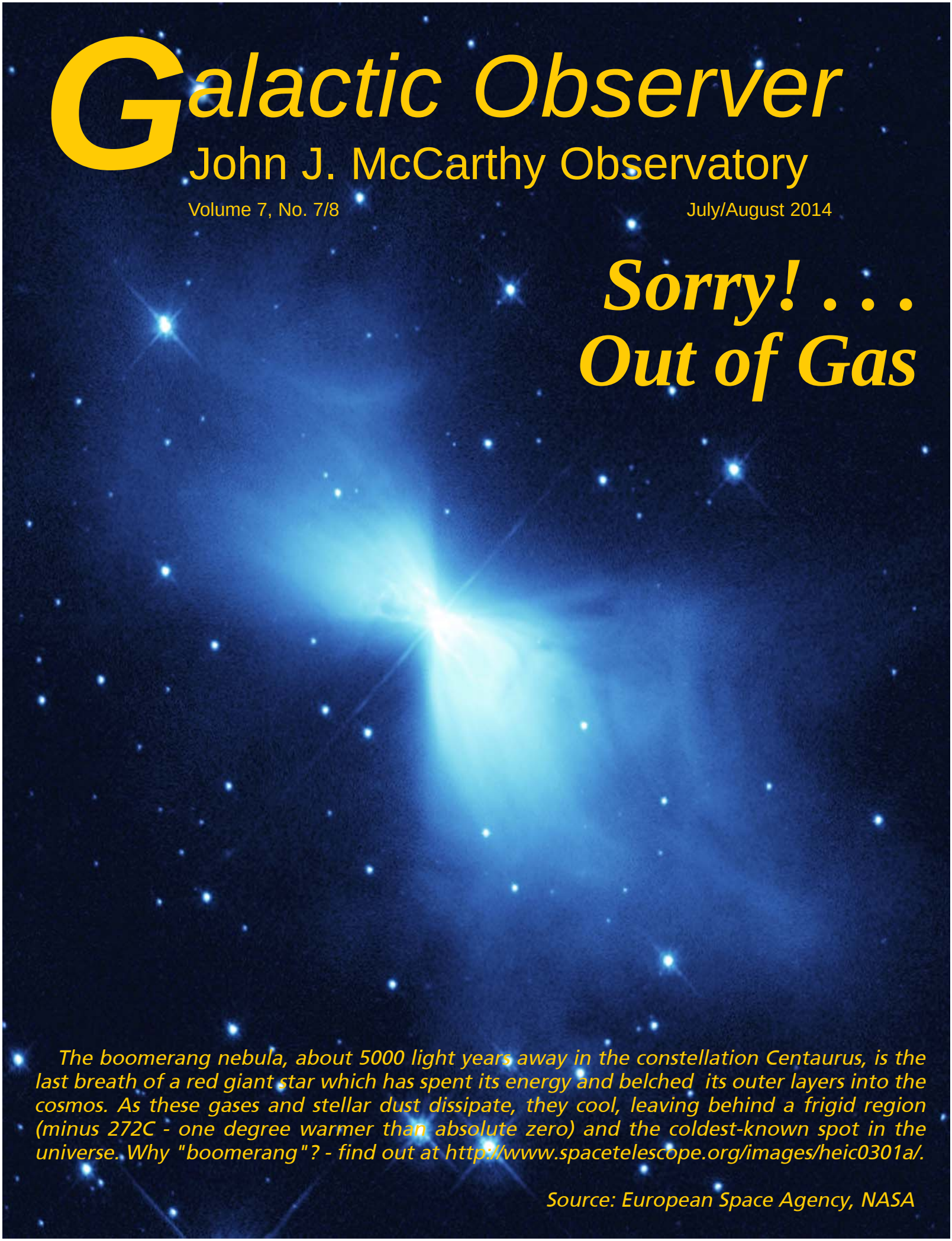
Galactic Observer

John J. McCarthy Observatory

Volume 7, No. 7/8 July/August 2014

Sorry! . . . Out of Gas



The boomerang nebula, about 5000 light years away in the constellation Centaurus, is the last breath of a red giant star which has spent its energy and belched its outer layers into the cosmos. As these gases and stellar dust dissipate, they cool, leaving behind a frigid region (minus 272C - one degree warmer than absolute zero) and the coldest-known spot in the universe. Why "boomerang"? - find out at http://www.spacetelescope.org/images/heic0301a/.

Source: European Space Agency, NASA

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It is through their efforts that the McCarthy Observatory has established itself as a significant educational and recreational resource within the western Connecticut community.

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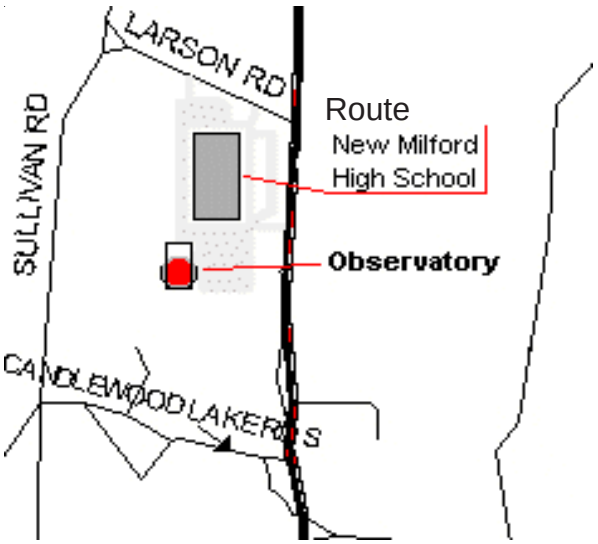
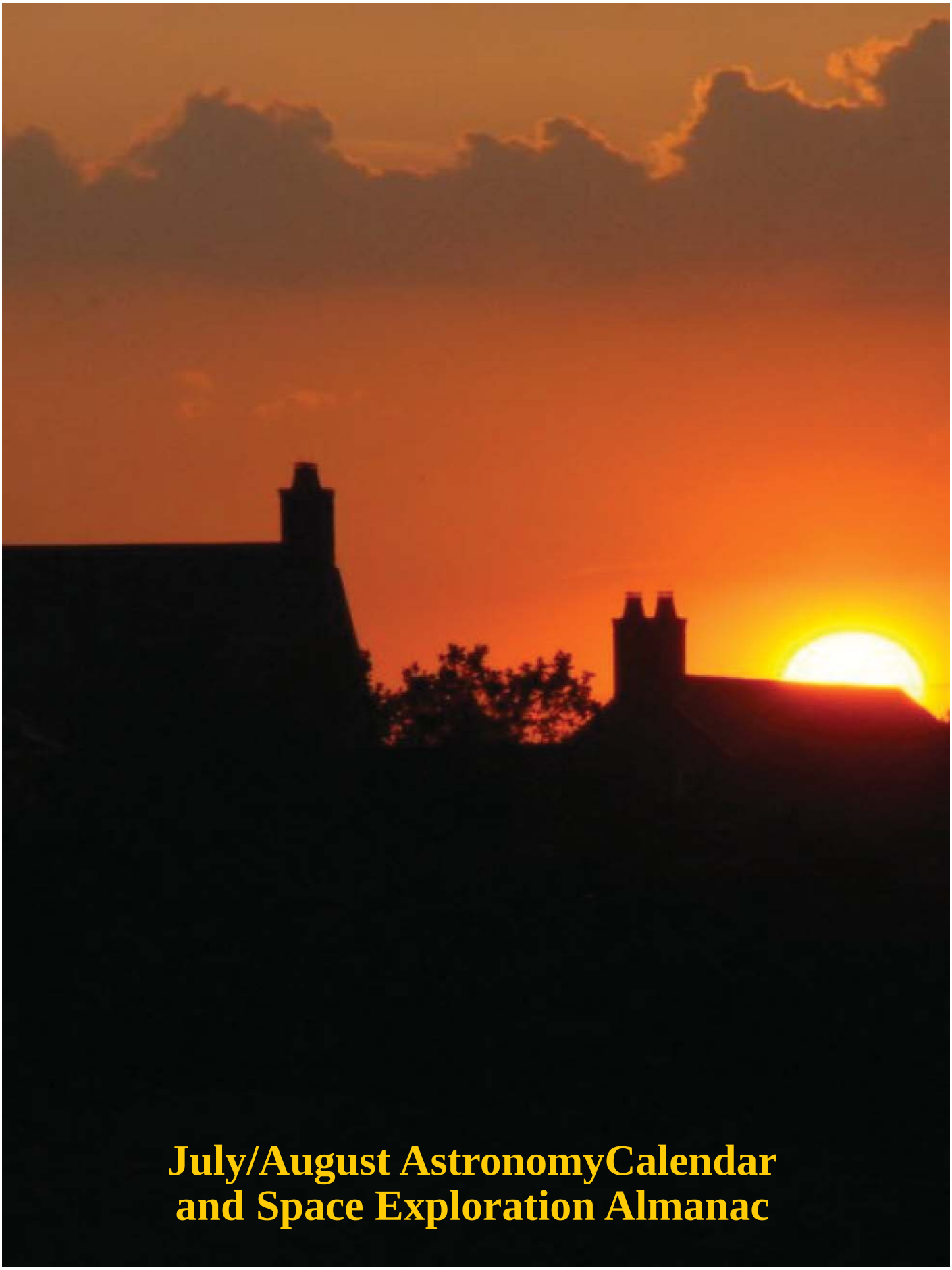


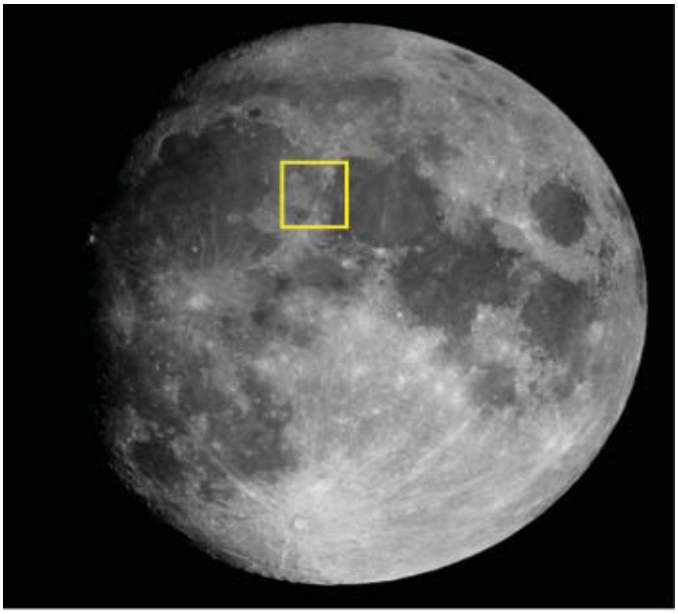
In This Issue



July/August AstronomyCalendar and Space Exploration Almanac

"Out the Window on Your Left"

IT'S BEEN OVER 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).

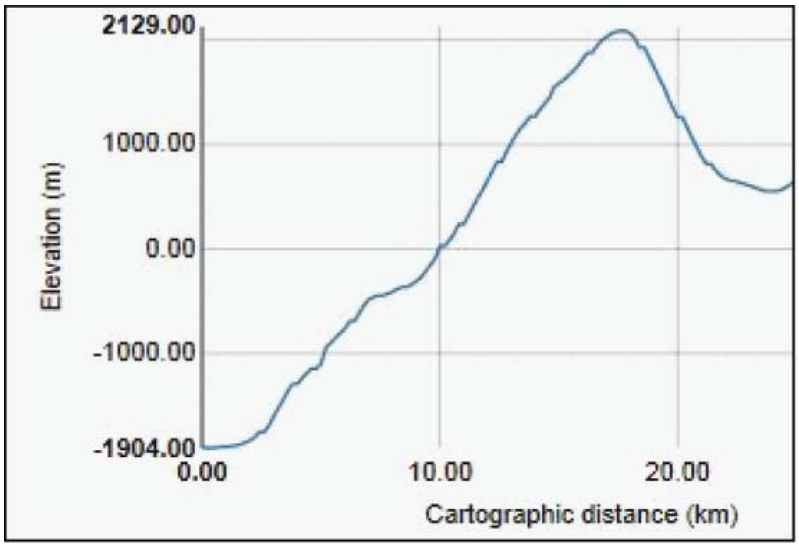


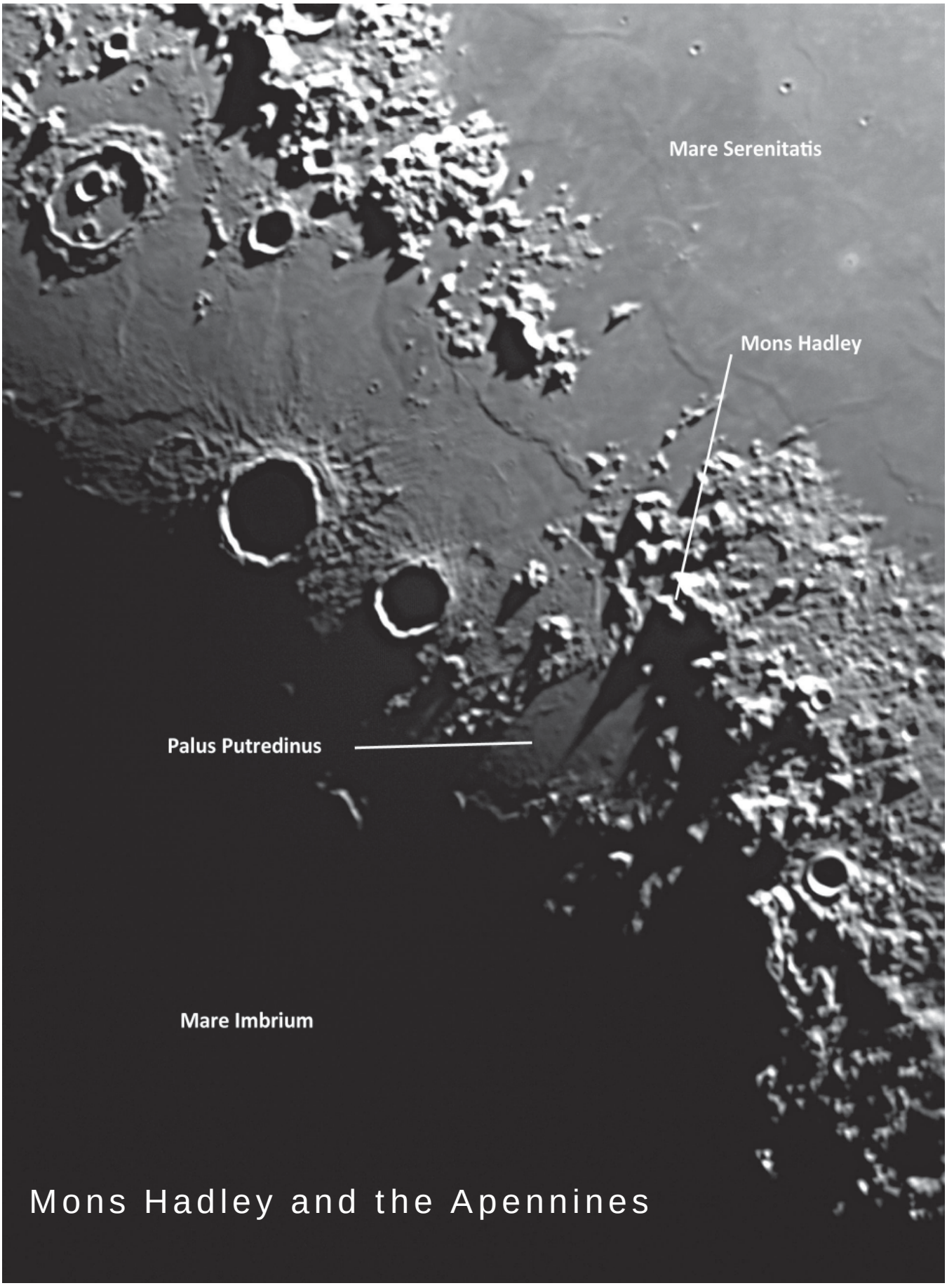
Lunar "seas," "oceans" and "marshes" are actually expansive, low-lying plains formed by ancient lava flows

Mons Hadley casts a long shadow across the ancient lava plains in this month's image. The mountain is a peak or collection of peaks at the northernmost portion of Montes Apenninus. The peak(s) and associated mountain range were formed as a result of the impact that created the Imbrium basin 3.85 billion years ago. Mons Hadley is approximately 15,000 feet (4.5 km) in elevation, the second highest mountain peak on the Moon. Apollo 15 landed just southwest of the base of the mountain in an area called Palus Putredinus (Marsh of Decay) and adjacent to Hadley Rille, a large lava-carved channel.

Hadley Rille was the site of the Apollo 15 moon mission in July, 1971. In this image, taken by Commander David Scott, Lunar Module Pilot Jim Irwin poses with the lunar roving vehicle against the backdrop of Mount Hadley.

As seen in the photo taken by the Lunar Reconnaissance Orbiter (below right), there are multiple components to the complex and the designation "Hadley" can be found on either the western (left) or eastern (right) peak on lunar maps. It appears that the shadow in this month's image is being cast by the more massive western component. The elevation cross-section and photo are available at: http://target.lroc.asu.edu/q3/.





Mons Hadley and the Apennines

Rosetta

The Rosetta spacecraft has spent the last 10 years traveling through the inner solar system. Along the way, it completed four gravity assist maneuvers, involving the Earth and Mars, and visited two asteroids, as it made its way to its ultimate destination 67P/Churyumov-Gerasimenko, a short period comet.

The spacecraft is currently executing a series of orbital maneuvers in preparation for its rendezvous on August 6th. Once in orbit around the comet, Rosetta will spend two years studying the nucleus, highlighted by the delivery of a lander to the comet's icy surface in November.

Rosetta will continue to follow the comet through perihelion (closest approach to the Sun) in August 2015 and then back out to the outer solar system where the comet crosses Jupiter's orbit before looping in again.

The nucleus of 67P/Churyumov-Gerasimenko is approximately 3 by 1.9 miles across (5 by 3 km). The icy body rotates once every 12.7 hours and is showing increased activity as it nears the Sun. The lander, Philae, carries a suite of instruments including a drill and nine experiments. Material extracted from the drill cores will be analyzed by the lander's onboard laboratory.

Rosetta and Philae at comet 67P/Churyumov-Gerasimenko. Copyright ESA-J. Huart, 2013

Final Countdown

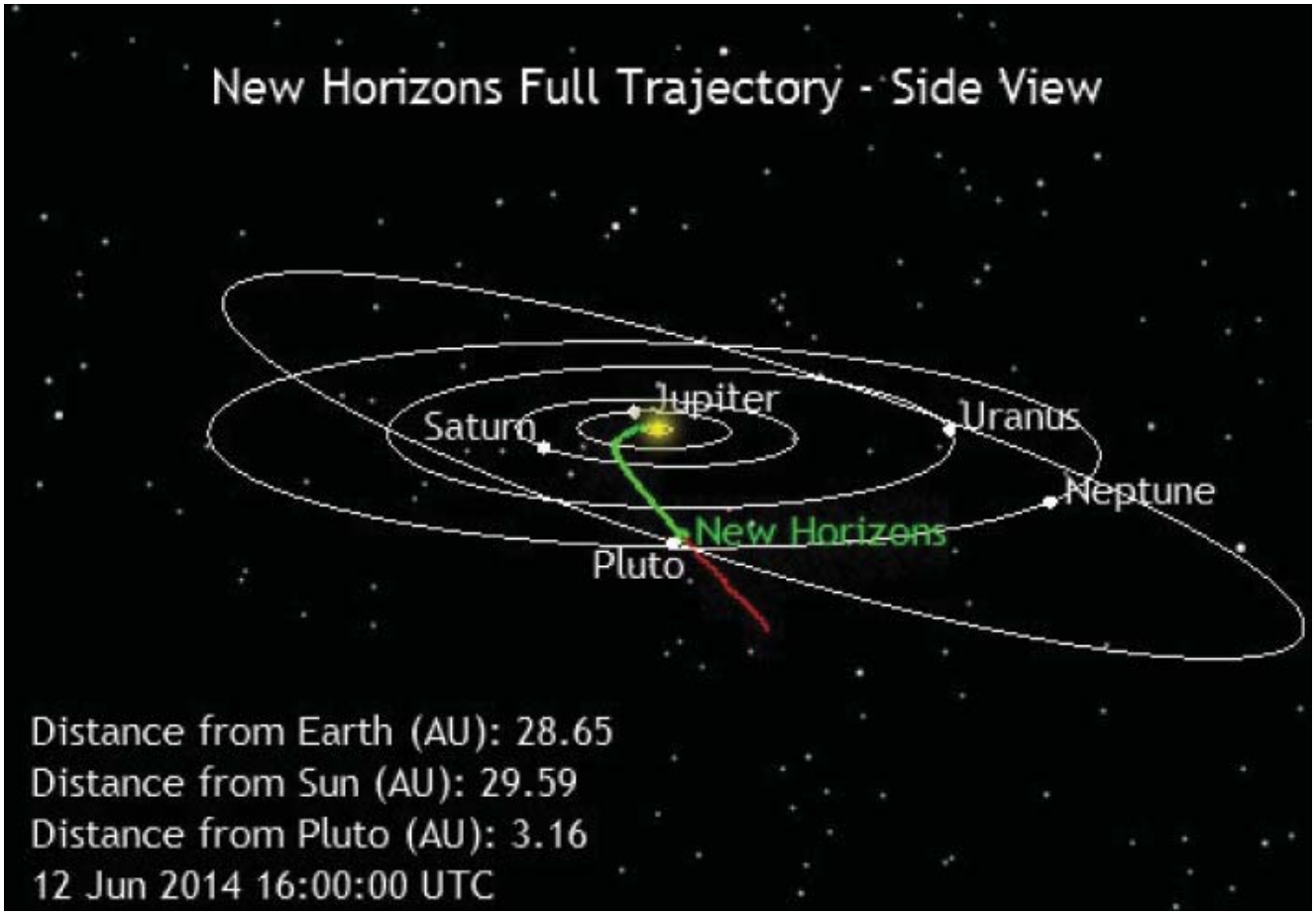
The New Horizons spacecraft will cross Neptune's orbit in August 2014. Less than a year later, on July 14, 2015, the spacecraft will make a high speed pass of the dwarf planet Pluto and its family of five moons. New Horizons will then head out into the Kuiper Belt, a broad disk of icy worlds left over from the formation of the solar system.

The spacecraft left Earth on January 19, 2006. Traveling ten times faster than a speeding bullet, it only took nine hours for the spacecraft to pass the Moon's orbit (a three day trip for the Apollo astronauts in 1969) and another year to Jupiter. Still, with the vastness of the outer solar system, it had another 8½ years to go after passing Jupiter before it will reach the dwarf planet.

Artist's concept of the New Horizons spacecraft during its planned encounter with Pluto and its moon, Charon. Credit: Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute (JHUAPL/SwRI).

The 1,000 pound spacecraft is about the size of a grand piano, and it is equipped with seven instruments that will photograph and analyze Pluto and its largest moon Charon. Being so far away from the Sun, the spacecraft is powered by the heat from a nuclear generator, solar panels being inadequate.

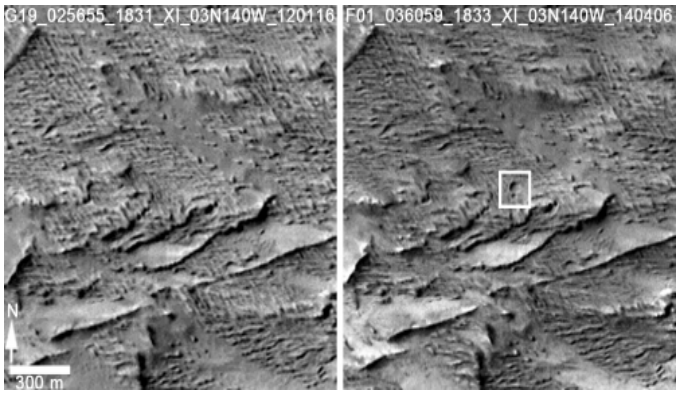
The computer-generated image below shows New Horizons' location in mid-June. The image was created by the Satellite Tool Kit (STK) software developed by Analytical Graphics, Inc. Images.



Cold with a Chance of Cosmic Rain

Sometime on the 27th or 28th of March 2012, a fragment of an asteroid 10 to 18 feet in length (3 to 5 meters) slammed into the Martian equatorial plains, creating a shallow, elongated crater 159 by 143 feet (48.5 by 43.5 meters). The crater and the landslides created by the impact were recently imaged by NASA's Mars Reconnaissance Orbiter (MRO). Scientists discovered the crater and were able to date the impact by reviewing older images acquired by the MRO's weather camera.

Detailed imaging of the site (see next page) revealed numerous secondary cratering and other effects of the blast that cover a 5 mile area. The crater is unusual in that it is relatively shallow. However, it's the largest, newly formed crater discovered (of approximately 400 fresh impacts), adding to our knowledge of the Martian subsurface strata and on the frequency of such impacts – an important consideration in solar system exploration.



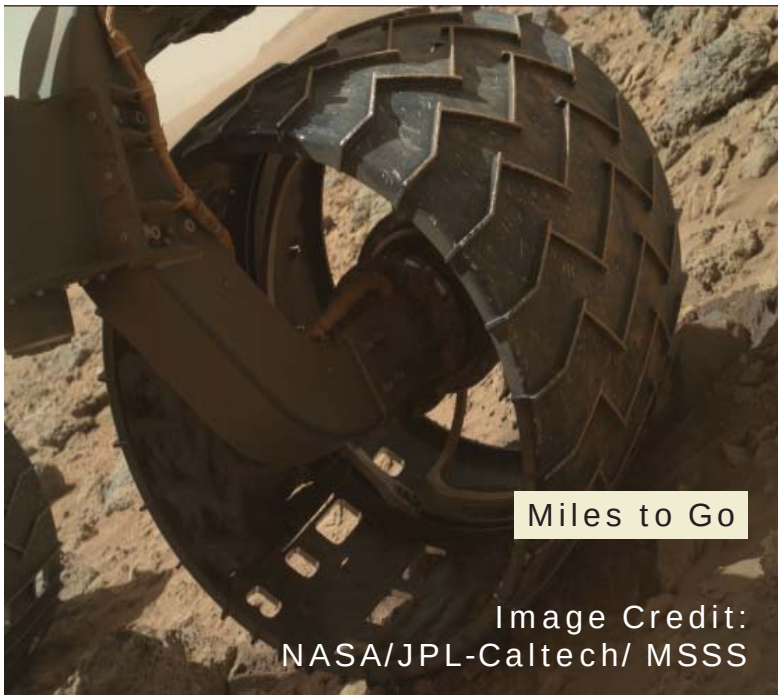
Images a one-mile segment of the Martian landscape taken from the MRO in January 16 2012 and April 6 2014 confirm an impact event. Image Credit: NASA/JPL-Caltech/MSSS

Two Years on Mars

It was two years ago on August 6th that engineers at NASA's Jet Propulsion Laboratory huddled around their computer screens awaiting data that would indicate that the Mars Science Laboratory (Curiosity) had survived its journey through the Martian atmosphere (decelerating from 13,200 miles per hour to full stop on Martian surface in seven minutes). Since Curiosity was much larger and heavier than any of its predecessors, NASA employed a combination of small rockets and a large parachute to initially slow the spacecraft in its descent and an innovative rocket-powered sky crane to lower the rover the last 25 feet to the surface.

Its successful landing that morning marked the beginning of two years of exploring Gale Crater and the foothills of the three mile high Mount Sharp. Since landing, Curiosity has found evidence of an ancient stream bed and rapidly flowing water. Unlike the acidic water that percolated through the rocks at the landing sites of Spirit and Opportunity, the water that flowed through Gale Crater had a more neutral chemistry. The chemical compounds and elements found at the site could have also supported microbial life at some time in the past. Unfortunately, Curiosity has not detected any methane in the Martian atmosphere. Methane, if present, is one of the markers for living organisms.

Curiosity has confirmed that Mars today is a much more hazardous place for life than in its early history. Without a magnetic field and/or dense at-



mosphere, the surface of Mars is bombarded with cosmic and solar radiation. Not only does radiation sterilize the surface, it presents a real hazard to future explorers and colonists.

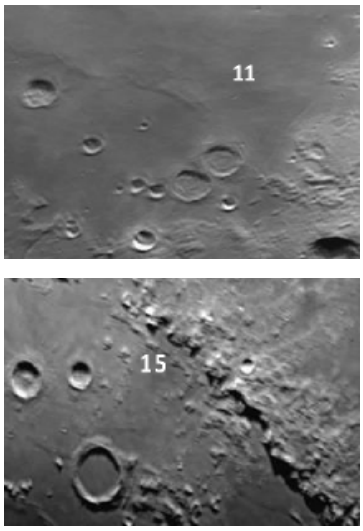
While Curiosity continues to explore its surroundings, it's taken much longer than expected to reach Mount Sharp. The one ton rover has been slowed by excessive wear of it six wheels due to the razor sharp rocks encountered. To mitigate further damage, engineers are rerouting the rover in an attempt to avoid the more treacherous hazards. The new, and longer, excursions have pushed back the schedule for the rover's exploration of Mount Sharp.

Summer Activities

Summer 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. Closer thome, the McCarthy Observatory hosts a star party on the second Saturday of each month. Please join us on July 12th and August 9th 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 12th 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 (see next page).
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 exces-

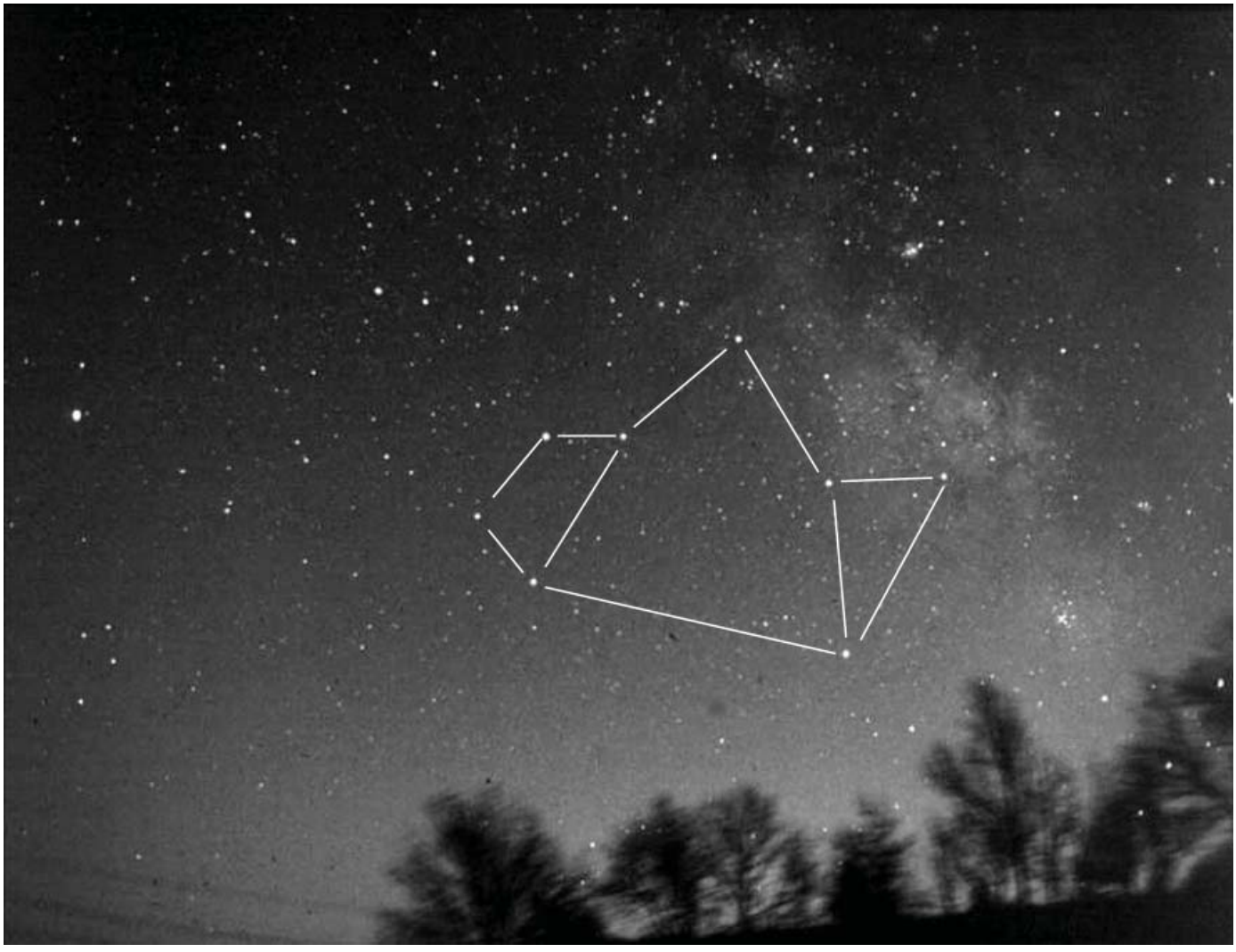
Sea of Tranquility and
Apollo 11 landing site



Apennines Mountains and
Apollo 15 landing site

sive 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.



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

• 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. 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.

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.


Photo Credit: Discovery Channel

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.

Sunrise and Sunset

Sun	Sunrise	Sunset
July 1st (EDT)	05:23	20:32
July 15th	05:33	20:26
July 31st	05:47	20:12
August 1st	05:48	20:11
August 15th	06:02	19:53
August 31st	06:19	19:28

Astronomical and Historical Events

July

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 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)

Astronomical and Historical Events for July (continued)

- 4th Earth at Aphelion, furthest distance from Sun (1.017 AU)
- 4th Dwarf Planet 134340 Pluto at Opposition (31.665 AU), rising with the setting Sun and visible (with a telescope) all night
- 4th History: impact of Comet Tempel 1 by Deep Impact's impactor (2005)
- 4th History: Pathfinder spacecraft, with rover Sojourner, lands on Mars (1997)
- 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
- 5th First Quarter Moon
- 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 History: closest pass of Jupiter's cloud tops by the Voyager 2 spacecraft (1979)
- 10th History: flyby of asteroid *21 Lutetia* by the European Space Agency's Rosetta spacecraft (2010).
- 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)
- 12th Full Moon (sometimes called the Full Buck, Thunder or Hay Moon)
- 12th Second Saturday Stars – Open House at the McCarthy Observatory
- 12th Mercury at its Greatest Western Elongation (21° separation from the Sun, as viewed from Earth, in the morning sky)
- 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 Centaur Object *37117 Narcissus* Closest Approach to Earth (7.664 AU)
- 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 Last Quarter Moon
- 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)

Astronomical and Historical Events for July (continued)

18th History: Allan Sandage born, astronomer specializing in observational cosmology (1926)
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 Flyby of Saturn's largest moon *Titan* by the Cassini spacecraft
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 Scheduled launch of a Russian Progress cargo-carrying spacecraft to the International Space Station from the Baikonur Cosmodrome in Kazakhstan
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: discovery of Neptune's rings (1984)
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 History: first rocket launch from Cape Canaveral (Bumper/V-2 rocket) in 1950
24th 79th Convention of Amateur Telescope Makers (Stellafane), Springfield, Vermont (through the 26th), see http://stellafane.org/convention/2014/index.html
25th History: Svetlana Savitskaya becomes the first woman to walk in space (1984)
25th History: launch of Soviet Mars orbiter Mars 5 (1973)
26th New 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 Moon at Apogee (furthest distance from Earth)
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 South Delta-Aquarids Meteor Shower peak
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)

August

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 First Quarter Moon
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 History: landing of the Mars Science Laboratory (MSL or Curiosity) at the base of Mount Sharp inside Gale Crater (2012)
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 Asteroid *16 Psyche* at Opposition (9.3 Magnitude)
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 Second Saturday Stars – Open House at the McCarthy Observatory
9th History: launch of the Soviet Luna 24 spacecraft, third attempt (and only successful attempt) to recover a sample from Mare Crisium (1976)
10th Full Moon (sometimes called Sturgeon, Green Corn or Grain Moon)
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 History: Asaph Hall discovers Martian moon *Deimos* (1877)
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 Distant flyby of Saturn's largest moon *Titan* by the Cassini spacecraft
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)
16th History: launch of Explorer 12 spacecraft, measured cosmic-ray particles, solar wind protons, and magnetospheric and interplanetary magnetic fields (1961)
17th Last Quarter Moon
17th Mars Autumnal Equinox (northern hemisphere)

Astronomical and Historical Events for August (continued)

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 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 Flyby of Saturn's largest moon *Titan* by the Cassini spacecraft
21st History: launch of the Orbiting Astronomical Observatory-3, Copernicus, with a UV telescope and X-ray detector (1972)
21st History: launch of Gemini V with astronauts Gordon Cooper and Charles Conrad (1965)
22nd Centaur Object *7066 Nessus* at Opposition (24.957 AU)
23rd Kuiper Belt Object 307982 (2004 PG115) at Opposition (36.536 AU)
24th Moon at Apogee (furthest distance from Earth)
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 New Moon
25th New Horizons crosses Neptune's orbit
25th Northern Iota Aquarids Meteor Shower Peak
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 Kuiper Belt Object 225088 (2007 OR10) at Opposition (86.114 AU)
26th History: flyby of the planet Saturn by the Voyager 2 spacecraft (1981)
27th Plutino 175113 (2004 PF115) at Opposition (40.509 AU)
27th History: launch of the Mariner 2 spacecraft to Venus; first successful planetary encounter (1962)
28th Kuiper Belt Object 120178 (2003 OP32) at Opposition (40.965 AU)
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 Neptune at Opposition (rising opposite the setting Sun and visible all night)
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)

References on Distances

• The apparent width of the Moon (and Sun) is approximately one-half a degree (½°), less than the width of your little finger at arm's length which covers approximately one degree (1°); three fingers span approximately five degrees (5°)

• 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* 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.*

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Page 3: The Sun sets over the buildings on the campus of the University of Maryland. Photo: Bill Cloutier

Second Saturday Stars poster: Sean Ross, Ross Designs

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Second Saturday Stars

FREE EVENT

Every Month at the

John J. McCarthy Observatory

Behind the New Milford High School

860.946.0312

www.mccarthyobservatory.org

July 12th

8:00 - 10:00 pm

TO PRIVATELY GO...

- Refreshments
- Family Entertainment
- Activity Center
- Stars & Planets
- Rain or shine

S.Ross

Map

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July 2014

Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Jun 2014 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30		**1** Smithsonian Air & Space Museum birthday (1976) 100-inch mirror for Hooker telescope arrives at Mt Wilson (1917) NASA officially activates the Launch Operations Center on Merritt Island, Florida; later renamed the Kennedy Space Center (1962)	**2** Launch of European Space Agency' Giotto spacecraft to Comet Halley (1985)	**3** Launch of ill-fated Japanese Nozomi spacecraft to Mars (1998) Launch of the Solar Anomalous and Magnetospheric Particle Explorer (SAMPEX) by a Scout rocket (1992)	**4** Crab nebula viewed by Chinese astronomers (1054) Mars Pathfinder landing (1997) Henrietta Leavitt born; measured distances to far galaxies (1868) Probe of comet Tempel 1 by Deep Impact impactor (2005)	**5** A. E. (Andrew Ellicott) Douglass ,an American astronomer who discovered a correlation between tree rings and the sunspot cycle. (1867)
6 Isaac Newton's *Principia* published (1687) Discovery of Jupiter's moon Lysithea by Seth Nicholson (1938)	**7** Launch of Mars Exploration Rover B *Opportunity* (2003)	**8** Launch of the Space Shuttle Atlantis (STS-135) to the International Space Station; final space shuttle flight to low Earth orbit (2011)	**9** Close pass of Jupiter's cloud tops by Voyager 2 spacecraft (1979)	**10** Alvan Graham Clark born, telescope maker (1832) Flyby of Asteroid 21 Lutetia by European Space Agency's Rosetta spacecraft (2010) launch of Telstar 1, prototype communication satellite designed and built by Bell Telephone Laboratories (1962)	**11** Launch of Soviet Gamma Observatory (1990) Skylab re-enters into the Earth's atmosphere (1979)	**12** Soviet Mars orbiter Phobos 2 launched (1988) 2nd Saturda Stars Open House McCarthy Observatory
13 Moon at Perigee (closest distance to Earth) Langley Research Center Birthday (1917) Soviet spacecraft Luna 15 launched, lander to crash on Moon (1969)	**14** First close-up view of Mars by Mariner 4 Spacecraft (1965)	**15** Launch of Apoll0 18 and Soyuz 19 in joint U.S./ Soviet mission (1975) The Dawn spacecraft enters orbit around the asteroid 4 Vesta (2011)	**16** Apollo 11 Moon mission Armstrong, Aldrin, Collins (1969) Schoemaker/ Levy Comet fragments impact Jupiter (July 16-22, 1994) first photo of a star other than our Sun (Vega) by Harvard University (1850)	**17** Monsignor Georges Lemaître born; Belgian priest and astronomer was first to propose expanding universe and Big Bang theory (1894) Docking and handshakes of Apollo 18 and Soyuz 19 crews (1975)	**18** Allan Standage born, cosmologist (1926) Rohini I, India's 1st satellite, failed at launch (1980) Launch of Zond 5, 1st successful Moon flyby (1965) Gemini X with John Young and Michael Collins (1966)	**19** Launch of Explorer 35 spacecraft into an elliptical lunar orbit, to study interplanetary plasma, magnetic field, energetic particles, and solar X-rays (1967) Edward Charles Pickering born - Harvard astronomer and physicist who discovered the first spectroscopic binary stars, later used to measure cosmic distances. (1846)
20 Apollo 11 lands on Moon (1969) Viking I lands on Mars (1976) Gus Grissom's capsule Liberty Bell raised after 30 years on ocean floor (1999)	**21** Launch of Soviet Mars 4 mission (1973) Virgil (Gus) Grissom, 2nd U.S. suborbital flight (1961)	**22** Landing of Soviet spacecraft Venera 8 on Venus (1972)	**23** Alan Hale and Tom Bopp announce discovery of comet Hale-Bopp (1995) Launch of Shuttle Columbia and Chandra X-ray Observatory; first mission commanded by a woman, Eileen Collins (1999) Launch of Landsat 1 into a near-polar orbit to study Earth's resources and meteorological phenomena (1972)	**24** Bumper V-2, first rocket launch from Cape Canaveral (1950) 78th Convention of Amateur Telescope Makers (Stellafane), Springfield, Vt (through the 27th),	**25** Svetlana Savitskaya becomes first woman to walk in space (1984) Launch of Soviet orbiter Mars 5 (1973)	**26** Shuttle Discovery (STS-114) "return to flight" (2005) Launch of Syncom 2, first geosynchronous satellite (1963) launch of Apollo 15, fourth lunar landing (1971)
27 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)	**28** Launch of Ranger 7, Moon impact mission (1964) Launch of Skylab 3 (Bean, Pogue, Garriott) (1973)	**29** South Delta-Aquarids meteor shower peak Deep Space I encounter with asteroid Braille (1999) President Eisenhower signs Public Law 85-568, creating the National Aeronautics and Space Administration (1958)	**30** Launch of the Wilkinson Microwave Anisotropy Probe WMAP); mapped the Cosmic Microwave Background radiation and determined the age of the universe (2001) Galileo observes Saturn's rings (1610)	**31** Impact of the Lunar Prospector (1999) Mariner 6 Mars flyby (1969)	Sep 2014 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	

August 2014

Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Phases of the Moon July 2014  July 5 July 12 July 18 July 26					1 Launch of Lunar Orbiter 5, the last of the Lunar Orbiter series (1967) 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)	2 Valery Fyodorovich Bykovsky born: Soviet cosmonaut flew three manned space mission space flights, spending five days in orbit aboard Vostok 5 in 1963 - a record for a solo flight. (1934)
3 Launch of MESSENGER spacecraft to Mercury (2004)	4 Launch of Phoenix Spacecraft to Mars (2007)	5 Astronaut Neil Armstrong born (1930) Launch of the Juno spacecraft to Jupiter (2011) Flyby of Mars by the Mariner 7 spacecraft (1969)	6 Gherman Titov, 2nd man in space (1961) Cassiopeia Supernova observed by Chinese (1181) Landing of Mars Science Lab (MSL or Curiosity) inside Gale Crater (2012)	7 Viking 2 on Mars (1976) Martian meteorite found to contain possible life (1996)	8 Launch of Genesis Spacraft (2001) Launch of Pioneer Venus 2 (1978) Launch of Soviet Zond 7 moon probe (1969)	9 Launch of Soviet Luna 24 spacecraft, third (and only successful attempt) to recover a sample from Mare Crisium (1976) **2nd Saturday Stars Open House McCarthy Observatory**
Moon at Perigee (closest distance to Earth) 10 Launch of Mars Reconnaissance Orbiter (2005) Magellan spacecraft orbits Venus (1990)	11 Asaph Hall discovers Martian Moon Deimos(1877)	12 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)	13 Discovery of long-period variable star Mira, Omicron Ceti by David Fabricius (1596) Discovery of Mars' south polar cap by Christiaan Huygens (1642)	14 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)	15 President Reagan announced his support for the construction of an orbiter to replace Challenger (1986)	16 Launch of Explorer 12 spacecraft, measured cosmic-ray particles, solar wind protons, and magnetospheric and interplanetary magnetic fields (1961)
17 launch of Venera 7; Soviet Venus lander (1970) Asaph Hall discovers Martian Moon Phobos (1877) Launch of Pioneer 7 (1966)	18 Launch of Suisei, Japan's Comet Halley mission (1985)	19 Launch of Sputnik 5, with dogs Belka and Strejka (1960) Birth of Orville Wright (1871) Sir John Flamsteed born, English astronomer (1646) Dmitri Ivanovich Mendeleev rises to 11,500 feet (3.5 km) to observe an eclipse in Russia (1887)	20 Launch of Mars orbiter/ lander Viking 1 (1975) Launch of Voyager 2 to outer planets (1977)	21 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)	22 Neptune was found to have a continuous ring system by the Voyager 2 spacecraf (1989)	23 Lunar Orbiter 1 takes first photograph of Earth from Moon (1966)
Moon at Apogee (furthest distance from Earth) 24 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)	25 flyby of Neptune by the Voyager 2 spacecraft (1989) Meteor shower (Northern Iota Aquarids peak)	26 Flyby of Saturn by Voyager 2 spacecraft (1981)	27 launch of the Mariner 2 spacecraft to Venus; first successful planetary encounter (1962)	28 Discovery of Saturn's moon Enceladus by William Herschel (1789) Flyby of asteroids Ida and Dactyl by the Galileo spacecraft (1993)	29 Discovery of Nova Cygni in the constellation Cygnus (1975)	30 Discovery of first Kuiper Belt object, 1992 QB1, by David Jewet 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)
31 US Naval Observatory authorized by an act of Congress (1842)	**Phases of the Moon August 2014**  August 3 August 10 August 17 August 25					