27/28. The number of meteors visible varies from 15 to 35 per hour. The stream of material causing this shower is relatively broad. The earth enters the stream around July 15 and leaves it in mid-August. The nearly full moon will interfere with observations near the date of maximum.

Meteors are best seen after midnight where the sky is clear and dark. This means the observer must get away from city lights. For the Las Vegas area, you need to get at least 30 miles away from the city. Excellent observing sites can be found near Lake Mead, Red Rock Canyon or Valley of Fire. For the Reno area, Pyramid Lake, about 40 miles north of Sparks, is a good location.

Meteors from a shower can be seen anywhere in the sky. Because the particles causing the meteors are traveling on parallel paths, you can trace back the path of each meteor to a common place in the sky. This place is called the radiant for the shower. The radiant for this shower is near the star Delta Aquarii in the zodiacal constellation of Aquarius.

While the Delta Aquarid shower is rather bland, next month we will have what is usually the best meteor shower of the year. Now is the time to start planning for the Perseid shower which will peak on the night of August 11/12. Fortunately, the Perseids will not be impeded much by a new moon this year.

Aphelion

As the earth travels around the sun, its distance from the sun changes slightly. This year, our distance from the sun will be greatest (aphelion) on July 6 at 4:00 am. The distance of the center of the earth from the center of the sun will be 152,096,360 kilometers or 94,508,300 miles. Over a year, our distance from the sun varies by ±1.7% from the average which is called the Astronomical Unit (AU). The AU has a length of 149,597,870 km or 92,955,810 miles. This is often rounded to 93 million miles or 150 million kilometers for a simple approximation.

Solar Eclipse

There will be a total eclipse of the Sun on July 11. The eclipse will be visible in the south Pacific where the tip of the Moon’s shadow first touches the earth north of New Zealand and leaves the earth over four hours later in southern Chile. The maximum duration of totality will be over five minutes. No part of the eclipse will be visible from the United States.
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