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Vol. 18, No. 8
August 2006
$1.25

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The Human Body

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Word from the Editor

Scattered Ice, Scattered Light

(NASA/JPL) An enhanced close-up view shows at least two distinct jets spraying a mist of fine particles from the south polar region of Enceladus. The particles in the plume scatter sunlight most effectively at high Sun-Enceladus-spacecraft angles, or phase angles, making the plumes appear bright.

This image shows the night side of Saturn and the active moon against dark sky. Enceladus is 505 kilometers (314 miles) across.

The rings of Saturn cross the upper part of the image. The near portion of the rings is in shadow and the far portion is receiving direct sunlight.

Some artifacts due to image compression and cosmic rays striking the camera’s detector remain as noise in the image.

The image was acquired in polarized green light with the Cassini spacecraft narrow-angle camera on May 4, 2006 at a distance of approximately 2.1 million kilometers (1.3 million miles) from Enceladus and 2.3 million kilometers (1.4 million miles) from Saturn. The image was taken at a Sun-Enceladus-spacecraft, or phase, angle of 159 degrees. Image scale is 13 kilometers (8 miles) per pixel.

See the article on page 8 which discusses some of the latest interpretations of the unusual behavior of this small moon. The geyser action depicted in this image originates near the south pole of Enceladus. The origin of the geysers is still being debated with the article on page 8 presenting one of the more interesting theories. More theories are likely to come forward in the near future.

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the mission for NASA’s Science Mission Directorate, Washington, D.C. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL. The imaging operations center is based at the Space Science Institute in Boulder, Colo.
NGC 5866

(NASA/STScI) This is a unique NASA Hubble Space Telescope view (here and on the cover) of the disk galaxy NGC 5866 tilted nearly edge-on to our line-of-sight. Hubble's sharp vision reveals a crisp dust lane dividing the galaxy into two halves. The image highlights the galaxy's structure: a subtle, reddish bulge surrounding a bright nucleus, a blue disk of stars running parallel to the dust lane, and a transparent outer halo.

Some faint, wispy trails of dust can be seen meandering away from the disk of the galaxy out into the bulge and inner halo of the galaxy. The outer halo is dotted with numerous gravitationally bound clusters of nearly a million stars each, known as globular clusters. Background galaxies that are millions to billions of light-years farther away than NGC 5866 are also seen through the halo.

NGC 5866 is a disk galaxy of type "S0" (pronounced s-zero). Viewed face on, it would look like a smooth, flat disk with little spiral structure. It remains in the spiral category because of the flatness of the main disk of stars as opposed to the more spherically round (or ellipsoidal) class of galaxies called "ellipticals." Such S0 galaxies, with disks like spirals and large bulges like ellipticals, are called 'lenticular' galaxies.

The dust lane is slightly warped compared to the disk of starlight. This warp indicates that NGC 5866 may have undergone a gravitational tidal disturbance in the distant past, by a close encounter with another galaxy. This is plausible because it is the largest member of a small cluster known as the NGC 5866 group of galaxies. The starlight disk in NGC 5866 extends well beyond the dust disk. This means that dust and gas still in the galaxy and potentially available to form stars does not stretch nearly as far out in the disk as it did when most of these stars in the disk were formed.

The Hubble image shows that NGC 5866 shares another property with the more gas-rich spiral galaxies. Numerous filaments that reach out perpendicular to the disk punctuate the edges of the dust lane. These are short-lived on an astronomical scale, since clouds of dust and gas will lose energy to collisions among themselves and collapse to a thin, flat disk.

For spiral galaxies, the incidence of these fingers of dust correlates well with indicators of how many stars have been formed recently, as the input of energy from young massive stars moves gas and dust around to create these structures. The thinness of dust lanes in S0s has been discussed in ground-based galaxy atlases, but it took the resolution of Hubble to show that they can have their own smaller fingers and chimneys of dust.

NGC 5866 lies in the Northern constellation Draco, at a distance of 44 million light-years. It has a diameter of roughly 60,000 light-years only two-thirds the diameter of the Milky Way, although its mass is similar to our galaxy. This Hubble image of NGC 5866 is a combination of blue, green and red observations taken with the Advanced Camera for Surveys in November 2005.
Teachers and Teens Discover a Cauldron of Star Formation

(NASA/SSC) Eight hundred light-years away in the Orion constellation, a gigantic murky cloud called the "Witch Head Nebula" is teeming with dust-obscured newborn stars waiting to be uncovered.

In less than two hours of observations with the dust-piercing infrared eyes of NASA’s *Spitzer Space Telescope*, a team of high school science teachers and students nearly quadrupled the number of known stars in the Witch Head’s "pointy chin" alone. Now, they’ve been granted 11 more hours on *Spitzer* to scan the entire nebula for stellar embryos. They will also try to determine if the region’s star formation is being triggered by strong winds from a nearby supergiant star named Rigel.

"Seeing newborn stars that no one had seen this clearly before was thrilling," said Cynthia Weehler, a science teacher at Burbank High School in San Antonio, TX.

"It’s exciting to be engaged in the process of science where you are not merely studying astronomy in a historical sense, but rather you are making the significant contributions that will one day become scientific history," adds Timothy Spuck, a science teacher at Oil City Area Senior High School in Oil City, Penn.

Spuck and Weehler are just two of five high school science teachers from across the country hunting for stellar embryos in the region. The teachers are participants in the Spitzer Space Telescope Research Program for Teachers and Students. As part of the program, the teachers attended workshops and wrote a joint proposal for time on *Spitzer*. They conducted observations in early 2005, and that summer invited some of their brightest students to the Spitzer Science Center at the California Institute of Technology (Caltech) in Pasadena, Calif., to analyze the data with professional astronomers.

"The most important thing I learned while visiting the Spitzer Science Center is that science isn’t something that can be taught from a text book, it’s something that you learn only by doing it yourself," said Brittany Ehrhart, a student at Oil City Area Senior High School.

Ehrhart’s classmate David Bowser II notes that his visit to the Spitzer Science Center taught him how to "analyze the pictures from the telescope and to plot the data to help classify the young stars."

"I wouldn’t change a thing about my experience," said Bowser. "If I had the opportunity to do it again, I would, and many other students should have the opportunity as well."

"What excites me most about this program is the enthusiasm of the teachers and students involved. They are not only observing for themselves, they are sharing their experiences and resources with other teachers in their school districts and states," said Dr. Thomas Soifer, Spitzer Science Center director and professor of physics at Caltech.

In January 2006, the team presented their first set of observations in a poster paper at the 207th American Astronomical Society meeting in Washington DC. The meeting was one of the largest professional astronomical gatherings in history.

"Being able to present our project at the AAS was a chance to see how interested research scientists are in education," said Weehler.
"They are committed to it, knowing that future research depends on students understanding of science, how research is done, and being as excited by it as they are."

"If we as a country want to remain in our currently leading role in the fields of science and technology, we need to inspire more people from the younger generation to join the field," adds Soifer. "This program is a meaningful way for NASA to help students understand the scientific process and decide on pursuing science as a long-term career goal."

New stars discovered by the teachers and students will be added to the Spitzer Science Center archives for astronomers across the community to reference in the years to come. Meanwhile, many of the teachers will use the Spitzer data as a teaching supplement in their classes.

The high schools involved in this project are: Lincoln High School in Stockton, Calif.; Phillips Exeter Academy in Exeter, N.H.; Luther Burbank High School in San Antonio, Tex.; Bassick High School in Bridgeport, Conn.; and Oil City Area Sr. High School in Oil City, Penn.

"Being part of the program has given me confidence that I can learn how science works. I didn’t know I could understand research until I got this chance. I think the program is great and that more students should be able to do this," said Jessica Herrera, a senior at Luther Burbank High School.

Astronomers Use Innovative Technique to Find Extrasolar Planet

(NASA/STScI) An international team of professional and amateur astronomers, using simple off-the-shelf equipment to trawl the skies for planets outside our solar system, has hauled in its first "catch."

The astronomers discovered a Jupiter-sized planet orbiting a Sun-like star 600 light-years from Earth in the constellation Corona Borealis. The team, led by Peter McCullough of the Space Telescope Science Institute in Baltimore, Md., includes four amateur astronomers from North America and Europe.

Using modest telescopes to search for extrasolar planets allows for a productive collaboration between professional and amateur astronomers that could accelerate the planet quest.

"This discovery suggests that a fleet of modest telescopes and the help of amateur astronomers can search for transiting extrasolar planets many times faster than we are now," McCullough said. The finding has been accepted for publication in the Astrophysical Journal.

McCullough deployed a relatively inexpensive telescope made from commercial equipment to scan the skies for extrasolar planets. Called the XO telescope, it consists of two 200-millimeter telephoto camera lenses and looks like a pair of binoculars. The telescope is on the summit of the Haleakala volcano, in Hawaii.

"To replicate the XO prototype telescope would cost $60,000," McCullough said.

Artist's concept of the newly discovered planet XO-1b.
McCullough explained. "We have spent far more than that on software, in particular on designing and operating the system and extracting this planet from the data."

McCullough's team found the planet, dubbed XO-1b, by noticing slight dips in the star's light output when the planet passed in front of the star, called a transit. The light from the star, called XO-1, dips by approximately 2 percent when the planet XO-1b passes in front of it. The observation also revealed that XO-1b is in a tight four-day orbit around its parent star.

Although astronomers have detected more than 180 extrasolar planets, XO-1b is only the tenth planet discovered using the transit method. It is the second planet found using telephoto lenses. The first, dubbed TrES-1, was reported in 2004. The transit method allows astronomers to determine a planet's mass and size. Astronomers use this information to deduce the planet's characteristics, such as its density.

The team confirmed the planet's existence by using the Harlan J. Smith Telescope and the Hobby-Eberly Telescope at the University of Texas's McDonald Observatory to measure the slight wobble induced by the planet on its parent star. This so-called radial-velocity method allowed the team to calculate a precise mass for the planet, which is slightly less than that of Jupiter (about 0.9 Jupiter masses). The planet also is much larger than its mass would suggest. "Of the planets that pass in front of their stars, XO-1b is the most similar to Jupiter yet known, and the star XO-1 is the most similar to the Sun," McCullough said, although he was quick to add, "but XO-1b is much, much closer to its star than Jupiter is to the Sun."

The astronomer's innovative technique of using relatively inexpensive telescopes to look for eclipsing planets favors finding planets orbiting close to their parent stars. The planet also must be large enough to produce a measurable dip in starlight.

The planet is the first discovered in McCullough's three-year search for transiting extrasolar planets. The planet quest is underwritten by a grant from NASA's Origins program.

McCullough's planet-finding technique involves nightly sweeps of the sky using the XO telescope in Hawaii to note the brightness of the stars it encounters. A computer software program sifts through many thousands of stars every two months looking for tiny dips in the stars' light, the signature of a possible planetary transit. The computer comes up with a few hundred possibilities. From those candidates, McCullough and his team select a few dozen promising leads. He passes these stars on to the four amateur astronomers to study the possible transits more carefully.

From September 2003 to September 2005, the XO telescope observed tens of thousands of bright stars. In that time, his team of amateur astronomers studied a few dozen promising candidate stars identified by McCullough and his team. The star XO-1 was pegged as a promising candidate in June 2005. The amateur astronomers observed it in June and July 2005, confirming that a planet-sized object was eclipsing the star. McCullough's team then turned to the McDonald Observatory in Texas to obtain the object's mass and verify it as a planet. He received the news of the telescope's observation at 12:06 a.m. Feb. 16, 2006, from Chris Johns-Krull, a friend and colleague at Rice University.

"It was a wonderful feeling because the
team had worked for three years to find this one planet," McCullough explained. "The discovery represents a few bytes out of nearly a terabyte of data: It's like trying to distill gold out of seawater."

The discovery also has special familial significance for the astronomer. "My father's mentor was Harlan J. Smith, the man whose ambition and hard work produced the telescope that we used to acquire the verifying data."

McCullough believes the newly found planet is a perfect candidate for study by the Hubble and Spitzer space telescopes. Hubble can measure precisely the star's distance and the planet's size. Spitzer can actually see the infrared radiation from the planet. By timing the disappearance of the planet behind the star, Spitzer also can measure the "ellipticity," or "out-of-roundness," of the planet's orbit. If the orbit is elliptical, then the varying gravitational force would result in extra heating of the planet, expanding its atmosphere and perhaps explaining why the object's diameter seems especially large for a body of its calculated mass.

"By timing the planet's passages across the star, both amateur and professional astronomers might be lucky enough to detect the presence of another planet in the XO-1 system by its gravitational tugs on XO-1b," McCullough said. "It's even possible that such a planet could be similar to Earth." ☞

Saturn's Moon
Enceladus Rolled Over

(NASA/JPL) Saturn's moon Enceladus, an active, icy world with an unusually warm south pole, may have performed an unusual trick for a planetary body. New research shows Enceladus rolled over, literally, explaining why the moon's hottest spot is at the south pole.

Enceladus recently grabbed scientists' attention when the Cassini spacecraft observed icy jets and plumes indicating active geysers spewing from the tiny moon's south polar region.

"The mystery we set out to explain was how the hot spot could end up at the pole if it didn't start there," said Francis Nimmo, assistant professor of Earth sciences, University of California, Santa Cruz.

The researchers propose the reorientation of the moon was driven by warm, low-density material rising to the surface from within Enceladus. A similar process may have happened on Uranus' moon Miranda, they said. Their findings appeared recently in the journal Nature.

"It's astounding that Cassini found a region of current geological activity on an icy moon that we would expect to be frigidly cold, especially down at this moon's equivalent of Antarctica," said Robert Pappalardo, co-author and planetary scientist at NASA's Jet Propulsion Laboratory in Pasadena, Calif. "We think the moon rolled over to put a deeply seated warm, active area there." Pappalardo worked on the study while at the University of Colorado.

Rotating bodies, including planets and moons, are stable if more of their mass is close to the equator. "Any redistribution of mass within the object can cause instability with respect to the axis of rotation. A reorientation will tend to position excess mass at the equator and areas of low density at the poles," Nimmo said. This is precisely what happened to Enceladus.

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/

The ASN has a Las Vegas Chapter. For information see: http://www.astronomynv.org/vegas/
Nimmo and Pappalardo calculated the effects of a low-density blob beneath the surface of Enceladus and showed it could cause the moon to roll over by up to 30-degrees and put the blob at the pole.

Pappalardo used an analogy to explain the Enceladus rollover. "A spinning bowling ball will tend to roll over to put its holes, the axis with the least mass, vertically along the spin axis. Similarly, Enceladus apparently rolled over to place the portion of the moon with the least mass along its vertical spin axis," he said.

The rising blob (called a "diapir") may be within either the icy shell or the underlying rocky core of Enceladus. In either case, as the material heats up it expands and becomes less dense, then rises toward the surface. This rising of warm, low-density material could also help explain the high heat and striking surface features, including the geysers and "tiger-stripe" region suggesting fault lines caused by tectonic stress.

Internal heating of Enceladus probably results from its eccentric orbit around Saturn. "Enceladus gets squeezed and stretched by tidal forces as it orbits Saturn, and that mechanical energy is transformed into heat energy in the moon's interior," added Nimmo.

Future Cassini observations of Enceladus may support this model. Meanwhile, scientists await the next Enceladus flyby in 2008 for more clues.

This research was supported by grants from NASA. The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. JPL, a division of Caltech, manages the mission for NASA’s Science Mission Directorate. The Cassini orbiter was designed, developed and assembled at JPL. ☞

The Las Vegas Astronomical Society
Hubble Captures a "Five-Star" Rated Gravitational Lens

(NASA/STScI) NASA's Hubble Space Telescope has captured the first-ever picture of a group of five star-like images of a single distant quasar.

The multiple-image effect seen in the Hubble picture is produced by a process called gravitational lensing, in which the gravitational field of a massive object (in this case, a cluster of galaxies) bends and amplifies light from an object (in this case, a quasar) farther behind it.

Although many examples of gravitational lensing have been observed, this "quintuple quasar" is the only case so far in which multiple quasar images are produced by an entire galaxy cluster acting as a gravitational lens.

The background quasar is the brilliant core of a galaxy. It is powered by a black hole, which is devouring gas and dust and creating a gusher of light in the process. When the quasar's light passes through the gravity field of the galaxy cluster that lies between us and the quasar, the light is bent by the space-warping gravity field in such a way that five separate images of the object are produced surrounding the cluster's center. The fifth quasar image is embedded to the right of the core of the central galaxy in the cluster. The cluster also creates a cobweb of images of other distant galaxies gravitationally lensed into arcs.

The galaxy cluster creating the lens is known as SDSS J1004+4112 and was discovered in the Sloan Digital Sky Survey. It is one of the more distant clusters known (seven billion...
light-years away), and is seen as it appeared when the universe was half its present age.

Spectral data taken with the Keck I 10-meter telescope show that these are images of the same galaxy. The spectral results match those inferred by a lens model based only on the image positions and measurements of the light emitted from the quasar.

A gravitational lens will always produce an odd number of lensed images, but one image is usually very weak and embedded deep within the light of the lensing object itself. Though previous observations of SDSS J1004+4112 have revealed four of the images of this system, *Hubble*'s sharp vision and the high magnification of this gravitational lens combine to place a fifth image far enough from the core of the central imaging galaxy

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to make it visible as well.

The galaxy hosting the background quasar is at a distance of 10 billion light-years. The quasar host galaxy can be seen in the image as multiple faint red arcs. This is the most highly magnified quasar host galaxy ever seen.

The Hubble picture also shows a large number of stretched arcs that are more distant galaxies lying behind the cluster, each of which is split into multiple distorted images. The most distant galaxy identified and confirmed so far is 12 billion light-years away (corresponding to only 1.8 billion years after the Big Bang).

By comparing this image to a picture of the cluster obtained with Hubble a year earlier, the researchers discovered a rare event, a supernova exploding in one of the cluster galaxies. The supernova exploded seven billion years ago, and the data, together with other supernova observations, are being used to try to reconstruct how the universe was enriched by heavy elements through these explosions.

### Hubble Eyes Star Birth in the Extreme

(NASA/STScI) Staring into the crowded, dusty core of two merging galaxies, NASA’s Hubble Space Telescope has uncovered a region where star formation has gone wild.

The interacting galaxies appear as a single, odd-looking galaxy called Arp 220. The galaxy is a nearby example of the aftermath of two colliding galaxies. In fact, Arp 220 is the brightest of the three galactic mergers closest to Earth. This latest view of the galaxy is yielding new insights into the early universe, when galactic wrecks were more common.

The sharp eye of Hubble’s Advanced Camera for Surveys has unveiled more than 200 mammoth star clusters. The newly found clusters far outnumber the six spied by Hubble in a 1992 observation of Arp 220 taken by the Wide Field Planetary Camera, which did not have the sharpness of the Advanced Camera.

The clusters are so compact, however, that even at their moderate distance they look to Hubble-like brilliant single stars. Astronomers know the clusters are not stars because they are much brighter than a star would be at that distance, 250 million light-years away.

The star birth frenzy is happening in a very small region, about 5,000 light-years across, where the gas and dust is very dense. There is as much gas in that tiny region as there is in the entire Milky Way Galaxy.

"This is star birth in the extreme," said astronomer Christine D. Wilson of McMaster University, and the leader of the study. "Our result implies that very high star-formation rates are required to form supermassive star clusters. This is a nearby look at a phenomenon that was common in the early universe, when many galaxies were merging."

Wilson’s team obtained measurements of the masses and ages for 14 of the clusters, which allowed them to more accurately estimate the masses and ages for all the clusters. The observations revealed two populations of star clusters. One population is less than 10 million years old; the second, over 70 million years old. Clusters in the younger group are more massive than those in the older group.

Although the new Hubble image showcases Arp 220 in visible light, the galaxy shines brightest in infrared light. In fact, Arp 220 is called an ultra-luminous infrared galaxy (ULIRG).

The galaxy is the 220th object in Halton Arp’s Atlas of Peculiar Galaxies.
Month in History

August

1: American astronomer Maria Mitchell was born in 1818. She was a Professor of Astronomy at Vassar College and the first woman elected to the American Academy of Arts and Sciences, the American Association for the Advancement of Science, and the American Philosophical Society.

3: Christopher Columbus launched his first voyage of discovery that found the New World in 1492.

4: Apollo 15 was the first manned mission to leave an 80-pound sub-satellite in orbit of the moon in 1971. The small satellite measured magnetic fields, charged particle densities and gravitational anomalies.

5: Neil Armstrong, the first person to walk on the moon, was born in 1930.

7: The first remote image of the earth was returned by a satellite in 1959.

7: A team of scientists announced the discovery of possible fossil micro-organisms in the Martian meteorite ALH84001 in 1997. The meteorite was discovered in the Allen Hills region of Antarctica in 1984.

11: Asaph Hall discovered the outer-most satellite of Mars, Deimos, in 1877.

13: Anders Jonas Ångstrom, the Swedish physicist and spectroscopist, was born in 1814. The Ångstrom Unit, which has a length of one tenth of a nanometer is named for him.

17: Asaph Hall discovered the innermost satellite of Mars, Phobos, in 1877. (Mars Global Surveyor image at right)

19: John Flamsteed, the first Astronomer Royal of Britain, was born on this day in 1646. He is responsible for a numerical method of star designation called Flamsteed numbers.

19: The first flight of an unmanned hot air balloon occurred in France in 1783. This was a test by the Montgolfier brothers prior to their successful manned flight later that year.

19: Orville Wright was born in 1871. Orville and his brother Wilbur built the first successful heavier than air flying machine.

20: Voyager 2 was launched on its journey into the outer solar system in 1977.

21: Gordon Cooper became the first person to fly in space for the second time on Gemini 5 in 1965. His first trip into space was on Mercury 9 in 1963.

23: Lunar Orbiter 7 returned the first image of the earth from the vicinity of the moon in 1966.

24: Voyager 2 returned the first close-up images of Neptune during its flyby of that world in 1989.

Give a Star

A popular service of The CCSN 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. Accompanying the certificate will be The Sky Challenger, which contains a series of adjustable charts of the sky as seen from North America to help you find your 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 Moon

First quarter: The moon 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 the closest the moon comes to the earth. It occurs when the moon is full.

Uranus. Uranus, in Aquarius, is rising in the early evening. Opposition (directly opposite the sun) will occur on September 5 when it will be rising as the sun sets.

Neptune. Neptune, in Capricornus, rises over an hour before Uranus. Opposition occurs on August 10. On August 8, the nearly full moon rises 7° to the right of Neptune as the sun is setting.

Pluto. Pluto is in the constellation of Serpens Cauda. It is visible in the southwest for most of the evening and sets near midnight. The best time to view Pluto would be before midnight when it is highest. A telescope of at least 12” diameter from a dark sky environment is usually required to see this faint planet. It appears star-like in all but the very largest telescopes.

The Planets

Mercury. Mercury starts the month rising in the east shortly before the sun. Greatest Western elongation (19°) occurs on August 7. Look for Mercury just 2° below Venus on the morning of August 10. By the end of the month, Mercury will be too close in direction to the sun to be visible with Superior Conjunction (far side of the sun) occurring on August 31.

Venus. Venus is visible in the morning sky rising about 1 hour before the sun. Through a small telescope at low to moderate power, Venus exhibits a gibbous phase. By late August, Venus will be too close in direction to the sun to be visible as it moves around the far side of the sun.

Mars. In Leo, Mars is too close in direction to the sun to observe as it sets in the west shortly after the sun. Conjunction on the far side of the sun will occur on October 23.

Jupiter. Jupiter, in Libra, is high in the southwest sky after sunset. The evenings of August 1 and August 28, Jupiter will be above the waxing crescent moon. Jupiter presents a spectacular view in a small telescope. Even with binoculars, its four major moons (discovered by Galileo) can be easily seen.

Saturn. Saturn, near Mars in Cancer, is too close in direction to the sun to be visible. Conjunction occurs on August 7 when Saturn passes on the far side of the sun.
Meteor Shower

The month of August is noted as one of the best meteor showers of the year. It is called the Perseid shower because the meteors seem to radiate out from the constellation of Perseus. The particles that cause the meteors are from Comet Swift-Tuttle of 1862. Since this comet travels on a very elongated orbit, the debris from this comet strikes the earth’s atmosphere at very high velocities. This produces bright meteors that travel rapidly across the sky. Some meteors of this shower are seen to fragment or explode.

The peak of activity for the Perseids occurs on the morning of August 12 (after midnight August 11). The best time for viewing will be 1:00 am to 4:00 am. Since the stream of material that causes the shower is fairly broad, Perseid meteors can actually be seen for about one week on either side of this date. About four days before and after the peak, you can see about one quarter as many Perseid meteors as you can on the night of the peak.

Normally it is possible to see anywhere from 75 to 200 meteors per hour on the night of the maximum under good conditions. Since the moon will be in the morning sky on the night of the peak, it will be a factor. This will not be one of the better years for observing this potentially rich meteor shower.

Perseid meteors are very fast. The average meteor enters the earth’s atmosphere at a speed of 20 to 25 miles per second. Perseid meteors typically travel at 40 miles per second. This can also help you distinguish Perseids from any other sporadic meteors that might occur on the same night.

To see the maximum number of meteors during a shower, you must find a dark location. You want to be away from city lights. From Las Vegas, try Valley of Fire, Echo Bay or Red Rock Canyon. Reno observers will have the best opportunity near Pyramid Lake.

As the earth travels around the sun, more meteors are encountered on the leading side of the earth. As a meteor observer, you are on the leading side of the earth after midnight. Meteors will be visible starting at about midnight.

Since meteors typically last for less than a second and can appear anywhere in the sky, optical aid (telescopes and binoculars) are not useful for general meteor observing. Binoculars can be useful for the occasional bright meteor that leaves a glowing trail in the sky. These trails can be observed for several seconds to a couple of minutes.
The CCSN Planetarium and the Fleischmann Planetarium are units of the Nevada System of Higher Education.

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