Galactic Observer

John J. McCarthy Observatory

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Undying Wrath

Sometimes, the end of a star's life is only the beginning. Find out more inside, page 18.

Image source: NASA/JPL-Caltech/McGill

The John J. McCarthy Observatory

New Milford High School
388 Danbury Road
New Milford, CT 06776

Phone/Voice: (860) 210-4117
Phone/Fax: (860) 354-1595
www.mccarthyobservatory.org

JJMO Staff

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

Steve Allison
Steve Barone
Colin Campbell
Dennis Cartolano
Mike Chiarella
Jeff Chodak
Bill Cloutier
Cecilia Detrich
Dirk Feather
Randy Fender
Randy Finden
John Gebauer
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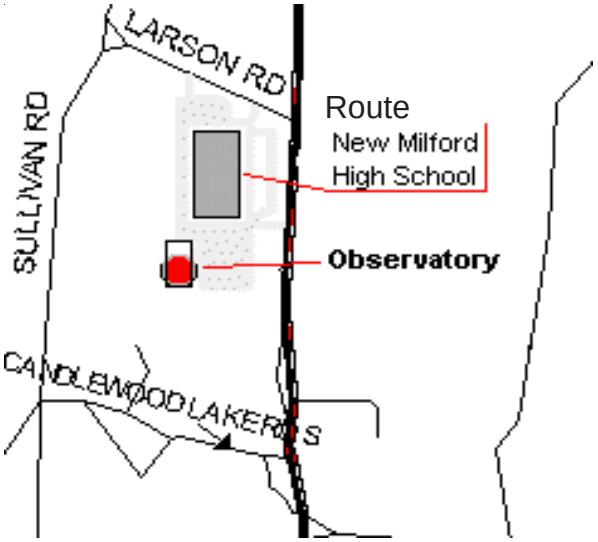
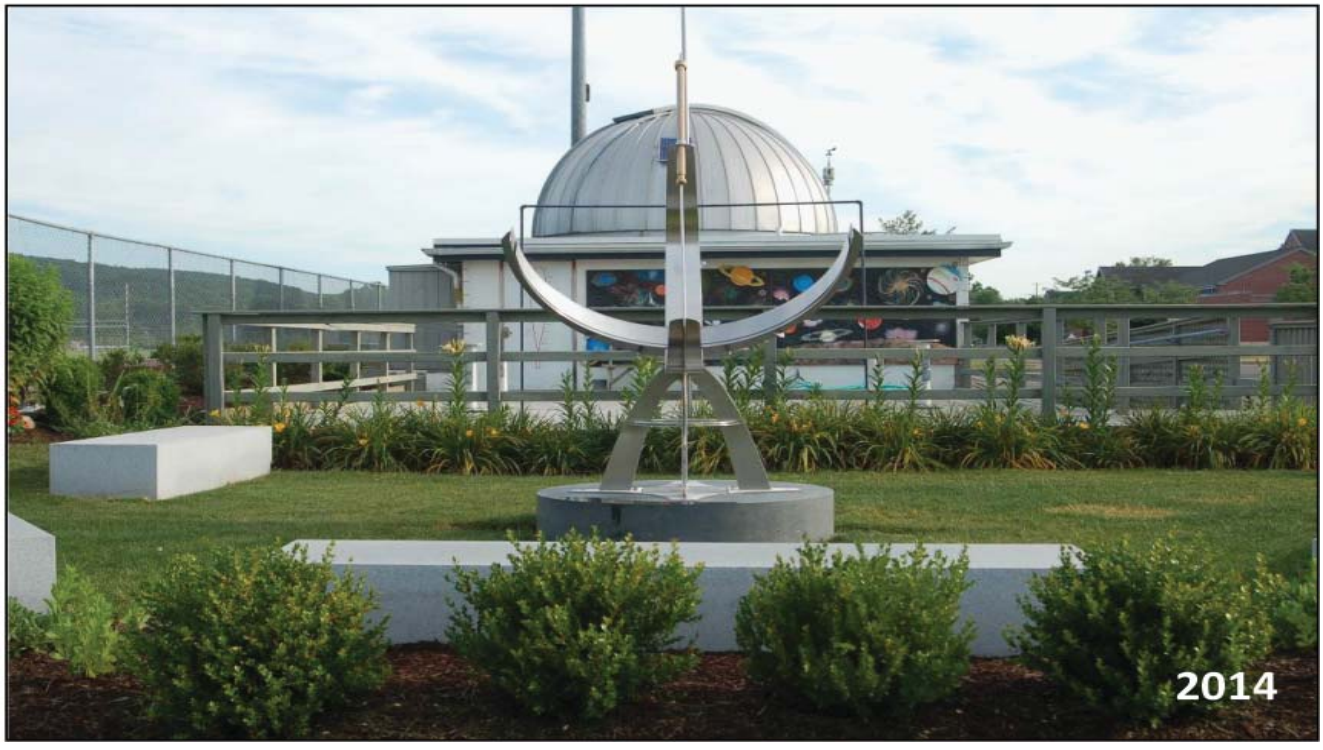


In This Issue

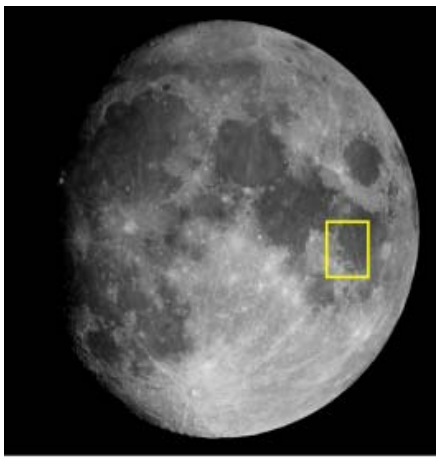
May Astronomy Calendar and Space Exploration Almanac



"Out the Window on Your Left"

It's been more than 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 craters named for Charles Messier, a French astronomer and comet hunter, are visible in this month's moonscape; Messier and Messier A. The shape of a crater and ejecta blanket depends upon the angle of the impact. Messier's

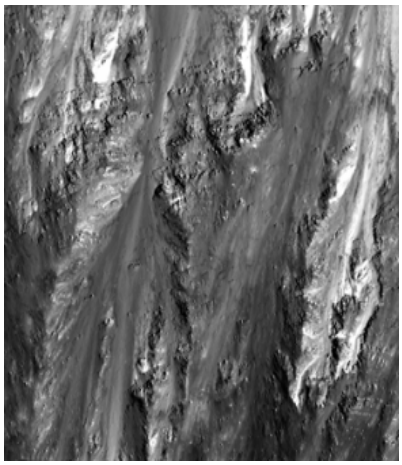


Charles Messier

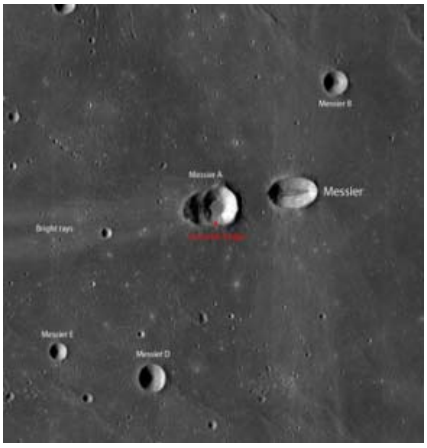
shape (9 by 5 miles or 15 by 8 km) indicates a shallow impact angle. The ejecta's butterfly wing pattern (to each side) is also characteristic of a grazing impact (1° to 5°).

Messier A is elongated (10 by 7 miles or 16 by 11 km) with two long rays pointing away from Messier. Impact modeling suggests that it was created by a fragment of the original impactor that ricocheted downrange.

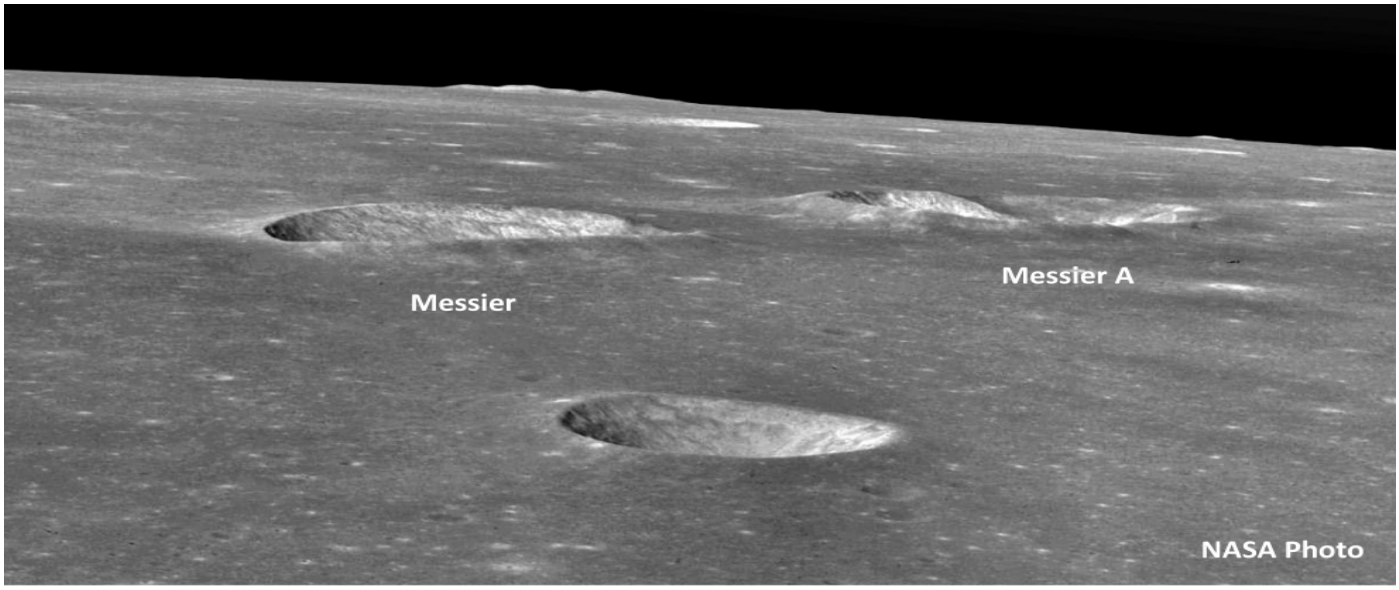
The unusual crater topographies are even more pronounced in the images taken by Apollo 10 (below) from lunar orbit in May 1969.



Avalanches etched into the walls of Messier A. Source: NASA/GSFC/Arizona State University



Messier crater region image from the Lunar Reconnaissance Orbiter. Source: NASA/GSFC/Arizona State University.



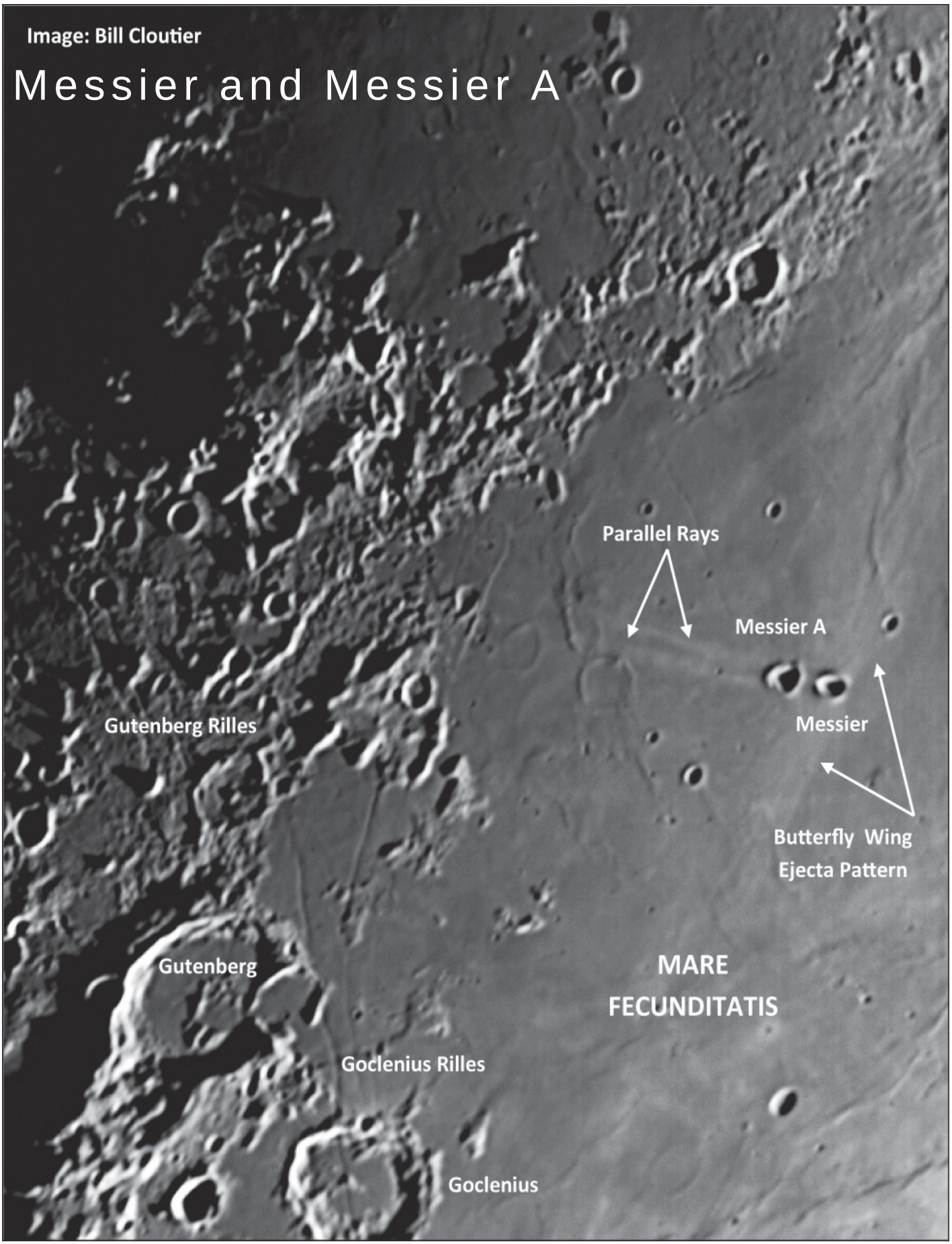
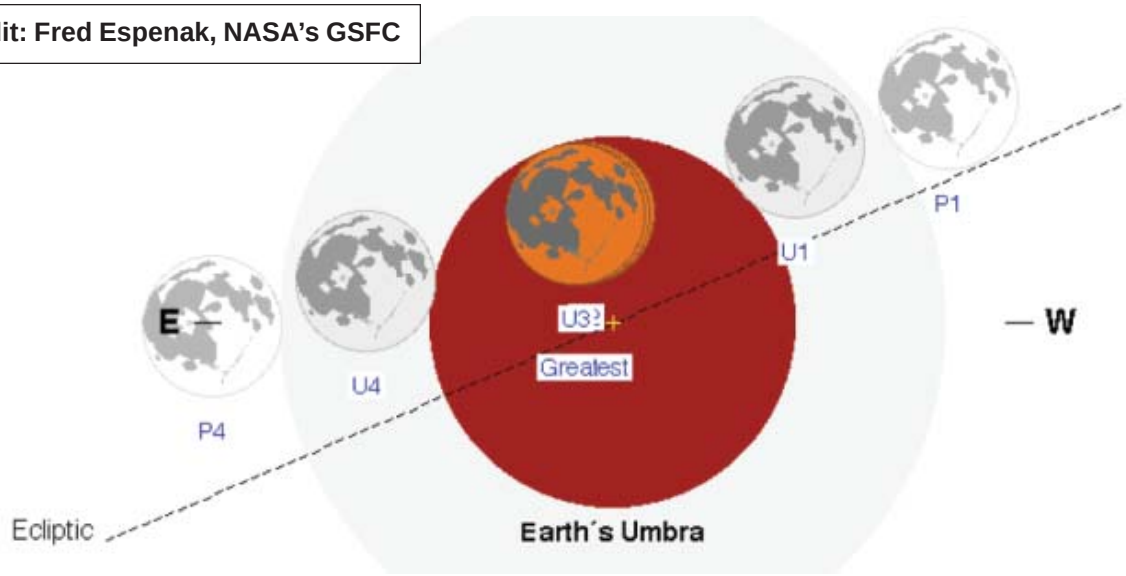


Image: Bill Cloutier
Messier and Messier A
Parallel Rays
Messier A
Messier
Gutenberg Rilles
Butterfly Wing
Ejecta Pattern
Gutenberg
MARE
FECUNDITATIS
Goclenius Rilles
Goclenius

April Lunar Eclipse

Credit: Fred Espenak, NASA's GSFC



Eighty years ago, on May 14, 1935, the Griffith Observatory opened to the public and its ownership transferred to the City of Los Angeles. Located on the southern slope of Mount Hollywood in Griffith Park, the public facility is operated by the city's Department of Recreation and Parks, and has welcomed over 76 million visitors since opening.

A public observatory was the brainchild of Griffith J. Griffith, a Welsh immigrant who made his fortune in Mexican silver mines and California real estate. In 1896, he purchased and donated 3,015 acres to city for a public park after visiting grand open spaces in Europe. In 1912, after a visit to the Mount Wilson observatory, Griffith offered the city

Griffith Observatory

Griffith Jenkins Griffith

$100,000 for a public observatory to be built on Mount Hollywood in Griffin Park. Griffith was quoted as saying "Man's sense of values ought to be revised. If all mankind could look through that telescope, it would change the world!"

Unfortunately, Griffith would not live to see his vision realized. Mired in political debate, work on the observatory didn't begin until 1933. However, guided by leading astronomers and scientists of the day, including astronomer George Ellery Hale, physicists Edward Kurth and Rudolph Langer, Adler Planetarium Director Philip Fox and Russell Porter, leader of the amateur telescope making movement, the observatory was constructed and dedicated two years later. The planetarium was only the third of its kind in the United States; the technology was not even invented until four years after Griffith's death.

The Griffith Observatory is visible from many parts of Los Angeles being located at an elevation of 1,134 feet above sea level. It is one of the most popular attractions in Southern California.

Saturn at Opposition

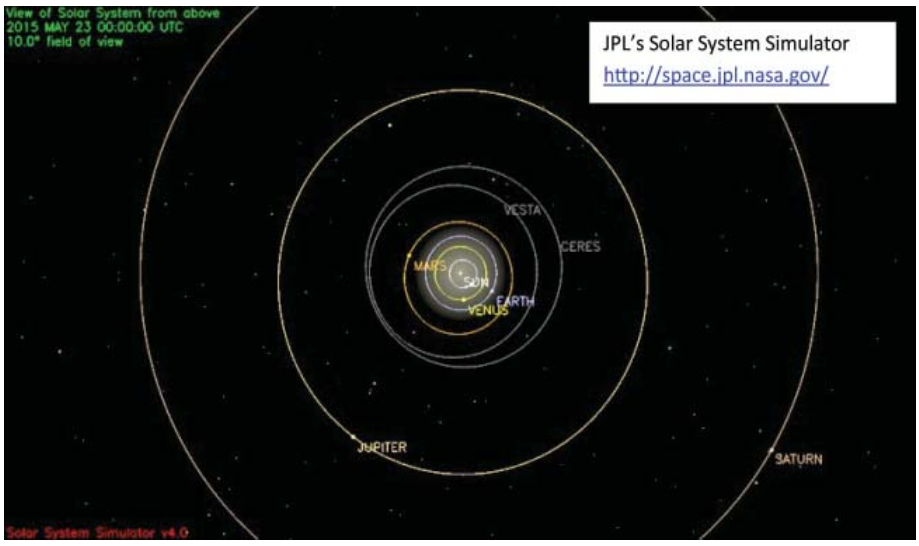
Saturn reaches opposition on May 23rd. On that date, the magnificent ringed world will rise in the eastern sky as the Sun sets in the west. Saturn will reach its maximum altitude, with the best viewing around midnight. Each succeeding night, the

planet will rise a few minutes earlier as the Earth begins to move away from Saturn. You can find Saturn (and its largest moon Titan) in the constellation Libra. Titan (larger than the planet Mercury) can be identified by its orange hue.

It takes approximately 29½ years for Saturn to complete an orbit around the Sun. During this time, our view of the rings changes from wide open to edge-on. The rings were last wide open in 2002-03, when the planet's southern pole was tipped towards Earth. The rings began to close up in subsequent years, appearing nearly edge-on in September 2009. Since then, the northern hemisphere has come into view with the rings opening up once more. The rings will be wide open in 2017 when the planet's north pole is tipped towards Earth, with a ring tilt of 26.6°. This year the ring tilt will be 24.4°, providing an exceptional view.

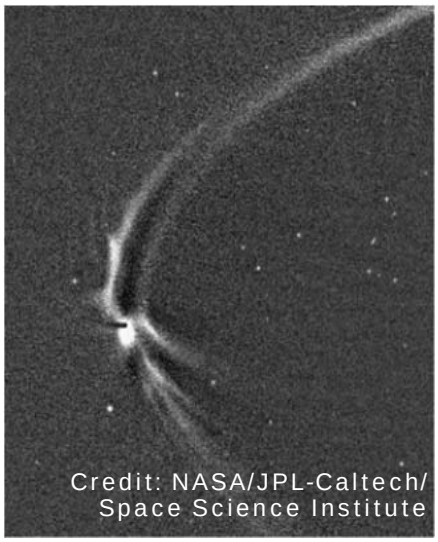
Saturn will be 8.9667 AU from Earth and 9.9784 AU from the Sun on May 23rd (1 AU being the average distance of the Sun from the Earth). At an apparent magnitude of +0.1, it will be bright enough to find in the evening sky despite being relatively low. The simulation (below) shows the planetary arrangement on May 23rd. Looking down on the solar system on this day, the Earth comes directly between the Sun and Saturn.

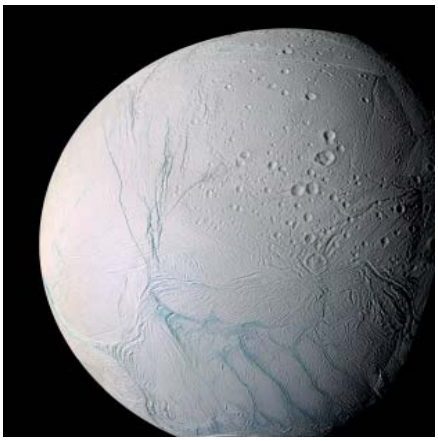
The simulated view also shows Mars nearing solar conjunction (passing very near or behind the Sun in Earth's sky). During this time period (approximately two weeks), the Sun disrupts radio transmissions between Earth and Mars. Spacecraft and rovers continue to collect and store data working on previously provided instructions. However, no new instructions are sent during solar conjunction since any corruption and/or loss of data could endanger the missions.



Enceladus' Icy Reach

Tendrils of icy particles in the Saturnian system have been traced back to the geysers on the south pole of the moon Enceladus. Scientists have been able to match specific tendrils with a particular set of the 36 most active geysers. Based upon observations by the Cassini spacecraft, it is believed that Enceladus is the primary source of Saturn's E-ring particles. The rate of loss of material from Enceladus may provide insight into the size of the moon's subsurface ocean. The size and chemical composition of the particles may also provide clues as to their source, for example, thermal vents on the sea floor.





Enhanced color view of southern helisphere of Enceladus, with south polar terrain at bottom, Source: NASA/JPL/ Space Science Institute

Martian Water

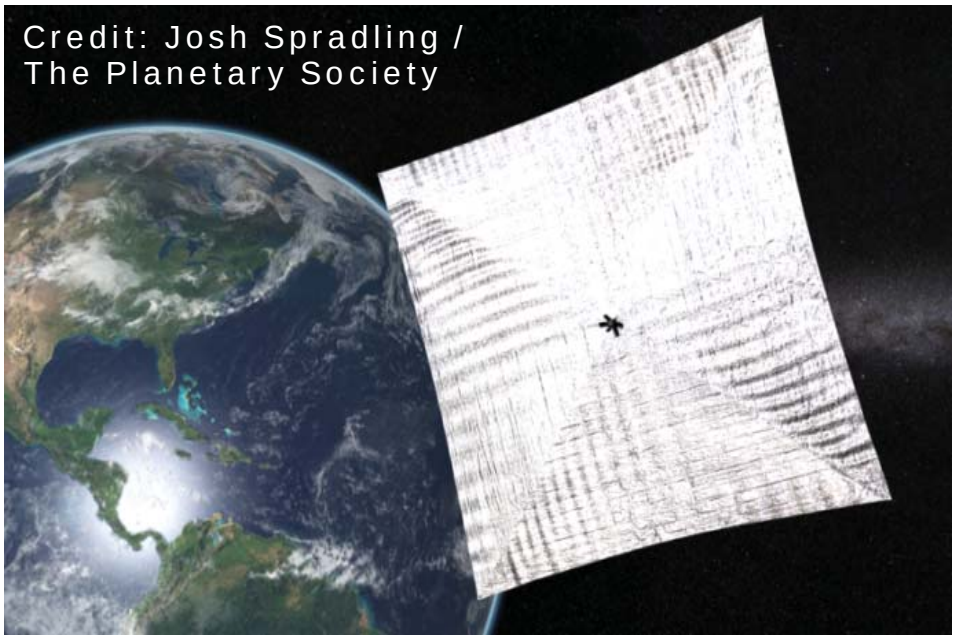
NASA'S MARS Science Laboratory Curiosity has been collecting temperature and humidity measurements at Gale crater from more than a full Martian year (approximately 26 Earth months). The measurements suggest that, as night falls, a small amount of water vapor in the Martian atmosphere condenses and remains in liquid form in the top layer of the soil despite subzero temperatures. Perchlorate salts, which have been found in the soil at several locations on Mars, are likely involved in the absorption of the water vapor and the suppression of the freezing point. As such, pockets of liquid water would be in the form of a salty brine. The water returns to vapor with the rising Sun.

Curiosity has already found evidence of ancient streams and a lakebed, signs of a favorable environment for primitive life more than 3 billion years ago. The presence of liquid water in the Martian soil, even in small quantities however, strengthens the argument that microbial life may be viable in the harsh conditions on Mars even today.

Mars Science Laboratory Curiosity (Credit: NASA/JPL-Caltech/Malin Space Science Systems)

Solar Sailing

In late May, a CubeSat carried aboard an Atlas V rocket will launch prototype solar sails into low Earth orbit. LightSail, a project of the Planetary Society, is designed to demonstrate the feasibility of using large reflective surfaces to move through space using only the Sun's energy for propulsion. The May flight is intended to test sail deployment (from the CubeSat the size of a loaf of bread). The 4.5 micron thick sails, measuring 344 square feet (32 square meters), won't be high enough for solar sailing. However, the lessons learned on this flight will pave the way for a full scale demonstration flight in 2016.



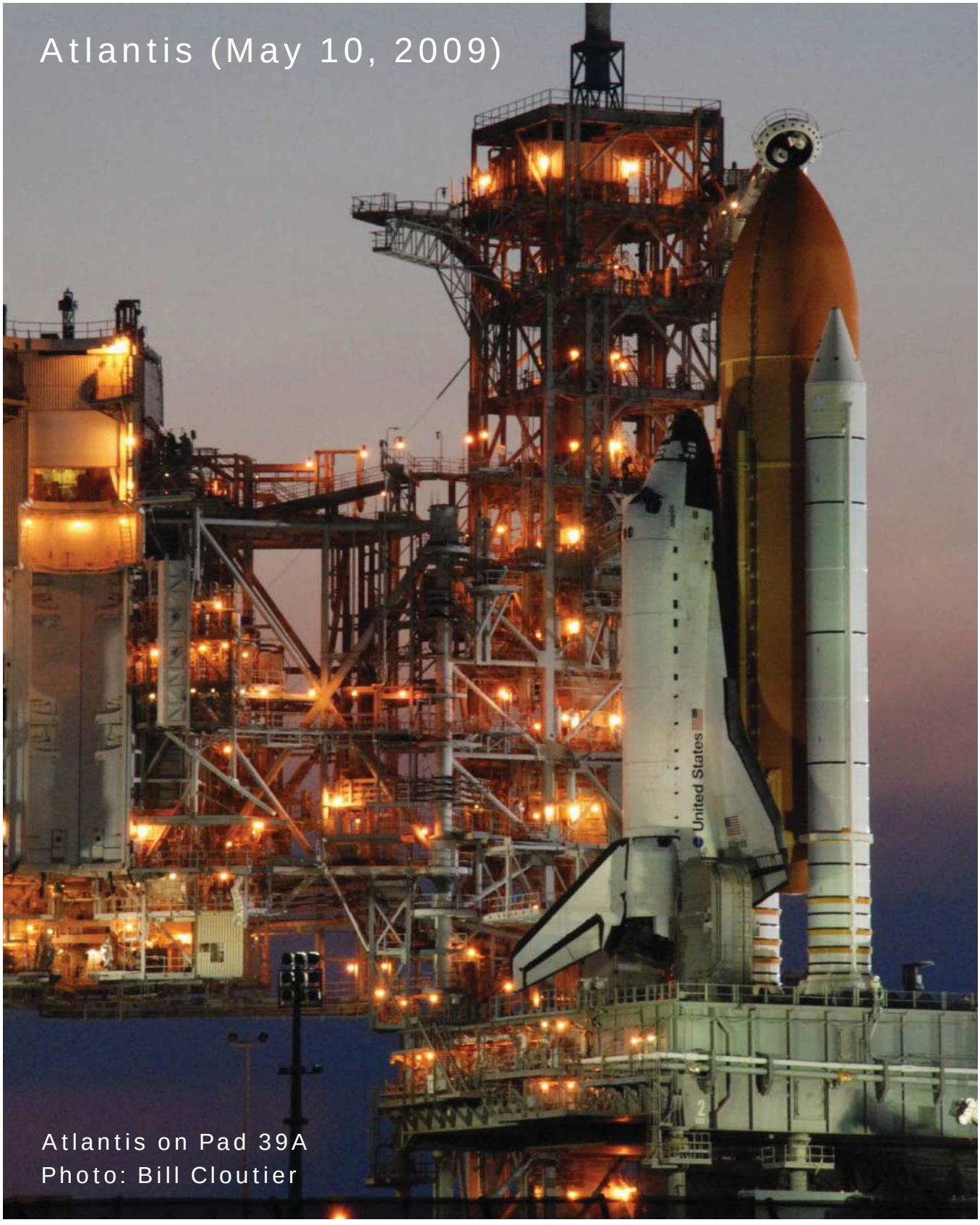

Engine Bell and Body Flap of Endeavour (Photo: Bill Cloutier)

Space Shuttle History

The space shuttle 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.

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 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.

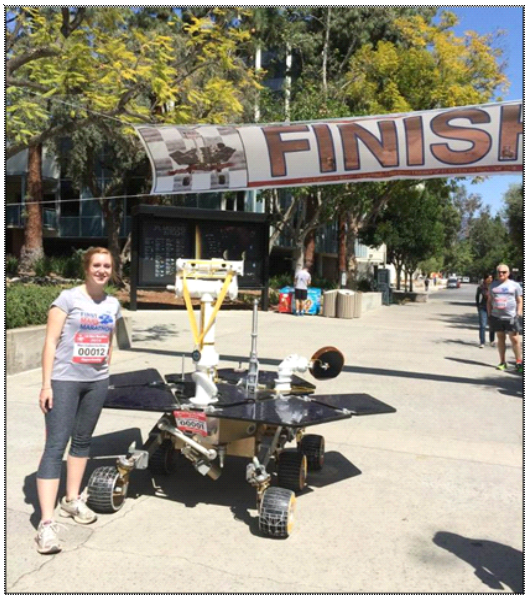


Martian Marathon

On April 9th, employees of NASA's Jet Propulsion Laboratory (JPL) ran 1.2 mile long laps through the laboratory's grounds to celebrate the driving achievement of the Mars Exploration Rover Opportunity. Runners completed the 22 laps, totaling 26.2 miles, in approximately 5 hours, slightly faster than the 11 years and 2 months it took the rover to cover the same distance while exploring the Red Planet.

A test rover broke through the finish-line tape after all the runners had completed the course. Opportunity passed the marathon distance on March 24th.

The test rover accepted the award for Opportunity from the deputy director of JPL (left), while runners (Kyle Cloutier, shown at right) posed with rover after the event.

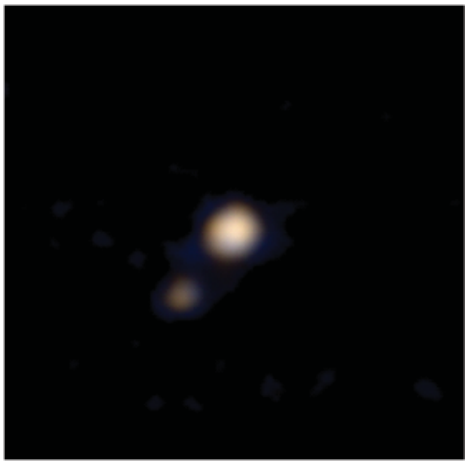


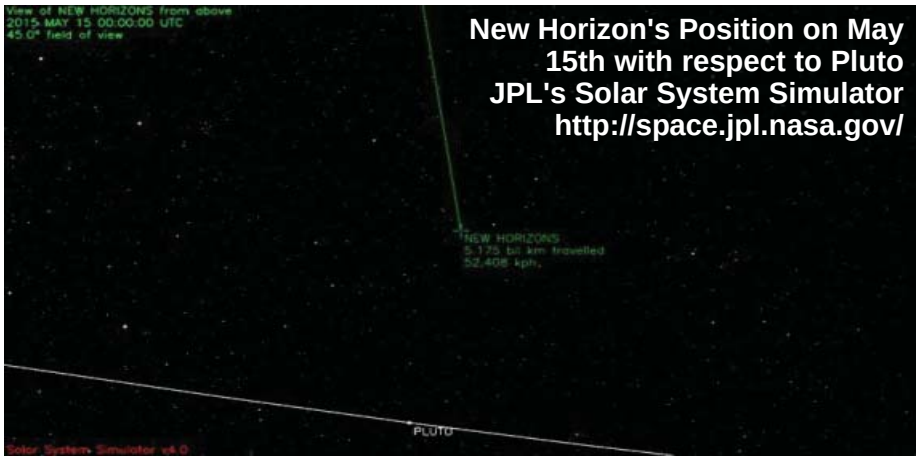
Photos: NASA/JPL-Caltech

New Horizons Status

New Horizons has entered its "Approach Phase 2" in preparation for its close encounter with Pluto and its moons on July 14th. The spacecraft is taking long distance photos both for navigation (a decision on whether a course correction is needed will be made on May 1st) and to look for additional moons or rings around Pluto, analyzing its deep-space environment, and putting its instruments through the paces in anticipation of the encounter far from Earth.

On April 9th, New Horizons' Ralph color imager took the first color image of Pluto (and its largest moon Charon) from a spacecraft. The image was taken from a distance of 71 million miles (115 million km). The color camera will be able to resolve surface features only a few miles across at closest approach (7,750 miles or 12,500 km) to Pluto.





New Horizon's Position on May 15th with respect to Pluto JPL's Solar System Simulator http://space.jpl.nasa.gov/

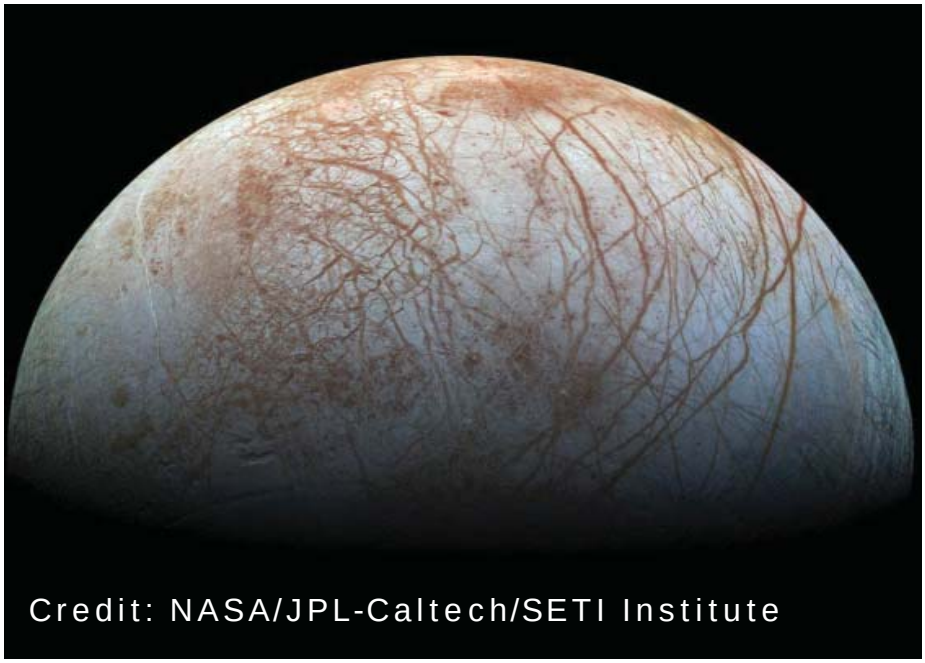
New Horizons' encounter with Pluto will be brief, passing through the system in less time than it takes to send the information back to Earth.

Due to its great distance from Earth and the amount of information anticipated to be gathered on Pluto and its moons, New Horizons will continue to send the data collected from its encounter for another sixteen months. High priority data will be sent first, so close-up images of Pluto and its moons should be made available to the public shortly after the encounter.

Europa or Bust

After years of wavering support and funding woes, it appears that a mission to Europa is finally beginning to materialize. The current administration has not only supported the concept of a Jupiter moon mission, but included funding in its latest budget request. NASA's Jet Propulsion Laboratory (JPL) expects that formal development of a spacecraft could begin later this year.

Engineers and scientists at JPL had been working on a conceptual design for a spacecraft that will likely form the basis for the mission. The Europa Clipper would, in concept, conduct up to 45 flybys of Europa in long, looping orbits around Jupiter that would minimize the time spent in Jupiter's magnetic field and harsh radiation environment. The spacecraft could be ready for launch by 2022.



Credit: NASA/JPL-Caltech/SETI Institute

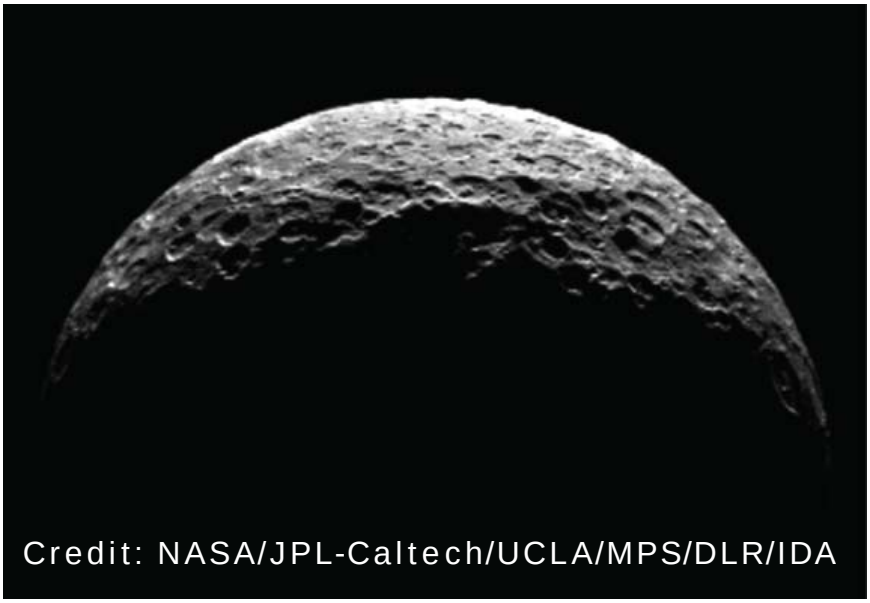
NASA has also inquired whether the European Space Agency (ESA) would be interested in joining the mission, contributing a lander or ice-penetrating probe (similar to the collaboration on Cassini where ESA provided the Huygens Titan probe).

ESA is already working on a mission to Jupiter's moons with a committed 2022 launch date. The Jupiter Icy Moons Explorer, or JUICE, spacecraft is scheduled to arrival at Jupiter in 2030. It will conduct detailed observations of Jupiter and three of its largest moons - Ganymede, Callisto and Europa - before dropping into orbit around Ganymede.

Postcards from Ceres

Since arriving on March 6th, the Dawn spacecraft has using its ion engine to slowly modify its orbit as it closes in on the dwarf planet. On April 10th, Dawn captured Ceres' sunlit north pole in a navigation image (below) taken from a distance of 21,000 miles (33,000 km).

Dawn will reach its first science orbit on April 23rd, at a distance of 8,400 miles (13,500 km) from the largest body in the asteroid belt. The spacecraft will survey Ceres for approximately two weeks before proceeding to progressively lower orbits.



Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

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.

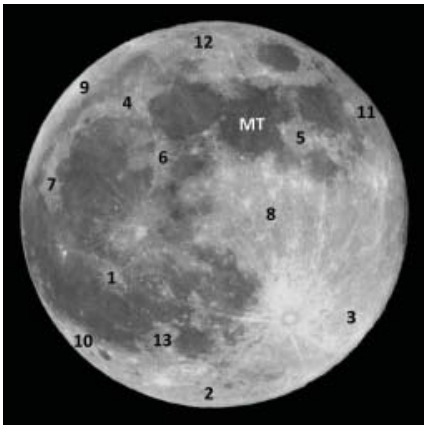
Many of Riccioli's original names remain in use today after being officially recognized by the International Astronomical Union in 1935. What have been lost are the names of the areas between the seas or the Moon's bright crust. Riccioli originally assigned names to these areas in a manner similar (although 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 nondescript 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.

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

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.

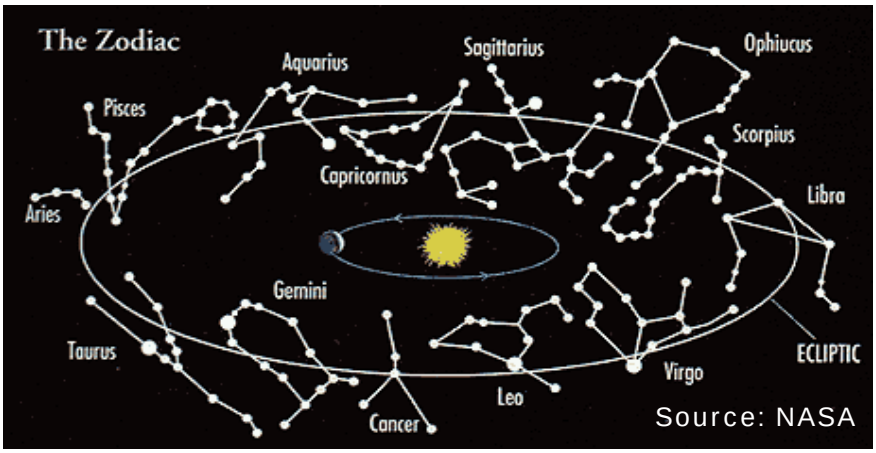
Lost in the political posturing and often overlooked is that, in less than 10 years, on May 20th, 1969, the 456 foot tall doors on the Vehicle Assembly Building at the Kennedy Space Center opened to reveal AS506, the official designation of the Saturn V rocket that would carry Apollo 11 to the moon. 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

	Sunrise	Sunset
May 1st (EDT)	05:51	19:51
May 15th	05:35	20:06
May 31st	05:23	20:20

May Nights

For those who like to do their 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.



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. Typically, you could expect to see up to 20 meteors per hour. Unfortunately, a bright waning gibbous Moon will wash out all but the brightest.

Comet Halley. Credit: ESA/Max-Planck-Institute

Astronomical and Historical Events

1st History: discovery of Saturn's moon Daphnis by the Cassini spacecraft (2005)
1st History: discovery of the Mars meteorite Dar al Gani 476 (1998)
1st History: discovery of Neptune's moon Nereid by Gerard Kuiper (1949)
2nd History: discovery of the first binary star (Xi Ursae Majoris) by William Herschel (1780)
3rd Full Moon (Full Flower Moon)
3rd Kuiper Belt Object 2010 FX86 at Opposition (45.321 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 Kuiper Belt Object 90568 (2004 GV9) at Opposition (38.410 AU)
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)
7th Flyby of Saturn's largest moon Titan by the Cassini spacecraft
7th Mercury at its Greatest Eastern Elongation (apparent separation from the setting Sun) in the west ern evening sky (21°)
9th Second Saturday Stars - Open House at McCarthy Observatory - Hubble 25th birthday party
9th Distant flyby of Saturn's moon Aegaeon, Daphnis and Telesto by the Cassini spacecraft
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 Albategnius (1962)
9th History: launch of first production model of the Project Mercury capsule from Wallops Island, Virginia to test the escape system (1960)
10th Distant flyby of Saturn's moon Polydeuces by the Cassini spacecraft
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 Last Quarter Moon
11th History: launch of the space shuttle Atlantis (STS-125), final Hubble Space Telescope servicing mission (2009)
12th History: first planetarium (Adler Planetarium in Chicago) opens in United States (1930)
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 History: Griffith Observatory, one of the first institutions in the U.S. dedicated to public science, opens in Los Angeles (1935)
14th Moon at perigee (closest distance from Earth)
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)
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)

Astronomical and Historical Events (continued)

15th Asteroid 3530 Hammel (named for Dr. Heidi B. Hammel) closest approach to Earth (1.492 AU)
15th History: discovery of Pluto's moons Nix and Hydra by Hal Weaver, et al's (2005)
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 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)
17th History: discovery of Jupiter's cloud belts by Italian Jesuit, astronomer, and physicist Niccolo Zucchi (1630)
18th New Moon
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 Plutino 38628 Huya at Opposition (27.556 AU)
19th History: launch of the first Army Hermes A-1 rocket from White Sands, NM (1950)
20th Plutino 2006 HJ123 at Opposition (34.042 AU)
20th History: launch of the Pioneer Venus 1 spacecraft (1978)
21st History: launch of the Japanese Venus Climate Orbiter Akatsuki or Planet-C spacecraft and the Ikaros solar sail (2010)
23rd Saturn at Opposition, rising with the setting Sun and visible all night
24th Asteroid 4179 Toutatis closest approach to Earth (2.939 AU)
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 First Quarter Moon
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)
25th History: science fiction writer and futurist Arthur C. Clark proposes communication satellites in geosynchronous orbit (1945)
25th History: first recorded perihelion passage of comet Halley by Chinese astronomers (240 BC)
26th Moon at apogee (furthest distance from Earth)
26th Scheduled launch of the next expedition crew to the International Space Station aboard a Russian Soyuz spacecraft from the Baikonur Cosmodrome in Kazakhstan
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)
27th Kuiper Belt Object 2007 JH43 at Opposition (39.547 AU)
28th Distant flyby of Saturn's moons Titan and Telesto by the Cassini spacecraft
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)
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)

Astronomical and Historical Events (continued)

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 Distant flyby of Saturn's moon Hyperion by the Cassini spacecraft
31st Kuiper Belt Object 278361 (2007 JJ43) at Opposition (40.210 AU)
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 (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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Front page design and graphic calendars: Allan Ostergren

Second Saturday Stars poster: Sean Ross, Ross Designs

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

Front Page

When some stars die, they don't go gently. At the center of this image, the remnants of a star, perhaps 2-3 times the mass of own sun, have collapsed into a neutron star. What remains is an ultradense cube about the size of Manhattan, where the mass contained in Mount Everest would be reduced to the size of a sugar cube.

The intense gravity, powerful magnetic forces and extreme velocities driving neutron stars typically evolve into pulsars - spinning at high speed and beaming radio waves out into neighboring space. This energetic wind is visible to astronomers in the glow of interstellar dust bathed in its radiance.

For more information, go to *http://www.nasa.gov/mission_pages/GLAST/science/neutron_stars.html* and *http://www.nasa.gov/mission_pages/chandra/multimedia/photo09-025.html*

Pulsar PSR B1509-58. Image Credit: NASA/CXC/SAO: X-ray; NASA/JPL-Caltech: Infrared

Observatory Construction Photos (including Page 3 Images)

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.

Photos taken by 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

May 9th

8:00 - 10:00 pm

HUBBLE TELESCOPE'S 25TH BIRTHDAY PARTY

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

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May 2015

Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Apr 2015 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	Jun 2015 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 Gerard Kuiper discovers Neptune's Moon Nereid 1949 Discovery of Mars meteorite *Dar al Gani* 1998 Space Day	Cassini, Enceladus Flyby Cassini: Distant Flyby of Polydeuces, Atlas & Dione Asteroid 1992 JD Near-Earth Flyby (0.024 AU)
3 Edmund Halley observes total eclipse phenomenon "Baily's Beads" (1715)	4 Launch of Magellan spacecraft to Venus by space shuttle Atlantis (1989) Launch of the AQUA satellite to study precipitation, evaporation, and the cycling of Earth's water (2002)	5 Eta Aquarids meteor shower peak Alan Shepard first American in space 1961	6 Groundbreaking for the John J. McCarthy Observatory (2000)	7 Distant flyby of Saturn's largest moon Titan by the Cassini spacecraft 16th Anniversary (1997), Galileo, Ganymede 8 Flyby	8 First snapshot of Earth and its moon, captured by NASA's Mars Global Surveyor (MGS) spacecraft while orbiting Mars (2003)	9 Launch of MUSES-C (Hayabusa), Japanese sample mission to asteroid Itokawa (2003) First Earth-based laser aimed at Moon crater Albategnius (1962) 2nd Saturday Stars Open House McCarthy Observatory Hubble Birthday Party
10 Estherville, Iowa meteorite shower - 1897 Konstantin Eduardovitch Tsiolkovsky, Russian Rocketry Pioneer created his calculations about space flight theory - 1897	11 Space Shuttle Atlantis, last Hubble Space Telescope Servicing Mission (2009)	12 First planetarium in U.S. (Adler) opens in Chicago (1930) NASA astronaut, Gregory Harold "Box" Johnson born, veteran of two space flights, STS-123 and STS-134 (1962)	13 Launch of first Bumper rocket, from White Sands New Mexico (1948)	14 Moon at Perogee (Closest to Earth) Griffith Observatory opens in Los Angeles (1935). Launch of Skylab 1973 Early liquid fueled rockets:German Society for Space Travel (1931); American Interplanetary Society (1933)	15 6th docking of a space shuttle (Atlantis) with Russian space station Mir (1997) Launch of Faith 7 - Final Mercury mission 1963	16 Soviet spacecraft Venera 5, 6 send data on Venus, then impact planet May 16-17,(1969) Space Shuttle Endeavour final launch (2011)
17 Norman Lockyer born, co-discoverer of helium (1836) Discovery of Jupiter's cloud belts by Italian Jesuit, astronomer, and physicist Niccolo Zucchi (1630)	18 Apollo 10 to Moon Young/Stafford/ Cernan (1969)	19 Launch of first Army Hermes A-1 rocket from White Sands, NM (1950)	20 Launch of Pioneer Venus 1 spacecraft (1978)	21 Launch of Japanese Venus Climate Orbiter Akatsuki or Planet-C spacecraft and the Ikaros solar sail (2010)	22 Space X first successful commercial launch of spacecraft to the ISS, Cape Canaveral (2012) First Hubble images of Saturn ring plane as the rings are edge-on to the Sun, viewed from Earth (1995)	23 Cassini spacecraft 91st flyby of Saturn's moon Titan (602 miles, or 970 kilometers). Dr. H. Paul Shuch born, American scientist and engineer, hasled radio amateurs in the search for extraterrestrial intelligence (1946)
24 Launch of Midas 2, 1st experimental infrared surveillance satellite 1960 Scott Carpenter, second American in space (1962)	25 Launch of Skylab 1 crew (1973 Comet Halley chronicled by Chinese astronomers (240 BC) Phoenix spacecraft lands on Martian soil 2008 JFK Moon goal speech (1961)	26 Moon at apogee (farthest from Earth) Launch of first "Navaho Missile", ICBM precursor (1948)	27 Lawrence Maxwell Krauss born, Canadian-American theoretical physicist and author The Physics of Star Trek and A Universe from Nothing (1954)	28 Abel and Baker 1st primates in orbit (1959) Frank Drake born, author of "the Drake Equation" on intelligent life (1930) Launch of Mars 3 (USSR) lander and rover - 1st spacecraft to attain soft landing on Mars (1971)	29 Launch of Luna 22 (USSR), orbiter mission to study the Moon's magnetic field, geology and gravitation (1974) Measurements during solar eclipse confirm Einstein's relativity theory - 1919	30 Mariner 9, 1st artificial satellite of Mars (1971) Launch of Surveyor 1 Moon lander; transmitted over 11,000 images from Oceanus Procellarum (1966)
31 European Space Agency Born 1975						

Phases of the Moon