

# **G***alactic Observer*

## John J. McCarthy Observatory

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July/August 2012

### ***Distant Partners***

About 117-140 million light years from Earth, the twin galaxies NGC 3314 appear locked in a pas de deux; but in reality they are tens of millions of light years apart. That's ten times the distance to our nearest galactic neighbor Andromeda.

Image Credit: NASA, ESA, the Hubble Heritage Team (STScI/AURA)-ESA/Hubble Collaboration, and W. Keel (University of Alabama)



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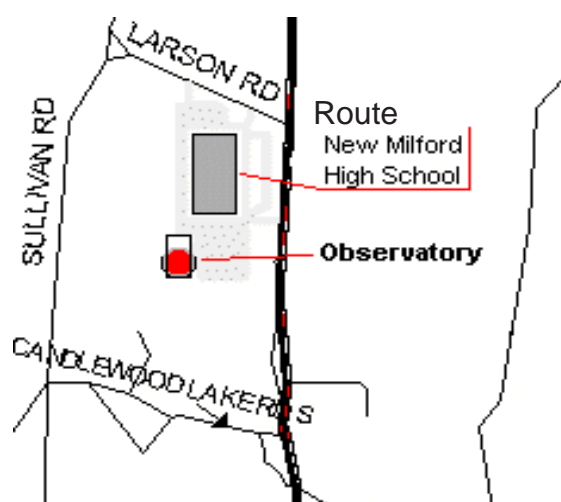
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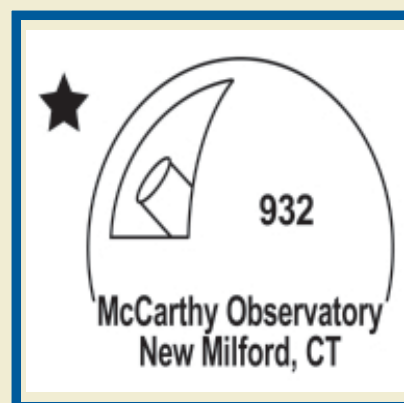
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## July and August Calendar and Space Exploration Almanac



**First Time Venus Transit Observer Conor Cloutier [A spectacle not to be repeated until just prior to his 111th birthday]**



# The Year of the Solar System

NASA announced on Oct. 7, 2010 that the upcoming year would be "The Year of the Solar System." The "Year," however, is a Martian year and, as such, 23 months in length. Some of the highlights of the "Year" of exploration are:

Date	Mission		Status
4 Nov 2010	Deep Impact encounters Comet Hartley 2		Successful rendezvous, see <a href="http://www.nasa.gov/mission_pages/epoxi/index.html">http://www.nasa.gov/mission_pages/epoxi/index.html</a>
19 Nov 2010	Launch of O/OREOS, a shoebox-sized satellite designed to test the durability of life in space		Ground stations receiving data
19 Nov 2010	Launch of experimental solar sail (NanoSail-D)		Mission completed (successfully)
7 Dec 2010	Japan's Akatsuki (Venus Climate Orbiter) spacecraft		Spacecraft fails to enter orbit around Venus - now in orbit around the Sun
14 Feb 2011	Stardust NExT encounters Comet Tempel 1		Successful rendezvous; see <a href="http://stardustnext.jpl.nasa.gov/">http://stardustnext.jpl.nasa.gov/</a>
17 Mar 2011	MESSENGER enters orbit around Mercury		First spacecraft to achieve orbit around Mercury; see <a href="http://messenger.jhuapl.edu/">http://messenger.jhuapl.edu/</a>
18 Mar 2011	New Horizons spacecraft crosses the orbit of Uranus		see <a href="http://pluto.jhuapl.edu/">http://pluto.jhuapl.edu/</a>
16 Jul 2011	Dawn spacecraft arrives at the asteroid Vesta		Orbit achieved; see <a href="http://dawn.jpl.nasa.gov/">http://dawn.jpl.nasa.gov/</a>
5 Aug 2011	Launch of the Juno spacecraft to Jupiter		Successful launch/deployment; see <a href="http://missionjuno.swri.edu/">http://missionjuno.swri.edu/</a>
10 Sept 2011	Launch of twin GRAIL spacecraft to map Moon's gravitational field		Successful launch/deployment; see <a href="http://solarsystem.nasa.gov/grail/">http://solarsystem.nasa.gov/grail/</a>
8 Nov 2011	Launch of the Russian Phobos-Grunt sample-return mission		Successful launch/failure to leave low-Earth orbit/re-entered Earth's atmosphere on January 15 <sup>th</sup>
26 Nov 2011	Launch of Mars Science Laboratory (MSL)		Successful launch/deployment; see <a href="http://marsprogram.jpl.nasa.gov/msl/">http://marsprogram.jpl.nasa.gov/msl/</a>
06 Aug 2012	MSL lands on Mars		
26 Aug 2012	Dawn spacecraft leaves Vesta for the dwarf planet Ceres		

## Other notable events:

• August 24, 2012

Neptune at Opposition

## "Out the Window on Your Left"

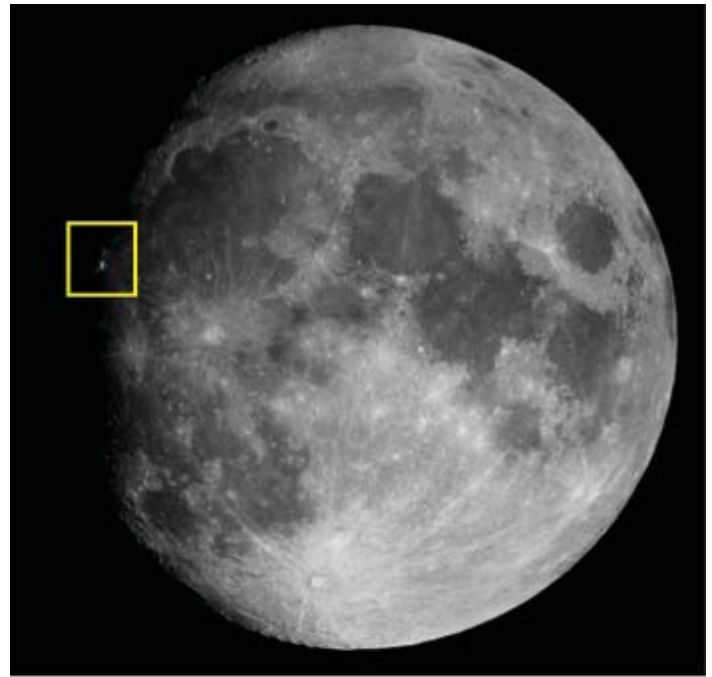
IT'S BEEN 40 YEARS SINCE we left the last footprint on the dusty lunar surface. Sadly, as a nation founded on exploration and the conquest of new frontiers, we appear to have lost our will to lead as a space-faring nation. But, what if the average citizen had the means to visit our only natural satellite; what would they see out the window of their spacecraft as they entered orbit around the Moon? This column may provide some thoughts to ponder when planning your visit (if only in your imagination).

The enigmatic Aristarchus Plateau fills our viewport this month, with the garishly bright crater Aristarchus (visible in the unlit portion of the Moon in the photo on the right), and the largest lava-carved channel on the Moon. The plateau is situated in the northeastern region of Oceanus Procellarum (Ocean of Storms), not far from the western reaches of Mare Imbrium (Sea of Rains).

Originally targeted by the later Apollo missions, the Aristarchus plateau is a geologic treasure trove. The plateau is thought to be an uplifted block of the Moon's crust, approximately 125 miles across (200 km) and tilted downward towards the northwest. The southeast corner rises more than a mile (2 km) above the lava plains of Oceanus Procellarum. It is surmised that the plateau formed as a result of the impact that created the Imbrium basin.

The 25 mile diameter (40 km) crater Aristarchus is named after Aristarchus of Samos (310 BC - ca. 230 BC), a Greek astronomer and mathematician who advocated a Sun-centered model of the solar system. The terraced crater formed approximately 175 million years ago. Its 2 mile depth (3.5 km) exposes bright ancient rock layers that are normally concealed or darkened with age.

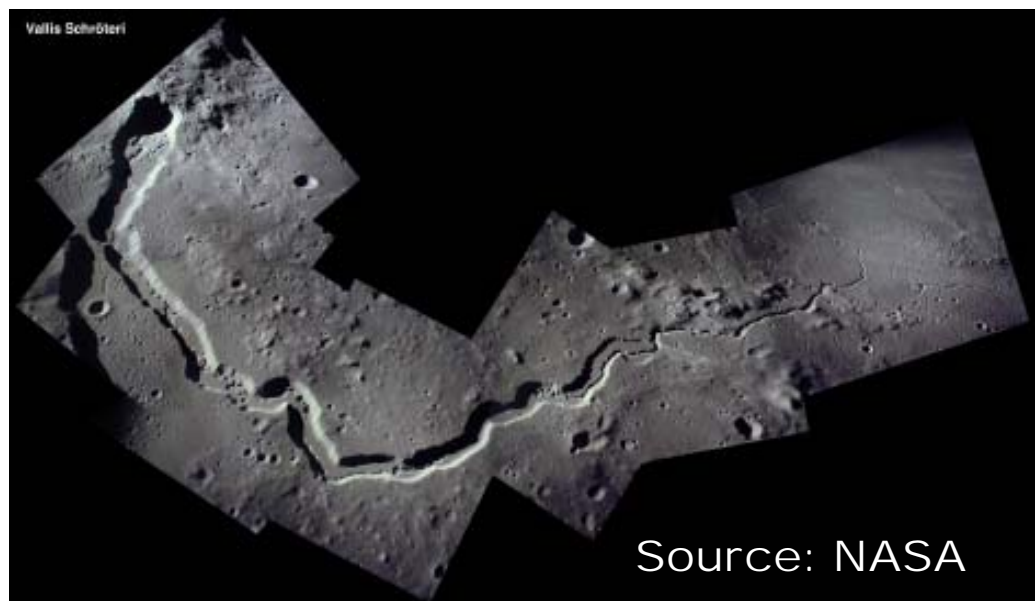
Adjacent to, and west of, Aristarchus is the crater Herodotus, a crater of similar diameter but much different in appearance. Older than Aristarchus, its lava-flooded floor has reduced its depth and its features have been softened by time and relentless



Lunar "seas" and "oceans" are actually expansive low-lying plains formed by ancient lava flows

bombardments of the lunar surface by rocky projectiles.

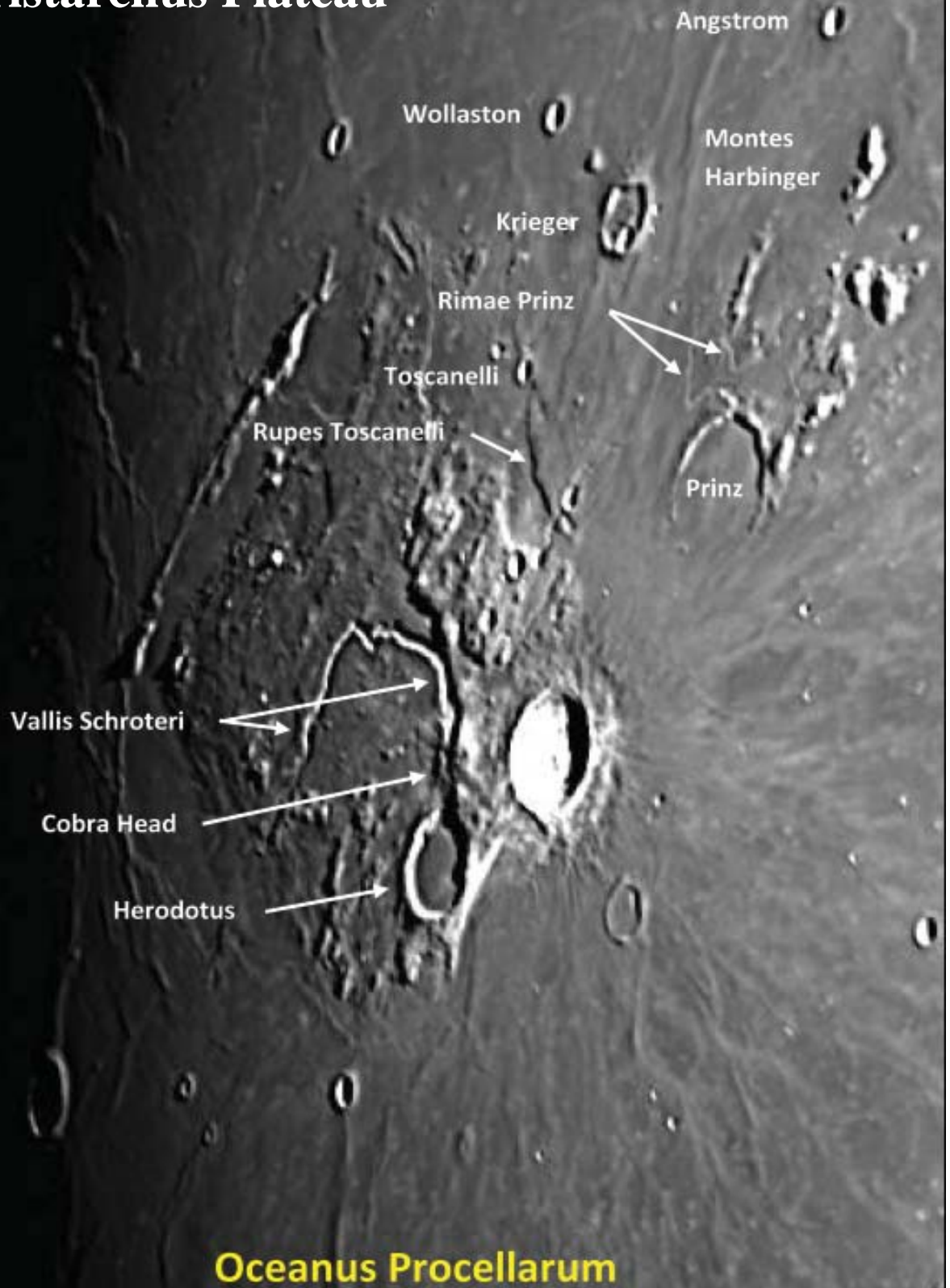
Located between the two craters is a volcanic pit, or magma vent, labeled the Cobra Head. It is the likely origin of a vast serpentine rille or channel, Vallis Schröteri (Schröter's Valley). Winding its way towards the southwest corner of the plateau, the 100 mile (160 km) long lava channel is up to 6 miles (11 km) wide at points and more than ½ mile (1 km) deep. It is believed that this vent was a major source of magma to the surrounding lava plains.



Source: NASA

Vallis Schröteri (Schröter's Valley)

# The Aristarchus Plateau



# Venus Transit 2012



Not unlike ardent storm chasers, the author and his daughter broke down their observing equipment set up hours earlier under cloudy skies for the transit of Venus and started pursuing fleeting sunbeams that could be seen in the distance in hopes of catching a glimpse of the setting Sun. Somewhere south of Baltimore on I-95, passersby might have noticed a young lady wearing dark, cardboard glasses in the passenger seat of a speeding sedan staring at the western horizon, while the driver appraised each passing exit ramp for higher ground. This image was captured just prior to sunset from a back parking lot in an industrial park overlooking the interstate not far from the Baltimore-Washington International Airport. Even momentary triumphs in amateur astronomy are to be treasured!





Kathleen Fischer Sundial



# Space Shuttle History



The space shuttle Atlantis on the eve of its flight to the Hubble Space Telescope in 2009. Two years later, in July 2011, Atlantis flew the last mission of the space shuttle era (STS-135).



## Countdown to Touchdown

In the early hours of August 6th (EDT), NASA will attempt to execute its most complex and high precision Martian landing so far when it gently sets down the one-ton Mars Science Laboratory (MSL) at the base of a mountain within the confines of Gale crater. A combination of small rockets and the largest parachute flown on a planetary mission will slow the descent vehicle from an initial speed of 13,200 miles per hour (at an altitude of approximately 78 miles or 125 km) to hovering over the Martian surface, in just seven minutes! At that point, the descent vehicle will use a "sky crane" to lower the MSL approximately 25 feet (7.5 meters) on to the surface. At touchdown, the descent vehicle will release the MSL and fly off.

MSL will land around mid-afternoon (local Martian time) on a late winter's day. With wheels on the ground, MSL will be ready to begin its prime mission, expected to last one Martian year (approximately 687 Earth days). Unlike previous missions that relied upon the distant Sun for power, MSL is equipped with multiple radioisotope thermoelectric generators that convert the heat produced from the decay of radioactive plutonium to electricity. This steady power source will allow the MSL to operate during the cold winter nights on Mars, avoiding the required periodic hibernation of the Mars Exploration Rovers or the limited lifespan of Phoenix.

## Summer Activities

**S**UMMER IS A GREAT time to enjoy the night sky. Some suggestions for this summer:

1. **Attend a star party.** Star parties are gatherings of amateur astronomers where the general public is invited to share the wonders of the night skies with skilled observers and through telescopes of every size and shape. A calendar of dates and locations across the United States is available at [www.skyandtelescope.com](http://www.skyandtelescope.com). Closer to home, the McCarthy Observatory hosts a star party on the second Saturday of each month. Please join us on July 9<sup>th</sup> and August 13<sup>th</sup> with your family and friends for a memorable evening under the stars.

2. **Take in a meteor shower.** With no telescope required, this naked-eye activity can be enjoyed in a lawn chair and a warm blanket. While an occasional meteor can be spotted at anytime, August 12<sup>th</sup> is the night to catch the Perseids meteor shower. A meteor shower occurs when the Earth passes through a cloud of debris usually left behind by a comet. Comet Swift-Tuttle is the source of the small grains of dust that create the Perseid shower. As one of the most famous showers, the Perseids meteor shower usually delivers an impressive display. This year expect a bright Moon to interfere (washing out dim meteors).

3. **Find the Apollo landing sites.** July marks the anniversaries of two moon landings. Apollo 11 landed on the southwestern shore of the Sea of Tranquility on July 20, 1969. Apollo 15 landed in the foothills of the Apennine Mountains on July 30, 1971. The southwestern shore of the Sea of Tranquility is visible 5 days after a New Moon. The Sun rises on the Apennine Mountains around the First Quarter Moon.

4. **Locate the Summer Milky Way.** Our solar system resides in one of the outer arms of a very large,

rotating pinwheel of 200-300 billion stars called the Milky Way Galaxy. During the summer, we can see the inner arms of the pinwheel in the direction of the galactic core. Unfortunately, a dark sky is required, as excessive lighting is ruining the natural inky black of the celestial sphere. However, it still can be seen from parts of New Milford, late at night and once the moon has set. If you have never seen the Milky Way:

- Locate the Big Dipper (the most prominent asterism in the northern sky). The last two stars in the bowl of the Dipper point to the North Star.

- Imagine a line extended from the two Dipper stars, through the North Star and an equal distance beyond. You should now be between the constellations Cepheus and Cassiopeia. Cassiopeia is shaped like a W or and is the starting point for our journey down the Milky Way.

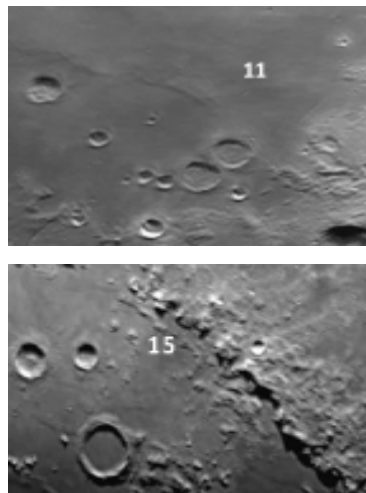
- The Milky Way flows from Cassiopeia south to Cygnus (the Swan or Northern Cross). Cygnus can be recognized by its brightest star Deneb (at the tail) and the three bright stars that form the wing.

- Continuing south, the bright star Altair provides the next navigation aid, directing us to Sagittarius, an asterism shaped like a teapot (next page). On a dark night, the star clouds of the Milky Way appear like steam from the spout of the teapot. The spout is also in the general direction of the center of our galaxy (26,000 light years away).

From a good observing site, you should see a band of cloudiness through this area of the sky. Through binoculars, the “clouds” can be resolved into bright areas populated by stars and darker areas with few or no stars. The darker patches are regions of gas and dust that obscure our view of the galactic center.



Sea of Tranquility and  
Apollo 11 landing site



Apennines Mountains and  
Apollo 15 landing site





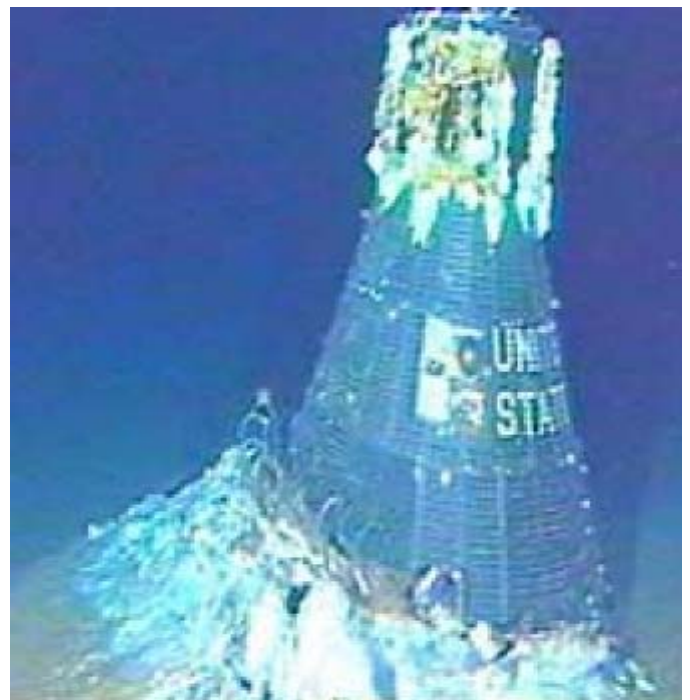
**"Teapot" asterism in  
Sagittarius and star  
clouds of the Milky Way**

### Liberty Bell

Almost 38 years to the day after it disappeared below the surface of the Atlantic Ocean, Gus Grissom's Mercury capsule (Liberty Bell 7) was recovered from the ocean floor. The capsule was lost after Grissom's 15 minute suborbital flight in 1961 when the explosive hatch detonated prematurely, allowing seawater to flood the capsule.

After a fourteen year effort to locate the spacecraft, the Mercury capsule was hoisted to the surface on July 20, 1999 from a depth of almost 15,000 feet (deeper than the wreck of the Titanic). The recovery team was unable to find the hatch.

The spacecraft was in remarkably good condition and was subsequently transported to the Kansas Cosmosphere and Space Center for refurbishing. After a thorough cleaning, that included disassembly and reassembly of the capsule, Liberty Bell 7 is on permanent display at the Cosmosphere.



**Photo Credir: Discovery Channel**

## Sunrise and Sunset

<u>Sun</u>	<u>Sunrise</u>	<u>Sunset</u>
<u>July 1st (EDT)</u>	<u>05:24</u>	<u>20:32</u>
<u>July 15th</u>	<u>05:33</u>	<u>20:26</u>
<u>July 31st</u>	<u>05:48</u>	<u>20:12</u>
<u>August 1st</u>	<u>05:49</u>	<u>20:11</u>
<u>August 15th</u>	<u>06:03</u>	<u>19:53</u>
<u>August 31st</u>	<u>06:19</u>	<u>19:28</u>

## Astronomical and Historical Events

### July

- 1st Moon at Apogee (furthest distance from Earth)
- 1st Mercury at its Greatest Eastern Elongation (26° separation from the Sun, as viewed from Earth, in the evening sky)
- 1st History: opening of the Smithsonian National Air & Space Museum (1976)
- 1st History: NASA officially activates the Launch Operations Center on Merritt Island, Florida; later renamed the Kennedy Space Center (1962)
- 1st History: 100 inch diameter mirror for the Hooker Telescope arrives on Mt. Wilson (1917)
- 1st History: discovery of Asteroid 6 Hebe by Karl Hencke (1847)
- 2nd History: launch of European Space Agency's Giotto spacecraft to Comet Halley (1985)
- 3rd Full Moon (sometimes called the Full Buck, Thunder or Hay Moon)
- 3rd History: launch of the ill-fated Nozomi spacecraft to Mars by Japan (1998)
- 3rd History: launch of the Solar Anomalous and Magnetospheric Particle Explorer (SAMPEX) by a Scout rocket (1992)
- 4th History: impact of Comet Tempel 1 by Deep Impact's impactor (2005)
- 4th History: Pathfinder spacecraft, with rover Sojourner, lands on Mars (1997)
- 5th Earth at Aphelion, furthest distance from Sun (1.017 AU from Sun)
- 4th History: Chinese astronomers record a "guest star" (supernova) in the constellation Taurus; visible for 23 days and 653 nights (1054); the remnant (Crab Nebula) later catalogued by Charles Messier as Messier 1 or M1
- 6th History: discovery of Jupiter's moon Lysithea by Seth Nicholson (1938)
- 6th History: Isaac Newton's "Principia" published (1687)
- 7th History: launch of the Mars Exploration Rover B (Opportunity) (2003)
- 8th History: launch of the Space Shuttle Atlantis (STS-135) to the International Space Station; final space shuttle flight to low Earth orbit (2011)
- 9th Comet 189P/NEAT closest approach to Earth (0.172 AU)
- 9th History: closest pass of Jupiter's cloud tops by the Voyager 2 spacecraft (1979)
- 10th Last Quarter Moon
- 10th History: flyby of Asteroid 21 Lutetia by the European Space Agency's Rosetta spacecraft (2010). Rosetta is the first mission to attempt to orbit a comet and deliver a lander to its surface. It is expected to arrive at its destination (Comet 67P/Churyumov-Gerasimenko) in May 2014. Six months later, it will release a lander to the comet's nucleus.
- 10th History: launch of Telstar 1, prototype communication satellite designed and built by Bell Telephone Laboratories (1962)
- 10th History: Alvan Graham Clark born, optician and telescope maker (1832)
- 11th History: launch of the Soviet Gamma Observatory (1990)
- 11th History: Skylab re-enters into the Earth's atmosphere (1979)

## Astronomical and Historical Events for July (continued)

- 12th History: launch of Soviet Mars orbiter Phobos 2 (1988)
- 13th Moon at Perigee (closest distance to Earth)
- 13th History: Soviet Union launches Luna 15, a lunar lander and sample return mission, in an attempt to upstage Apollo 11; crashed during landing (1969)
- 13th History: Langley Research Center's birthday (1917)
- 14th Second Saturday Stars - Open House at the McCarthy Observatory
- 14th Scheduled launch of the next expedition crew to the International Space Station aboard a Soyuz TMA-05M spacecraft from the Baikonur Cosmodrome in Kazakhstan
- 14th History: flyby and first close-up view of Mars by the Mariner 4 spacecraft (1965)
- 15th History: the Dawn spacecraft enters orbit around the asteroid 4 Vesta (2011)
- 16th History: over twenty fragments of comet Shoemaker-Levy 9, with diameters estimated at up to 2 kilometers, collide with Jupiter between July 16th and the 22nd (1994); the comet had been discovered a year earlier by astronomers Carolyn and Eugene Shoemaker and David Levy
- 16th History: launch of Badr-A, first Pakistan satellite (1990)
- 16th History: launch of Apollo 11, with astronauts Neil Armstrong, Edwin "Buzz" Aldrin and Michael Collins, first manned lunar landing (1969)
- 16th History: first launch of a Proton rocket by the Soviet Union (1965)
- 16th History: first photo of a star other than our Sun (Vega) by Harvard University (1850)
- 17th History: docking (and crew handshake) of an Apollo spacecraft with astronauts Thomas Stafford, Vance Brand, and "Deke" Stayton with a Soyuz spacecraft with cosmonauts Alexei Leonov and Valeri Kubasov (the Apollo-Soyuz Test Project (ASTP)) (1975)
- 18th History: launch of Rohini 1, India's first satellite (1980)
- 18th History: launch of Gemini X, with astronauts John Young and Michael Collins (1966)
- 18th History: launch of Soviet Zond 3 spacecraft; first successful flyby of Moon; transmitted photographs that included the far side (1965)
- 18th History: Allan Sandage born, astronomer specializing in observational cosmology (1926)
- 19th New Moon
- 19th History: launch of the Explorer 35 spacecraft into an elliptical lunar orbit; designed to study interplanetary plasma, magnetic field, energetic particles, and solar X-rays (1967)
- 20th Scheduled launch of a Japanese H-2 cargo-carrying transfer vehicle to the International Space Station from the Tanegashima Space Center in Japan
- 20th History: discovery of Jupiter's moon Callirrhoe (2000)
- 20th History: Gus Grissom's Mercury capsule (Liberty Bell 7) retrieved from the Atlantic Ocean floor at a depth of 15,000 feet, 38 years after it had sunk after splashdown (1999)
- 20th History: Viking 1 lands on Mars (1976)
- 20th History: Apollo 11 lands on Moon at 4:17 pm EDT; first step onto the lunar surface at 10:56 pm (1969)
- 21st History: launch of the Soviet Mars mission Mars 4 (1973)
- 21st History: launch of Mercury-Redstone 4 with astronaut Virgil (Gus) Grissom; second suborbital flight by the United States (1961)
- 21st History: discovery of Jupiter's moon Sinope by Seth Nicholson (1914)
- 22nd Distant flyby of Saturn's moon Helene by the Cassini spacecraft
- 22nd History: landing of Soviet spacecraft Venera 8 on Venus (1972)
- 23rd History: launch of Space Shuttle Columbia (STS-93) and the Chandra X-ray Observatory (1999); first mission commanded by a woman, Eileen Collins
- 23rd History: discovery of Comet Hale-Bopp by Alan Hale and Tom Bopp (1995)
- 23rd History: launch of Landsat 1 into a near-polar orbit to obtain information on Earth's resources, environmental pollution, and meteorological phenomena (1972)
- 24th Flyby of Saturn's largest moon Titan by the Cassini spacecraft
- 24th History: first rocket launch from Cape Canaveral (Bumper/V-2 rocket) in 1950
- 25th History: Svetlana Savitskaya becomes the first woman to walk in space (1984)



## Astronomical and Historical Events for July (continued)

- 25th History: launch of Soviet Mars orbiter Mars 5 (1973)
- 26th First Quarter Moon
- 26th History: launch of the Space Shuttle Discovery (STS-114) "Return to Flight," 907 days after the loss of Space Shuttle Columbia (2005)
- 26th History: launch of Apollo 15 with astronauts David Scott, James Irwin and Alfred Worden; fourth lunar landing (1971)
- 26th History: launch of Syncom 2, first geosynchronous satellite (1963)
- 28th Delta-Aquarids meteor shower peak
- 28th History: launch of Skylab-3 astronauts Alan Bean, Jack Lousma and Owen Garriott (1973)
- 28th History: launch of Ranger 7; Moon impact mission (1964)
- 29th Moon at Apogee (furthest distance from Earth)
- 29th History: deorbit and destruction of the Salyut 6 space station; first of the Soviet's second-generation space station design (1982)
- 29th History: Deep Space 1 flyby of Asteroid Braille (1999)
- 30th History: the Cassini spacecraft arrives at Saturn after a seven year journey (2004)
- 30th History: launch of the Wilkinson Microwave Anisotropy Probe (WMAP); mapped the Cosmic Microwave Background radiation and determined the age of the universe to be 13.73 billion years old to within one percent (2001)
- 30th History: Apollo 15 lands on Moon at 6:16 pm EDT (1971)
- 30th History: discovery of Jupiter's moon Carme by Seth Nicholson (1938)
- 30th History: Galileo observes Saturn's Rings (1610)
- 31st History: impact of the Lunar Prospector (1999)
- 31st History: flyby of Mars by Mariner 6 (1969)
- 31st Scheduled launch of a Progress M-16M cargo-carrying spacecraft to the International Space Station from the Baikonur Cosmodrome in Kazakhstan

## August

- 1st Full Moon (sometimes called Sturgeon, Green Corn or Grain Moon)
- 1st Peak of the Alpha Capricornids meteor shower
- 1st History: discovery of Martian meteorite (shergottite class) SAU 051 in Oman (2000)
- 1st History: launch of Lunar Orbiter 5, the last of the Lunar Orbiter series; photographed potential Apollo and Surveyor landing sites and captured the first image of a nearly full Earth from space (1967)
- 1st History: Maria Mitchell born, first woman to be elected as an astronomer to the American Academy of Arts and Sciences (1818)
- 3rd History: launch of the MESSENGER spacecraft to Mercury (2004)
- 4th History: launch of the Phoenix polar lander spacecraft to Mars (2007)
- 5th History: launch of the Juno spacecraft to Jupiter (2011)
- 5th History: flyby of Mars by the Mariner 7 spacecraft (1969)
- 5th History: birthday of astronaut Neil Armstrong (1930)
- 6th Scheduled landing of the Mars Science Laboratory (MSL or Curiosity) at the base of Mount Sharp inside Gale Crater
- 6th History: launch of Vostok 2 and cosmonaut Gherman Titov; second man in Space (1961)
- 6th History: Chinese astronomers first observe supernova in Cassiopeia; remained visible for more than 6 months (1181)
- 7th History: announcement of possible microfossils found in Martian meteorite ALH84001 (1996)
- 7th History: Viking 2 arrives at Mars (1976)
- 8th History: launch of Genesis spacecraft, solar particle sample return mission (2001)
- 8th History: launch of Pioneer Venus 2 (1978)
- 8th History: launch of the Soviet Zond 7 moon probe (1969)
- 9th Last Quarter Moon

Astronomical and Historical Events for August (continued)

- 9th History: launch of the Soviet Luna 24 spacecraft, third attempt (and only successful attempt) to recover a sample from Mare Crisium (1976)
- 10th Moon at Perigee (closest distance to Earth)
- 10th History: launch of Mars Reconnaissance Orbiter to Mars (2005)
- 10th History: launch of Kitsat A, first South Korean satellite (1992)
- 10th History: the Magellan spacecraft enters orbit around Venus; radar mapped 98% of the planet over the following two years (1990)
- 10th History: launch of the Lunar Orbiter 1 spacecraft; photographed smooth areas of the lunar surface for assessing future landing sites and captured iconic image of the Earth rising above the lunar surface (1966)
- 11th Second Saturday Stars - Open House at the McCarthy Observatory
- 11th History: Asaph Hall discovers Martian moon Deimos (1877)
- 12th Distant flyby of Saturn's moon Telesto by the Cassini spacecraft
- 12th Peak of the Perseids meteor shower
- 12th History: launch of the High Energy Astronomical Observatory (HEAO-1) to monitor x-ray sources (1977)
- 12th History: Soviet spacecraft Vostok 4 launched one day after Vostok 3 - first time multiple manned spacecraft in orbit, although they did not rendezvous (1962)
- 12th History: launch of Echo 1, the first experimental communications satellite (1960)
- 13th Moon Occults Venus
- 13th History: discovery of Mars' south polar cap by Christiaan Huygens (1642)
- 13th History: discovery of long-period variable star Mira, (Omicron Ceti) by David Fabricius (1596)
- 15th Venus at its Greatest Western Elongation ( $46^\circ$  separation from the Sun, as viewed from Earth, in the morning sky)
- 16th Mercury at its Greatest Western Elongation ( $19^\circ$  separation from the Sun, as viewed from Earth, in the morning sky)
- 16th History: launch of Explorer 12 spacecraft, measured cosmic-ray particles, solar wind protons, and magnetospheric and interplanetary magnetic fields (1961)
- 17th New Moon
- 17th 77th Convention of Amateur Telescope Makers (Stellafane), Springfield, Vermont (through the 18th), see <http://stellafane.org/convention/2012/index.html>
- 17th History: launch of Venera 7; Soviet Venus lander (1970)
- 17th History: launch of Pioneer 7 (1966)
- 17th History: Asaph Hall discovers Martian moon Phobos (1877)
- 18th Kuiper Belt Object 2004 PG115 at Opposition (36.185 AU)
- 18th History: launch of Suisei; Japan's Comet Halley mission (1985)
- 19th History: launch of first Philippine communications satellite Agila 2 (also known as Mabuhay 1 or ABS 5) (1997)
- 19th History: launch of Soviet Sputnik 5 spacecraft with dogs Belka and Strelka (1960)
- 19th History: discovery of S Andromedae (SN 1885A), supernova in the Andromeda Galaxy and the first discovered outside the Milky Way Galaxy; discovered by Irish amateur astronomer Isaac Ward in Belfast on the 19th and independently the following day by Ernst Hartwig at Dorpat (Tartu) Observatory in Estonia (1885)
- 19th History: birthday of Orville Wright (1871)
- 19th History: John Flamsteed born; English astronomer known for his accurate astronomical observations and first Astronomer Royal (1646)
- 20th History: launch of Voyager 2 to the outer planets (1977)
- 20th History: launch of Mars orbiter/lander Viking 1 (1975)
- 21st History: launch of the Orbiting Astronomical Observatory-3, Copernicus, with a UV telescope and X-ray detector (1972)

## Astronomical and Historical Events for August (continued)

- 21st History: launch of Gemini V with astronauts Gordon Cooper and Charles Conrad (1965)
- 23rd Moon at Apogee (furthest distance from Earth)
- 24th First Quarter Moon
- 24th Neptune at Opposition (rising opposite the setting Sun and visible all night)
- 24th Kuiper Belt Object 225088 (2007 OR10) at Opposition (85.635 AU)
- 24th History: Pluto reclassified as a Dwarf Planet (2006)
- 24th History: launch of the Soviet Luna 11 spacecraft to analyze the Moon's chemical composition, study gravitational anomalies and measure radiation levels (1966)
- 25th History: flyby of Neptune by the Voyager 2 spacecraft (1989)
- 25th History: launch of the Spitzer Space Telescope (2003)
- 25th History: launch of the Advanced Composition Explorer spacecraft to study energetic particles from the solar wind, the interplanetary medium, and other sources (1997)
- 26th Dawn spacecraft departs from the asteroid 4 Vesta to Dwarf Planet 1 Ceres
- 26th History: flyby of the planet Saturn by the Voyager 2 spacecraft (1981)
- 27th History: launch of the Mariner 2 spacecraft to Venus; first successful planetary encounter (1962)
- 28th History: flyby of the asteroids Ida and Dactyl by the Galileo spacecraft (1993)
- 28th History: discovery of Saturn's moon Enceladus by William Herschel (1789)
- 29th Kuiper Belt Object 145452 (2005 RN43) at Opposition (39.668 AU)
- 29th History: discovery of a bright nova in the constellation Cygnus (Nova Cygni 1975); visible to the unaided eye for about a week (1975)
- 30th History: discovery of first Kuiper Belt Object (1992 QB1) by David Jewitt and Jane Luu
- 30th History: launch of Japanese satellite Yohkoh (Sunbeam) to observe phenomena taking place on the Sun (1991)
- 30th History: launch of STS-8 and astronaut Guy Bluford; first African-American in space and first night launch and landing by a shuttle (1983)
- 31st Full Moon (sometimes called Full Corn or Fruit Moon)

## References on Distances

- The apparent width of the Moon (and Sun) is approximately one-half a degree ( $\frac{1}{2}^\circ$ ), less than the width of your little finger at arm's length which covers approximately one degree ( $1^\circ$ ); three fingers span approximately five degrees ( $5^\circ$ )
- One astronomical unit (AU) is the distance from the Sun to the Earth or approximately 93 million miles

## International Space Station/Space Shuttle/Iridium Satellites

Visit [www.heavens-above.com](http://www.heavens-above.com) for the times of visibility and detailed star charts for viewing the International Space Station, the Space Shuttle (when in orbit) and the bright flares from Iridium satellites.

## Solar Activity

For the latest on what's happening on the Sun and the current forecast for flares and aurora, check out [www.spaceweather.com](http://www.spaceweather.com).

## Image Credits

Front page design and graphic calendars: Allan Ostergren

Conor Cloutier checks out the 2012 Venus transit from Perdido Bay in Pensacola, Florida. His next opportunity to see a transit (from Earth) will be in December 2117, just prior to his 111th birthday (unless he's living on Mars by then).

The photo was taken by Bill Cloutier (III) with a NIKON COOLPIX S51c (1/30 second, f/3.3, ISO 100).

**All other non-credited photos were taken by the author: Bill Cloutier**





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**July 14th**  
**8:00 - 10:00 pm**

**Spacecraft**  
**DAWN**

at

**Asteroid**  
**VESTA**  
&

**ion propulsion**



Refreshments  
Family Entertainment  
Activity Center  
Stars & Planets  
Rain or shine

S. Ross

**Map**




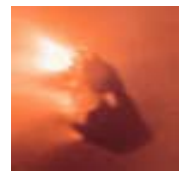
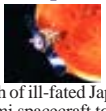

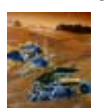



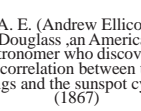










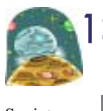























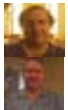














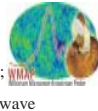







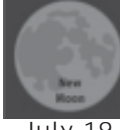

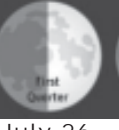



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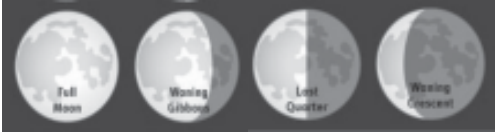







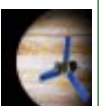
















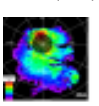





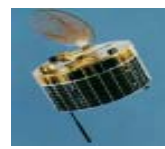











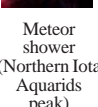


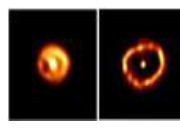



# July 2012

## Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
<div>1</div> <div> Moon at Apogee (farthest from earth)</div> <div> 100-inch mirror for Hooker telescope arrives at Mt Wilson (1917)</div> <div> Smithsonian Air &amp; Space Museum birthday (1976)</div>	<div>2</div> <div> Launch of European Space Agency Giotto spacecraft to Comet Halley (1985)</div>	<div>3</div> <div> Launch of ill-fated Japanese Nozomi spacecraft to Mars (1998)</div> <div> Launch of the Solar Anomalous and Magnetospheric Particle Explorer (SAMPEX) by a Scout rocket (1992)</div>	<div>4</div> <div> Mars Pathfinder landing (1997)</div> <div> Crab nebula viewed by Chinese astronomers (1054)</div> <div> Probe of comet Tempel 1 by Deep Impact impactor (2005)</div>	<div>5</div> <div> A. E. (Andrew Ellicott) Douglass, an American astronomer who discovered a correlation between tree rings and the sunspot cycle. (1867)</div> <div> Discovery of Jupiter's moon Lysithea by Seth Nicholson (1938)</div>	<div>6</div> <div> Isaac Newton's <i>Principia</i> published (1687)</div> <div> Launch of Mars Exploration Rover B <i>Opportunity</i> (2003)</div>	
<div>8</div> <div> Launch of the Space Shuttle Atlantis (STS-135) to the International Space Station; final space shuttle flight to low Earth orbit (2011)</div>	<div>9</div> <div> Close pass of Jupiter's cloud tops by Voyager 2 spacecraft (1979)</div>	<div>10</div> <div> Alvan Graham Clark born, telescope maker (1832)</div> <div> Flyby of Asteroid 21 Lutetia by European Space Agency's Rosetta spacecraft (2010)</div> <div> launch of Telstar 1, prototype communication satellite designed and built by Bell Telephone Laboratories (1962)</div>	<div>11</div> <div> Launch of Soviet Gamma Observatory (1990)</div> <div> Skylab re-enters into the Earth's atmosphere (1979)</div>	<div>12</div> <div> Soviet Mars orbiter Phobos 2 launched (1988)</div>	<div>13</div> <div> Moon at Perigee (closest distance to Earth)</div> <div> Soviet spacecraft Luna 15 launched, lander to crash on Moon (1969)</div> <div> Langley Research Center Birthday (1917)</div>	<div>14</div> <div> First close-up view of Mars by Mariner 4 Spacecraft (1965)</div> <div> 2nd Saturday Stars Open House McCarthy Observatory</div>
<div>15</div> <div> Launch of Apollo 18 and Soyuz 19 in joint U.S./Soviet mission (1975)</div> <div> The Dawn spacecraft enters orbit around the asteroid 4 Vesta (2011)</div>	<div>16</div> <div> Apollo 11 Moon mission Armstrong, Aldrin, Collins (1969)</div> <div> Schoemaker/Levy Comet fragments impact Jupiter (July 16-22, 1994)</div> <div> first photo of a star other than our Sun (Vega) by Harvard University (1850)</div>	<div>17</div> <div> Monsignor Georges Lemaître born; Belgian priest and astronomer was first to propose expanding universe and Big Bang theory (1894)</div> <div> Docking and handshakes of Apollo 18 and Soyuz 19 crews (1975)</div>	<div>18</div> <div> Allan Standage born, cosmologist (1926)</div> <div> Rohini I, India's 1st satellite, failed at launch (1980)</div> <div> Launch of Zond 5, 1st successful Moon flyby (1965)</div> <div> Gemini X with John Young and Michael Collins (1966)</div>	<div>19</div> <div> Launch of Explorer 35 spacecraft into an elliptical lunar orbit, to study interplanetary plasma, magnetic field, energetic particles, and solar X-rays (1967)</div> <div> Edward Charles Pickering born - Harvard astronomer and physicist who discovered the first spectroscopic binary stars, later used to measure cosmic distances. (1846)</div>	<div>20</div> <div> Apollo 11 lands on Moon (1969)</div> <div> Viking I lands on Mars (1976)</div> <div> Gus Grissom's capsule Liberty Bell raised after 30 years on ocean floor (1999)</div>	<div>21</div> <div> Launch of Soviet Mars 4 mission (1973)</div> <div> Virgil (Gus) Grissom, 2nd U.S. suborbital flight (1961)</div>
<div>22</div> <div> Landing of Soviet spacecraft Venera 8 on Venus (1972)</div>	<div>23</div> <div> Alan Hale and Tom Bopp announce discovery of comet Hale-Bopp (1995)</div> <div> Launch of Shuttle Columbia and Chandra X-ray Observatory; first mission commanded by a woman, Eileen Collins (1999)</div> <div> Launch of Landsat 1 into a near-polar orbit to study Earth's resources and meteorological phenomena (1972)</div>	<div>24</div> <div> Bumper V-2, first rocket launch from Cape Canaveral (1950)</div>	<div>25</div> <div> Svetlana Savitskaya becomes first woman to walk in space (1984)</div> <div> Launch of Soviet orbiter Mars 5 (1973)</div>	<div>26</div> <div> Shuttle Discovery (STS-114) "return to flight" (2005)</div> <div> Launch of Syncom 2, first geosynchronous satellite (1963)</div> <div> launch of Apollo 15, fourth lunar landing (1971)</div>	<div>27</div> <div> Sir George Biddell Airy born - an English mathematician and Astronomer Royal who worked on planetary orbits, measuring the mean density of the Earth, and establishing Greenwich as the prime meridian (1801)</div>	<div>28</div> <div> Launch of Ranger 7, Moon impact mission (1964)</div> <div> Launch of Skylab 3 (Bean, Pogue, Garriott) (1973)</div>
<div>29</div> <div> Moon at Apogee (furthest distance from Earth)</div> <div> Deep Space I encounter with asteroid Braille (1999)</div> <div> President Eisenhower signs Public Law 85-568, creating the National Aeronautics and Space Administration (1958)</div>	<div>30</div> <div> Launch of the Wilkinson Microwave Anisotropy Probe WMAP; WMAP mapped the Cosmic Microwave Background radiation and determined the age of the universe (2001)</div> <div> Galileo observes Saturn's rings (1610)</div>	<div>31</div> <div> Impact of the Lunar Prospector (1999)</div> <div> Mariner 6 Mars flyby (1969)</div>	<div>Phases of the Moon</div> <div> Full Moon</div> <div> Waning Gibbous</div> <div> Last Quarter</div> <div> Waxing Crescent</div> <div>July 3                      July 10</div> <div> New Moon</div> <div> Waxing Crescent</div> <div> First Quarter</div> <div> Waning Gibbous</div> <div>July 19                      July 26</div>			

# August 2012

## Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
<b>Phases of the Moon</b>  Aug 1                      Aug 9  Aug 17                      Aug 24                      Aug 31			<b>1</b>  Alpha Capricornids meteor shower peak  Maria Mitchell born, first woman elected as an astronomer to the American Academy of Arts and Sciences (1818)  Discovery of Martian meteorite SAU 051 in Oman (2000)	<b>2</b>  Launch of Lunar Orbiter 5, the last of the Lunar Orbiter series, designed to take additional Apollo and Surveyor landing site photography and to take broad survey images of unphotographed parts of the Moon's far side (1967)	<b>3</b>  Launch of MESSENGER spacecraft to Mercury (2004)	<b>4</b>  Launch of Phoenix Spacecraft to Mars (2007)
<b>5</b>  Astronaut Neil Armstrong born (1930)  Launch of the Juno spacecraft to Jupiter (2011)  Flyby of Mars by the Mariner 7 spacecraft (1969)	<b>6</b>  Southern Iota Aquarids meteor showers at peak  Gherman Titov, 2nd man in space (1961)  Cassiopeia Supernova observed by Chinese (1181)	<b>7</b>  Viking 2 arrives at Mars (1976)  Martian meteorite found to contain possible life (1996)	<b>8</b>  Launch of Genesis Spacraft (2001)  Launch of Pioneer Venus 2 (1978)  Launch of Soviet Zond 7 moon probe (1969)	<b>9</b>  Launch of the Soviet Luna 24 spacecraft, third (and only successful attempt) to recover a sample from Mare Crisium (1976)	<b>10</b>  Moon at Perigee (closest distance to Earth)  Launch of Mars Reconnaissance Orbiter (2005)  Magellan spacecraft orbits Venus (1990)	<b>11</b>  Asaph Hall discovers Martian Moon Deimos (1877)  2nd Saturday Stars Open House <b>McCarthy Observatory</b>
<b>12</b>  Perseid meteor showers at peak  Launch of the High Energy Astronomical Observatory (HEAO-1) to monitor x-ray sources (1977)  Launch of Echo 1A, communications satellite in 2nd attempt (1960)	<b>13</b>  Discovery of long-period variable star Mira, Omicron Ceti by David Fabricius (1596)  Discovery of Mars' south polar cap by Christiaan Huygens (1642)  Moon Occults Venus	<b>14</b>  Educator astronaut Barbara Morgan leads a Q&A session with children in Boise, Idaho from the space shuttle Endeavour, fulfilling legacy of Christa McAuliffe, who died in the 1986 Challenger disaster (2007)	<b>15</b>  President Reagan announced his support for the construction of an orbiter to replace Challenger (1986)	<b>16</b>  Launch of Explorer 12 spacecraft, measured cosmic-ray particles, solar wind protons, and magnetospheric and interplanetary magnetic fields (1961)	<b>17</b>  launch of Venera 7; Soviet Venus lander (1970)  Asaph Hall discovers Martian Moon Phobos (1877)  Launch of Pioneer 7 (1966)	<b>18</b>  Launch of Suisei, Japan's Comet Halley mission (1985)
<b>19</b>  Launch of Sputnik 5, with dogs Belka and Strelka (1960)  Birth of Orville Wright (1871)  Sir John Flamsteed born, English astronomer (1646)  Dmitri Ivanovich Mendelev rises to 11,500 feet (3.5 km) to observe an eclipse in Russia (1887)	<b>20</b>  Launch of Mars orbiter/lander Viking 1 (1975)  Launch of Voyager 2 to outer planets (1977)	<b>21</b>  Launch of Gemini V with astronauts Gordon Cooper and Charles Conrad (1965)  Launch of the Orbiting Astronomical Observatory-3, Copernicus, with a UV telescope and X-ray detector (1972)	<b>22</b>  Neptune was found to have a continuous ring system by the Voyager 2 spacecraft (1989)	<b>23</b>  Moon at apogee (farthest from Earth)  Lunar Orbiter 1 takes first photograph of Earth from Moon 1966	<b>24</b>  Pluto reclassified as a dwarf planet (2006)  Launch of the Soviet Luna 11 spacecraft to analyze the Moon's chemistry, gravitation and radiation levels (1966)	<b>25</b>  flyby of Neptune by the Voyager 2 spacecraft (1989)  Meteor shower (Northern Iota Aquarids peak)
<b>26</b>  Flyby of Saturn by Voyager 2 spacecraft (1981)	<b>27</b>  launch of the Mariner 2 spacecraft to Venus; first successful planetary encounter (1962)	<b>28</b>  Discovery of Saturn's moon Enceladus by William Herschel (1789)  Flyby of asteroids Ida and Dactyl by the Galileo spacecraft (1993)	<b>29</b>  Discovery of Nova Cygni in the constellation Cygnus (1975)	<b>30</b>  Discovery of first Kuiper Belt object, 1992 QB1, by David Jewett and Jane Luu  Launch of STS-8 and astronaut Guy Bluford, 1st African-American in space (1983)  First recorded occurrence - comet Howard-Koomen-Michels hits sun (energy equals 1 million hydrogen bombs). (1979)	<b>31</b>  Full Corn Moon  US Naval Observatory authorized by an act of Congress (1842)	