

Galactic Observer

John J. McCarthy Observatory

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Fiery Furnace

When a star goes nova, it typically disgorges its hydrogen onto a companion white dwarf star, setting off a catastrophic nuclear explosion. But occasionally, the host star tries to keep it in and balloons, to immense size.

A large, colorful nebula with a central red star and surrounding blue and white clouds. The nebula is roughly circular and has a complex, filamentary structure. The central star is bright red and has a prominent diffraction pattern. The surrounding clouds are a mix of blue, white, and yellow, with some darker regions. The background is black with several bright blue stars.

In 2002, the red variable star V838 Monocerotis, 20,000 light years away in the constellation Unicorn, was observed expanding at a rapid rate. In a short time it became one of the brightest stars, 380 times the size of our sun and a million times brighter. The expansion caused the star's outer layers to cool and redden, its brightness reflecting against the surrounding dust cloud to create a burst of color called a light echo.

Image credit: NASA, ESA, and The Hubble Heritage Team (STScI/AURA)

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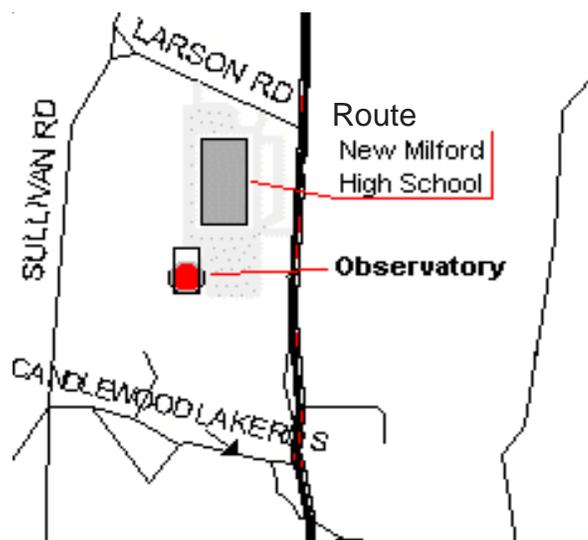
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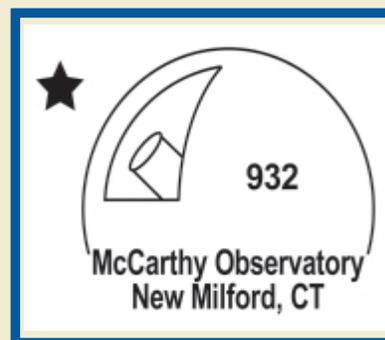
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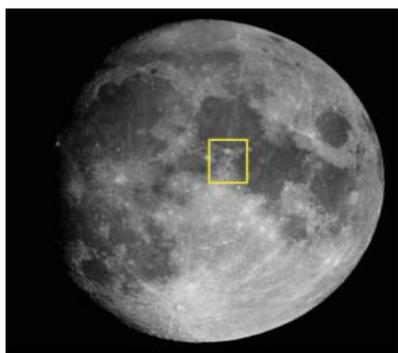


May Astronomy Calendar and Space Exploration Almanac



“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).



The view this month includes a rugged area designated Terra Nivium (“Land of Snows”) by the selenographer Giovanni Riccioli on the lunar map contained within his 1651 treatise *Almagestum Novum*. The region is bounded by the Apennine Mountains to the west, the

Haemus Mountains and Mare Serenitatis to the north and Mare Vaporum to the south. The Haemus Mountains also form the southern rim of the 460 mile (740 km) wide Serenitatis impact basin that formed 3.87 billion years ago. The mountains rise 2 miles (3 km) above the lava plains.

Terra Nivium is noteworthy only in the number of small mares (or lava lakes) found within the region. Further east, the western shore of Mare Tranquillitatis is denoted by Sinus Honoris (Bay of Honor) and the ancient impact crater Julius Caesar.

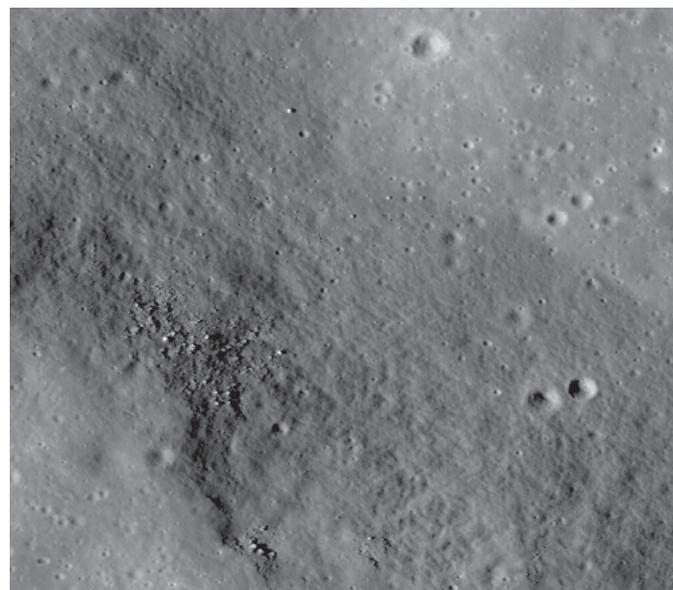
The formation of Julius Caesar predates the Imbrium basin impact that occurred approximately 3.85 billion years ago. The Imbrium impact battered the crater’s western wall with rock projectiles while lava flows breached the 56 mile (90 km) diameter crater from the east.

The Ariadaeus Rille, seen just to the south of Julius Caesar, is a straight walled graben; formed where the ground has fallen between two parallel faults. The rille is 137 miles (220 km) long and 2½ to 3 miles (4 to 5 km) wide. A diagonal channel connects the western end to another rille, the Hyginus Rille. This rille is unique with a series of pits overlaying the channel, suggesting that magma flowed beneath the fault before the floor collapsed.

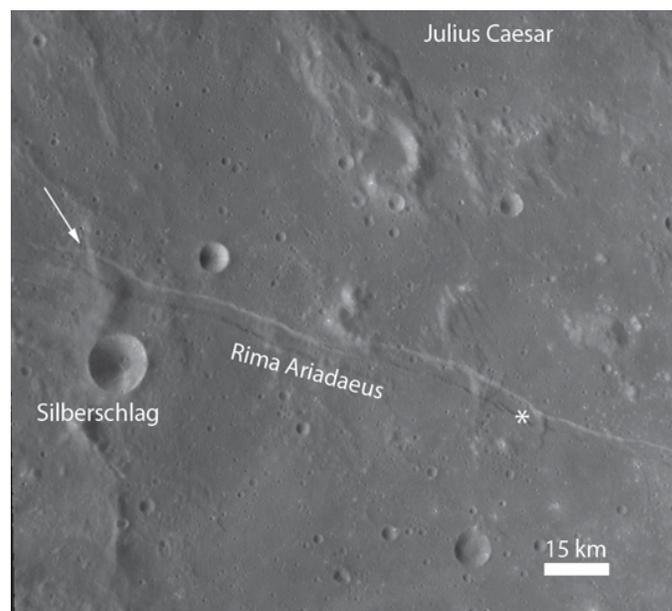
The cluster of small, lava filled depressions in Terra Nivium were given the designation of lakes (lacus)

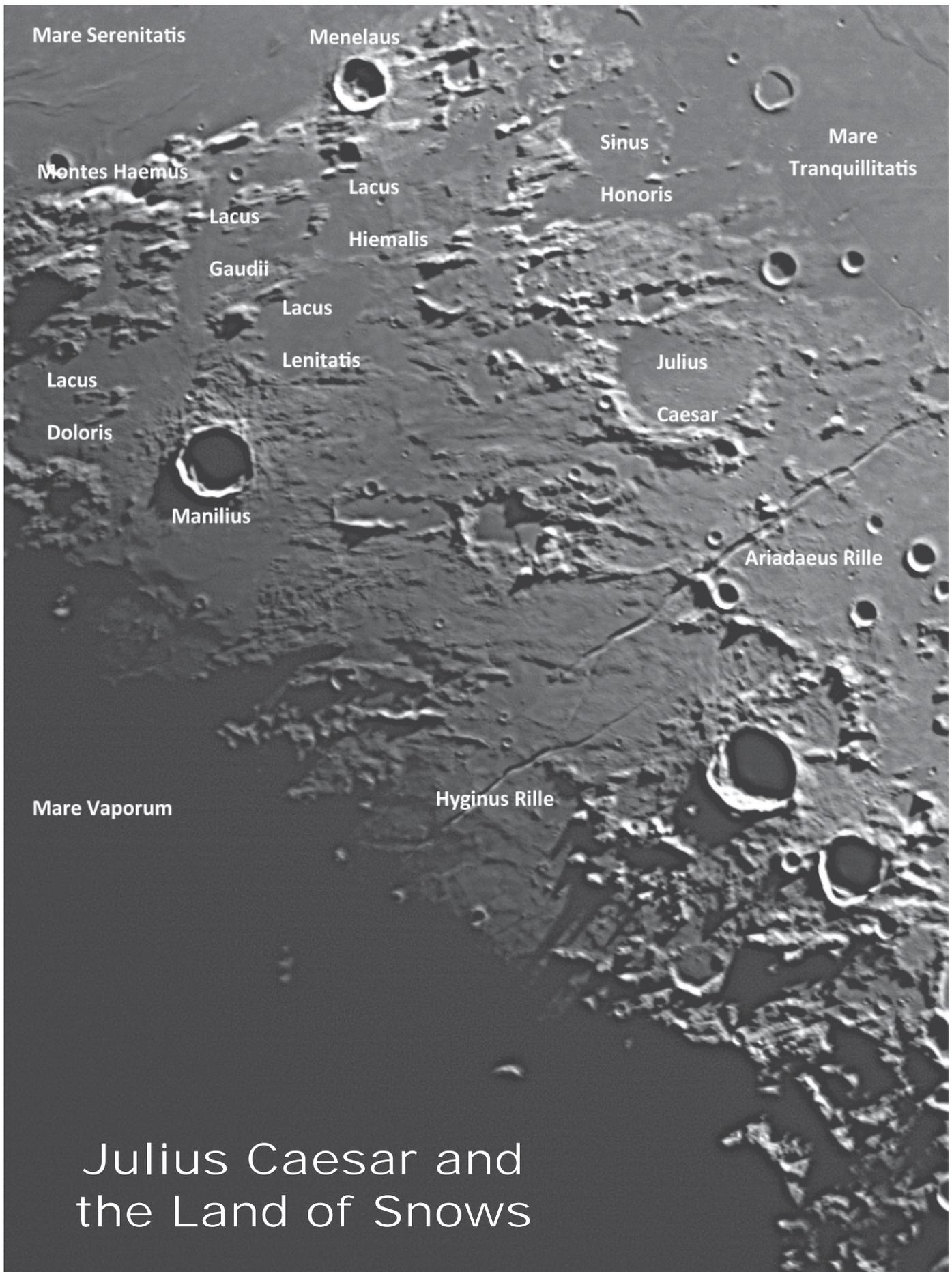
by Riccioli. Visible in the image are Lacus Dolaris (Lake of Sorrow), Lacus Gaudii (Lake of Delight), Lacus Lenitatis (Lake of Tenderness) and Lacus Hiemalis (Lake of Winter). The diminutive maria range from 31 miles (50 km) to 70 miles (113 km) in diameter.

The impact crater Menelaus, located on the southern shore of Mare Serenitatis, exhibits a distinctive asymmetrical ray pattern suggesting an oblique impact. Slumped material, either impact debris or from a landslide, is visible on the sunlit portion of the crater floor.



IRima Ariadaeus taken by the Lunar Reconnaissance Orbiter. Above, a closeup (1.2 km (3/4 mi)); at bottom, a 15 kilometer view (9.6 miles). Credit: NASA/Goddard Space Flight Center/Arizona State University





Mare Serenitatis

Menelaus

Sinus

Mare
Tranquillitatis

Montes Haemus

Lacus

Honoris

Lacus

Hiemalis

Gaudii

Lacus

Lenitatis

Julius

Lacus

Caesar

Doloris

Manilius

Ariadaeus Rille

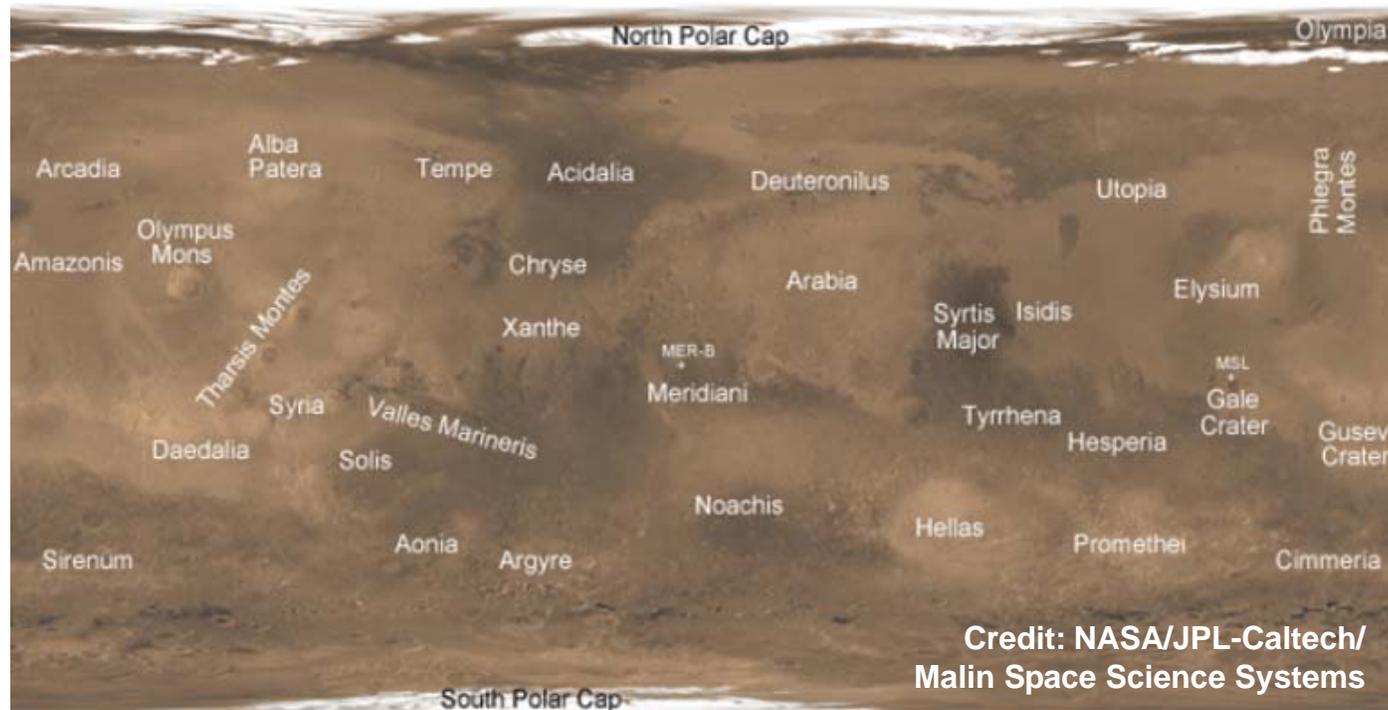
Mare Vaporum

Hyginus Rille

Julius Caesar and the Land of Snows

Mars at its Best

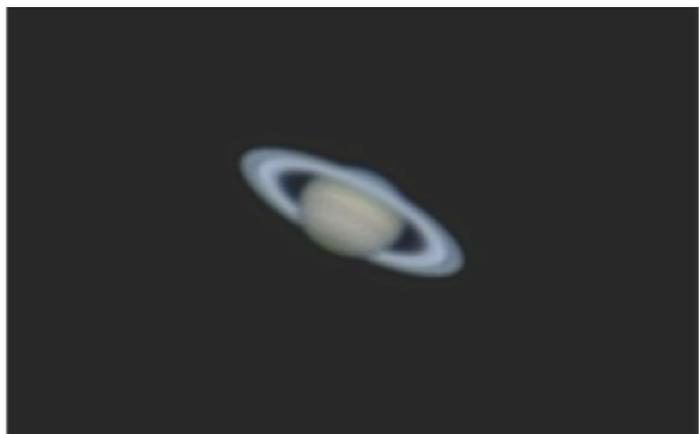
The Earth catches up with Mars every 26 months. It reached its closest approach to the Red Planet on April 14th. While the two worlds are now moving apart, Mars is still well placed for viewing in early May. Mars appears slightly larger than it did in 2012; unfortunately, it's lower in the sky this year. This means that observers will be looking through more of Earth's atmosphere as they try to discern distinguishing features on the diminutive world. The image (below) may be helpful in identifying specific features through the telescope.



Credit: NASA/JPL-Caltech/
Malin Space Science Systems

Lord of the Rings

Saturn reaches opposition on May 10th. On that date, the magnificent ringed world will rise in the eastern sky as the Sun sets in the west. Saturn will reach its maximum altitude, with the best viewing, around midnight. On Each succeeding night, the planet will rise a few minutes earlier as the Earth begins to move away. You can find Saturn (and its largest moon *Titan*) in the constellation Virgo. *Titan* (larger than the planet Mercury) can be identified by its orange hue.

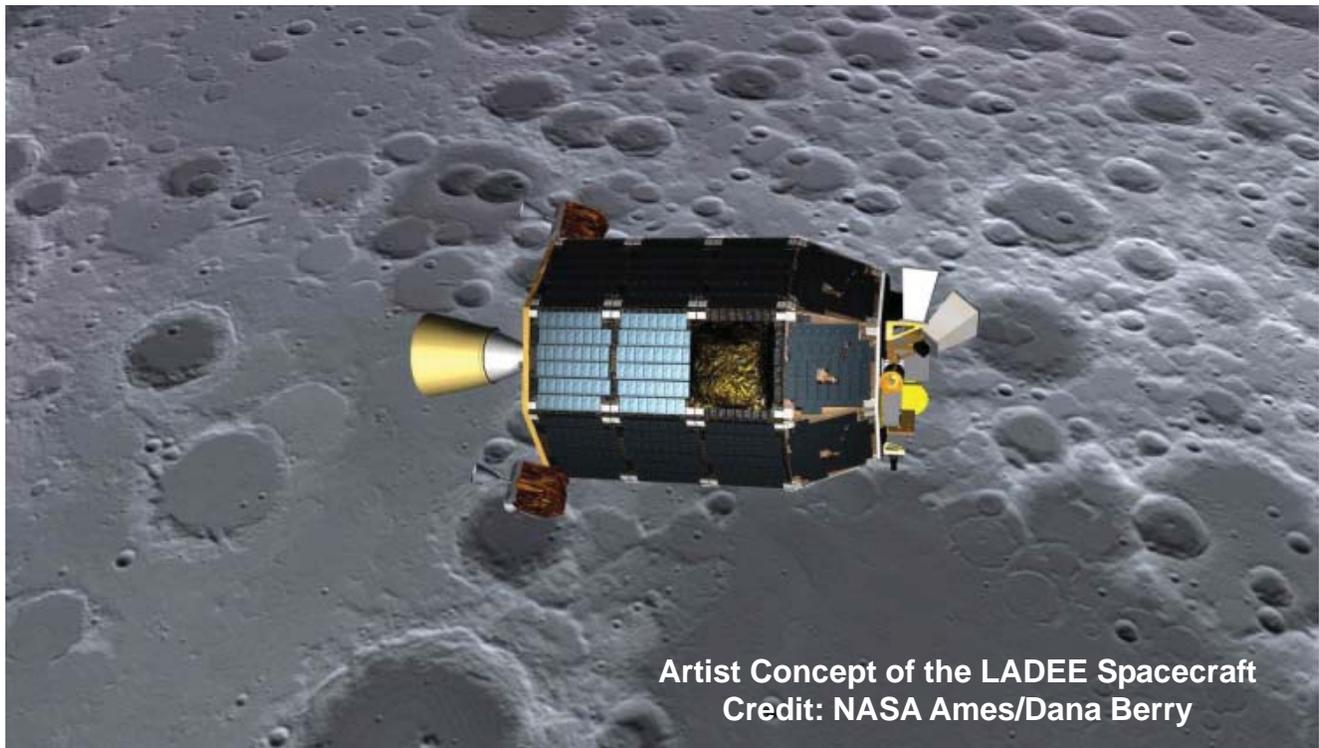


The 2011 *Astronomy Picture of the Day* for March 15th combined images taken by the Cassini spacecraft to create flyby videos of Saturn, its rings and several moons as they would appear to the space traveler. The video can be found at <http://apod.nasa.gov/apod/ap110315.html>.

Dust to Dust

NASA's Lunar Atmosphere and Dust Environment Explorer spacecraft (LADEE) completed its five month long science mission, impacting the far side of the Moon shortly after midnight on the morning of April 18th. The crater created by the spacecraft's impact velocity (in excess of 3,000 mph) should be visible to the Lunar Reconnaissance Orbiter in future flyovers of the impact site.

LADEE was designed to study the moon's extremely thin atmosphere (exosphere) and any dust in suspension. The spacecraft also successfully tested a high-speed, pulsed laser beam communication system. While LADEE did not detect large quantities of dust, it did find a dusty veil surrounding the Moon, created by the relentless bombardment of micrometeorites on the dusty surface.



Artist Concept of the LADEE Spacecraft
Credit: NASA Ames/Dana Berry

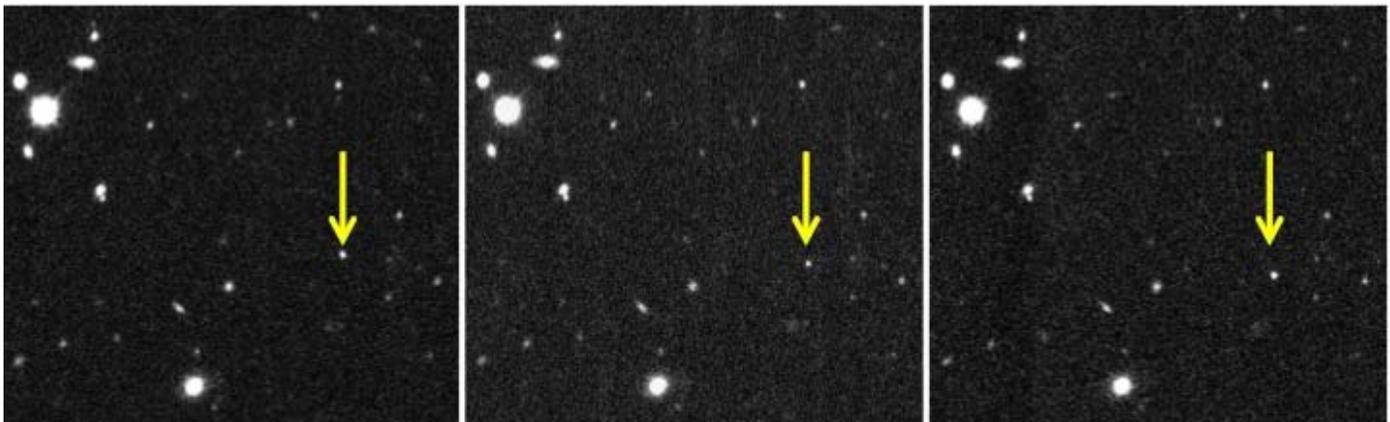
Distant Worlds

Astronomers have added three new worlds to the swarm of deep space denizens. All three travel through space far from a cold, faint Sun.

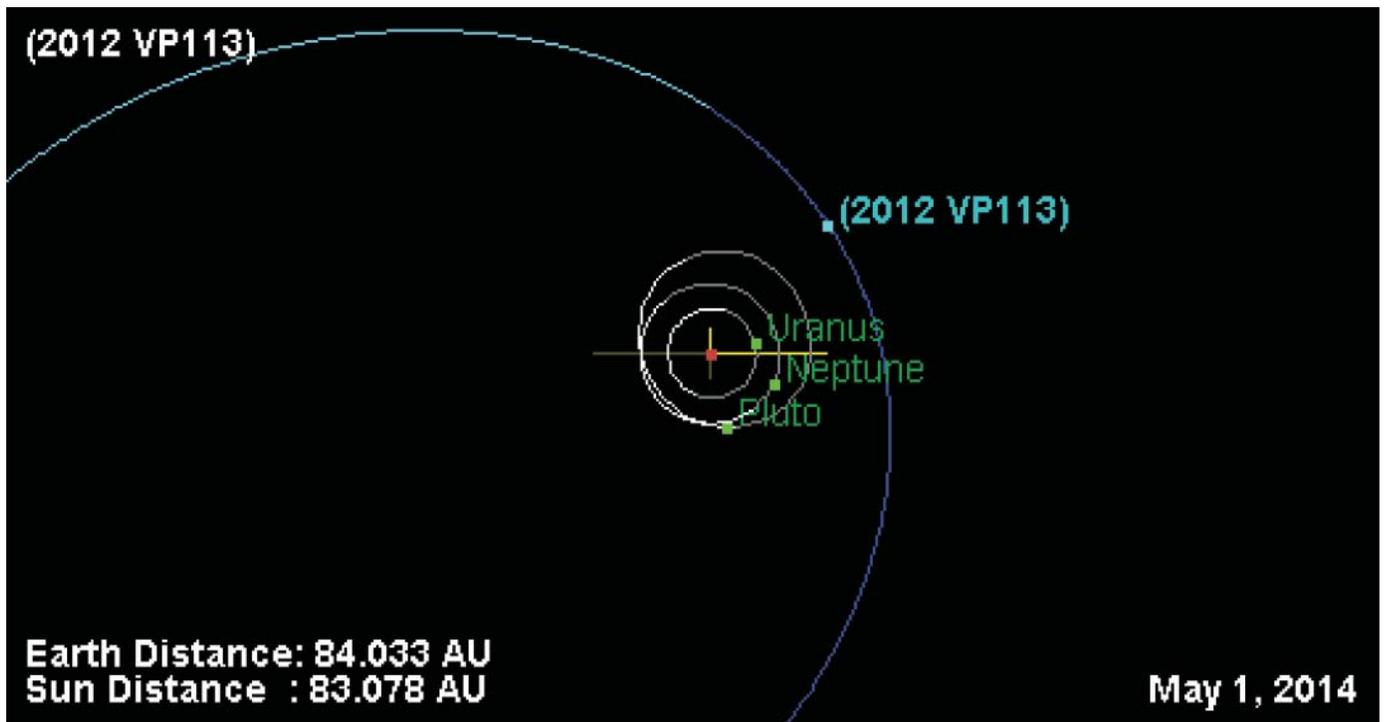
The most distant newcomer is 2012 VP113, a world that never gets closer than 80 astronomical units (AUs) from the Sun or almost three times the distance to Neptune. At its furthest, 2012 VP113 travels through the inner reaches of the Oort Cloud, 450 AU away. 2012 VP113 joins Sedna as one of the few worlds detected at such an extreme distance from the Sun and hints of the presence of potentially larger worlds. Dimmer than Sedna, VP113 is estimated to be 280 miles (450 km) in diameter, large enough to be spherical in shape (depending upon its composition).

Discovered in the same sky survey as 2012 VP113 was 2013 FY27. While discovered at a similar distance, 2013 FY27 is a member of the Kuiper Belt and is currently at the furthest point in its orbit, while 2012 VP113 was at its closest. 2013 FY27 is the ninth brightest object beyond Neptune and also large enough to be considered a dwarf planet at an estimated diameter of 600 miles (1,000 km).

Also discovered in the survey conducted with the Dark Energy Camera on NOAO's Blanco 4-meter telescope in Chile was 2013 FZ27. While not as bright as FY27, FZ27 was discovered at a distance of 50 AU and has the potential to be a dwarf planet at an estimated diameter of 372 miles (600 km).



Images taken about 2 hours apart on Nov. 5, 2012. The motion of 2012 VP113 stands out compared to the steady state background of stars and galaxies. Image Credit: Scott Sheppard/Carnegie Institution for Science



Space Shuttle History

Endeavour: On May 16, 2011, the space shuttle Endeavour lifted off from Pad 39A at the Kennedy Space Center for a 16 day mission to the International Space Station. The STS-134 mission, which included the delivery of the Alpha Magnetic Spectrometer, would be Endeavour's final flight.

Endeavour first arrived at the Kennedy Space Center on May 7, 1991 as a replacement for the lost Challenger. It was built out of spare parts from the Atlantis orbiter. Endeavour was first launched (STS-49) a year later on May 7, 1992. The orbiter's name was selected through a national competition among students and was named after the ship commanded by British explorer James Cook in his exploration of the South Pacific in 1768-71. Cook, among other accomplishments, observed the transit of the Sun by Venus from Tahiti in June

1769. The orbiter is currently being readied for permanent display at the California Science Center in Los Angeles, California.

Atlantis: On May 11, 2009, Atlantis lifted off for the final servicing mission of the Hubble Space Telescope. The 12 day mission (STS-125) included five spacewalks and the installation of two new scientific instruments, the Cosmic Origins Spectrograph and Wide Field Camera 3. The



Mission Specialists Andrew Feustel and John Grunsfeld servicing the Hubble Space Telescope on the end of the remote manipulator system arm, controlled from inside Atlantis' crew cabin. Image credit: NASA

mission also included repair of two instruments, the Space Telescope Imaging Spectrograph and the Advanced Camera for Surveys, and replacement of the telescope's batteries and gyroscopes. The telescope has been operating at near maximum efficiency and could last well beyond the scheduled launch of the James Webb telescope in 2018. Atlantis (right) on Pad 39A, prior to its May 2009 launch.

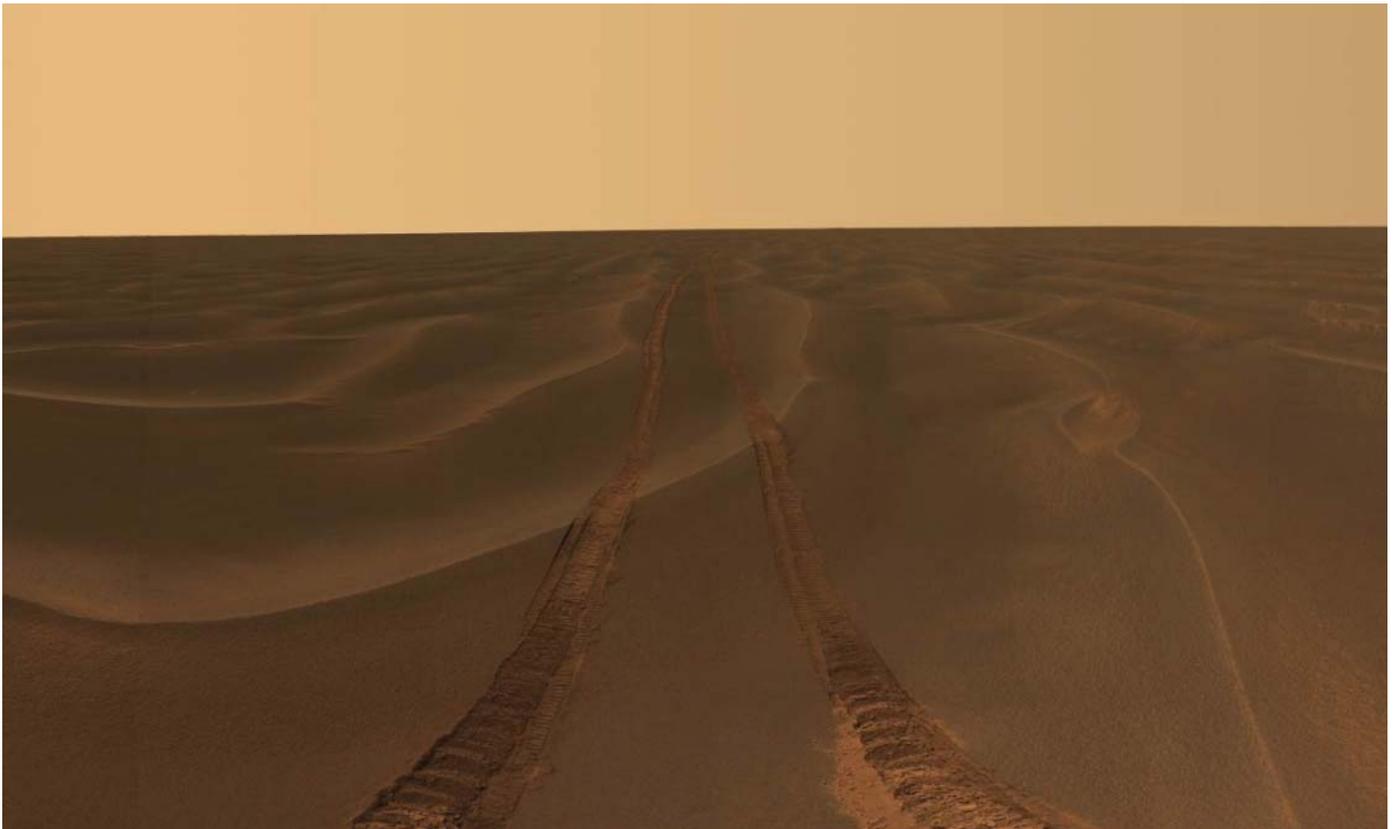


“Spirit & Opportunity: 10 Years Roving Across Mars”

Through the generosity of Cornell University, NASA’s Jet Propulsion Laboratory and NASA, the Smithsonian has assembled an exhibition celebrating the Mars Exploration Rovers, Spirit and Opportunity, and the 10th anniversary of their landings on the Red Planet. The exhibition is located on the second floor of the Smithsonian’s National Air and Space Museum in Washington, D.C.

The rovers, launched in the summer of 2003, landed the following January on a 90-day mission. Ten years later, Opportunity is operational and exploring the west rim of Endeavour Crater with 24.2 miles on the odometer. Spirit got bogged down in loose sand and was unable to reach a favorable winter survival location. It hasn’t been heard from since March 2010.

The exhibit includes 50 images; selected to chronicle the discoveries of the two rovers, as well as the stark beauty of the Martian landscape. The images are on display through September 14, 2014, including the one shown below of Opportunity’s wheel tracks.

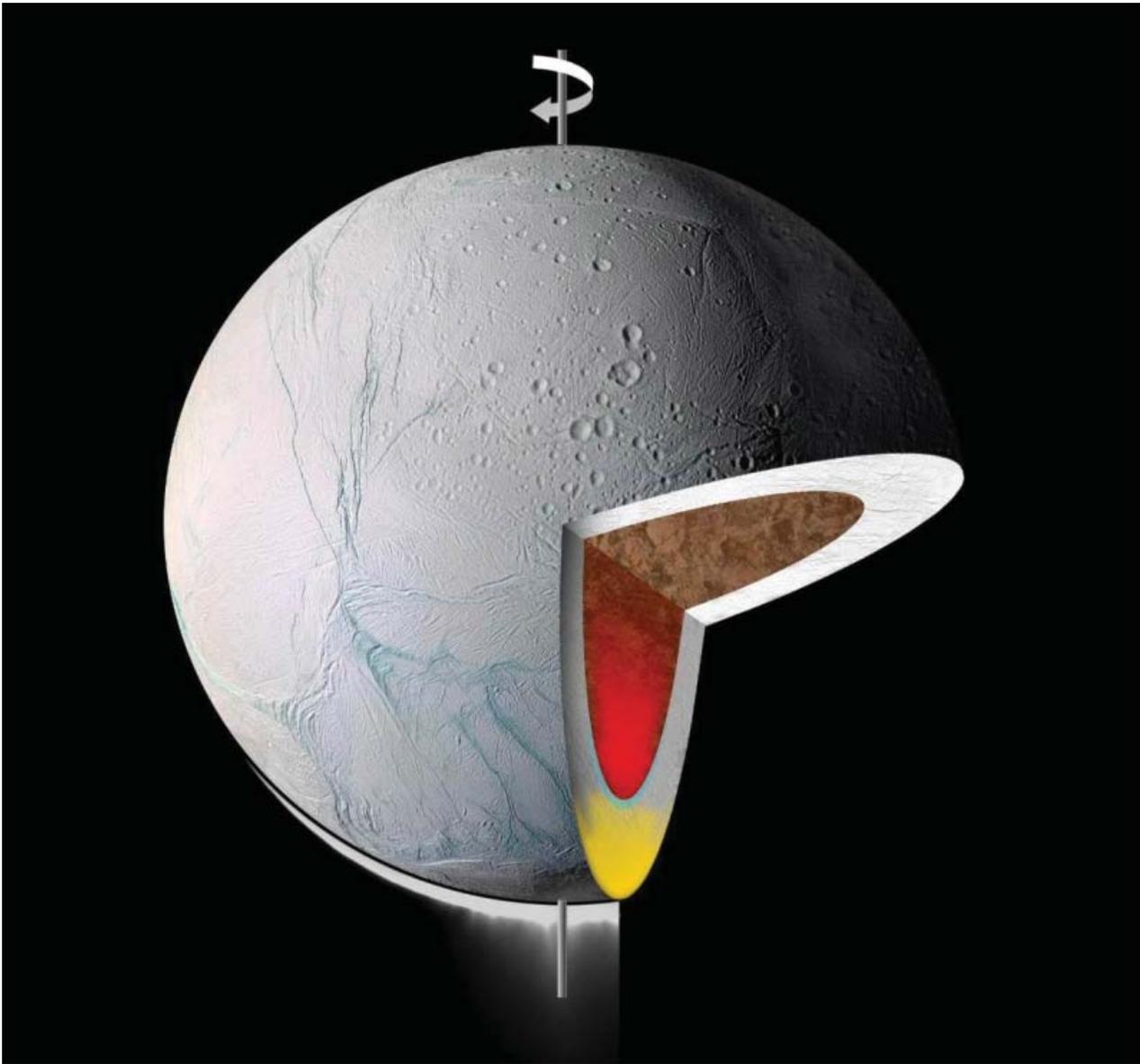


Dunes of Mars' Meridiani Plains taken by the Opportunity Rover.
Credit: NASA/JPL-Caltech/Cornell University

Ocean on Enceladus

Discovered by William Herschel in 1789, Enceladus is Saturn’s sixth largest moon. At only 310 miles (500 km) in diameter, a world this small would typically be expected to be frozen solid. However, its proximity to Saturn results in the tidal heating of the moon’s interior. Subsurface activity was first discovered in 2005 when plumes of icy vapor erupting from fissures near the moon’s south pole were imaged by the Cassini spacecraft. Since that time, Cassini has made several close passes of the moon and through the plumes.

The close encounters have helped scientists model the interior of Enceladus. It is now believed that a layer of ice 30 miles in thickness covers a rocky north pole. At the south pole the ice is believed to be only 18 to 24 miles thick. This ice cap may cover a subsurface ocean 5 to 10 miles in depth. The ocean appears to be deepest at the south pole and sits on a rocky, silicate surface. If true, the rock would interact with the water, enriching the water with minerals needed to support life. While the thickness of the ice cap may preclude direct access by a lander, more advanced orbiting spacecraft could analyze the icy plumes for the ingredients of life.



Model of Enceladus' interior showing a possible water reservoir (yellow) within the icy shell Graphic credit: NASA/JPL/Space Science Institute

Fair Winds

Since its landing in January 2004, the power generating capacity of NASA's Mars Exploration Rover Opportunity has been gradually diminished by the accumulation of wind-blown Martian dust on its solar arrays. The photo on the right shows a relatively dust free deck taken during Opportunity's first year on the planet.

Ten years later, in a self-portrait taken in January 2014, the rover was covered with dust. However, what the winds have delivered, the winds have also removed. By March 2014, several wind gusts hit the rover perched on the western rim of Endeavour Crater, removing years of accumulation and restoring power to the rover to levels not seen since its first winter. (next page)



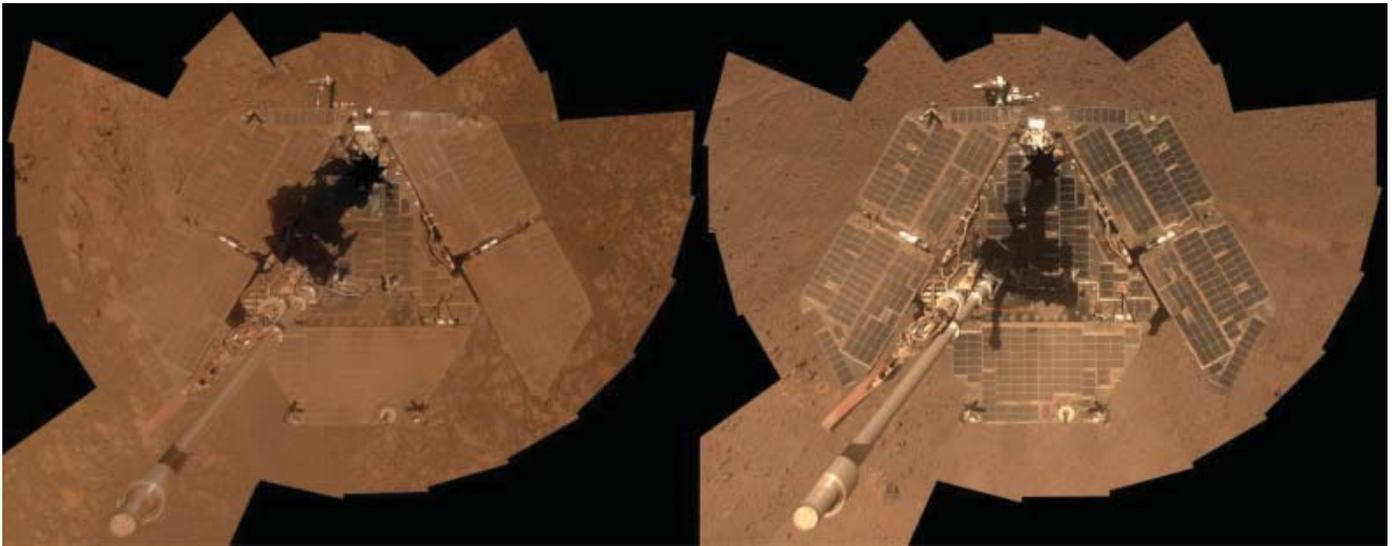


Image Credit: NASA/JPL-Caltech/Cornell University/Arizona State University

May Showers

The *Eta Aquarids* meteor shower peaks in the early mornings of the 5th and 6th. The dust producing the shooting stars is from *Comet Halley*. As with all meteor showers, the Aquarids are named for the constellation (Aquarius) from which they appear to radiate. You can expect to see up to 20 meteors per hour (more from the southern hemisphere where the radiant is higher) after the First Quarter Moon sets around midnight.

Forgotten Names for an Ancient World

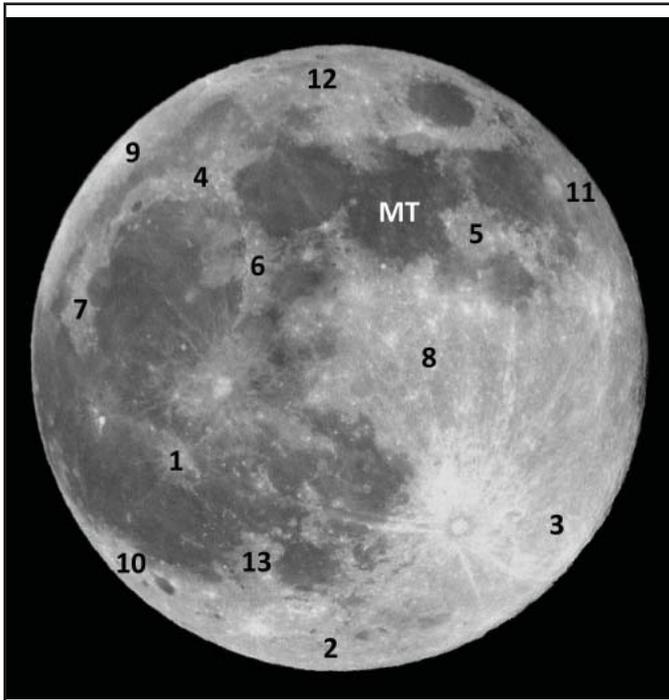
Lunar maps include the names of the prominent features: craters, mountain ranges and the large, expansive lunar seas. Few, if any, include the names of the brighter lunar highlands: the original crust before it was transformed by a cosmic bombardment lasting several hundred million years.

Lunar cartography or mapping was both limited and crude until Galileo first trained his telescope upon the Moon. With the ability provided by the telescope to resolve individual features came the need for a uniform or standard naming convention. The first such detailed map was created by Belgian astronomer Michel Langren in 1645. Features on Langren's map were named for prominent leaders of the Catholic Church, scholars, philosophers and saints. Two years later, Johannes Hevelius, a wealthy Polish brewer, published the first treatise devoted to the Moon. His publication "Selenographia" included maps of every lunar phase developed over several years of observing. Unlike Langren, Hevelius used the names of terrestrial features for his lunar maps, specifically from ancient Greece and Rome. His naming convention was widely used by European astronomers

for over a century. However, Hevelius' lunar nomenclature was gradually replaced by a naming convention developed by Jesuit astronomer Giovanni Riccioli.

Riccioli included lunar maps in a dissertation defending the Catholic Church's view of the universe (Earth-centered) against the views being expressed by Galileo, Kepler and Copernicus (Sun-centered). Riccioli's lunar drawings were created by fellow Jesuit Francesco Grimaldi. Riccioli assigned names to the lunar seas associated with weather or other conditions (Sea of Rain, Clouds, Cold, Serenity, and Crises). Other features were given names of scientists and philosophers from ancient Greece, Rome or from medieval Europe. The craters around the Sea of Nectar did include names of Catholic saints, although most were associated with astronomy.





Key to Major Land Features

1. Insula Ventorum (Island of Winds)
2. Terra Colaris (Land of Heat)
3. Terra Fertilitatis (Land of Fertility)
4. Terra Grandinis (Land of Hail)
5. Terra Manna (Land of Manna)
6. Terra Niuiu (Land of Snows)
7. Terra Pruinae (Land of Frost)
8. Terra Sanitatis (Land of Healthiness)
9. Terra Siccitatis (Land of Dryness)
10. Terra Sterilitatis (Land of Sterility)
11. Terra Vigoris (Land of Cheerfulness)
12. Terra Vitae (Land of Liveliness)
13. Peninsula Fulminu (Peninsula of Thunder)

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

Many of Riccioli's original names remain in use today after being officially recognized by the International Astronomical Union in 1935. What have been lost are the names of the areas between the seas or the Moon's bright crust. Riccioli originally assigned names to these areas in a manner similar (although sometimes opposite) to what he used for the lunar seas (Land of Heat, Hail, Frost, Dryness and Sterility).

Today, references to the lunar crust or "land" are generally non-descript and sterile in comparison (south polar region, eastern limb, Descartes highlands) to Riccioli's imaginative and sometimes poetic labels. Several of the areas described by Riccioli on Grimaldi's maps (shown above) are indicated on the next page.

So, the next time you see the Moon in the sky, take a few minutes and reacquaint yourself with a part of history. Once you have located Mare Tranquillitatis (MT) or the Sea of Tranquility* on the moon's eastern (right) limb, look for Terra Sanitatis or the Land of Healthiness, the adjoining brighter area to the southwest.

May History

On May 25, 1961, President Kennedy, in an address before a joint session of Congress, set forth a challenge to the American people: "I believe this nation should commit itself, before this decade is out, to landing a man on the Moon and returning him safely to the earth." With what started out as an attempt to reverse the political setbacks in Laos, the Congo, the Bay of Pigs in Cuba, and as a response to the first flight into space by cosmonaut Yuri Gagarin, Kennedy's speech set the gears of a

technological revolution into motion. The post-Sputnik world of the 1960's would see two great nations compete to control the "high ground," the new frontier in the Cold War.



Lost in the political posturing and often overlooked is that, in less than 10 years, on May 20th, 1969, the 456 foot tall doors on the Vehicle Assembly Building at the Kennedy Space Center opened to reveal AS506, the official designation of the Saturn V rocket that would carry Apollo 11 to the moon. More than 20,000 private firms and hundreds of thousands of workers participated in this program, for a fraction of the cost of the Vietnam War. Not only did the United States reach the Moon, it built a national infrastructure of technology, manufacturing and education that has not been rivaled. In 1969, the United States was truly on top of the world.

Sunrise and Sunset

	<u>Sunrise</u>	<u>Sunset</u>
May 1 st (EDT)	05:51	19:52
May 15 th	05:34	20:06
May 31 st	05:22	20:21

May Nights

For those of you who like to do your stargazing early in the evening, a myriad of spectacular objects appear out of the twilight, winking into view as the Earth turns away from the Sun. Leo dominates the southwestern sky with its backward shaped question mark arrangement of stars, punctuated by the star Regulus, forming the front of the lion, and a triangular arrangement of stars forming the back or tail of the creature. To the west of Leo is an open star cluster called the Beehive (M44) in the constellation Cancer. On a dark night it can be seen with the naked eye. East of Leo, towards the constellation Boötes is the globular cluster M3. Boötes is easily identified by its bright star Arcturus. Follow the arc in the handle of the Big Dipper to find Arcturus, at the base of the kite-shaped constellation. M3 is located further away than the center of our galaxy, the Milky Way, and is one of the many outstanding globular clusters that will grace the late spring and summer skies.

Astronomical and Historical Events

- 1st History: discovery of the Mars meteorite *Dar al Gani 476* (1998)
- 1st History: discovery of Neptune's moon *Nereid* by Gerard Kuiper (1949)
- 4th Kuiper Belt Object 90568 (2004 GV9) at Opposition (38.362 AU)
- 4th History: launch of the AQUA satellite to study precipitation, evaporation, and the cycling of Earth's water (2002)
- 4th History: launch of the Magellan/Venus radar mapping spacecraft and attached Inertial Upper Stage from the space shuttle Atlantis (STS-30) (1989)
- 5th *Eta Aquarids* meteor shower peak (best viewing: early morning on the 5th and 6th)
- 5th History: launch of Freedom 7 and astronaut Alan Shepard aboard a Mercury-Redstone rocket, first American in space (1961)
- 6th First Quarter Moon
- 6th Moon at apogee (furthest distance from Earth)
- 6th History: groundbreaking for the John J. McCarthy Observatory, a world-class observatory in New Milford, CT., with a mission to promote science literacy (2000)
- 9th History: launch of MUSES-C (Hayabusa), Japanese sample return mission to asteroid *Itokawa* (2003)
- 9th History: first Earth-based laser aimed at the Moon: crater Albatagnius (1962)
- 9th History: launch of first production model of the Project Mercury capsule from Wallops Island, Virginia to test the escape system (1960)
- 10th **Second Saturday Stars - Open House at McCarthy Observatory**
- 10th Saturn at Opposition, rising with the setting Sun and visible all night
- 10th History: President Truman signs Public Law 507, creating the National Science Foundation (1950)
- 10th History: Estherville Meteorite Shower: a 455 pound meteorite fell to earth in Emmet County, just north of Estherville, Iowa, where it buried itself 15 feet in the ground - largest meteorite known to have fallen in North America (1879)
- 11th History: launch of the space shuttle Atlantis (STS-125), final Hubble Space Telescope servicing mission (2009)
- 13th History: launch of first Project Bumper rocket from White Sands, NM; the two stage rocket was a combination of a German V-2 and American WAC Corporal rocket (1948)
- 14th Full Moon (Full Flower Moon)
- 14th History: launch of the Herschel infrared telescope and the Planck microwave observatory (2009)
- 14th History: launch of Skylab, the United States' first space station (1973)
- 14th History: the American Interplanetary Society (later renamed the American Rocket Society) launches its first liquid fueled (liquid oxygen and gasoline) rocket from Staten Island, N.Y. (1933)

Astronomical and Historical Events (continued)

- 14th History: the German Society for Space Travel (Verein für Raumschiffahrt or VfR) launches the Repulsor-1, a liquid fueled (liquid oxygen and gasoline) rocket (1931)
- 14th History: Orgueil Meteorite Shower: large carbonaceous chondrite that disintegrated and fell in fragments near the French town of Orgueil; presence of organics renewed the debate on spontaneous generation as the origin of life; fragments analyzed by the French chemist Louise Pasteur for indigenous microorganisms (1864)
- 15th Asteroid *9 Metis* at Opposition (9.6 Magnitude)
- 15th History: sixth docking of a space shuttle (Atlantis) with Russian space station Mir (1997)
- 15th History: launch of Faith 7 and astronaut Gordon Cooper aboard a Mercury-Atlas rocket, final Mercury mission (1963)
- 15th History: Soviet Union launches Sputnik IV containing a self-sustaining biological cabin and dummy astronaut (1960)
- 16th History: launch of the space shuttle Endeavor on its final mission (2011)
- 16th History: Soviet spacecraft Venera 5 returns 53 minutes of data while descending by parachute through the atmosphere of Venus and before impacting the surface (1969)
- 17th Flyby of Saturn's largest moon *Titan* by the Cassini spacecraft
- 17th History: Soviet spacecraft Venera 6 returns 51 minutes of data while descending by parachute through the atmosphere of Venus and before impacting the surface (1969)
- 18th Moon at perigee (closest distance from Earth)
- 18th History: launch of Apollo 10 with astronauts John Young, Tom Stafford and Gene Cernan; the lunar module Snoopy was flown within 50,000 feet of the lunar surface while the command module Charlie Brown orbited the Moon (1969)
- 19th History: launch of the first Army Hermes A-1 rocket from White Sands, NM (1950)
- 20th History: launch of the Pioneer Venus 1 spacecraft (1978)
- 21st Last Quarter Moon
- 21st History: launch of the Japanese Venus Climate Orbiter Akatsuki or Planet-C spacecraft and the Ikaros solar sail (2010)
- 24th History: launch of Aurora 7 and astronaut Scott Carpenter aboard a Mercury-Atlas rocket; second American to orbit Earth (1962)
- 24th History: launch of Midas 2; first Experimental Infrared Surveillance Satellite (1960)
- 25th Mercury at its Greatest Eastern Elongation (apparent separation from the Sun) in the evening sky (23°)
- 25th History: the Phoenix spacecraft lands in the Martian arctic (2008)
- 25th History: launch of Skylab I crew; astronauts Pete Conrad, Paul Weitz and Joseph Kerwin (1973)
- 25th History: President John F. Kennedy's Moon goal speech to Congress (1961)
- 26th History: launch of the first "Navaho Missile," a pilotless aircraft consisting of a missile and a booster; program goal was to determine the feasibility of an intercontinental missile (1948)
- 28th New Moon
- 28th Scheduled launch of the next expedition crew to the International Space Station aboard a Russian Soyuz spacecraft from the Baikonur Cosmodrome in Kazakhstan
- 28th Kuiper Belt Object 278361 (2007 JJ43) at Opposition (40.290 AU)
- 28th History: launch of Mars 3 (USSR) lander and rover; lander became the first spacecraft to attain soft landing on Mars, although transmissions ceased after 15 seconds (1971)
- 28th History: launch of an Army Jupiter missile carrying two primates (Able and Baker) to an altitude of 300 miles; monkeys survived the flight (1959)

Astronomical and Historical Events (continued)

- 28th History: Frank Drake born, radio astronomer devised the “Drake Equation” as an attempt to estimate the number of worlds in our galaxy that might harbor intelligent life (1930)
- 29th History: launch of Luna 22 (USSR), lunar orbiter mission that included imaging as well as studying the Moon’s magnetic field, the composition of lunar surface rocks, and the gravitational field (1974)
- 29th History: measurements during solar eclipse agree with predictions based on Einstein’s General Relativity theory (1919)
- 30th History: launch of Mariner 9, Mars orbiter and first artificial satellite of Mars; mapped Martian surface and imaged moons *Phobos* and *Deimos* (1971)
- 30th History: launch of Surveyor 1, Moon lander; transmitted over 11,000 images from Oceanus Procellarum (1966)
- 31st History: European Space Agency’s birthday (1975)

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°); 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
For more information on V838 Monocerotis, go to http://www.nasa.gov/multimedia/imagegallery/image_feature_784.html

Page 3: P In May 2000, site work was underway on what would become a world-class astronomical observatory. Construction was completed, and the John J. McCarthy Observatory dedicated, just seven months later.

All other photos taken by Bill Cloutier

Second Saturday Stars poster: Sean Ross, Ross Designs

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

Second Starburst Saturday

FREE EVENT

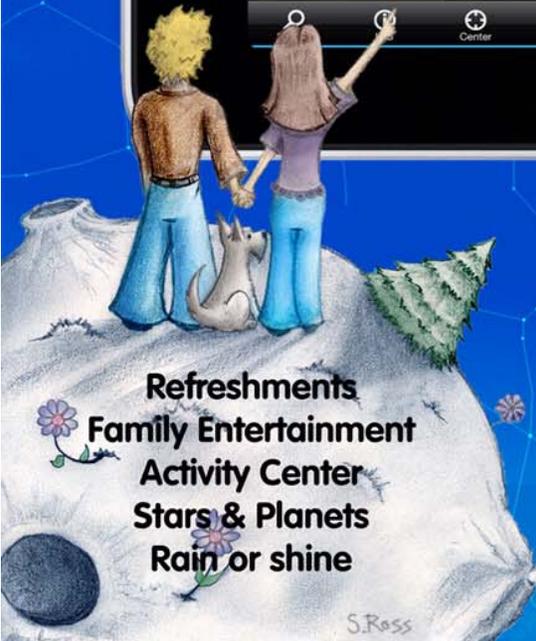
Every Month at the
John J. McCarthy Observatory
Behind the New Milford High School
860.946.0312

www.mccarthyobservatory.org

May 10th

8:00 - 10:00 pm

**Astronomy on
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Refreshments
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Rain or shine



May 2014

Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
<div style="text-align: center;"> <h3>Phases of the Moon</h3> <p>May 6 May 14 May 21 May 28</p> </div>				<p style="text-align: center;">1</p> <p>Gerard Kuiper discovers Neptune's Moon Nereid 1949</p> <p>Discovery of Mars meteorite <i>Dar al Gani</i> 1998</p>	<p style="text-align: center;">2</p> <p>Cassini, Enceladus Flyby Cassini: Distant Flyby of Polydeuces, Atlas & Dione</p> <p>Asteroid 1992 JD Near-Earth Flyby (0.024 AU)</p>	<p style="text-align: center;">3</p> <p>Edmund Halley observes total eclipse phenomenon "Baily's Beads" (1715)</p>
<p style="text-align: center;">4</p> <p>Launch of Magellan spacecraft to Venus by space shuttle Atlantis (1989)</p> <p>Launch of the AQUA satellite to study precipitation, evaporation, and the cycling of Earth's water (2002)</p>	<p style="text-align: center;">5</p> <p>Eta Aquarids meteor shower peak</p> <p>Alan Shepard first American in space 1961</p> <p>Space Day</p>	<p style="text-align: center;">6</p> <p>Moon at apogee (farthest from Earth)</p> <p>Groundbreaking for the John J. McCarthy Observatory (2000)</p>	<p style="text-align: center;">7</p> <p>Distant flyby of Saturn's largest moon Titan by the Cassini spacecraft</p> <p>16th Anniversary (1997), Galileo, Ganymede 8 Flyby</p>	<p style="text-align: center;">8</p> <p>First snapshot of Earth and its moon, captured by NASA's Mars Global Surveyor (MGS) spacecraft while orbiting Mars (2003)</p>	<p style="text-align: center;">9</p> <p>Launch of MUSES-C (Hayabusa), Japanese sample mission to asteroid Itokawa (2003)</p> <p>First Earth-based laser aimed at Moon crater Albatengius (1962)</p>	<p style="text-align: center;">10</p> <p>Konstantin Eduardovich Tsiolkovsky, Russian Rocketry Pioneer created his calculations about space flight theory - 1897</p> <p>2nd Saturday Stars Open House McCarthy Observatory</p>
<p style="text-align: center;">11</p> <p>Space Shuttle Atlantis, last Hubble Space Telescope Servicing Mission (2009)</p>	<p style="text-align: center;">12</p> <p>NASA astronaut, Gregory Harold "Box" Johnson born, veteran of two space flights, STS-123 and STS-134 (1962)</p>	<p style="text-align: center;">13</p> <p>Launch of first Bumper rocket, from White Sands New Mexico (1948)</p>	<p style="text-align: center;">14</p> <p>Herschel/Planck Ariane 5 Launch 2009</p> <p>Launch of Skylab 1973</p> <p>Early liquid fueled rockets: German Society for Space Travel (1931); American Interplanetary Society (1933)</p>	<p style="text-align: center;">15</p> <p>6th docking of a space shuttle (Atlantis) with Russian space station Mir (1997)</p> <p>Launch of Faith 7 - Final Mercury mission 1963</p>	<p style="text-align: center;">16</p> <p>Soviet spacecraft Venera 5, 6 send data on Venus, then impact planet May 16-17, (1969)</p> <p>Space Shuttle Endeavour final launch (2011)</p>	<p style="text-align: center;">17</p> <p>Norman Lockyer born, co-discoverer of helium (1836)</p>
<p style="text-align: center;">18</p> <p>Moon at perigee (closest to earth)</p> <p>Apollo 10 to Moon Young/Stafford/Cernan (1969)</p>	<p style="text-align: center;">19</p> <p>Launch of first Army Hermes A-1 rocket from White Sands, NM (1950)</p>	<p style="text-align: center;">20</p> <p>Launch of Pioneer Venus 1 spacecraft (1978)</p> <p>Annular Solar Eclipse</p>	<p style="text-align: center;">21</p> <p>Launch of Japanese Venus Climate Orbiter Akatsuki or Planet-C spacecraft and the Ikaros solar sail (2010)</p>	<p style="text-align: center;">22</p> <p>Space X first successful commercial launch of spacecraft to the ISS, Cape Canaveral (2012)</p> <p>First Hubble images of Saturn ring plane as the rings are edge-on to the Sun, viewed from Earth (1995)</p>	<p style="text-align: center;">23</p> <p>Cassini spacecraft 91st flyby of Saturn's moon Titan (602 miles, or 970 kilometers).</p> <p>Dr. H. Paul Shuch born, American scientist and engineer, has coordinated radio amateurs in the search for extraterrestrial intelligence (1946)</p>	<p style="text-align: center;">24</p> <p>Launch of Midas 2, 1st experimental infrared surveillance satellite 1960</p> <p>Scott Carpenter, second American in space (1962)</p>
<p style="text-align: center;">25</p> <p>Launch of Skylab 1 crew 1973</p> <p>Phoenix spacecraft lands on Martian soil 2008</p> <p>JFK Moon goal speech (1961)</p>	<p style="text-align: center;">26</p> <p>Launch of first "Navaho Missile", ICBM precursor (1948)</p>	<p style="text-align: center;">27</p> <p>Lawrence Maxwell Krauss born, Canadian-American theoretical physicist and author <i>The Physics of Star Trek</i> and <i>A Universe from Nothing</i> (1954)</p>	<p style="text-align: center;">28</p> <p>Abel and Baker 1st primates in orbit (1959)</p> <p>Frank Drake born, author of "the Drake Equation" on intelligent life (1930)</p> <p>Launch of Mars 3 (USSR) lander and rover - 1st spacecraft to attain soft landing on Mars (1971)</p>	<p style="text-align: center;">29</p> <p>Launch of Luna 22 (USSR), orbiter mission to study the Moon's magnetic field, the geology, and gravitational field (1974)</p> <p>Measurements during solar eclipse confirm Einstein's relativity theory - 1919</p>	<p style="text-align: center;">30</p> <p>Mariner 9, 1st artificial satellite of Mars (1971)</p> <p>Launch of Surveyor 1 Moon lander; transmitted over 11,000 images from Oceanus Procellarum (1966)</p>	<p style="text-align: center;">31</p> <p>European Space Agency Born 1975</p>