Galactic Observer

John J. McCarthy Observatory

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Flight of Fancy

Spawned in the ejected remains of a supernova, NGC 6302 (the "Butterfly" or "Bug" Nebula) appears locked in an epic metamorphosis within the constellation Scorpio. The whispy wings of the nebula, stretching more than two light years across, may have resulted from its material being forced through a dense disc of gas and dust surrounding the dying star at its center.

Image Credit: NASA/ESA/Hubble

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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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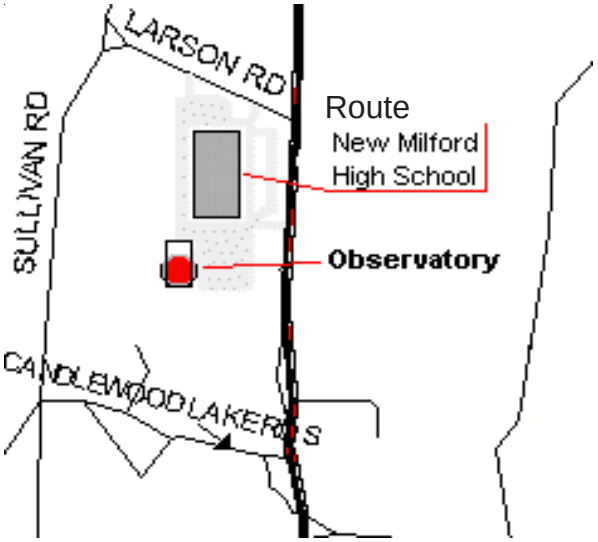

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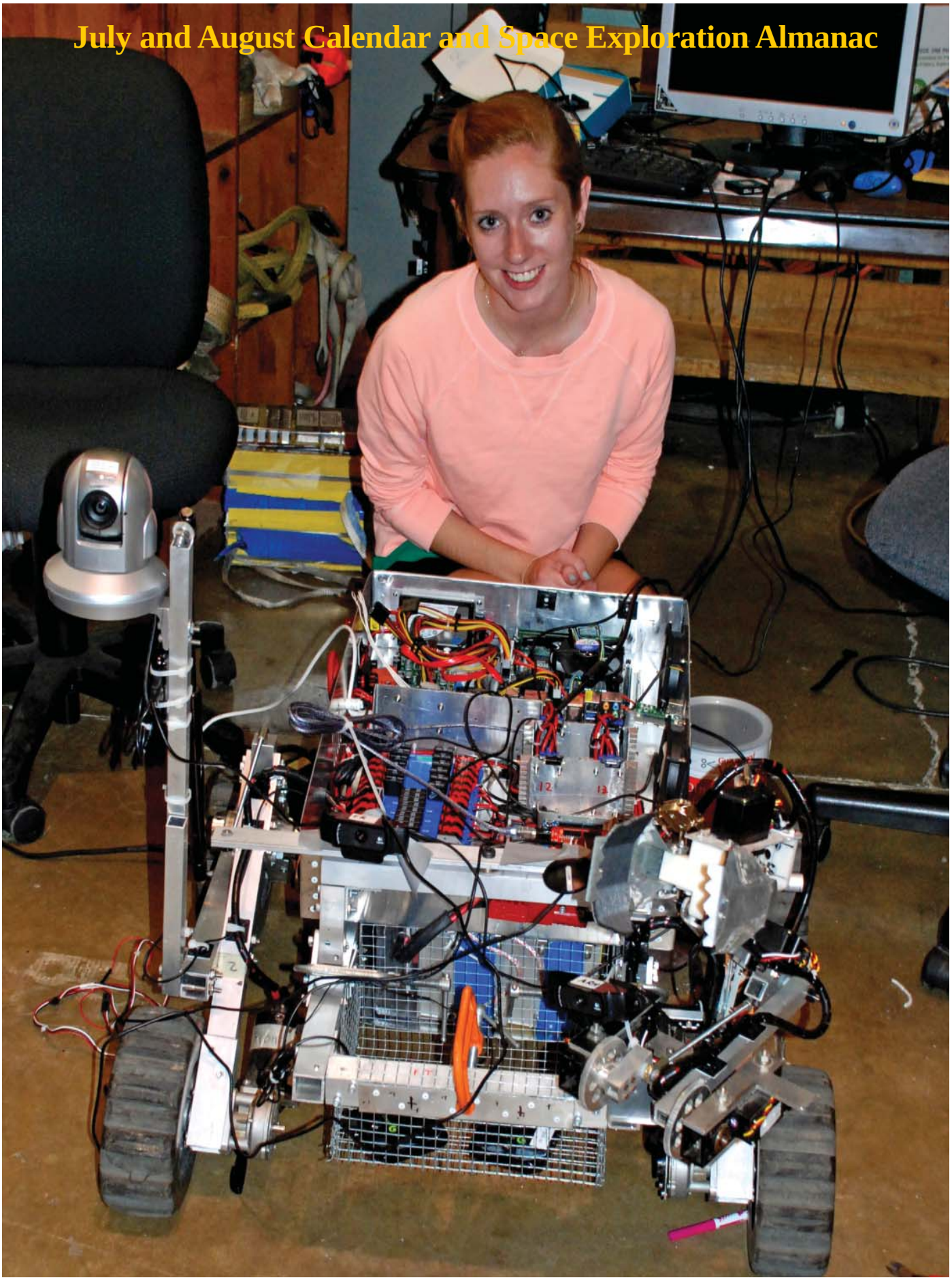
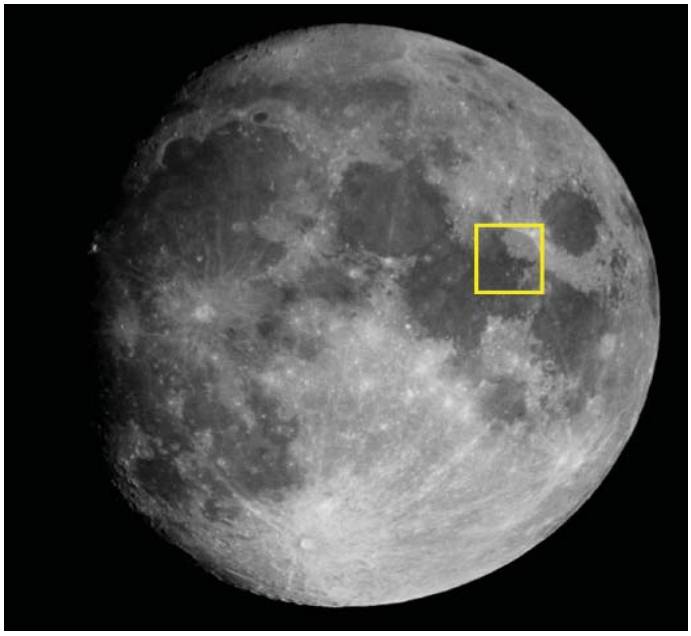
July and August Calendar and Space Exploration Almanac



"Out the Window on Your Left"

It's been over 40 years since we left the last foot print on the dusty lunar surface. Sadly, as a na tion founded on exploration and the conquest of new frontiers, we appear to have lost our will



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

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).

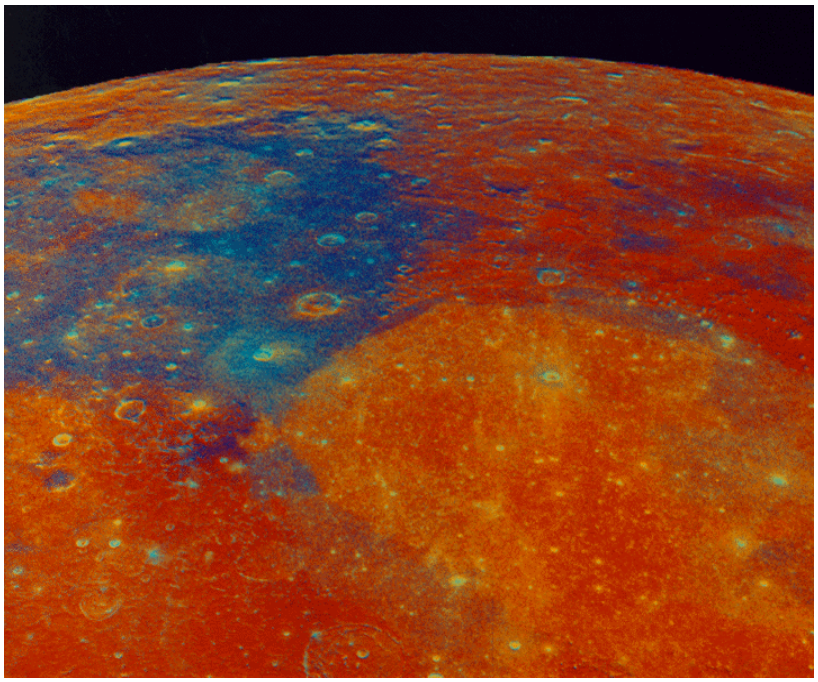
The view this month is of the eastern reach of Mare Tranquillitatis (Sea of Tranquility), specifically the region in the vicinity of the crater Cauchy. With a diameter less than 8 miles (12 km), Cauchy is bowl-shaped, with smooth, sloping walls. The crater is noteworthy in that it is bounded by faults to the north and south, most likely as a result of the stresses induced from the settling and contracting of the adjacent lava flows, although the faults are also radial to the Imbrium basin, formed in the moon-shattering event that could have provided the stress to tear apart the crust.

North of the crater is Rima Cauchy, a 130 mile long (210 km) en echelon graben (a rift formed by individual segments). A graben is created when the lunar crust is thrust downward between two parallel faults from tensional (pulling) forces.

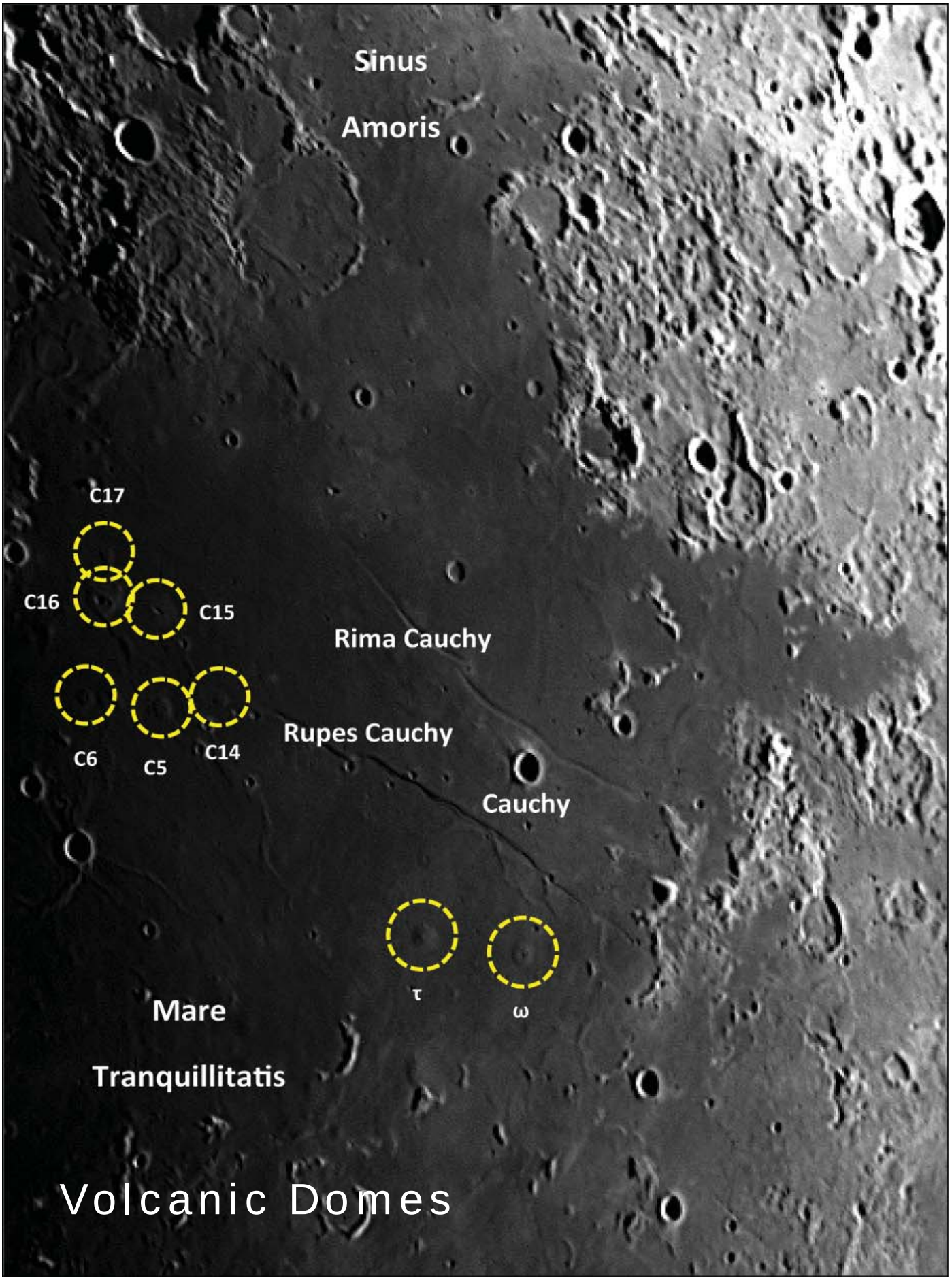
South of Cauchy, and paralleling Rima Cauchy, is Rupes Cauchy, a 124 mile (200 km) long scarp or cliff. The lava plains to the south of the scarp are almost 1,000 feet (300 m) lower than the plains to the north. Visible to the south of the scarp, and crater Cauchy, are two domes designated Omega (˜) Cauchy and Tau (˜) Cauchy. The domes are thought to be shield volcanoes formed by eruptions of silica-rich lava, although some domes can form when a magma chamber forced the overlying rock to bulge upward without breaking through.

Domes are typically 5 to 8 miles (8 to 12 km) in diameter and several hundred feet high. For example, Omega is over 4 miles across (6.9 km) and approximately 380 feet (116 km) high. It has a small crater at the summit that is approximately a mile across (1.775 km) and almost 800 feet (231 m) deep, based upon measurements from the Lunar Reconnaissance Orbiter.

A field of domes (circled in yellow and designated with a "C" for Cauchy) and, at least, one volcanic vent lies at the western terminus of Rupes Cauchy. They too may have been created as a result of the shock waves from the Imbrium impact or by pressure from shallow, subsurface magma pools.



Mare Serenitatis region viewed from the Galileo spacecraft in December 1992 The image is enhanced in false-color to distinguish soil characteristics: enriched titanium (blue); lower titanium (orange); exolosive volcanic deposits (dark purple); low iron and titanium (red)


Sinus
Amoris
C17
C16
C15
Rima Cauchy
C6
C5
C14
Rupes Cauchy
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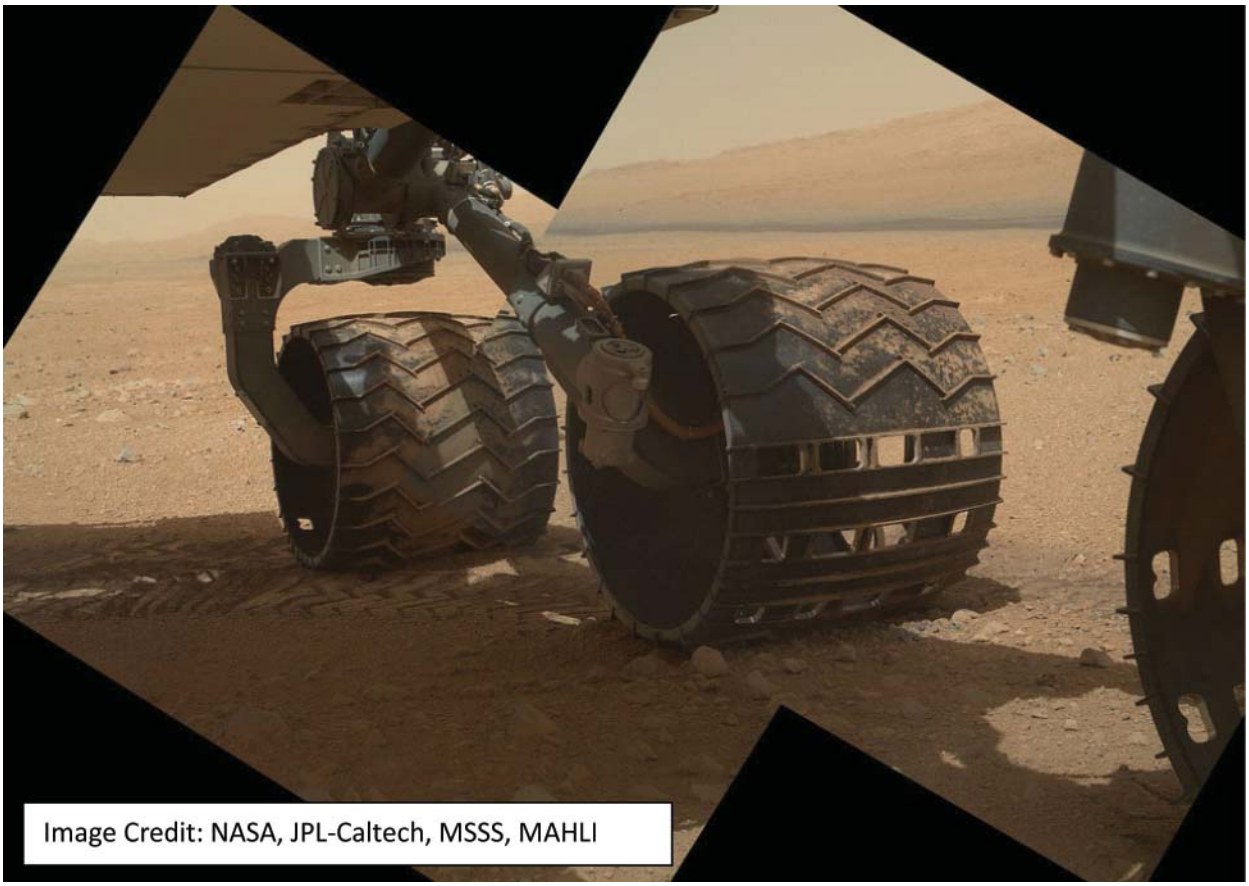
Mare
Tranquillitatis
Volcanic Domes

One Year with Wheels on the Ground

On a late Martian winter's day, the loose, rust-colored soil within Gale Crater was disturbed by a visitor from Earth, as a rocket-powered "sky crane" gently lowered the one-ton Mars Science Laboratory onto the planet's surface. The six-wheeled mobile laboratory named Curiosity has spent the last year exploring the lower reaches of Aeolis Mons (aka Mount Sharp) located in the center of the crater. During that short time, Curiosity has found:

- evidence of an ancient, fast moving stream; the size and distribution of the gravel and small stones in the stream bed indicates that the water was up to several feet in depth and moving at about three feet per second;
- that while Mars has lost much of its original atmosphere, what's remains is quite active;
- evidence that Mars could have supported life (e.g., microbes) in the past, based upon the presence of key chemical ingredients for life in the sedimentary rock samples analyzed by the laboratory; and
- indications that the rivers or lakes in the immediate area were more hospitable to life, with a more neutral pH and less briny, than other areas that have been explored.



In its 8 month journey from Earth, Curiosity also collected data on radiation levels. Radiation was detected from the steady stream of charged particles from our Sun, and the occasional outburst (coronal mass ejections), as well as from sources outside our solar system: cosmic rays from exploding stars and other high-energy sources throughout our galaxy. Based on Curiosity's data, the cumulative radiation dose received by astronauts making that same journey to Mars would likely exceed NASA's current guidelines.

Radiation dose is a function of both the intensity of the source and the time exposed. One of the more effective means of decreasing an astronaut's total exposure is to reduce the travel time to Mars, difficult with current chemical fueled rockets. Another option is to redesign the spacecraft to incorporate more effective shielding (without adding substantial mass), thus lowering the intensity of the radiation field.

Curiosity's next challenge is the exploration of Mount Sharp. The mound of sediment rises over

15,000 feet above the crater floor and is currently thought to have been deposited by Martian winds. The layering should provide a geologic time capsule as well as a visual record of changes in the Martian climate over the eons.

An American Woman Astronomer

"*We especially need imagination in science. It is not all mathematics, nor all logic, but it is somewhat beauty and poetry.*"

- Maria Mitchell

Maria (pronounced Ma-RYE-ah) Mitchell was born on August 1, 1818, on Nantucket, Massachusetts to William and Lydia Mitchell. She had an advantage that many young ladies at the time did not: a father who believed in the equality of education for all.

Courtesy of the Nantucket Maria Mitchell Association

Maria's father was an astronomer, as well as a teacher, and had built an observatory on the roof of the Pacific National Bank building where he and Maria would spend their evenings observing the night sky. It was on that rooftop on October 1 1847, that Maria Mitchell spotted a dim fuzzy object with her telescope that didn't appear on any of her star charts; she had discovered a comet.

The comet was known as "Miss Mitchell's Comet." She received a gold medal from the King of Denmark (a sponsor of comet hunters) for her discovery and traveled to Europe to meet other astronomers, including Sir John Herschel whose aunt Caroline was the only other woman who had discovered a comet. Maria's fame led to her election to the American Academy of Arts and Sciences in 1848; the first female member.

In 1849, Maria was employed by the U.S. Coast Survey (the oldest scientific organization in the United States) as a celestial observer. The position, which paid $300 per year, made Maria the first professional female stronomer.

In 1865, Maria was offered a faculty position (Professor of Astronomy) at the newly-founded Vassar College in Poughkeepsie, New York. At Vasser, she had use of a 12 inch refractor built by Henry Fitz of New York, the third largest in the United States at the time. She taught at Vassar until she retired in 1888. Among the many tributes to Maria is a lunar crater that has been named in her honor. Her home in Nantucket has been preserved and is open to visitors.

Another American Woman Astronomer

Henrietta Leavitt was born in 1868 in Lancaster, Massachusetts. A graduate of Radcliffe College, she suffered a serious illness after graduation that left her with a significant hearing loss. Interested in astronomy, she volunteered at the Harvard College Observatory in 1895 as a "human computer." She went on to become part of the permanent staff, earning $.30 an hour.

Credit: American Association of Variable Star Observers

Examining stars on photographic plates, Henrietta catalogued over 2,400 variable stars including 1,777 in the Magellanic Clouds. Her discovery of a relationship between the luminosity (brightness) and the periodicity of a certain class of variable star (cepheids) became an important tool in measuring distances to stars in nearby galaxies.

Henrietta also developed a standard (the Harvard Standard) for comparing the brightness of stars. The director of the Observatory put her in charge of stellar photometry in 1921. Unfortunately, she passed away shortly thereafter at the age of 53, losing a battle to cancer.

Her contributions to astronomy were recognized with the naming of both an asteroid and a lunar crater in her honor.

Countdown to Pluto

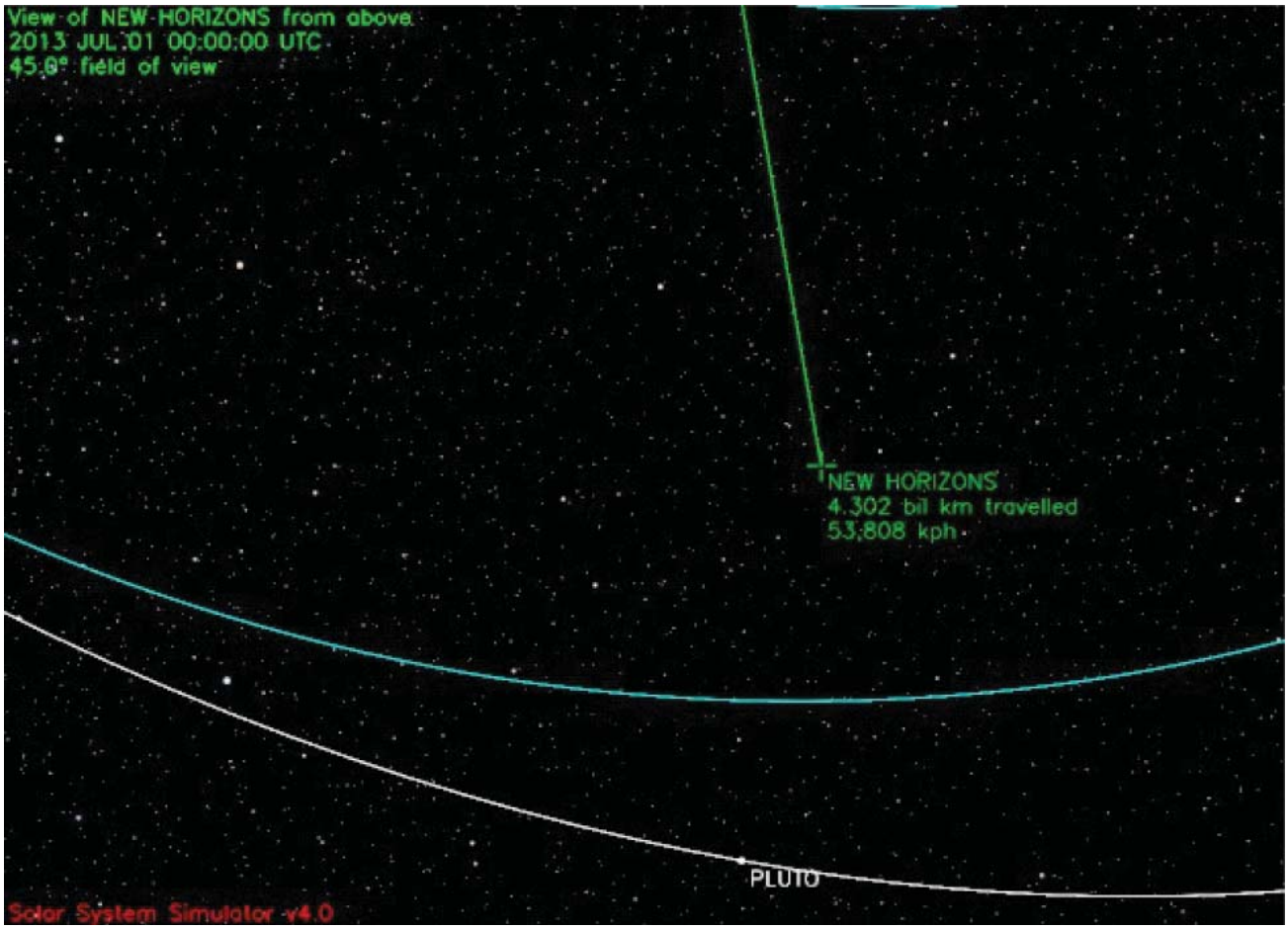
On a January afternoon, seven and a half years ago, New Horizons began its journey to Pluto on top of an Atlas V rocket from the Cape Canaveral Air Force Station in Florida. In another two years (July 2015) the spacecraft will make its closest approach to Pluto and its natural satellites.

The number of known moons orbiting the dwarf planet has increased by two since New Horizons

began its journey. In 2011, a fourth moon (currently designated P4) was discovered by astronomers using the Hubble Space Telescope while searching for rings around Pluto. A year later, in 2012, a fifth moon (P5) was discovered in images taken by the Hubble in an effort to identify possible threats to the spacecraft during its 30,000 mile per hour flyby.

New Horizons is now approaching the orbit of Neptune, which it will cross in August 2014, less than a year before its closest approach to Pluto, and before racing off into the Kuiper Belt.

Pluto reaches opposition on July 1st, rising in the evening sky opposite a setting Sun. At more than 32 times further from the Sun than the Earth, you will need a moderate sized telescope to spot the 14th magnitude Pluto. You can find Pluto in the constellation Sagittarius, although against the background stars of the Milky Way, the hunt will be challenging.



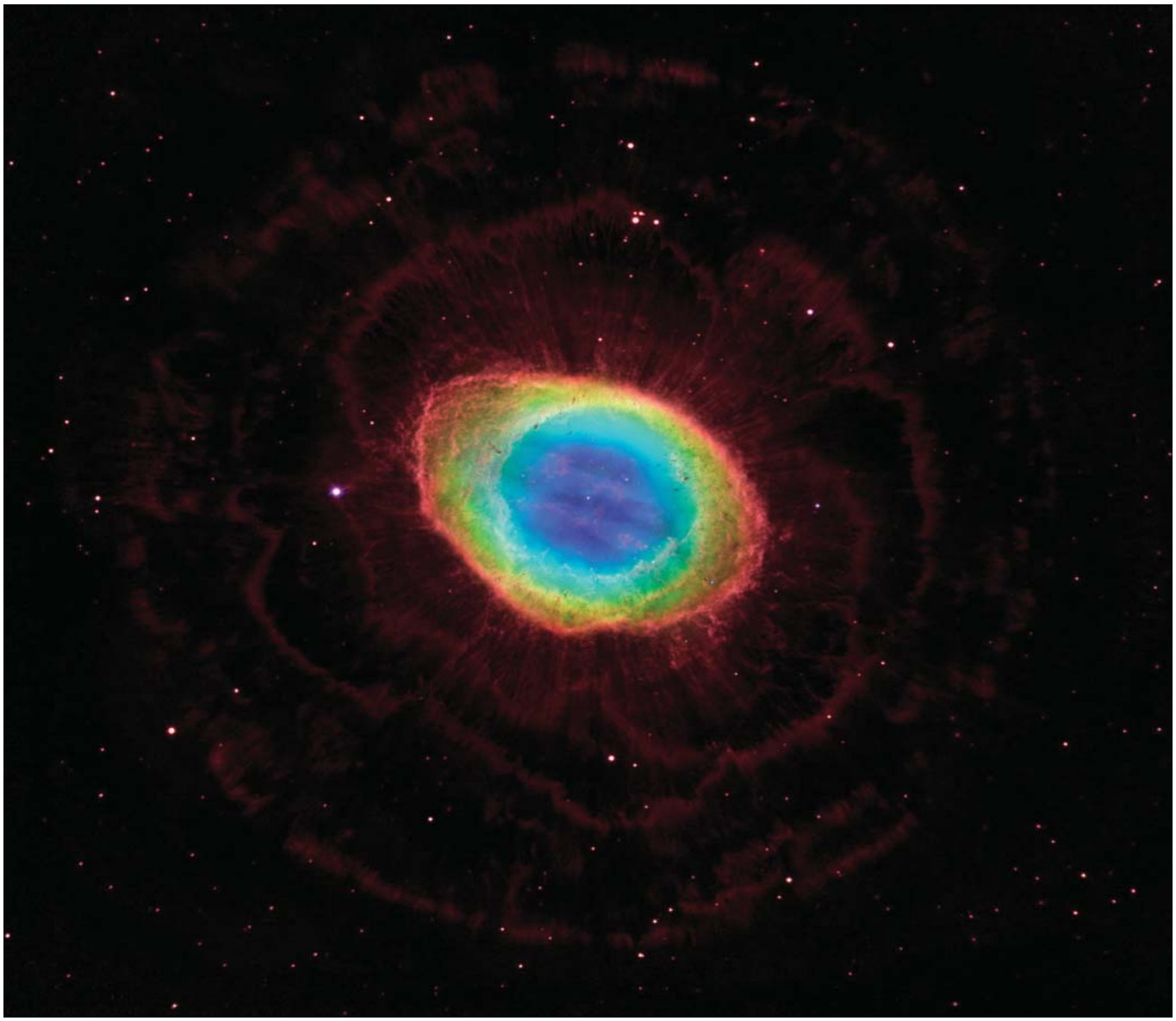
Position of the New Horizons spacecraft on July 1st
Credit: NASA/Jet Propulsion Solar System Simulator (http://space.jpl.nasa.gov/

A New View of the Ring Nebula

THE RING NEBULA (AKA MESSIER 57 or NGC 6720) is the remnant of a star several times larger than our Sun that collapsed upon consuming its available fuel (hydrogen). It is located approximately 2,300 light years from Earth in the direction of the constellation Lyra. At the center of the nebula is a white dwarf, a dense, compact remnant star about the size of the Earth. Radiation from the white dwarf energizes the gas in the nebula, causing it to glow.

The gas was expelled 4,000 years ago during the collapse of the star. The ring-shaped cloud is approximately one light year across and is expanding at more than 12 miles per second (43,000 miles an hour). From Earth we see the nebula face-on and two dimensional. However, the Hubble's new Wide Field Camera 3, combined with Earth-bound telescopes, has provided astronomers a much more detailed image of the nebula's internal structure.

The latest images show the material inside the center of the nebula moving outward faster than the outer layers. Not apparent in the two dimension images is a football-shaped core extending out beyond the ring at either end.



Credit: NASA, ESA, C.R. O'Dell (Vanderbilt University), and D. Thompson
(Large Binocular Telescope Obseratory)

The image above is a composite of visible light from the Hubble Space Telescope and infrared data from the Large Binocular Telescope in Arizona. The blue color in the image is from the energized helium. The dark knots of gas surrounding the nebula give the appearance of petals of a flower.

Summer Activities

Summer is a great time to enjoy the night sky. Some suggestions for this summer:

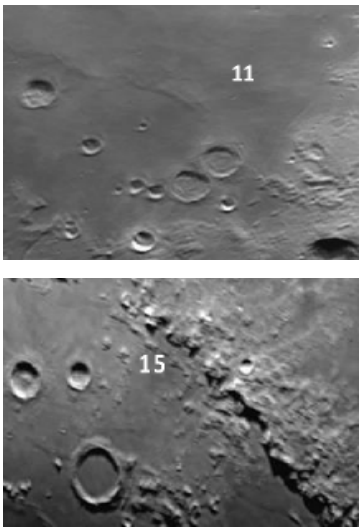
1. **Attend a star party.** Star parties are gatherings of amateur astronomers where the general public is invited to share the wonders of the night skies with skilled observers and through telescopes of every size and shape. A calendar of dates and locations across the United States is available at *www.skyandtelescope. com.* Closer to home, the McCarthy Observatory hosts a star party on the second Saturday of each month. Please join us on July 13th and August 10th 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 the Moon will set before midnight providing a dark sky for late night observers.

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.

Sea of Tranquility and Apollo 11 landing site



Apennines Mountains and Apollo 15 landing site

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:

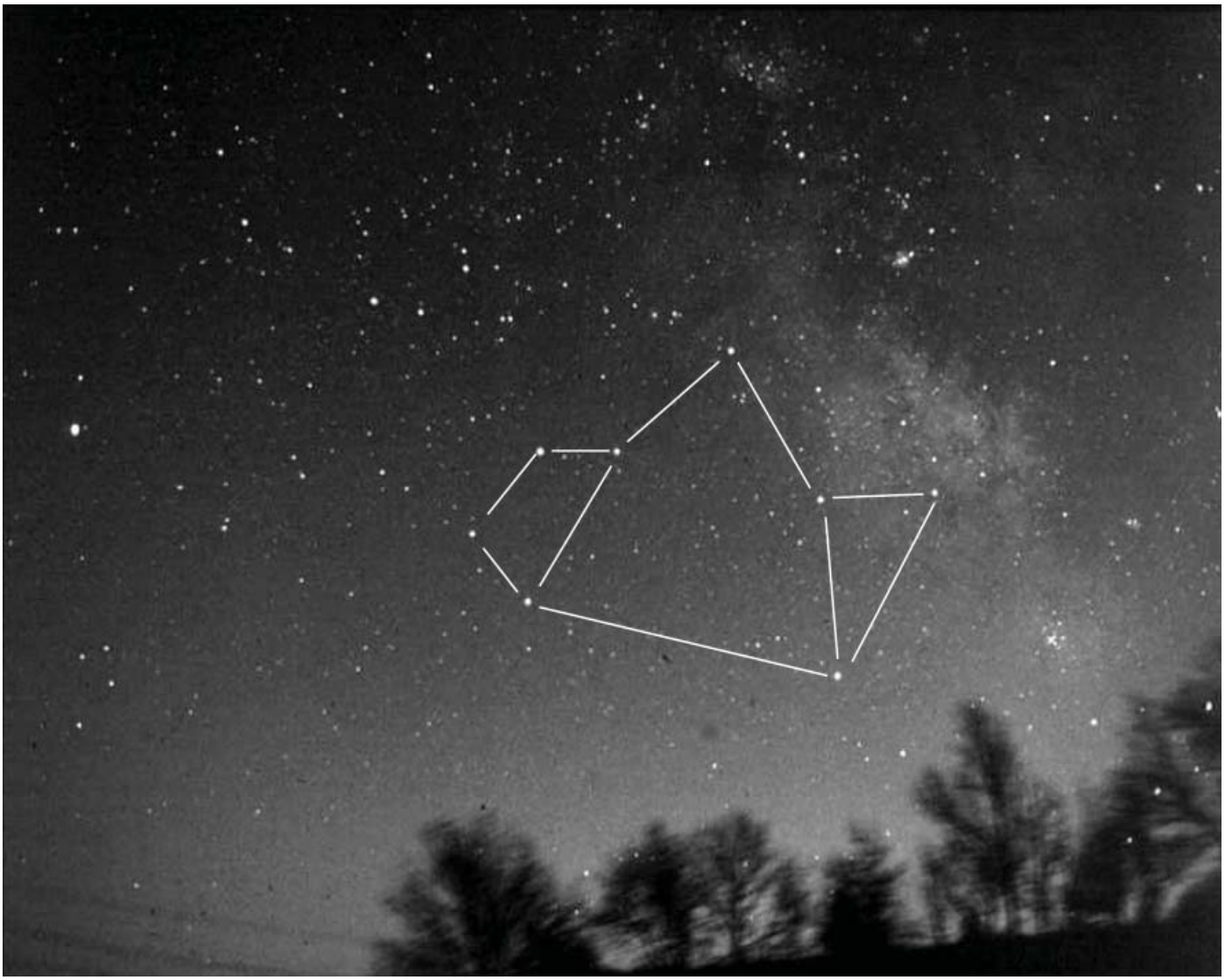
• Locate the Big Dipper (the most prominent asterism in the northern sky). The last two stars in the bowl of the Dipper point to the North Star.

• 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. 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 (*see image next page*).



"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.

Sunrise and Sunset (New Milford, CT)

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	06:03	19:53
August 31st	06:19	19:28

Astronomical and Historical Events

July

1st Dwarf Planet 134340 Pluto at Opposition (31.449 AU), rising with the setting Sun and visible all night

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)

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: Henrietta Leavitt born; discovered a stellar standard for measuring distances to distant galaxies while working at the Harvard College Observatory (1868)

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 Earth at Aphelion, furthest distance from Sun (1.017 AU from Sun)

6st Moon at Apogee (furthest distance from Earth)

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 New Moon

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 Scheduled flyby of Saturn's largest moon *Titan* by the Cassini spacecraft

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)

Astronomical and Historical Events for July (continued)

- 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 History: launch of Soviet Mars orbiter Phobos 2 (1988)
- 13th Second Saturday Stars – Open House at the McCarthy Observatory
- 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 History: flyby and first close-up view of Mars by the Mariner 4 spacecraft (1965)
- 15th First Quarter Moon
- 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 Asteroid 8 Flora at Opposition (8.6 Magnitude)
- 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 Distant 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 Moon at Perigee (closest distance to Earth)
- 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 Full Moon (sometimes called the Full Buck, Thunder or Hay Moon)
- 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)

Astronomical and Historical Events for July (continued)

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
25th History: Svetlana Savitskaya becomes the first woman to walk in space (1984)
25th History: launch of Soviet Mars orbiter Mars 5 (1973)
26th Scheduled flyby of Saturn's largest moon *Titan* by the Cassini spacecraft
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)
27th Scheduled launch of Russian Progress cargo-carrying spacecraft to the International Space Station from the Baikonur Cosmodrome in Kazakhstan
27th Delta-Aquarids meteor shower peak
28th Alpha Capricornids 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 Last Quarter Moon
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 Mercury at its Greatest Western Elongation (20° separation from the Sun, as viewed from Earth, in the morning sky)
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 Mars Spring Equinox in the Northern Hemisphere
31st History: impact of the Lunar Prospector (1999)
31st History: flyby of Mars by Mariner 6 (1969)

August

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 Moon at Apogee (furthest distance from Earth)
3rd Scheduled launch of a Japanese H-2 cargo-carrying Transfer Vehicle to the International Space Station from the Tanegashima Space Center, Japan
3rd History: launch of the MESSENGER spacecraft to Mercury (2004)
4th Asteroid 3 Juno at Opposition (8.6 Magnitude)
4th History: launch of the Phoenix polar lander spacecraft to Mars (2007)
5th History: launch of the Juno spacecraft to Jupiter (2011)

Astronomical and Historical Events for August (continued)

5th History: flyby of Mars by the Mariner 7 spacecraft (1969)
5th History: birthday of astronaut Neil Armstrong (1930)
6th New Moon
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 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 78th Convention of Amateur Telescope Makers (Stellafane), Springfield, Vermont (through the 11th), see http://stellafane.org/convention/2013/index.html
9th History: launch of the Soviet Luna 24 spacecraft, third attempt (and only successful attempt) to recover a sample from Mare Crisium (1976)
10th Second Saturday Stars – Open House at the McCarthy Observatory
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 International Sun-Earth Explorer (ISEE-3) satellite to study the interaction between the Earth's magnetic field and the solar wind; first spacecraft to be placed at one of the Earth-Sun Lagrangian points (L1); later renamed the International Cometary Explorer (ICE) and sent to rendezvous with Comet Giacobini-Zinner, becoming first spacecraft to visit a comet (1978)
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 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)
14th First Quarter Moon
16th Asteroid 7 Iris at Opposition (7.6 Magnitude)
16th History: launch of Explorer 12 spacecraft, measured cosmic-ray particles, solar wind protons, and magnetospheric and interplanetary magnetic fields (1961)
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 Moon at Perigee (closest distance to Earth)

Astronomical and Historical Events for August (continued)

- 18th History: maiden flight of the DC-X (Delta Clipper Experimental), reusable, single stage to orbit launch vehicle from the White Sands Missile Range in southern New Mexico; flew for 59 seconds (1993)
- 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 Full Moon (sometimes called Sturgeon, Green Corn or Grain Moon)
- 20th Asteroid 25143 Itokawa closest approach to Earth (0.845 AU), first asteroid to be visited and samples returned by the Japanese spacecraft Hayabusa
- 20th Kuiper Belt Object 307982 (2004 PG115) at Opposition (36.352 AU)
- 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)
- 21st History: launch of Gemini V with astronauts Gordon Cooper and Charles Conrad (1965)
- 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 Kuiper Belt Object 225088 (2007 OR10) at Opposition (85.875 AU)
- 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 History: flyby of the planet Saturn by the Voyager 2 spacecraft (1981)
- 27th Neptune at Opposition
- 27th History: launch of the Mariner 2 spacecraft to Venus; first successful planetary encounter (1962)
- 28th Last Quarter Moon
- 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 History: discovery of a bright nova in the constellation Cygnus (Nova Cygni 1975); visible to the unaided eye for about a week (1975)
- 30th Moon at Apogee (furthest distance from Earth)
- 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 Kuiper Belt Object 145452 (2005 RN43) at Opposition (39.656 AU)

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.*

Image Credits

Front page design and graphic calendars: Allan Ostergren

Second Saturday Stars poster: Sean Ross, Ross Designs

Miss Kyle Cloutier, one of the students at the University of Maryland that designed and built the remotely operated rover. When the photo was taken, the rover "Demeter" was undergoing final tests at Maryland prior to being shipped off to the 2013 RASC-AL Exploration Robo-Ops Competition at the NASA Johnson Space Center in Houston, Texas.

Photo by Bill Cloutier

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

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 13th

8:00 - 10:00 pm

Astronomy Observation Journals:

SATURN'S RINGS

Kid's Night

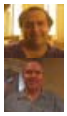
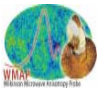
Refreshments
Family Entertainment
Activity Center
Stars & Planets
Rain or shine

Map

art & design · sean ross · rossdesign@charter.net

July 2013

Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	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  Moon at apogee (farthest from Earth)  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 spacecaft (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 atmo-sphere (1979)	12  Soviet Mars orbiter Phobos 2 launched (1988)	13  Langley Research Center Birthday (1917)  Soviet spacecraft Luna 15 launched, lander to crash on Moon (1969) 2nd Saturda Stars Open House McCarthy Observator 
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  Moon at Perigee (closest distance to Earth) 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)	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  Delta-Aquarids meteor shower peak 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  Alpha Capricornids meteor shower peak Launch of Ranger 7, Moon impact mission (1964)   Launch of Skylab 3 (Bean, Pogue, Garriott) (1973)	29 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)		

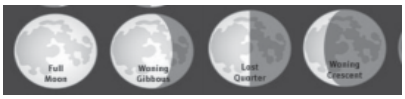
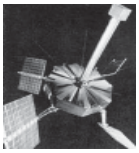
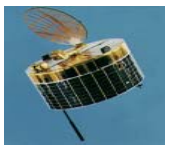
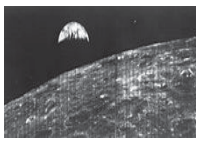
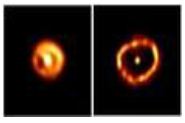
Phases of the Moon

July 8 July 15

July 22 July 29

August 2013

Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Phases of the Moon  Aug 6 Aug 14  Aug 20 Aug 29				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)	Moon at Perigee (closest distance to Earth) 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 Laboratory (MSL or Curiosity) inside Gale Crater (2012)	7  Viking 2 arrives at 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 78th Convention of Amateur Telescope Makers (Stellafane), Springfield, Vermont (through the 11th), Launch of the Soviet Luna 24 spacecraft, third (and only successful attempt) to recover a sample from Mare Crisium (1976)	10 Launch of Mars Reconnaissance Orbiter (2005) Magellan spacecraft orbits Venus (1990) **2nd Saturday Stars Open House McCarthy Observatory**
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) Moon Occults Venus	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)	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)